RICHIESTA DI OFFERTA PER FASE SUCCESSIVA DI PROGRAMMA SPAZIALE

Agenzia Spaziale Italiana
Roma, via del Politecnico snc
00133 Roma

Procedura negoziata esperita in attuazione dell'art. 135 e nel rispetto dei principi di cui agli artt. 1, 2 e 3 del D. Lgs. n. 36/2023 e ss.mm.ii. per l'affidamento di servizi di ricerca e sviluppo inerenti

per l'affidamento dei servizi di ricerca e sviluppo di
Fase "C/D/E1" del Programma "EarthNext "
Rif. CONTRATTO ASI n. 2022-14-I.0

CIG B6B945FA23

TERMINE DI SCADENZA PER LA PRESENTAZIONE DELLE OFFERTE: 18/07/2025 ORA 12:00:00

Direzione Generale

Spett.le
Officina Stellare S.p.A.
Via della Tecnica 87/89
36030 Sarcedo (VI)
c.a. Gino Bucciol
p.c. Annalisa Capanni
Andrea Alberti
Lorenzo Iannascoli

PEC officinastellare@legalmail.it

Oggetto: Richiesta d'Offerta per le Attività di fase C/D/E1 di *EarthNext – Closer to the Earth, Next to the Future* del programma ALCOR, ai sensi di quanto previsto dall'art. 135 e degli artt. 1, 2 e 3 del D. Lgs. n. 36/2023. CIG B6B945FA23

Contesto programmatico

Il progetto "**EarthNext – Closer to the Earth, Next to the Future"** rientra nelle iniziative del programma ALCOR, il programma dell'Agenzia Spaziale Italiana dedicato allo sviluppo di missioni con piattaforme *CubeSat* e relative tecnologie abilitanti che ha fortemente consolidato la leadership italiana nel settore a livello europeo ed internazionale. Le missioni del programma ALCOR coprono una vasta gamma di applicazioni fra le quali l'osservazione della Terra con satelliti in VLEO *(Very Low Earth Orbit)*.

Descrizione dell'obiettivo dell'attività richiesta

Nell'ambito del progetto "*EarthNext – Closer to the Earth, Next to the Future"* è intenzione dell'Agenzia Spaziale Italiana realizzare una missione per:

- dimostrare operazioni in VLEO mediante piattaforme *CubeSat*, utilizzando a bordo un sistema di propulsione elettrica compatto finalizzato a compensare il decadimento orbitale generato dalla resistenza atmosferica alle quote di interesse;
- dimostrare la capacità di *CubeSat* operanti in VLEO di fornire prodotti di valore aggiunto per applicazioni terrestri e marittime attraverso l'acquisizione di immagini multi-spettrali ad alta risoluzione.

Oggetto della richiesta d'offerta

La presente Richiesta d'Offerta ha per oggetto **la progettazione di dettaglio, la realizzazione e la verifica dello *Space Segment* e del *Ground Segment* della missione EarthNext (fase C/D**). Dovrà inoltre includere con quotazione separata anche le attività propedeutiche al lancio e le operazioni in orbita relativamente alla fase di LEOP, IOT e *Commissioning* (fase E1), in accordo a quanto dettagliato all'interno del Capitolato Tecnico allegato alla presente.
Tutte le attività sono descritte nel dettaglio del Capitolato tecnico del progetto.

Tali attività sono da intendersi per servizi di ricerca e sviluppo e, in quanto tali, identificabili con il codice del *Common Procurement Vocabulary* (CPV) 73300000-5 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 dello stesso, in quanto non ricorre il caso di cui alla lettera a) che recita "i risultati appartengono esclusivamente alla stazione appaltante, per essere destinati all'esercizio della propria attività". Infatti, pur mantenendo l'ASI la proprietà intellettuale dei risultati dell'attività affidata, gli stessi potranno essere messi a disposizione della comunità scientifica e tecnologica nazionale, secondo le modalità definite da ASI nel proprio Regolamento e nel rispetto della disciplina relativa alla tutela del *background Intellectual Property Rights* degli Operatori Economici.

Si chiede, pertanto, di voler formulare la Vostra migliore offerta per quanto sopra descritto nei limiti di un importo massimo complessivo di **€ 7.477.480,00 (IVA non imponibile 8 bis)** per una durata di **40 mesi**.

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

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.

Le attività proposte con il presente provvedimento sono non imponibili ai fini I.V.A. ai sensi dell'art. 8 bis, lettera e) del D.P.R. 26/10/1972, n. 633 e successive modificazioni, in quanto concernenti prestazioni di servizi relativi alla costruzione, assiemaggio, allestimento, manutenzione di satelliti, reso applicabile all'ASI dall'art. 34 bis del D.L. 02/03/1989, n. 69, articolo aggiunto dalla legge di conversione n. 154 del 27/04/1989;

Modalità di presentazione

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 **il 18/07/2025**.

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 30 dicembre 2024, n. 598 recante "Attuazione dell'articolo 1, commi 65 e 67, della legge 23 dicembre 2005, n. 266 per l'anno 2025", 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.

Il Responsabile Unico del Progetto è il Dott. Vincenzo Pulcino, mail vincenzo.pulcino@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.

In sede di contrattualizzazione ASI provvederà alle verifiche in merito all'assenza dei motivi di esclusione di cui agli artt. 94 e 95 del D. Lgs. n. 36/2023 s.m.i.., nonché in ordine alla sussistenza dei requisiti di carattere generale, professionale, di capacità tecnica richiesti per l'esecuzione del contratto.

La stipulazione del contratto è in ogni caso subordinata al positivo esito delle procedure previste dalla normativa vigente in materia di lotta alla mafia, fatto salvo quanto previsto dall'art. 88 comma 4-bis e 89 e dall'art. 92 comma 3 del d.lgs. 6 settembre 2011 n. 159 (c.d. Codice Antimafia).

Trattamento dei dati personali

Ai sensi degli artt. 13 e 14 Regolamento (UE) 2016/679 ("GDPR") si informa che i dati personali forniti saranno trattati a cura delle persone a tale scopo preposte, esclusivamente per le finalità connesse alla partecipazione alla presente procedura e per gli eventuali adempimenti successivi sulla base della necessità di adempiere a obblighi giuridici che regolano le procedure di affidamento (art. 6 § 1 lett. c) GDPR). 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 tempo massimo di conservazione dei dati personali di norma non sarà superiore a dieci anni successivi alla conclusione delle attività contrattuali, salvo che la normativa applicabile imponga di conservarli per un periodo superiore, o che la conservazione sia necessaria a tutela dei diritti e/o interessi legittimi dell'Agenzia.
Il Titolare del trattamento è l'Agenzia Spaziale Italiana (ASI) con sede legale in Roma, Via del Politecnico s.n.c., PEC asi@asi.postacert.it.
Il conferimento dei dati personali richiesti è obbligatorio ai fini della partecipazione alla presente procedura, ed un eventuale rifiuto a fornirli non consente la partecipazione alla stessa.
L'interessato gode dei diritti di cui agli artt. 15 e seguenti 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 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, come previsto dall'art. 77 del GDPR stesso, o di adire le opportune sedi giudiziarie (art. 79 del GDPR).

Cordiali saluti,

IL DIRETTORE GENERALE
Luca Vincenzo Maria SALAMONE

Luca Vincenzo
Maria Salamone

Allegati:

- Capitolato Tecnico per il progetto “EarthNext – Fasi C/D/E1”
- DC-SQA-2025-005 - Earthnext SMA&E Objectives
- DC-SQA-2025-006 - EarthNext PA Requirements
- DC-SQA-2025-007 - Earthnext Deliverable Requirement Document Definition
- OP-UPQ-2016-004 Preparazione Offerta
- MO-UPQ-2017-007 Fac-Simile Lettera Trasmissione

Progetto "EarthNext – Closer to the Earth, Next to the future" – Fasi C/D/E1

	UNITÀ / NOME	FIRMA	DATA
PREPARATO	*UOT* – Giuseppe Leccese *SQA* – Marianna Rinaldi	Giuseppe Leccese 06.05.2025 11:55:11 GMT+02:00 Marianna Rinaldi 06.05.2025 12:24:29 GMT+02:00	
VERIFICATO	*UOT* – Vincenzo Pulcino	Vincenzo Pulcino 06.05.2025 12:31:26 GMT+02:00	
APPROVATO	*UOT* – Vincenzo Pulcino		

Registro delle modifiche

Data	Sezione del documento / Motivo della revisione	Revisione
10-02-2025	Prima emissione formale	A

ALLEGATI:

Allegato 1: Documentazione da consegnare

Allegato 2: Hardware e software oggetto di fornitura

Allegato 3: CFI ASI

DISTRIBUZIONE DEL DOCUMENTO:

Allegato alla Richiesta d'Offerta

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ALLEGATI

Allegato 1: Documentazione da consegnare

Allegato 2: Hardware e software oggetto di fornitura

Allegato 3: CFI ASI

1.0 SCOPO E CAMPO D'APPLICAZIONE

Questo documento costituisce il Capitolato Tecnico (CT) allegato alla Richiesta d'Offerta dell'Agenzia Spaziale Italiana (ASI) per il progetto "*EarthNext - Closer to the Earth, Next to the Future" – Fasi C/D/E1*.

I requisiti specificati nel presente documento devono essere resi applicabili a tutta la struttura industriale coinvolta nel processo d'Offerta.

2.0 DEFINIZIONI ED ACRONIMI

2.1 DEFINIZIONI

Le definizioni contenute nello standard ECSS-P-001 sono applicabili.

2.2 ACRONIMI

AI	Action Item
AIV	Assembly Integration and Verification
AIT	Assembly Integration and Testing
AIVT	Assembly Integration Verification and Testing
ASI	Agenzia Spaziale Italiana
ATG	Allegato Tecnico Gestionale
C1RR	Commissioning 1 Results Review
C2RR	Commissioning 2 Results Review
CAD	Computer-Aided Design
CDR	Critical Design Review
CE	Camera Electronics
CGA	Capitolato Generale dell'ASI
CFI	Customer Furnished Items
CI	Configuration Item
COTS	Component Off The Shelf
CT	Capitolato Tecnico
DA	Documento Applicabile
DCL	Declared Component List
DDF	Deign Definition File
DDP	Design Development Plan
DML	Declared Material List
DMPL	Declared Materials and Processes List
DPL	Declared Process List

DR	Documento di Riferimento
ECSS	European Cooperation for Space Standardization
EIDP	End Item Data Package
EM	Engineering Model
EPS	Electrical Power System
EQM	Engineering Qualification Model
EQSR	Equipment Qualification Status Review
ESA	European Space Agency
FM	Flight Model
FPA	Focal Plane Assmebly
FRR	Flight Readiness Review
GS	Ground Segment
GNC	Guidance Navigation and Control
GSE	Ground Support Equipment
GSRD	Ground Segment Requirements Document
HDRM	Hold Down & Release Mechanism
HW	HardWare
ICD	Interface Control Document
IOD	In-Orbit Demonstration
IOT	In-Orbit Testing
HW	HardWare
KOM	Kick-Off Meeting
LE	Launch Event
LEOP	Launch and Early Orbit Phase
LRR	Launch Readiness Review
MAIT	Manufacturing Assembly Integration and Testing
MOC	Mission Operation Centre
OBAI	On-Board Artificial Intelligence
OBC	On-Board Computer
PA	Product Assurance
PDGS	Payload Data Ground Segment
PDR	Preliminary Design Review
PFM	Proto-Flight Model
PMI	Piccole e Medie Imprese

PPDS	Platform and Payload Data System
PT	Product Tree
QA	Quality Assurance
QAR	Qualification Acceptance Review
QM	Qualification Model
QSL	Qualification Status List
RCR	Requirements Consolidation Review
RdO	Richiesta d'Offerta
RF	Radio Frequency
RFD	Request for Deviation
RFW	Request for Waiver
RID	Review Item Discrepancy
SEP	System Engineering Plan
SPDM	Solar Panel Deployment Mechanism
SQA	Servizio Quality and Product Assurance
SGICD	Space-to-Ground Interface Control Document
S/S	Sub-System
STOM	Structural Thermal and Optical Model
SW	SoftWare
TMA	Three Mirror Anastigmatic
TRB	Test Review Board
TRR	Test Readiness Review
TT&C	Telemetry Tracking and Control
UOT	Unità Osservazione della Terra
VCD	Verification Control Document
VLEO	Very Low Earth Orbit

3.0 DOCUMENTAZIONE APPLICABILE E DI RIFERIMENTO

3.1 DOCUMENTAZIONE APPLICABILE

I seguenti documenti costituiscono parte integrante del Capitolato Tecnico secondo la priorità definita al 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*

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

GESTIONE

[DA 03] *Istruzione Operativa "Capitolato gestionale delle Richieste d'Offerta dell'ASI" – Doc. OP-IPC-2005-010*

[DA 04] *Istruzione Operativa "Requisiti per la preparazione della Work Breakdown Structure (WBS)" – Doc. OP-IPC-2005-002*

[DA 05] *ECSS-S-ST-00-01C, Glossary of terms (*)*

[DA 06] *ECSS-M-ST-10C Rev.1, Project planning and implementation (*)*

PRODUCT ASSURANCE

[DA 07] *DC-SQA-2025-005 - Earthnext SMA&E Objectives*

[DA 08] *DC-SQA-2025-006 - EarthNext PA Requirements*

[DA 09] *DC-SQA-2025-007 - Earthnext Deliverable Requirement Document Definition*

[DA 10] *Sistemi di Gestione per la Qualità, UNI EN ISO 9001:2015*

INGEGNERIA E TECNICI

[DA 11] *Mission Requirements Document (MRD) OC22031-SPE-00006, EarthNext Mission Requirements Document Issue1.1*

[DA 12] *System Requirements Document (SRD) OC22031-SPE-00009, EarthNext System Requirements Document Issue 2.1*

[DA 13] *EIDP, EarthNext PDR Phase A/B*

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

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 standards (*)

[DR 2] Tailored ECSS Engineering Standards for In-Orbit Demonstration CubeSat Projects, TEC-SY/128/2013/SPD/RW Issue 1 Revision 3

[DR 3] CubeSat Design Specification (1U -12U), CP-CDS-R14, Revision 14

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

3.3 ORDINE DI PRECEDENZA

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

- lettera di RdO
- Capitolato Generale dell'ASI (CGA)
- il presente CT
- i DA 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.

4.0 OBIETTIVI ED ATTIVITÀ

4.1 CONTESTO DI RIFERIMENTO

Il settore dei CubeSat, è una realtà consolidata nello scenario spaziale, e costituisce uno strumento affidabile caratterizzato da tecnologie all'avanguardia, tali da permetterne l'impiego in una vasta gamma di applicazioni e servizi. Le piattaforme CubeSat, sfruttando opportunità di lancio a basso costo, permettono di imbarcare tecnologie per una dimostrazione in orbita in tempi brevi, inoltre possono concorrere ad abilitare nuovi concetti di missione, anche in supporto di satelliti "tradizionali".

Negli ultimi anni ASI sta investendo in questo settore, sia in ambito nazionale che attraverso programmi dell'European Space Agency (ESA), per la realizzazione di missioni CubeSat e per lo sviluppo di equipaggiamenti di bordo. Tali attività pongono di fatto il nostro Paese all'avanguardia nel panorama mondiale, grazie al nutrito numero di Piccole e Medie Imprese (PMI) ad alta tecnologia presenti nel settore.
I satelliti in orbita terrestre molto bassa (VLEO) stanno diventando sempre più importanti nei programmi privati e governativi per le operazioni civili, con applicazioni che vanno dall'osservazione della Terra alle previsioni meteorologiche dalle telecomunicazioni all'accesso a Internet in aree rurali. Per VLEO si intendono le orbite comprese tra 250 e 400 km di altitudine al di sopra della superficie terrestre, la gamma di altitudini più bassa per cui un satellite può orbitale sostenendo funzioni e servizi operativi per uno scopo e con una ragionevole aspettativa di vita.
Le operazioni dei satelliti in VLEO offrono diversi vantaggi rispetto alle missioni ad altitudini più elevate, per citarne alcuni: una risoluzione spaziale più elevata, potenziali costi di missione più bassi, rischio ridotto di collisione con detriti orbitali e di danni da radiazioni, maggiore capacità del veicolo di lancio e de-orbiting a fine vita più agevole. Inoltre, la latenza delle comunicazioni è ridotta e il link budget di comunicazione è più favorevole grazie alle minori perdite di propagazione.
Diverse entità istituzionali e industriali, perlopiù di nazioni che hanno una vocazione spaziale, si stanno già concentrando sulla tecnologia VLEO e sulle relative applicazioni satellitari. Tra gli esempi più significativi, passati e futuri, di tali missioni, si possono citare GOCE (ESA); SLATS (JAXA); DISCOVERER/SOAR (Horizon/University of Manchester); OTTER (DARPA); ALBEDO Satellite Constellation/10cm (USA/ALBEDO); la costellazione di satelliti STINGRAY (USA/EOI) e LolaSat (ESA/Smart Small Satellite Systems). Molte aziende, come Smart Small Satellite Systems GmbH, Kreios Space, Thales Alenia Space, Cubecab e Skeyeon, stanno sviluppando soluzioni innovative per superare le sfide uniche associate al funzionamento in VLEO. Ad esempio, l'europea Kreios Space sta sviluppando un sistema di propulsione ad aria compressa per i satelliti in VLEO, mentre la statunitense Skeyeon ha brevettato un motore a ioni autosufficiente.

In conclusione, la tecnologia satellitare per il volo in VLEO rappresenta un campo in rapida evoluzione con un potenziale significativo per le applicazioni commerciali, scientifiche e militari. Nonostante le sfide, i vantaggi di operare in VLEO danno vita ad un'area molto promettente per gli investimenti futuri.

4.2 DESCRIZIONE DELLA FORNITURA

Le attività oggetto di questo CT riguardano le fasi C, D e E1 della missione EarthNext, in particolare:

- Durante la fase C, che va da T0 a T0+22 mesi, e si conclude con la Critical Design Review (CDR), verranno:
  - consolidati i requisiti ai diversi livelli di integrazione del sistema
  - valutata lo stato di qualifica dei sottosistemi COTS
  - integrati e verificati lo Structural Thermal and Optical Model (STOM) del CubeSat e l’Engineering Model (EM) del CubeSat
  - presentato il design di dettaglio della missione, del sistema, dei segmenti e dei sottosistemi
  - presentati i risultati delle analisi termo-meccaniche di dettaglio
  - confermata la compatibilità dei segmenti e dei sottosistemi con le interfacce esterne ed interne
  - presentati i piani di assemblaggio e collaudo (AIVT plan)
  - presentati i piani preliminari di LEOP, IOT e commissioning
- Durante la fase D, che va da T0+22 mesi a T0+28 mesi, e si conclude con la Qualification Acceptance Review (QAR), verranno:
  - realizzati e verificati i sottosistemi secondo i modelli riportati nelle note all’Allegato 2;
  - verificata la compatibilità dei segmenti e dei sottosistemi con le interfacce esterne ed interne;
  - integrato e verificato il Proto-Flight Model (PFM) del CubeSat;
  - integrato nel dispenser e affidato al provider di lancio o equivalente il CubeSat PFM.
- Durante la fase E1, che va da T1-1 mesi a T1+11 mesi, e si conclude con la Commissioning 2 Results Review (C2RR), verrà:
  - eseguito dal CubeSat carrier il trasferimento orbitale fino all’orbita di parcheggio;
  - rilasciato il CubeSat nell’orbita di parcheggio;
  - effettuato un primo commissioning, propedeutico alle operazioni di discesa in VLEO;
  - eseguito dal CubeSat il trasferimento orbitale fino alla VLEO obiettivo;
  - effettuato un secondo commissioning, propedeutico alle operazioni di utilizzo.

La fornitura associata alle attività descritte di fase C/D/E1 consiste nella documentazione riportata in Allegato 1, nell’HW/SW riportato in Allegato 2, e quanto richiesto a corredo delle attività durante lo svolgimento delle stesse.

4.3 DESCRIZIONE E REQUISITI DELLE ATTIVITÀ

4.3.1 Attività di gestione

Il Contraente è responsabile dell'esecuzione delle attività oggetto del Contratto, nonché di tutte le attività non esplicitamente individuate, ma necessarie alla completa e conforme esecuzione del Contratto, ed in particolare per:

- il raggiungimento degli obiettivi nel rispetto dei requisiti e dei vincoli;
- la definizione, l'esecuzione e la gestione delle relative attività;
- l'acquisizione degli elementi (autorizzazioni, licenze, etc) a tal fine necessari;
- la realizzazione degli elementi Hardware (HW) e SW da realizzare.

La compliance ai requisiti/obiettivi contenuti in [AD07] dovrà essere riportata dal Contraente mediante una implementation matrix/compliance matrix all'interno del Verification Control Document (VCD). The implementation/compliance matrix sarà verificata nel corso delle review.

Il Contraente dovrà garantire a tutti i componenti del team di gestione ASI il pieno accesso ad informazioni, siti ed attività secondo le prescrizioni contrattuali.

Qualora, nel corso delle attività, emergesse la necessità di specificare meglio i requisiti e/o di intraprendere soluzioni differenti da quelle inizialmente previste, il Contraente dovrà farsi parte attiva affinché questo avvenga nel rispetto dei vincoli di programma ed al fine del pieno raggiungimento delle funzionalità/prestazioni/operatività contrattualmente definiti.

Il Contraente deve soddisfare i requisiti inclusi nei documenti contrattuali.

Il Contraente dovrà definire un planning contrattuale.

Il planning contrattuale dovrà essere gestito in modo da permettere la piena visibilità del progetto.

Il contenuto della pianificazione sarà aggiornato secondo la frequenza concordata con ASI e comunque in occasione di ogni milestone contrattuale con l'obiettivo di mantenere gli eventi a contratto.

La pianificazione operativa dovrà evidenziare e permettere di monitorare eventuali cammini critici di progetto.

Dovrà essere eseguita un'analisi dei rischi. Verranno analizzati sia i rischi esterni al progetto che quelli legati agli elementi fondamentali della missione.

I rischi verranno definiti, categorizzati e monitorati seguendo le normative ECSS.

Per ogni rischio individuato dovranno essere proposte e, eventualmente, implementate delle azioni per la mitigazione del rischio stesso. Il Contraente è responsabile della gestione dei rischi e delle azioni da attuare, l'individuazione di rischi non comporta nessun onere aggiuntivo a carico di ASI.

Il team di gestione ASI controllerà che i rischi di progetto vengano correttamente individuati, adeguatamente tracciati e comunicati a tutti i livelli pertinenti nell'ambito del progetto.

La corretta esecuzione dei lavori e il rispetto dei requisiti contrattuali e di pianificazione sarà svolta dal team di gestione del progetto attraverso le seguenti attività:

- controllo dell'avanzamento;
- controllo della configurazione;
- product assurance.

Le modalità di controllo stabilite tra ASI ed il Contraente saranno applicate dal Contraente anche a tutti i componenti del team del Contraente, al fine di conseguire un'uniforme modalità di valutazione e pervenire a meccanismi di consuntivazione omogenei che consentano ad ASI la verifica.

Il controllo dell’avanzamento dei lavori avviene tramite la verifica del consuntivo delle attività e la verifica del raggiungimento degli obiettivi degli eventi contrattuali. Lo stato di avanzamento del progetto sarà valutato da ASI e formalmente quantificato in occasione degli eventi chiave contrattuali con cadenza bi-mensile.

Il processo di controllo e le procedure stabilite tra l’ASI ed il Contraente dovranno essere resi applicabili all’intero team del Contraente.

Nel corso degli eventi contrattuali (review o milestone) il Contraente dovrà dare evidenza del lavoro svolto fino alla data della milestone. Alle review saranno discusse le eventuali criticità emerse nel corso della gestione del progetto e le relative azioni correttive. La review dovrà coprire gli aspetti contrattuali, gestionali, di pianificazione e tecnici del progetto.

Il Contraente dovrà mantenere un elenco aggiornato delle azioni aperte nel corso del progetto, identificate in maniera univoca, che fornirà ad ASI in occasione degli eventi chiave contrattuali.

Il Contraente sarà responsabile della gestione delle Review Item Discrepancies (RIDs) e Action Items (AIs) che siano stati generati nel corso di riunioni o review o assegnati al Contraente dall’ASI attraverso comunicazioni formali.

4.3.2 Product assurance

Include la gestione di qualità del prodotto, da effettuarsi secondo gli standard europei ECSS adattati a missioni CubeSat, con riferimento sia alla fase progettuale che realizzativa e di qualità della fornitura. Il Contraente fornirà attività di qualità in accordo a quanto descritto dai WP specifici relativi alla PA. I requisiti minimi di Product Assurance (PA) richiesti sono quelli previsti in [DA 08].

4.3.4 Approvvigionamenti

La selezione delle fonti di approvvigionamento, il controllo dei documenti di acquisto e l'ispezione degli articoli in entrata sono coperti dai requisiti Quality Management System dello standard ISO 9001.

La funzione PA parteciperà e approverà la selezione delle fonti di approvvigionamento e i criteri di selezione. Considererà inoltre la capacità continua dimostrata dal Fornitore (negli ultimi due anni) di fornire articoli o servizi del tipo e del livello di qualità oggetto dell'approvvigionamento.

I registri delle fonti di approvvigionamento coinvolte nell'esecuzione del Contratto saranno stabiliti e mantenuti.

Su richiesta, l'elenco delle fonti di approvvigionamento, comprensivo di tutte le informazioni contenute nei registri di cui sopra, sarà a disposizione dell'ASI per conoscenza.

Le forniture saranno identificate con precisione e tutti i requisiti applicabili saranno adeguatamente definiti nei documenti di approvvigionamento.

Verranno conservate le registrazioni di tutta la documentazione relativa agli appalti, compresi i rapporti di ispezione in entrata e le ricevute delle merci.

4.3.5 MAIT

Saranno adottate le linee guida in relazione all’hardware di volo riportate in [DA 07].

Gli standard di lavorazione devono essere impiegati per garantire una qualità di lavorazione accettabile e costante. Se necessario, devono essere inclusi campioni fisici o ausili visivi.

La maggior parte dei processi da utilizzare deve derivare da precedenti applicazioni simili.

Eventuali processi critici, se presenti, devono essere valutati.

Devono essere implementate disposizioni per un'identificazione positiva dello stato di ispezione e collaudo di qualsiasi articolo in qualsiasi fase del ciclo di produzione, assemblaggio e integrazione, a partire dall'ispezione in entrata fino alla spedizione dell'articolo finale.

Gli articoli da lavorare o fabbricare in un ambiente controllato devono essere ispezionati e testati in un ambiente simile per evitare il degrado della qualità.

La contaminazione deve essere prevenuta nella massima misura operando in aree di lavoro pulite e mediante un'adeguata manipolazione, conservazione, imballaggio e stoccaggio.

La sensibilità dei componenti del satellite alla contaminazione sarà valutata e i requisiti di pulizia saranno definiti durante il ciclo di fabbricazione, assemblaggio e integrazione, a partire dall'ispezione in entrata fino alla spedizione dell'articolo finale.

L'hardware di volo deve essere immagazzinato e trasportato nell'ambiente pulito richiesto al fine di mitigare il rischio di contaminazione su superfici sensibili.

Misure di protezione specifiche, come coperture antipolvere protettive, devono essere attuate per proteggere gli elementi sensibili alla contaminazione quando sono integrati in un livello superiore di assemblaggio.

Tutte le forniture in entrata e la relativa documentazione devono essere ispezionate prima dell'uso, per verificarne la conformità ai documenti di procurement.

Le ispezioni devono essere eseguite in conformità con le procedure e le istruzioni stabilite, per garantire che il livello di qualità sia adeguatamente determinato.

Le attività di ispezione in entrata devono essere documentate.

I log-book che coprono le attività di integrazione e test devono essere preparati e mantenuti dopo la produzione e l'assemblaggio degli articoli.

I registri devono contenere informazioni storiche, significative per il funzionamento dell'articolo, comprese le non conformità, le deviazioni e le attività aperte.

Le attività di verifica devono essere eseguite in modo incrementale a diversi livelli e in diverse fasi, applicando un coerente concetto di building block dal basso verso l'alto e utilizzando un'adeguata combinazione di diversi metodi di verifica.

Il processo di verifica deve considerarsi completato quando l'ASI ed il Contraente concordano reciprocamente che, sulla base di idonee evidenze documentate, i requisiti identificati sono stati verificati e gli obiettivi di verifica associati sono stati pienamente raggiunti.

4.3.6 Trasporti, logistica, supporti operativi ed assistenza tecnica

Il Contraente effettuerà a suo rischio i trasporti in Italia ed all'estero di tutte le apparecchiature, unità integrate e di quant'altro previsto per l'esecuzione del Contratto, come indicato nell'Allegato Tecnico Gestionale (ATG).

Le relative spese di imballaggio e trasporto, assicurazione, manutenzione in via, etc., sono a carico del Contraente.

Il Contraente ha l'obbligo di assicurare tutti i beni oggetto del presente Contratto, di cui all'ATG, contro i rischi di furto, incendio, perdita e distruzione fino al momento indicato in Contratto.

Il Contraente sarà tenuto a rinnovare in tempo utile le polizze di assicurazione in scadenza, restando, in caso contrario, responsabile di qualsiasi danno che possa derivare all'ASI per mancato rinnovo dell'assicurazione.

4.3.7 Attività di collaudo, accettazione e consegna

L’accettazione da parte dell’ASI del prodotto definito nell’ATG è subordinata all’emissione, da parte del Contraente, di tutta la documentazione ivi prevista.

Entro 10 giorni lavorativi dall’approvazione da parte ASI del Certificato di Verifica di Conformità che abbia avuto esito positivo, l’ASI comunicherà l’accettazione finale del prodotto previste dagli allegati all’ATG.

4.3.8 Servizi di lancio

Il Contraente sarà responsabile dell’esecuzione/fornitura di tutte le attività/input tecnici e programmatici necessari a consentire il procurement dei servizi di lancio e del lanciatore da parte dell’ASI assicurando la coerenza e la compatibilità con il progetto ed i vincoli programmatici. A titolo esemplificativo ma non esaustivo il Contraente dovrà fornire piani e analisi, acquisire licenze ed autorizzazioni, definire le interfacce e procurare ogni item necessario correlato al sistema di lancio.

Il Contraente dovrà condurre la campagna di lancio, in stretto coordinamento con l’ASI, fornendo tutto il personale e gli equipaggiamenti necessari alla ricezione e verifica del satellite al sito di lancio, alla sua integrazione sul lanciatore, alla successiva attività di testing e supporto al lancio. Il Contraente dovrà inoltre garantire la partecipazione a tutte le review/meeting correlate al lancio e la fornitura di informazioni, documentazione e certificazioni eventualmente richieste dal provider di lancio.

4.3.9 LEOP, IOT e Commissioning

Il Contraente dovrà effettuare le attività di Launch and Early Orbit Phase (LEOP), In-Orbit Testing (IOT) e Commissioning, allo scopo di determinarne la prontezza ad entrare nella successiva fase di operazioni (E2, non inclusa nella presente RdO) garantendo i livelli di performance e di qualità attesi.

Le attività di LEOP prevedranno l’attivazione e verifica progressiva dei sottosistemi/unità di bordo al fine del raggiungimento del funzionamento nominale del sistema.

Le attività di IOT saranno volte a dimostrare le capacità funzionali, prestazionali, operative e logistiche del sistema, inclusa la sua calibrazione e caratterizzazione in orbita, in risposta a tutti i requisiti applicabili.

Il Commissioning, infine, avrà come obiettivo la qualifica operativa del sistema dando evidenza che ha un comportamento stabile in un periodo di tempo dato, entro parametri definiti e misurabili, così da poterne dichiarare l’idoneità all’entrata in servizio.

4.4 ALBERO DEL PRODOTTO

L’albero del prodotto riportato in Figure 1, Figure 2, Figure 3, Figure 4 e Figure 5 illustra in modo schematico l’oggetto prodotto dal progetto.

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

Ciascun elemento dell’albero del prodotto dovrà essere identificato mediante il numero di Configuration Item (CI).

L’elenco dei CI, consegnato in sede di Offerta, sarà aggiornato come necessario durante lo sviluppo del prodotto.

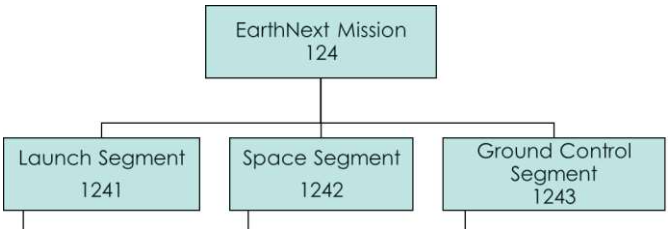


Figure 1 – Albero del prodotto a livello sistema

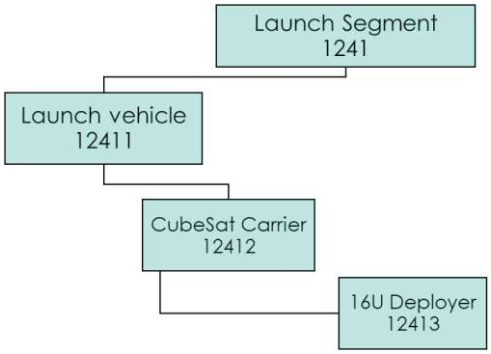


Figure 2 – Albero del prodotto del launch segment

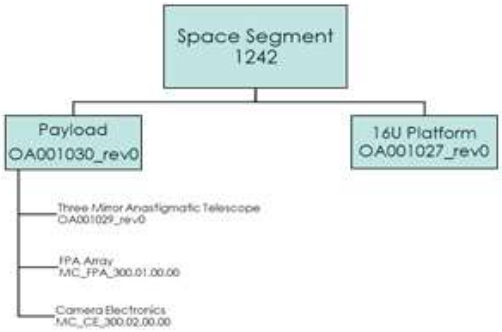


Figure 3 – Albero del prodotto dello space segment

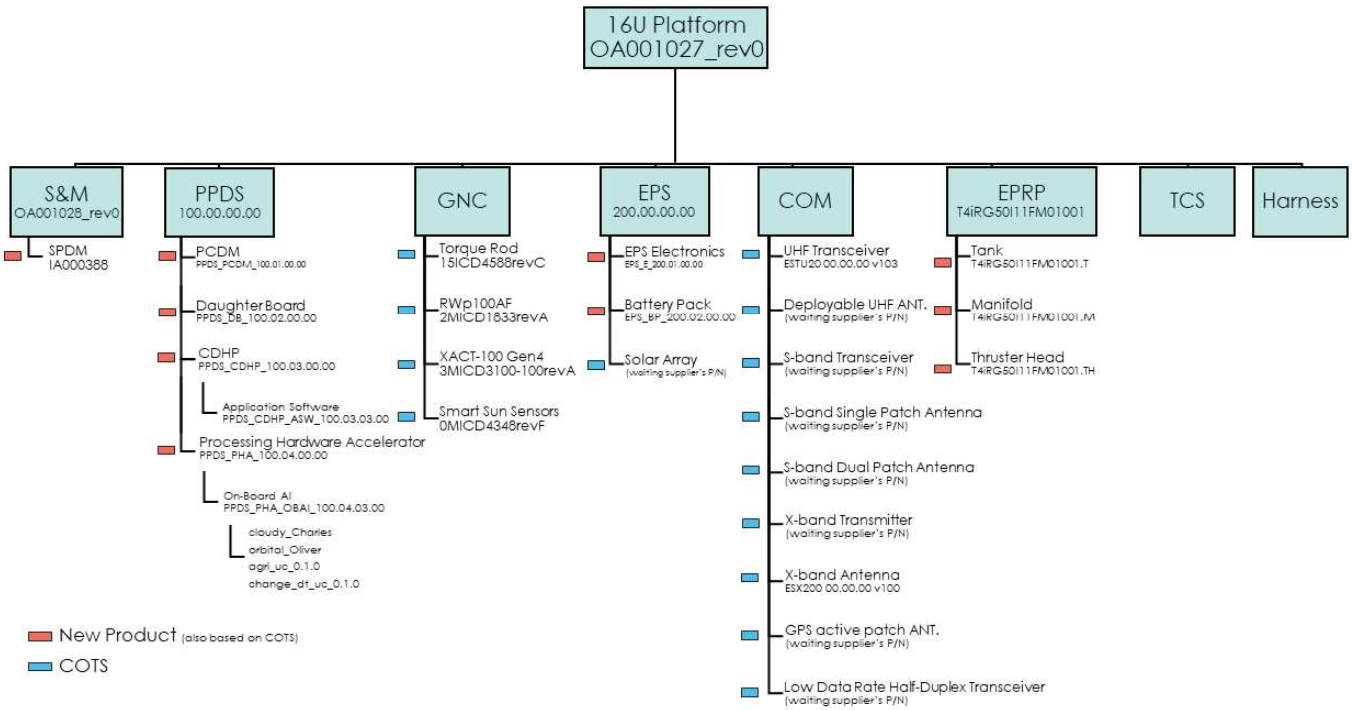


Figure 4 – Albero del prodotto della piattaforma

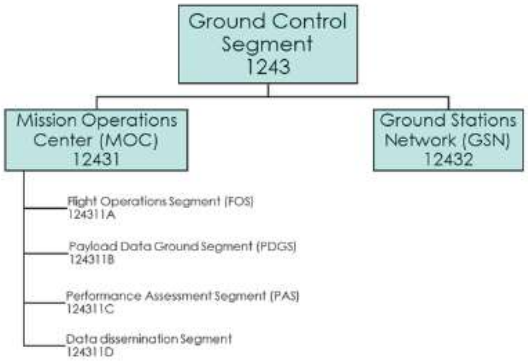


Figure 5 – Albero del prodotto del ground segment

4.5 FILOSOFIA DI SVILUPPO E DEI MODELLI

La filosofia dei modelli è basata sulla necessità di ridurre i rischi degli elementi critici il prima possibile e di ridurre il programma complessivo di sviluppo dei modelli.

Al termine della Fase B sono stati consegnati i breadboard di:

- Optomechanical S/S
- Solar Panel Release Mechanism (SPDM)
- Propulsion S/S
- OBC

- FPA Camera
- OBC SW

Nel corso delle Fasi C/D/E1, oggetto della RdO, verranno:

- Progettati e sviluppati i seguenti modelli strutturali relativi ad alcuni dei sottosistemi della piattaforma:
  - Structure STM;
  - TMA STOM;

  Che verranno integrati nel CubeSat STOM, insieme ai dummy dei S/S della piattaforma e al modello strutturale dei pannelli solari, con il relativo meccanismo di dispiegamento. Il CubeSat STOM verrà successivamente sottoposto a campagna di qualifica termomeccanica e ottica.
- Progettati, sviluppati e testati (qualifica) i seguenti modelli di qualifica relativi ad alcuni dei sottosistemi della piattaforma:
  - Propulsion S/S QM;
  - EPS S/S EQM;
  - FPA&CE EQM;
  - PPDS S/S EQM.

  Che verranno integrati nel CubeSat EM, costituito dallo Structure STM, contenente il TMA STOM, insieme ai modelli FM dei S/S COTS della piattaforma. Il CubeSat EM verrà successivamente sottoposto a campagna di verifica.
- Progettati e sviluppati i seguenti modelli strutturali relativi ad alcuni dei sottosistemi della piattaforma:
  - Structure PFM;
  - TMA PFM;

- Progettati, sviluppati e testati (accettazione) i seguenti modelli di volo relativi ad alcuni sottosistemi della piattaforma:
  - Propulsion S/S FM;
  - EPS S/S FM;
  - FPA&CE FM;
  - PPDS S/S FM.

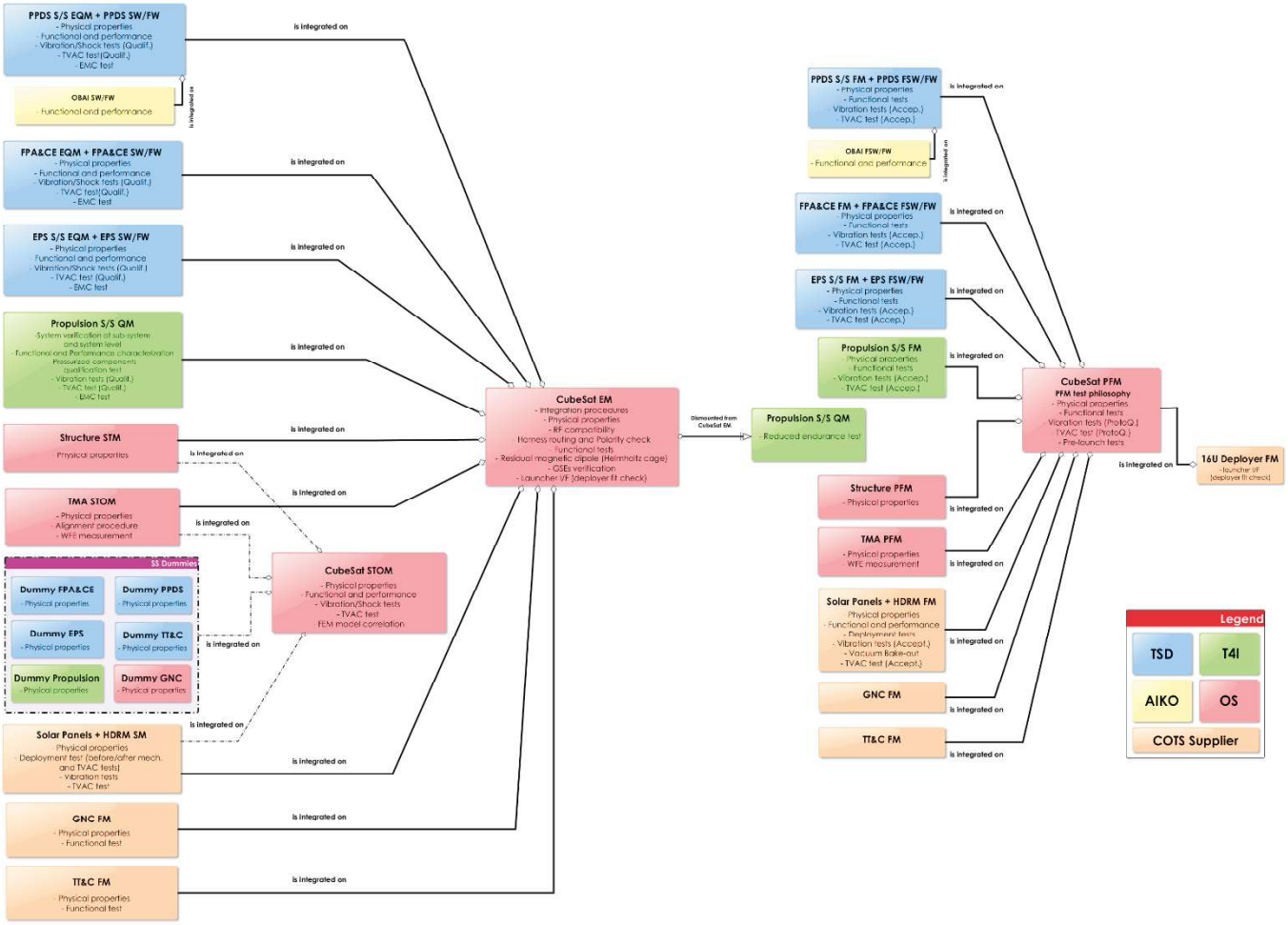
  Sia i modelli strutturali che i modelli di volo verranno integrati nel CubeSat PFM, insieme ai modelli FM dei S/S COTS della piattaforma. Il CubeSat PFM verrà successivamente sottoposto a campagna di proto-qualifica.

Nel corso delle Fasi C/D/E1, oggetto della RdO:

- Ogni modello HW (EQM/QM, FM) dei sottosistemi EPS, FPA&CE, PPDS sarà corredato da relativo applicativo software e sistema operativo. Nell'ambito di ogni modello HW si prevede di rilasciare varie versioni del software applicativo con una modalità di sviluppo incrementale (X.y dove X è la major release (release) e y la minor release (version)). Le major release saranno in

corrispondenza di milestone o fasi significative, come riportato in Allegato 2, e comprenderanno, con relativo tracciamento, qualsiasi modifica incorporata da una versione/release precedente.

- Verrà sviluppato e testato il GS MOC software, di cui si prevede di rilasciare varie versioni dell’applicativo con una modalità di sviluppo per funzioni incrementali (X.y dove X è la major release (release) e y la minor release (version)). Le major release saranno in corrispondenza di milestone o fasi significative, come riportato in Allegato 2, e comprenderanno, con relativo tracciamento, qualsiasi modifica incorporata da una versione/release precedente.
- Verrà sviluppato e testato l’OBAI software, di cui si prevede di rilasciare varie versioni dell’applicativo con una modalità di sviluppo per funzioni incrementali (X.y dove X è la major release (release) e y la minor release (version)). Le major release saranno in corrispondenza di milestone o fasi significative, come riportato in Allegato 2, e comprenderanno, con relativo tracciamento, qualsiasi modifica incorporata da una versione/release precedente.
- Verrà aggiornato, ove funzionalmente necessario, e testato il SW/FW del Propulsion S/S. Per ogni modello HW della fornitura, come da Allegato 2, sarà tracciato il SW/FW implementato a bordo.


PPDS S/S EQM + PPDS SW/FW
- Physical properties
- Functional and performance
- Vibration/Shock tests (Qualif.)
- TVAC test (Qualif.)
- EMC test
OBAI SW/FW
- Functional and performance
FPA&CE EQM + FPA&CE SW/FW
- Physical properties
- Functional and performance
- Vibration/Shock tests (Qualif.)
- TVAC test (Qualif.)
- EMC test
EPS S/S EQM + EPS SW/FW
- Physical properties
Functional and performance
- Vibration/Shock tests (Qualif.)
- TVAC test (Qualif.)
- EMC test
Propulsion S/S QM
System verification at sub-system and system level
- Functional and Performance characterization
Pressurized components qualification test
- Vibration tests (Qualif.)
- TVAC test (Qualif.)
- EMC test
Structure STM
- Physical properties
TMA STOM
- Physical properties
- Alignment procedure
- WFE measurement
SS Dummies
Dummy FPA&CE
- Physical properties
Dummy PPDS
- Physical properties
Dummy EPS
- Physical properties
Dummy TT&C
- Physical properties
Dummy Propulsion
- Physical properties
Dummy GNC
- Physical properties
Solar Panels + HDRM SM
- Physical properties
- Deployment test (before/after mech. and TVAC tests)
- Vibration tests
- TVAC test
GNC FM
- Physical properties
- Functional test
TT&C FM
- Physical properties
- Functional test
is integrated on
CubeSat EM
- Integration procedures
- Physical properties
- RF compatibility
Harness routing and Polarity check
- Functional tests
- Residual magnetic dipole (Helmholtz cage)
- GSEs verification
- Launcher I/F (deployer fit check)
CubeSat STOM
- Physical properties
- Functional and performance
- Vibration/Shock tests
- TVAC test
FEM model correlation
Dismounted from CubeSat EM
Propulsion S/S QM
- Reduced endurance test
PPDS S/S FM + PPDS FSW/FW
- Physical properties
- Functional tests
- Vibration tests (Accep.)
- TVAC test (Accep.)
OBAI FSW/FW
- Functional and performance
FPA&CE FM + FPA&CE FSW/FW
Physical properties
- Functional tests
- Vibration tests (Accep.)
- TVAC test (Accep.)
EPS S/S FM + EPS FSW/FW
- Physical properties
- Functional tests
- Vibration tests (Accep.)
- TVAC test (Accep.)
Propulsion S/S FM
Physical properties
- Functional tests
- Vibration tests (Accep.)
- TVAC test (Accep.)
CubeSat PFM
PFM test philosophy
- Physical properties
- Functional tests
- Vibration tests (ProtoQ.)
- TVAC test (ProtoQ.)
- Pre-launch tests
16U Deployer FM
- Launcher I/F (deployer fit check)
Structure PFM
- Physical properties
TMA PFM
- Physical properties
- WFE measurement
Solar Panels + HDRM FM
Physical properties
- Functional and performance
- Deployment tests
- Vibration tests (Accept.)
- Vacuum Bake-out
- TVAC test (Accept.)
GNC FM
TT&C FM
Legend
TSD
T4I
AIKO
OS
COTS Supplier

5.0 PIANIFICAZIONE DELLE ATTIVITÀ, FASI ED EVENTI CHIAVE

La durata complessiva del progetto per le fasi C/D/E1 è di 40 mesi di cui 28 mesi per la fase C/D a decorrere dalla data di Kick Off Meeting (KOM), identificata con T0, e 12 mesi per la fase E1 a decorrere dalla data della Flight Readiness Review (FRR), identificata con T1 – 1 mese, con T1 data del Launch Event (LE). Durante l'esecuzione del progetto sono previsti gli eventi chiave con il Contraente indicati in Tabella 1.

Tabella 1 - Eventi chiave con pianificazione in mesi.

ACRONIMO	NOME	PIANIFICAZIONE
KOM	Kick Off	T0
RCR	Requirements Consolidation Review	T0 + 2 mesi
EQSR	Equipment Qualification Status Review	T0 + 4 mesi
STOM TRB	Test Review Board CubeSat STOM	T0 + 10 mesi
EM TRB	Test Review Board CubeSat EM	T0 + 19 mesi
CDR	Critical Design Review	T0 + 22 mesi
TRR	Test Readiness Review	T0 + 24 mesi
QAR	Qualification Acceptance Review	T0 + 28 mesi
FRR	Flight Readiness Review	T1 – 1 mesi
LRR	Launch Readiness Review	TBD by launch provider
LE	Launch Event	T1
C1RR	Commissioning 1 Result Review	T1 + 5 mesi
C2RR	Commissioning 2 Result Review	T1 + 11 mesi

Lo stato di avanzamento del progetto verrà presentato con cadenza bimestrale in occasione dei Progress Meeting (PM). Nelle occorrenze in cui i Progress Meeting coincidono con gli eventi chiave sopra definiti, decadranno a favore delle milestone individuate.

5.1 KOM – KICK OFF MEETING

Obiettivo del KOM è congelare la baseline tecnico-programmatica del progetto. In particolare, saranno richiesti obiettivi del progetto, team del Contraente, relativa organizzazione, interfacce e responsabilità, eventi chiave e pianificazione, attività, elementi di fornitura, stato dei sotto-contratti, rischi del progetto e strategie di mitigazione.

5.2 RCR – REQUIREMENTS CONSOLIDATION REVIEW

Scopo della RCR è verificare il consolidamento dei requisiti nei Requirement Documents consegnati al termine della Fase B. Sarà verificata la completezza e la correttezza di tutti i requisiti, compresi i rationale, i parent requirements, i metodi di verifica, etc., a fronte delle giustifiche fornite nel DDF. Sarà verificata l'adeguatezza del Verification Control Document (VCD) ed effettuata una prima mappatura dello stato di compliance ai requisiti consolidati.

5.3 EQSR – EQUIPMENT QUALIFICATION STATUS REVIEW

Scopo della EQSR è verificare lo stato di qualifica rispetto ai requisiti dei componenti Commercial Off The Shelf (COTS) previsti nel progetto, categorizzarli in base allo stato di qualifica, autorizzarne il procurement, ed eventualmente prevedere delle attività di delta-qualifica su Engineering Qualification Model (EQM) dedicati.

5.4 STOM TRB – TEST REVIEW BOARD of CubeSat STOM

Scopo della STOM TRB è di verificare la disponibilità e l'adeguatezza della documentazione di test e le risultanze delle attività di validazione termo-strutturale del modello STOM del CubeSat. Gli obiettivi di dettaglio della TRB sono:

- Verificare che le procedure di test siano state eseguite e compilate;
- Verificare la completezza, l'adeguatezza e la consistenza del/i test report(s);
- Verificare l'accettabilità di eventuali non conformità, deroghe e deviazioni.

5.5 EM TRB – TEST REVIEW BOARD of CubeSat EM

Scopo della EM TRB è di verificare la disponibilità e l'adeguatezza della documentazione di test e le risultanze delle attività di validazione funzionale del modello EM del CubeSat. Gli obiettivi di dettaglio della TRB sono:

- Verificare che le procedure di test siano state eseguite e compilate;
- Verificare la completezza, l'adeguatezza e la consistenza del/i test report(s);
- Verificare l'accettabilità di eventuali non conformità, deroghe e deviazioni.

5.6 CDR – CRITICAL DESIGN REVIEW

Scopo della CDR è rilasciare il design finale, confermando la compatibilità con le interfacce esterne, quindi rilasciare i piani di Assembly, Integration and Testing (AIT), decretando la possibilità di avviare le attività di verifica. Gli obiettivi di dettaglio della CDR sono:

- verificare che il design di dettaglio proposto e le performance previste soddisfino i requisiti in tutte le fasi di missione, inclusa la compatibilità col lanciatore, e che l'allocazione di prestazioni, budget e margini ai vari sottosistemi/equipaggiamenti del sistema siano conformi ai requisiti di sistema;
- verificare che il programma di verifica/validazione e MAIT siano adeguati;
- verificare la completezza, l'adeguatezza e la consistenza delle interfacce interne ed esterne dal livello sistema fino al livello di sottosistema/equipaggiamento, utilizzando appositi ed appropriati modelli;
- verificare e confermare che la configurazione del lanciatore sia compatibile con i requisiti di missione;
- verificare che tutti i rischi tecnici e programmatici siano stati ben identificati e che siano state implementate azioni di mitigazione appropriate;
- verificare la completezza e l'adeguatezza dei documenti di PA, in particolare la Critical Item List e la Qualification Status List, e la loro conformità con i requisiti di sistema e il PA Plan;
- verificare la completezza e l'adeguatezza dello Space Debris Mitigation Report;
- verificare che il progetto abbia tenuto conto di tutte le lessons learned di altri progetti;
- verificare la completezza, l'adeguatezza e la coerenza dello stato di qualifica e di validazione dei processi critici e dei sottosistemi/equipaggiamenti;

- verificare le risultanze della campagna di test end-to end del sistema CubeSat EM - Ground Segment;

5.7 TRR – TEST READINESS REVIEW

Scopo della TRR è decretare la prontezza ai test di qualifica/accettazione sul CubeSat PFM e sul Ground Segment. Gli obiettivi di dettaglio della TRR sono:

- verificare la completezza, l'adeguatezza e la coerenza dello stato di qualifica e di validazione dei processi critici, dei sottosistemi/equipaggiamenti e la loro prontezza per le campagne di test;
- verificare la prontezza delle facilities alle campagne di test;
- verificare la prontezza, in termini di disponibilità e calibrazione, del Ground Support Equipment (GSE) per le campagne di test;
- verificare la prontezza, in termini di completa e corretta integrazione, del CubeSat PFM e del Ground Segment per le campagne di test;
- verificare i piani di test del CubeSat PFM e del Ground Segment;
- verificare le procedure di test del CubeSat PFM e del Ground Segment;
- verificare le procedure di test end-to end del sistema CubeSat PFM - Ground Segment;
- confermare che qualsiasi Request for Waiver/Deviation (RFW/D) non impatti la campagna di test.

5.8 QAR – QUALIFICATION ACCEPTANCE REVIEW

Scopo della QAR è verificare i risultati dei test di qualifica/accettazione effettuati sul CubeSat PFM e sul Ground Segment. Gli obiettivi di dettaglio della QAR sono:

- confermare che il processo di proto-qualifica abbia dimostrato che il design, inclusi i margini, risponda ai requisiti applicabili, inclusi quelli relative alle interfacce esterne con (Launch e Ground Segments);
- verificare che la proto-qualifica del satellite e dei suoi SW, sottosistemi/equipaggiamenti e strumenti di bordo sia stata raggiunta con successo.
- verificare che il report dei test di proto-qualifica sia completo;
- confermare lo stato di approvazione di tutte le RFW/RFD relative ai prodotti;
- confermare che tutte le non-conformità siano state chiuse in modo soddisfacente o che il relativo piano di chiusura sia stabilito;
- confermare che il processo di proto-qualifica abbia dimostrato che il prodotto sia libero da errori di lavorazione e sia pronto per il successivo impiego operativo;
- confermare che tutti i sottosistemi/equipaggiamenti siano passati per il relativo processo di accettazione;
- verificare il prodotto "as-built" e i suoi elementi costitutivi rispetto al prodotto "as designed" e i suoi elementi costitutivi;
- verificare la prontezza del Ground Segment ad operare il satellite durante le successive fasi operative;
- verificare la completezza e l'adeguatezza dello Space Debris Mitigation Report.
- verificare che il progetto abbia tenuto conto di tutte le lessons learned di altri progetti.

5.9 FRR – FLIGHT READINESS REVIEW

L’obiettivo della FRR è verificare che lo Space Segment ed il Ground Segment, inclusi tutti i sistemi di supporto, come i sistemi di tracking, comunicazione e sicurezza, siano pronti per il lancio. È inoltre quello di verificare la prontezza del team deputato alle operazioni, delle procedure operative, e la loro compatibilità con il sistema di volo, nonché di accettare e rilasciare il Ground Segment per le operazioni.

5.10 LRR – LAUNCH READINESS REVIEW

L’obiettivo della LRR è dichiarare la prontezza al lancio del Launch Segment, Space Segment e Ground Segment, inclusi tutti i sistemi di supporto, come i sistemi di tracking, comunicazione e sicurezza, e di dare l’autorizzazione a procedere con il lancio.

5.11 C1RR – COMMISSIONING 1 RESULT REVIEW

L’obiettivo della C1RR è dichiarare il completamento di una serie di test in orbita atti a verificare che tutti gli elementi del sistema funzionino con adeguate prestazioni, e di dare l’autorizzazione per le routine di operazioni di discesa in VLEO.

5.12 C2RR – COMMISSIONING 2 RESULT REVIEW

L’obiettivo della C2RR è dichiarare il completamento di una serie di test in orbita atti a verificare che tutti gli elementi del sistema funzionino con adeguate prestazioni, e di are l’autorizzazione per le routine di operazioni di utilizzo.

6.0 FORNITURE DI RESPONSABILITÀ DELL’ASI

Salvo diverse disposizioni da parte di ASI il Contraente deve trattare le forniture di ASI in accordo al PA Plan ed alle proprie procedure interne di gestione dei prodotti, come applicabili ai singoli casi specifici.

In assenza di specifiche istruzioni dell’Agenzia, il Contraente deve presentare in offerta le procedure di trattamento delle forniture ASI.

Nel caso in cui per particolari forniture non esistano adeguate procedure documentate, il Contraente è obbligato a informare ASI e predisporre adeguate procedure da sottoporre ad ASI per approvazione.

6.1 HW/SW

È prevista la fornitura da parte dell’ASI, senza trasferimento di proprietà, degli HW e SW prodotti nel corso della fase B ai fini della esecuzione delle attività contrattuali. In particolare, saranno da considerarsi CFI ASI gli elementi riportati in Allegato 3.

6.2 DOCUMENTAZIONE

Non è prevista fornitura di documentazione da parte ASI ai fini della esecuzione delle attività contrattuali.

7.0 FORNITURA CONTRATTUALE

7.1 HW/SW

Il Contraente deve consegnare l’HW ed il SW riportato nel dettaglio nella lista in Allegato 2, dove sono evidenziate: prodotti da consegnare (sistema, stazioni di terra, satellite, GSE, strumenti, unità, SW, modelli, ricambi, etc.), le quantità di ciascun prodotto, evento di consegna, luogo di consegna, note.

7.2 DOCUMENTAZIONE

Il Contraente deve consegnare la documentazione riportata nel dettaglio nella lista in Allegato 1, che identifica la pianificazione delle consegne di tale documentazione e la documentazione che sarà sottoposta all’approvazione dell’ASI.

Allegato 1: Documentazione da consegnare

PROGETTO "EarthNext" - Fasi C/D/E1
DOCUMENTAZIONE DA CONSEGNARE

CODICE	TITOLO	NOTE	EVENTO DI CONSEGNA									
			RCR	EQSR	STOM TRB	EM TRB	CDR	TRR	QAR	FRR	LRR	C1RR	C2RR
			T0+2	T0+4	T0+10	T0+19	T0+22	T0+24	T0+28	T1-1	T1	T1+5	T1+11
[DOC 1]	Project Management Plan (PMP)		I				M		M				
[DOC 2]	Design Development Plan (DDP)	*Including the System Engineering Plan (SEP)*	I				M		M				
[DOC 3]	Product Assurance Plan (PAP)		I				M		M				
[DOC 4]	Satellite User Manual	*Including Supplier User Manual for COTS*						I	M				
[DOC 5]	STOM AIVT Plan			I									
[DOC 6]	EM AIVT Plan			I	M								
[DOC 7]	EQM/QMs AIVT Plan				I		M						
[DOC 8]	PFM AIVT Plan						I	M					
[DOC 9]	Ground Segment AIVT Plan				I			M					
[DOC 10]	Ground Segment Test Procedure				I			M					

"I" sta ad indicare "Issue", ovvero una versione da consegnare aggiornata
"M" sta ad indicare "Maintenance", ovvero una versione da consegnare aggiornata se ne sono intercorsi degli aggiornamenti
Entrambe le tipologie di versione dovranno essere comunque sempre consegnate all'interno del data package

Allegato 1: Documentazione da consegnare

PROGETTO "EarthNext" - Fasi C/D/E1
DOCUMENTAZIONE DA CONSEGNARE

CODICE	TITOLO	NOTE	EVENTO DI CONSEGNA									
			RCR	EQSR	STOM TRB	EM TRB	CDR	TRR	QAR	FRR	LRR	C1RR	C2RR
			T0+2	T0+4	T0+10	T0+19	T0+22	T0+24	T0+28	T1-1	T1	T1+5	T1+11
[DOC 11]	PFM Test Procedure							I					
[DOC 12]	STOM Test Report				I								
[DOC 13]	EM Test Report					I							
[DOC 14]	EQM/QMs Test Report					I	M	M					
[DOC 15]	PFM Test Report								I				
[DOC 16]	Ground Segment Test Report					I	M		M				
[DOC 17]	Mission Operations Plan						I		M			M	
[DOC 18]	Mission Requirement Document (MRD)		I										
[DOC 19]	System Requirement Document (SRD)		I		M	M							
[DOC 20]	Platform Requirement Specification (PRS)		I		M	M							

"I" sta ad indicare "Issue", ovvero una versione da consegnare aggiornata
"M" sta ad indicare "Maintenance", ovvero una versione da consegnare aggiornata se ne sono intercorsi degli aggiornamenti
Entrambe le tipologie di versione dovranno essere comunque sempre consegnate all'interno del data package

Allegato 1: Documentazione da consegnare

PROGETTO "EarthNext" - Fasi C/D/E1
DOCUMENTAZIONE DA CONSEGNARE

CODICE	TITOLO	NOTE	EVENTO DI CONSEGNA									
			RCR	EQSR	STOM TRB	EM TRB	CDR	TRR	QAR	FRR	LRR	C1RR	C2RR
			T0+2	T0+4	T0+10	T0+19	T0+22	T0+24	T0+28	T1-1	T1	T1+5	T1+11
[DOC 21]	Payload Requirements Specification (PLRS)		I		M	M							
[DOC 22]	Software Requirement Document (SWRD)		I			M							
[DOC 23]	Ground Segment Requirements Document (GSRD)		I			M							
[DOC 24]	Design Definition File	*Including technical budgets*	I		M	M	M		M				
[DOC 25]	Verification Control Document (VCD)	*Compliance matrix only, including SMA&E implementation matrix*	I		M	M	M	M	M	M	M	M	M
[DOC 26]	Mission Analysis Report (MAR)		I				M		M			M	
[DOC 27]	System Design Report (SDR)		I		M	M	M		M				
[DOC 28]	Risk Assesment Report				I	M	M		M	M	M	M	
[DOC 29]	Space Debris Mitigation Document		I				M		M				
[DOC 30]	Space-to-ground Interface Control Document (SGICD)		I			M	M	M	M				

"I" sta ad indicare "Issue", ovvero una versione da consegnare aggiornata
"M" sta ad indicare "Maintenance", ovvero una versione da consegnare aggiornata se ne sono intercorsi degli aggiornamenti
Entrambe le tipologie di versione dovranno essere comunque sempre consegnate all'interno del data package

Allegato 1: Documentazione da consegnare

PROGETTO "EarthNext" - Fasi C/D/E1
DOCUMENTAZIONE DA CONSEGNARE

CODICE	TITOLO	NOTE	EVENTO DI CONSEGNA									
			RCR	EQSR	STOM TRB	EM TRB	CDR	TRR	QAR	FRR	LRR	C1RR	C2RR
			T0+2	T0+4	T0+10	T0+19	T0+22	T0+24	T0+28	T1-1	T1	T1+5	T1+11
[DOC 31]	Satellite Interface Control Document (ICD)	*Including the Payload-Platform Interfaces*	I		M	M	M	M	M				
[DOC 32]	Launcher Interface Requirements Document (LIRD)		I	M	M	M	M	M	M				
[DOC 33]	Declared Lists Document (DLs)	*Including DCL, DML, DMPL, DPL. COTS category A/B in QSL excluded.*					I	M	M				
[DOC 34]	Configuration Item Data List (CIDL)						I		M				
[DOC 35]	As-Built Configuration List (ABCL)							I	M				
[DOC 36]	Critical Item List (CIL)		I	M	M	M	I		I				
[DOC 37]	Qualification Status List (QSL)			I	M	M	I		I				
[DOC 38]	Failure Modes, Effects and Analysis (FMEA)	*At satellite level only*					I		M				
[DOC 39]	Part Stress Analysis	*COTS category A/B in QSL excluded*					I		M				
[DOC 40]	Spacecraft Mechanical Analysis Report				I		M	M	M				

"I" sta ad indicare "Issue", ovvero una versione da consegnare aggiornata
"M" sta ad indicare "Maintenance", ovvero una versione da consegnare aggiornata se ne sono intercorsi degli aggiornamenti
Entrambe le tipologie di versione dovranno essere comunque sempre consegnate all'interno del data package

Allegato 1: Documentazione da consegnare

PROGETTO "EarthNext" - Fasi C/D/E1
DOCUMENTAZIONE DA CONSEGNARE

CODICE	TITOLO	NOTE	EVENTO DI CONSEGNA									
			RCR	EQSR	STOM TRB	EM TRB	CDR	TRR	QAR	FRR	LRR	C1RR	C2RR
			T0+2	T0+4	T0+10	T0+19	T0+22	T0+24	T0+28	T1-1	T1	T1+5	T1+11
[DOC 41]	Spacecraft Thermal Analysis Report				I		M	M	M				
[DOC 42]	Spacecraft AOCS Analysis Report						I	M	M				
[DOC 43]	Spacecraft Integration Logbook							I	M				
[DOC 44]	End-Item Data Package (EIDP)								I				
[DOC 45]	Certificate of Conformity (CoC)								I				
[DOC 46]	LEOP, IOT and Commisioning Operation Plan								I	M			
[DOC 47]	LEOP, IOT and Commisioning Operation Procedure									I	M		
[DOC 48]	LEOP, IOT and Commisioning Operation Report											I	I
[DOC 49]	Progress Report	*Bimestrale*											

"I" sta ad indicare "Issue", ovvero una versione da consegnare aggiornata
"M" sta ad indicare "Maintenance", ovvero una versione da consegnare aggiornata se ne sono intercorsi degli aggiornamenti
Entrambe le tipologie di versione dovranno essere comunque sempre consegnate all'interno del data package

Allegato 2: Hardware e software da consegnare

PROGETTO "EarthNext" - Fasi C/D/E1

HARDWARE E SOFTWARE DA CONSEGNARE

CODICE	PRODOTTO	QUANTITÀ	MODELLO	EVENTO	LUOGO	NOTE
HW 01	TMA	1	STOM	EM TRB	OS	*Integrated in CubeSat EM.*
HW 02	Structure S/S	1	STM	EM TRB	OS	*Integrated in CubeSat EM.*
HW 03	Propulsion S/S	1	QM	EM TRB	OS	*Re-integrated in CubeSat EM after standalone endurance test.*
HW 04	EPS	1	EQM	EM TRB	OS	*Integrated in CubeSat EM.*
HW 05	FPA & CE	1	EQM	EM TRB	OS	*Integrated in CubeSat EM.*
HW 06	PPDS	1	EQM	EM TRB	OS	*Integrated in CubeSat EM.*
HW 07	Solar Panels + HDRM	1	SM	EM TRB	OS	*Integrated in CubeSat EM.*
HW 08	**CubeSat**	**1**	**EM**	**EM TRB**	**OS**	***Fully integrated.***
HW 09	TMA	1	PFM	QAR	OS	*Integrated in CubeSat PFM.*
HW 10	Structure S/S	1	PFM	QAR	OS	*Integrated in CubeSat PFM.*
HW 11	Propulsion S/S	1	FM	QAR	OS	*Integrated in CubeSat PFM.*
HW 12	EPS	1	FM	QAR	OS	*Integrated in CubeSat PFM.*
HW 13	FPA & CE	1	FM	QAR	OS	*Integrated in CubeSat PFM.*

Allegato 2: Hardware e software da consegnare

HW 14	PPDS	1	FM	QAR	OS	*Integrated in CubeSat PFM.*
HW 15	Solar Panels + HDRM	1	FM	QAR	OS	*Integrated in CubeSat PFM.*
HW 16	GNC	1	FM	QAR	OS	*Employed in CubeSat EM for functional test and then integrated in CubeSat PFM.*
HW 17	TT&C	1	FM	QAR	OS	*Employed in CubeSat EM for functional test and then integrated in CubeSat PFM.*
HW 18	**CubeSat**	**1**	**PFM**	**QAR**	**OS**	***Fully integrated.***
SW 01	CAD	1	N/A	CDR and QAR	ASI and/or OS	*Readable file only.*
SW 02	EPS SW	1	N/A	TRR and QAR	ASI and/or OS	*Deployed on EPS EQM and EPS FM.*
SW 03	FPA&CE SW	1	N/A	TRR and QAR	ASI and/or OS	*Integrated in FPA&CE EQM and FPA&CE FM.*
SW 04	PPDS SW	1	N/A	TRR and QAR	ASI and/or OS	*Integrated in PPDS EQM and PPDS FM.*
SW 05	OBAI SW	1	N/A	TRR and QAR	ASI and/or OS	*Integrated in PPDS EQM and PPDS FM.*
SW 06	GS MOC SW	1	N/A	TRR and QAR	ASI and/or OS	*If the MOC is implemented through a cloud platform, the User Manual of the MOC SW will be delivered together with a number of accesses to the Ground Control service.*

Allegato 3: CFI ASI

PROGETTO "EarthNext" - Fasi C/D/E1

CFI ASI

CODICE	PRODOTTO	TIPOLOGIA
CFI 01	Optomechanical Subsystem B/B	HW
CFI 02	Solar Panel Release Mechanism B/B	HW
CFI 03	Propulsion System B/B	HW
CFI 04	OBC B/B	HW
CFI 05	FPA Camera B/B	HW
CFI 06	OBC SW B/B	SW

	UNIT – NAME	SIGNATURE	DATE
PREPARED	SQA – Marianna Rinaldi UOT – Giuseppe Leccese	Marianna Rinaldi 10.04.2025 14:39:35 GMT+02:00 Giuseppe Leccese 09.04.2025 17:05:20 GMT+02:00	
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APPROVED	SQA – Rita Carpentiero UOT – Vincenzo Pulcino	Rita Carpentiero 12.05.2025 19:00:46 GMT+02:00	

Document change log

Date	Reason for change / Page-paragraphs affected	Revision
17/01/2025	First Issue	A

ATTACHMENTS:

DOCUMENT DISTRIBUTION:

Attached to the “Capitolato Tecnico”

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1. INTRODUCTION

1.1 Scope of the document

The document is aimed to provide the list of the minimum objectives to be addressed and implemented by the contractor to ensure engineering and product assurance best practice in the design, manufacturing and testing of the EarthNext mission across the space engineering technical disciplines, to highlights and identify promptly the risks associated to the program.
Due to the specific nature of the project, the contractor can choose whether to apply the “accepted standards” listed in the following paragraphs or demonstrate the implementation and compliance to the objective by implemententing a different standard/procedure.
The minimum objectives indicated in the following pharagraphs need to be addressed and an Implementation Matrix/Compliance Matrix is expected from the contractor (see Annex 1) as a state of compliance.
Compliance with the requirements contained within this document is verified as part of selected life-cycle reviews, and by assessments, reviews, and audits. Compliance with the requirements contained within this document is monitored by Safety and Mission Assurance (SMA) and engineering area.
Due to the high level of integration of CubeSats, the verification programme is focused mainly at system-level, driven by a risk mitigation approach.

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1.2 Field of application

The present document is applicable to the project "EarthNext".

2. DOCUMENTS

REMARK: as ECSS Standards are under continuous development/update, the final list of the applicable standards and version shall be frozen at beginning of the activities (kick-off meeting or contract signature).

2.1 Applicable documents

[AD 01] ECSS-S-ST-00-01C, Glossary of terms

2.2 Reference documents

Reference documents are those documents used to provide clarification and integration in support of the applicable documents. Although the following reference documents do not form part of the Contract and are not identified in the Contract they do integrate it.

[RD 01] ECSS tree, 2025 version, https://ecss.nl/standards/ecss-tree/
[RD 02] Handbook on CubeSat Propulsion, ESA-TECMP-TN-2023-000791
[RD 03] DC-SQA-2025-006 EarthNext PA Requirements
[RD 04] DC-SQA-2025-007 Earthnext Deliverable Requirement Document Definition

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3. LIST OF ACRONYMS

AI	Artificial Intelligence
AoA	Analysis of Alternatives
AOCS	Attitude and Orbit Control System
CRM	Continuous Risk Management
EEE	Electronics, Electrical, and Electromechanical
FMEA	Failure Mode and Effects Analysis
ICD	Interface Control Document
LCRs	Life Cycle Reviews
LET	Linear Energy Transfer
M&P	Materials and Processes
NC	Non-Conformance
NRB	Non-conformance Review Board
PA	Product Assurance
PFM	Proto-Flight Model
QA	Quality Assurance
QMS	Quality Management System
RDM	Radiation Design Margin
R&M	Reliability and Maintainability
RF	Radio Frequency
RIDM	Risk Informed Decision Making
RVT	Radiation Verification Test
SEE	Single Event Effect
SPFs	Single Point Failures
STM	Structural Thermal Model
SW	Software
TID	Total Ionizing Dose
TIDL	Total Ionizing Dose Level
TNID	Total Non-Ionizing Dose

4. SAFETY, MISSIONE ASSURANCE AND ENGINEERING OBJECTIVES

4.1 System Engineering

System engineering is an interdisciplinary approach governing the total technical effort to transform requirements into a system solution.
A system is an integrated set of elements to accomplish a defined objective. These elements include hardware, software, firmware, human resources, information/data, techniques, facilities services, and other support elements.

4.1.1 Accepted standards

ECSS-E-ST-10C Rev. 1	System engineering general requirements
ECSS-E-ST-10-06C	Technical requirements specification

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4.1.2 Objectives

1. To meet the essential system engineering tasks, their objectives and outputs.
2. To guarantee the integration and control of engineering disciplines and lower level system engineering work.

4.2 Fault Tolerance, Reliability and Maintainability

Establish the reliability, maintenance, maintainability, and fault tolerance philosophy to address mission success and safety, and identify corresponding Reliability and Maintainability (R&M) methods (e.g., Failure Mode and Effects Analysis - FMEA, fault tree analysis, critical items list, critical item control plan), R&M Standard for Spaceflight and Support Systems and/or alternative standards being used to capture, analyze, mitigate, or control faults and failures, including Single Point Failures (SPFs).
Provide on-going insight and status during subsequent Life Cycle Reviews (LCRs) by addressing corresponding risks and associated risk mitigation and contingency plans, as applicable, commensurate with the mission type and mission or instrument risk tolerance class(es).

4.2.1 Accepted standards

ECSS-Q-ST-30C	Dependability
ECSS-Q-ST-30-02C	Failure Modes, effects (and criticality) analysis

4.2.2 Objectives

1. To guarantee the dependability assurance programme, which comprises:
   - Identification of all technical risks with respect to functional needs which can lead to non-compliance with dependability requirements.
   - Application of analysis and design methods to ensure that dependability targets are met.
   - Optimization of the overall cost and schedule by making sure that: i) design rules, dependability analyses and risk reducing actions are tailored with respect to an appropriate severity categorisation, ii) risks reducing actions are implemented continuously since the early phase of a project and especially during the design phase.
   - Inputs to serial production activities.
2. Fault tolerance and graceful degradation designed and implemented addressing, at the discretion of the Program and Project, mission success criteria.
3. Fault tolerance and graceful degradation designed and implemented addressing critical risks where failure would result in injury to personnel or collaterial damage.
4. Address selected R&M objectives (i.e., requirements and associated analysis and verification methods) for critical items or processes whose failure would result in failure to meet mission objectives.
5. Address R&M objectives (i.e., requirements and associated analysis and verification methods) for critical items or proceses where failure would result in injury to personnel or collateral damage.

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4.3 Interface Management

The objective of interface management is to achieve functional and physical compatibility amongst all interrelated items in the product tree. These objectives/standards are applicable to the following interfaces, where a relationship exist among parties:

- Interfaces within the Space Segment, Ground Segment or Launch Segment.
- Interfaces between the different Segments of the Space System.
- Interfaces between the different Segments of the Ground System.
- Interfaces between the Support Segment and the Space Segment, Ground Segment or Launch Segment.

4.3.1 Accepted standard

E-ST-10-24C	Interface Management

4.3.2 Objectives

1. To achieve functional and physical compatibility amongst all interrelated items in the product tree through the interface management.
2. To ensure the development of a design solution compliant with the applicable interface requirements that ensures compatibility between the involved products.
3. To guarantee that the interface definition process and control are formalized and that all interface (e.g., ICDs) are managed and subject to configuration control process

4.4 Environmental Test Program Verification and Validation

Establish a qualification, flight acceptance, and/or protoflight test program to verify and validate performance in an operational, simulated operational, or relevant space environment. Include an approach to utilize breadboards, proof of concept models, engineering units, qualifications units, flight unit, and flight spare units, as appropriate.

4.4.1 Accepted standard

E-ST-10-02C Rev. 1	Verification
E-ST-10-03C Rev. 1	Testing
E-ST-10-04C Rev. 1	Space environment

4.4.2 Objectives

1. Complete system verification and validation testing.
2. Mixed qualification, flight acceptance, and protoflight test programs for development and flight units. Flight spare units are flight acceptance or protoflight tested if designated for flight.
3. Protoflight test program for primary and secondary structures is acceptable.
4. End-to-end testing of critical functions using flight software wherever possible; otherwise, use of qualified software simulators.

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5. Testing at higher levels of assembly including system level is acceptable.

4.5 Electronics, Electrical, and Electromechanical Parts and Photovoltaic Assemblies

Select Electronics, Electrical, and Electromechanical (EEE) parts at an appropriate level for functions tied directly to mission success commensurate with safety, performance, and environmental requirements. Perform additional screening and qualification tests, as necessary, to reduce mission risk. For secondary functions not tied directly to mission success, lower level parts are acceptable in accordance with project-level documentation.

4.5.1 Accepted standard

ECSS-E-ST-20C Rev. 2	Electrical and electronic
ECSS-E-ST-20-06C Rev. 1	Spacecraft charging
ECSS-E-ST-20-07C Rev. 2	Electromagnetic compatibility
ECSS-E-ST-20-08C Rev. 2	Photovoltaic assemblies and components
ECSS-E-ST-20-40C	ASIC, FPGA and IP Core engineering
ECSS-Q-ST-60 Rev. 3	Electrical, electronic and electromechanical (EEE) components
ECSS-Q-ST-60-13C Rev. 1	Commercial electrical, electronic and electromechanical (EEE) components
ECSS-Q-ST-30-11C Rev. 2	Derating - EEE components
ECSS-Q-ST-60-03C	ASIC, FPGA and IP Core product assurance
NASA-STD-8739.10	Electrical, electronic, and electromechanical (EEE) parts assurance standard

4.5.2 Objectives

1. To perform a parts assessment analysis and control board to demonstrate the adequate level of parts selected by collection of quality/testing data (such as life test, radiation test, etc.) and previous heritage.
2. To guarantee an adeguate screening and qualification tests, as necessary, to reduce mission risk.
3. For secondary functions not tied directly to mission success, lower level parts are acceptable in accordance with project-level documentation.
4. To take into account in the spacecraft testing, analysis and design, spacecraft charging phenomena
5. To take into account in the spacecraft testing, analysis and design, elettromagnetic compatibility requirements
6. EEE quality level should be at minimum:
   - Class 3 fully components; options for lower grade can be taken into account for semiconductors, oscillators, wires, connectors and resistors.
   - Derating of components to provide a guaranteed performance and reliability up to the equipment end-of-life.
   - Justification documents can be combined and not required for some automotive qualified passives; for automotive active parts the justification documents is not required, provided that adequate radiation data are available to meet mission requirements. Identification of EEE in line with declared component list.

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4.6 Radiation

To address the risk related to the three main radiation effects on electronic components and devices: Total Ionizing Dose (TID), displacement damage or Total Non-Ionizing Dose (TNID), and Single Event Effects (SEE).

4.6.1 Accepted standards

ECSS-Q-ST-60-15C	Radiation hardness assurance – EEE components
ECSS-E-ST-10-12C	Methods for the calculation of radiation received and its effects, and a policy for design margins
ESCC 22900	Total dose steady-state irradiation test method
ESCC 25100	Single event effects test method and guidelines
ESCC 22500	Guidelines for displacement damage irradiation testing

4.6.2 Objectives

Topics	**Objective**
TID tests	TIDL<5 Krad testing recommended TIDL>5 Krad testing required at part or board level
TID RDM	Defined and agreed between customer and supplier, encompassing the specified mission environment 1.2 with test at part level on the flight lot 2 with test at part level not on the flight lot 3 with test at board level
TID RVT **Test on the flight Lot**	Applicable when TID>5 Krad
TNID tests	Fully applicable at part or board level Test of optoelectronics required at part or board level
TNID RDM	Defined and agreed between customer and supplier, encompassing the specified mission environment 1.2 with test at part level on the flight lot 2 with test at part level not on the flight lot 3 with test at board level
Heavy Ion SEE test	Recommended Required for MOSFETs, VDS>200 V
Proton SEE test	Required at part or board level
SEE analysis	When heavy ion data is available, fully applicable for LETth <38 MeVcm2/mg When no SEE HI and only proton data is available: •Parts sensitive to destructive events induced by protons shall not be used •Derating of MOSFETs VDS < 200 V to 30% of their max rated voltage •SEE mitigation shall be implemented for destructive and for non-destructive events: •Potential SEL to be mitigated for all CMOS and BiCMOS based •Derating of MOSFET VDs <200 V to 30% of their max rated voltage

An assessment on EEE part or devices potentially sensitive to radiation effects and availability of relevant radiation data is the starting point to define the RVT needs and levels. Further radiation evaluation / analysis can be requested depending on the assessed relevant risks.

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4.7 Thermo-Mechanical Engineering

To establish the definition, analysis, design, manufacture, verification and in-service operation of thermal control subsystems of spacecraft and other space products. To define the mechanical engineering requirements for structural engineering to be considered in all engineering aspects of structures: requirement definition and specification, design, development, verification, production, in-service and eventual disposal.

4.7.1 Accepted standards

ECSS-E-ST-31C	Thermal control general requirements
ECSS-E-ST-32C Rev.1	Structural general requirements
ECSS-E-ST-32-01C Rev. 2	Fracture control
ECSS-E-ST-32-02C Rev. 1	Structural design and verification of pressurized hardware
ECSS-E-ST-32-08C Rev. 1	Materials
ECSS-E-ST-33-01C Rev. 2	Mechanisms

4.7.2 Objectives

1. Design and test the structure in line with the mission success commensurate with safety, performance, and environmental requirements. Perform additional screening and qualification tests, as necessary, to reduce mission risk.
2. Perform structural and thermal analisys (shock test on Structural Thermal Model (STM) for critical function at subsystem/equipment level or no shock, Proto-Flight Model (PFM) acceptable).
3. Perform a SPF and fracture control analysis.

4.8 Materials and Processes

Prepare and implement Materials and Processes (M&P) selection, control, and implementation plan. Implement an M&P control board process or similar developer process that defines the planning management, and coordination of the selection, application, procurement, nondestructive evaluation, control, and standardization of M&P and for directing the disposition of M&P problem resolutions.

4.8.1 Accepted standards

ECSS-Q-ST-70C Rev.2	Materials, mechanical parts and processes
ECSS-Q-ST-70-71C Rev.1	Materials, processes and their data selection
ECSS-E-ST-32-08C Rev. 1	Materials
ECSS-E-ST-32-10C Rev. 1	Structural factors of safety for spaceflight hardware
NASA-STD-6016	Standard materials and processes requirements for spacecraft

4.8.2 Objectives

1. Requirements are applicable based on critical items and processes whose failure would result in failure to meet mission objectives, injury to personnel, or collateral damage.

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2. Materials needs to be assessed for application, compatibility, corrosion resistance and life limits.

4.9 Propulsion

To specify the activities to be performed in the engineering of these propulsion systems and their applicability. To define the requirement for the engineering aspects such as functional, physical, environmental, quality factors, operational and verification.

4.9.1 Accepted standards

ECSS-E-ST-35C Rev. 1	Propulsion general requirements
ECSS-E-ST-35-01C	Liquid and electric propulsion for spacecraft
ECSS-E-ST-35-06C Rev. 2	Cleanliness requirements for spacecraft propulsion hardware

4.9.2 Objectives

1. To guarantee that the propulsion system conforms to the spacecraft mission requirements including ground operations, pre-launch and launch activities, in-orbit and disposal operations.
2. To guarantee that the propulsion system provides the total impulse to fulfil the mission objectives and the thrust and torques in the different AOCS modes.
3. To guarantee that the propulsion system provides the means for propellant gauging during the mission.
4. To ensure the definition of performance requirements (thrust level and range, thrust modulation, thrust resolution and accuracy, thrust noise, specific impulse, propellant mass flow rate, electrical power consumption, thrust vector alignement and beam divergence).
5. To ensure the definition of thruster response time requirements (start-up, changes in thrust level during normal operations, shut-down).
6. To ensure the definition of lifetime requirements (cycle life, mission life).
7. To evaluate the plume effects on the spacecraft including the effects of primary ions and charge exchange ions around the thrusters, the elements of the spacecraft sensitive to plume effects, he generation of perturbing torques, forces, thermal gradiatens, contamination and erosion of surfaces due to plume effects.

4.10 Attitude and Orbit Control

To Establish the definition, analysis, design, manufacture, verification and in-service operation of spacecraft's Attitude and Orbit Control System (AOCS). To define the engineering requirements to be considered in all engineering aspects of attitude and orbit control: requirement definition and specification, design, development, verification, production, in-service and eventual disposal.

4.10.1 Accepted standards

ECSS-E-ST-60-30C	Satellite attitude and orbit control system (AOCS) requirements

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4.10.2 Objectives

1. AOCS functions shall be verified on a dedicated Test Bench or on a FlatSat Engineering Model.

4.11 Ground and Operation

To Establish the definition, analysis, design, manufacture, verification and in-service operation of Ground Segment and Operations. To define the engineering requirements to be considered in all engineering aspects of Ground and Operation: requirement definition and specification, design, development, verification, production, in-service and eventual disposal.

4.11.1 Accepted standards

ECSS-E-ST-50-05C Rev. 2	Radiofrequency and modulation
ECSS-E-ST-70C	Ground systems and operations
ECSS-E-ST-70-01C	On-board control procedures

4.11.2 Objectives

1. Design and test the platform or subsystem in line with the mission success commensurate with safety, performance, and orbital requirements. Perform additional screening and qualification tests with Software (SW) integrated, as necessary, to reduce mission risk.

4.12 Communications Engineering and Telemetry Coverage for Critical Events

Monitor and downlink to ground station or relay spacecraft or record telemetry coverage during critical events where failure would result in failure to meet mission objectives. Critical events in the operation of a spacecraft are those which, if not executed successfully (or recovered from quickly in the event of a problem), can lead to loss or significant degradation of the mission. Included in critical event planning are timelines allowing for problem identification, generation of recovery commands, and up-linking in a timely manner to minimize risk to the in-space assets. Examples include separation from a launch vehicle, critical propulsion events, deployment of appendages necessary for communication or power generation, stabilization into a controlled power-positive attitude, and entry-descent and landing sequences.

4.12.1 Accepted standards

ECSS-E-ST-50C Rev. 1	Communications
ECSS-E-ST-50-05C Rev. 2	Radio frequency and modulation
ECSS-E-ST-50-12C Rev. 1	SpaceWire - Links, nodes, routers and networks
ECSS-E-ST-50-13C	Interface and communication protocol for MIL-STD-1553B data bus onboard spacecraft
MIL1553-B-Notice 2	Digital Time Division Command/ Response Multiplex Data Bus

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4.12.2 Objectives

1. 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 used for orbit determination. It shall address at leat the following:
   - Frequency allocation, assignment and use.
   - Requirements on transmitted signals concerning, for example, spectral.
   - Occupation, Radio Frequency (RF) power levels, protection of other radio services.
   - Definition of the permissible modulation methods and parameters.
   - Specification of the major technical requirements relevant for the interface.
   - Between spacecraft and Earth stations.
   - Operational aspects, such as acquisition.
   - Cross-support.
2. To define the development of the end-to-end data communications system for the spacecraft that shall comprise components in three distinct domains, namely the ground network, the space link, and the space network.
3. To record telemetry coverage during all events where a failure would result in missing the mission objectives, to downlink to ground station and to ensure data are available for critical anomaly investigations to prevent future recurrence.

4.13 Quality Assurance

Plan, document, and implement the Quality Assurance (QA) programme, including how the critical design, construction, and verification specifications are captured and conveyed to project PA/QA teams, system developers, and hardware suppliers; how quality data will be managed; supplier risk management and monitoring; Quality Management System (QMS) elements and elements for production readiness; product and process QA and product acceptance; and how risks due to nonconformance will be managed.

4.13.1 Accepted Standards

NPR 8735.2	Hardware quality assurance program requirements for programs and projects
ECSS-Q-ST-10C Rev. 1	Product assurance management
ECSS-Q-ST-10-04C	Critical-item Control
ECSS-Q-ST-10-09C Rev. 1	Nonconformance control system
ECSS-Q-ST-20C Rev. 2	Quality assurance
ECSS-Q-ST-20-08C	Storage, handling and transportation of spacecraft hardware
ECSS-Q-ST-20-07C	Quality and safety assurance for space test centres

4.13.2 Objectives

1. Apply quality controls and QA processes to systems identified as strongly tied to mission success objectives throughout the hardware development lifecycle.
2. Require established design and construction technical standards and QMS standards to minimize supply chain risk and demonstrate adequate production readiness, both for in-

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house and external supplier hardware production and launch and mission operations functions.

3. Acquire and use quality data and other quality deliverables to track QA rigor and risks across the entire mission lifecycle.
4. Establish a non-conformance control system that should address the following points:
   - Detection and immediate actions.
   - Non-conformance Review Board (NRB) technical authority and composition.
   - Customer NRB, request for deviation or waiver.
   - Implementation of actions and non-conformance (NC) closeout.
   - Documentation and archive of NC.
5. To ensure that all technical and programmatic risks associated with the testing of space products performed under the responsibility of the space test centre are adequately managed through the implementation of an effective quality and safety assurance programme. Basic principles of the space test centre quality and safety programme are the early identification of aspects potentially detrimental for the quality of the test service, the safety of persons and products, and the cost-effective prevention of any adverse consequence of such aspects.

4.14 Cleanliness and Contamination Control

4.14.1 Accepted standards

ECSS-Q-ST-70-01C	Cleanliness and contamination control
ECSS-E-ST-35-06C Rev. 2	Cleanliness requirements for spacecraft propulsion hardware

4.14.2 Objectives

1. To prevent contamination to the maximum extent by operating in working areas with a proper cleanliness level and by proper handling, preservation, packing and storage.
2. To assess the sensitivity of the satellite components to contamination and set requirements for cleanliness during the manufacturing, assembly and integration cycle, starting from the incoming inspection up to shipping of the end item.
3. To ensure that the flight hardware is stored and transported in the required cleanliness environment in order to mitigate the risk of contamination on sensitive surfaces.
4. To insure the correct of implementation of specific protection measures, such as protective dust covers, to protect contamination sensitive items when they are integrated in higher level of assembly.
5. To provide the means deemed to clean the flight hardware as necessary to ensure that no dust, metallic part, or any uncontrolled material would compromise the mission (e.g. by obstructing optics or creating electrical short-circuits).
6. To guarantee that the hardware design phase takes into account the cleanliness assurance precautions and features.
7. To guarantee that during operation and use contamination is not generate or released.
8. To monitor and avoid to exceed the distribution and the maximum ammount of particles per class, as given in Table 4-1 of ECSS- E-ST-35-06C Rev. 2.

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4.15 Software

To establish the definition, analysis, development, verification and validation of on-board and payload SWs. To define the engineering requirements to be considered in all engineering aspects of SW design: requirement definition and specification, design, development, verification.

4.15.1 Accepted standards

NPR 7150.2	NASA software engineering requirements
NASA-STD-8739.8	Software assurance and software safety standard
ECSS-Q-ST-80C Rev. 1	Software product assurance
ECSS-E-ST-40C	Software general requirements

4.15.2 Objectives

1. On-board SW and payload SW functional separation shall be demonstrated independently from any criticality decomposition.
2. Design and test in line with the mission success commensurate with safety, performance, and mission requirements. Perform additional screening and high-level qualification tests with SW integrated, as necessary, to reduce mission risk.

4.16 Risk Informed Decision Making and Continuous Risk Management Processes

Plan, implement, and document a graded approach to risk management implementing Risk Informed Decision Making (RIDM) and Continuous Risk Management (CRM) processes.

Support risk-informed selection of project and activity solutions and designs by developing, comparing, documenting and communicating to organizational decision-makers the risk profiles of available alternatives and corresponding performance measures.

Proactively identify risks using well-structured statements, risk scenarios, decisions (i.e., accept, watch, research, mitigate, elevate, and close risks) based on risk ranking, rationale behind all recommendations to management, and controls. Conduct Analysis of Alternatives (AoA) to develop risk mitigation strategies. Make reassessments of the risk response strategies on a continuous basis. Tracking of individual risks, leading indicators, and performance measures on a continuous basis. Tracking concentrates on the realization and operational stages of the lifecycle.

Communicate results, decisions, and associated rationale to programmatic chains of command. Make recommendations on reformulation and reallocation of objectives, requirements, and risk tolerances.

4.16.1 Acceptable Standards

ECSS- M-ST-80C	Risk management *Technological innovation and programmatic constraints could introduce risk factors, to be analyzed and controlled.*

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ECSS-Q-ST-10-04C	Critical-item control *Critical-item management can be part of the overall risk management.*
NPR 8000.4	Agency Risk Management Procedural Requirements

4.16.2 Objectives

1. Apply comprehensive scope and rigor across programmatic, engineering, institutional, partnership, and enterprise domains, addressing mission technical, cost, schedule, safety, and security performance.
2. RIDM is built upon the identification and consideration of principal mission objectives, as appropriate to identify the critical dimensions of performance.
3. Risk and uncertainty profiles of corresponding performance measures for safety, technical, cost, schedule, and security execution domains developed via comprehensive risk analysis and AoA.
4. Formal deliberation criteria and processes defined, applied, and documented to support key decisions.

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5. ANNEX 1

Instructions for completing each column of the Assurance Implementation Matrix are as follows:

a. Topic: Reports the list of topics/objectives addressed in this document
b. Approved Standards: Include the accepted standards
c. Objective Satisfied (Y/N): Provide a "Yes" or "No" answer to whether the project plans to satisfy the corresponding objective provided.
d. Project Implementation: Document the project-specific implementation to satisfy the corresponding objective provided, including any approaches provided in the associated accepted standard(s).
e. Alternate Approaches and Standards: Include details for any alternate approaches or standards proposed and the related project-specific implementation to satisfy the corresponding objective provided.

Topic	Approved Standards	Objective Satisfied (Y/N)	Project Implementation	Alternate Approaches and Standards
System Engineering				
Fault Tolerance, Reliability, and Maintainability				
[…]				

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07/05/2025	First Issue	A

ATTACHMENTS:

Annex A: "Deliverables"

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1 SCOPE

This document establishes the top-level Product Assurance Requirements applicable to **"EarthNext- Closer to Earth, Next to the Future" (EARTHNEXT) - Fasi C/D/E1** project.

The PA program shall ensure that for **"EARTHNEXT"** 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 policies and principles of **ECSS-S-ST-00C**.

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

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2 DEFINITIONS

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

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3 DOCUMENTS

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

3.1 3.1 Applicable Documents

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

[AD1] Istruzione Operativa Linee guida per il Tailoring delle norme ECSS", ASI document n° OP-UQT-2022-001

[AD2] Linee guida per la redazione del piano della Qualità e del piano di assicurazione del prodotto. ASI document n° OP-UQT-2024-001

[AD3] DC-UQT-2024-004-A_EARTHNEXT_Deliverable Requirement Document Definition

[AD4] "Sistemi di Gestione per la Qualità" Document UNI EN ISO 9001:2015

[AD5] "Sistemi di Gestione per la Qualità" Document UNI EN ISO 9001:2015

[AD6] DC-UOT-2025-037 Capitolato Tecnico EarthNext Fasi C/D/E1

3.2 3.2 Reference Documents

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

[RD01]

[RD02] DC-UQT-2024-002 EARTHNEXT SMA and engineering objectives

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4 PA REQUIREMENTS

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

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

4.1 Product Assurance Plan

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

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

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

ENXT-PAR-001 'Product Assurance Plan

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

Required output:

Delivery schedule	
First issue at proposal Update	**Product Assurance Plan** (PA Plan) prepared according to the required [AD3] and the related applicable documents.

ASI reserves the right to:

a. access all documents and records made for the **"EARTHNEXT"** project, including the physical access to all Contractor's or sub-Contractor (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 **"EARTHNEXT"** 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**.**

4.2 PA Progress reporting

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

ENXT-PAR-002 'PA Progress Report'
The Contractor shall issue a PA progress report documenting all the PA activities carried out in the relevant period as defined in the contract/SoW. This report could be part of the periodic project progress report.

Required output:

Delivery schedule	
as required by SoW	**PA Progress Report** to be prepared as part of progress report. It should include at least the list and status of all NCR, RFx.

4.3 Quality Assurance

The Contractor shall prepare, implement, maintain and control a Plan for all QA activities. The plan could be part of the overall PA/Mission Assurance Plan.

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The Contractor shall employ a Quality Management System for:
• Configuration control of engineering data and project documentation
• Keeping quality control records
• Traceability of material items
• Maintaining calibrated equipment suitable for inspections and tests
• Reporting non-conformances in a systematic manner
• Handling, storage and preservation of flight items

If the Contractor quality management system is not ISO 9001 or EN 9100 certified, the Contractor shall include in its PA plan measures to compensate for the lack of one or more elements of the quality management system.

The Contractor shall include Key Inspection Points/Mandatory Inspection Point (KIP/MP) in the Product Quality Assurance Plan (or in the other document in agreement with the agency), in order to verify the quality of workmanship for the planned manufacturing, assembly, and integration processes. MIP/KIP Inspection Points shall be carried out by the Contractor in coordination with the ASI PA/QA (with a duly notification in case of MIP) before CDR and before the start of system integration, following the completion of the incoming inspections and acceptance tests at unit/equipment level.

ENXT-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 or Mission Assurance Plan.

Required output:

Delivery schedule	
as for PA Plan	**Quality Assurance Plan** (QA Plan), could be part of PA Plan/Mission Assurance Plan**.**

4.4 Configuration Control

The Contractor shall establish the Configuration Items to be controlled, e.g. requirements, technical specifications, engineering drawings/schematics, interface definitions, and determine how they shall be identified.
Once CIs have been placed under control, the Contractor shall ensure that Engineering Change Requests are prepared, and submitted to a Configuration Control Board for review and authorisation.

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The CCB shall involve all parties necessary to decide on the change to the configuration. The Contractor shall execute the change as approved.

4.5 Quality records

The Contractor shall maintain quality records to provide objective evidence of complete and effective performance of QA tasks and to demonstrate achievement of the required quality.
Quality records shall be stored in safe conditions, which prevent alterations, loss or deterioration, and shall be retained for the duration of the project plus a minimum of 1 additional year, if not differently specified in the contract.

4.5.1 Traceability

The Contractor shall implement a traceability system, which shall be maintained throughout all phases of contract performance.
The traceability system shall allow to:
a) Establish unequivocal relationship between parts / materials / products and associated documentation / records.
b) Trace personnel and equipment related to procurement, fabrication, inspection, test, assembly, integration and operations activities.

Each part, material or product shall be identified by a unique and permanent part or type number. These numbers shall be related to the engineering drawings.

4.5.2 Metrology and Calibration

The Contractor shall control, calibrate and maintain inspection, measuring and test equipment, whether owned by the Contractor, or on loan, to demonstrate the conformance of product to the specified requirements.
The Contractor shall:
a) Identify the measurements to be made, the accuracy required and select the appropriate inspection, measuring and test equipment. Measurement uncertainty shall be known and consistent with required measurement capability;
b) Identify, calibrate and adjust all inspection, measuring and test equipment at prescribed intervals, or prior to use, against certified equipment having a known valid relationship to national/international recognized standards - where no such standards exist, the basis used for calibration shall be documented and agreed by ASI.
c) Maintain calibration records for inspection, measuring and test equipment;
d) Ensure that the environmental conditions are suitable for the calibrations, inspections, measurements and tests being carried out;
e) Ensure that the handling, preservation and storage of inspection, measuring and test equipment is such that the accuracy and fitness for use is maintained;

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f) Safeguard inspection, measuring and test facilities, including both test hardware and test software, from adjustments, which would invalidate the calibration setting.

4.6 Incoming Inspections

The Contractor shall inspect all incoming supplies and the associated documentation, prior to use, to verify their conformance to the procurement documents.
Inspections shall be performed in accordance with established procedures and instructions, to ensure that the quality level is properly determined.
Incoming inspection activities shall be documented and shall include:
a) Verification of the packing conditions and of the status of any environmental sensors.
b) Visual inspection of the delivered items.
c) Verification of correct identification and, where appropriate, configuration identification for conformance to the ordering data.
d) Performance of inspection and tests on selected characteristics of incoming supplies and/or test specimen submitted with the supplies.
e) Identification of the shelf life of limited life items.

4.7 Audits Plan

The Contractor shall identify the need for the external and internal PA/QA audits plan to:

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

The audits shall be planned according to the level of risks of the **"EARTHNEXT"** 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 **"EARTHNEXT"** project, that are supposed or selected to be audited. Checklist(s) shall be made available to ASI upon request.

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ASI reserves the right to be represented in sub-Contractor (supplier) audits, or request the Audit to be performed. 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.

ENXT-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 **"EARTHNEXT"** 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 **"EARTHNEXT"** project.

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

Foreseen output:

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

4.8 Non Conformance Control

The Contractor shall define and implement a non-conformance management process and related control system.

During the verification control process, the Contractor shall identify any non-conformances of the design or flight configuration to the requirements, register a Non-Conformance Report, and notify the Agency.
If the Contractor already possesses a software tool for the processing of non-conformances, this can be used. A list of all NCR should be delivered periodically to the Agency (at leat included in the progress report).
The Contractor shall assess the criticality of the NCR, and, in case of CRITICAL/MAJOR NC together with the Agency, decide what course of action shall be taken, either rectification, request for deviation or waiver of the requirement, or use 'as-is' in low risk cases.
Non-conformances shall be classified as critical, major or minor, with the following criteria:
• Critical Non-conformances are those, which may affect safety, and occur during/after qualification/acceptance testing at any item level;

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• Major Non-conformances are those which are not critical, but may have an impact on the defined requirements in the following areas: o Operational, functional or contractual requirements;
o Reliability, maintainability;
o Lifetime;
o Interchangeability;

Additionally, any non-conformance shall be classified as major in the following cases:

- Deviation from qualification/acceptance test procedures and expected results at any level of integration;
- EEE component non-conformities after delivery from the manufacturer shall be classified as major, except the following non-conformances at incoming inspection, which may be classified as Minor:

o failures, where no risk for a lot related reliability or quality problem exists;
o the form, fit or function are not affected;
o minor inconsistencies in the accompanying documentation.

Minor non-conformances are those, which by definition cannot be classified as critical or major. A minor non-conformance is of inconsequential nature as regards the above features, or is trivial with regard to workmanship criteria.
Critical non-conformances shall be formally notified to ASI within 2 working day after review by the contractor PA. Major non-conformances shall be formally notified to ASI within 5 week after review by the Contractor PA.
All critical and major non-conformances shall be dispositioned by the Contractor and ASI.
Non-conformances shall be reviewed to identify the root causes, and implement corrective actions to prevent recurrence.
In the case of RFD or RFW, the relevant forms shall be produced by the Contractor and attached to the NCR entry in the database. The form shall then be reviewed and dispositioned by all relevant parties (Agency, launch safety authority etc).

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.

ENXT-PAR-006 'Non conformance management'

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1. The Contractor shall define and implement a non-conformance management process and related control system
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.

ENXT-PAR-007 '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 ASI approval.

Required output:

Delivery schedule	Required output (no specific DRDs are required)
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

4.9 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 **"EARTHNEXT"** project, in order to fulfil all requirements and constraints (Programmatically and Management, Technical, PA/QA).

The Contractor's PA Organisation shall be responsible for the incremental qualification and acceptance definition process from his sub-Contractors (suppliers). During this process the Contractor shall implement a qualification status reporting system in accordance with **"EARTHNEXT"** project PA requirements.

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

Final ASI acceptance or delivery Review(s) shall be pre-planned and prepared by the Contractor, in coordination with ASI, according to a specific procedure to be produced by the Contractor and to be approved by ASI.

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A Qualification Status List of the programme items shall be maintained to summarize for each configuration item the status achieved with respect to the planned qualification
The delivery should include the **Final Report,** at acceptance events**.**

ENXT-PAR-008 'Qualification Plan'
The Contractor PA function shall ensure that the qualification programme is defined, planned, implemented and the qualification results are recorded, evaluated and documented.

ENXT-PAR-009 'Qualification Status List'
The Contractor PA function shall ensure that a Qualification Status List of the programme items is maintained.

Required output:

Delivery schedule	
First at PDR (as a minimum, updated at major Design Reviews, CDR, QR, AR) Could be part of another document if foreseen by contract	**Qualification Status list and qualification plan**

4.10 Logbooks

The Contractor shall prepare and maintain logbooks covering the integration and testing activities following manufacturing and assembly of items.
The logbooks shall contain historical information, which is significant for operation of the item, including non-conformances, deviations and open tasks.

4.11 Handling, storage, preservation and transportation of flight hardware, Control of temporary installations and removals

The Contractor shall provide for protection of items during handling, and for handling devices, procedures and instructions to prevent handling damage during all phases of manufacturing, assembly, integration, testing, storage, transportation and operation.
The Contractor shall have secure storage areas available for incoming materials, intermediate items needing temporary storage and end items before shipping.
Controls shall be maintained over the acceptance into and withdrawal from the storage area.
Limited-life materials, suspended limited-life material, nonconforming items, and all other items which require to be stored separately for health or safety reasons shall be

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placed in segregated areas within the storage area. Each segregated area within the stores shall be clearly identified and labelled.

The Contractor shall ensure the control of flight items, which are temporarily removed, or non-flight items, which are temporarily installed.
Records of temporary installations and removals shall be established and maintained in the logbook.
Temporarily installed items shall be accounted, listed and indicated in the user manual to prevent them from being incorporated in the final flight configuration.

Required output:

Delivery schedule	
Could be part of another document	**Handling storange and User Manual**

4.11.1 Cleanliness and Contamination Control

Contamination shall be prevented to the maximum extent by operating in clean working areas and by proper handling, preservation, packing and storage.
The Contractor shall assess the sensitivity of the satellite components to contamination and set requirements for cleanliness during the manufacturing, assembly and integration cycle, starting from the incoming inspection up to shipping of the end item.
The Contractor shall then ensure that the flight hardware is stored and transported in the required cleanliness environment in order to mitigate the risk of contamination on sensitive surfaces.
Specific protection measures, such as protective dust covers, shall be implemented to protect contamination sensitive items when they are integrated in higher level of assembly. The Contractor shall clean the flight hardware as necessary to ensure that no dust, metallic part, or any uncontrolled material would compromise the mission (e.g. by obstructing optics or creating electrical short-circuits).

4.12 Dependability

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

It is recognised that cubesats systems are largely single-string with little volume and mass available for redundancy against single point failures. The emphasis shall therefore focus on prevention of failure propagation. If failures do occur, then they may be accepted provided that they do not propagate to cause other elements of the system to fail. In this case, an effective failure isolation shall be performed.

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However, no single point failure (SPF) or error should have critical or catastrophic consequences, ie. loss of satellite or no data return. If a SPF cannot be eliminated from the design, then it shall be designated as a Critical Item, and the related risk shall be assessed and carefully controlled.
Rules shall be derived in order to prevent failure propagation, e.g. no SPF shall affect the behaviour of the main power bus.
Ground commands needed to recover the satellite in case of a failure (when the satellite is in Safe mode) shall be specifically tested on ground during the system verification programme prior to launch.
The satellite shall possess tolerance to faults occurring in the On-Board Data Handling subsystem due to Single Event Effects (SEEs). The OBDH shall be able to recover from these faults. This capability shall be verified during ground testing.
Regarding maintainability, the on-board software and mission parameters stored in on-board memory shall be able to be patched during the mission.

ENXT-PAR -0011 'FMEA/FMECA Analysis'
The Contractor shall perform functional and product FMECA based on the criticality of consequences.

ENXT-PAR -0012 'Radiation Analysis report"
The Contractor shall produce a Radiation analysis report according to according to ECSS-Q-ST-60-15C Annex B, 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	
as part of the PA plan	**Dependability Plan**
PDR, CDR, updated as necessary	**FMEA/FMECA Analysis**
PDR, CDR, updated as necessary	**Radiation analysis report (if required)**

4.13 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.

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Items regarded as functionally critical to the safety and reliability shall be formally identified and controlled. Critical items shall include the Fracture Critical Items if any.
A consolidated list of all critical items shall be maintained by the Contractor.
All designated critical items, shall be subjected to special controls as follows:

- The item shall have a unique drawing number and shall be serialised.
- Design, manufacturing, and testing documentation shall be identified and marked.
- Any special requirements pertaining to procurement, manufacturing and inspection/testing shall be indicated on the drawings (and therefore under configuration control).
- Procurement specifications shall be mandatory
- Records of inspection and test results

ENXT-PAR -0013 'Critical Items List'
The Contractor shall establish and maintain a Critical Items List till FRR.

Required output:

Delivery schedule	
PDR, CDR, QR, updated as necessary	**Critical Items List**

4.14 EEE Components Control

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

4.14.1 Selection process

It is recognised that CubeSat projects widely use COTS components in order to reduce costs. The Contractor shall therefore perform a careful selection process on EEE components in order to ensure that they are fit for purpose in the operational environment over the required mission lifetime and do not adversely affect the operation of other elements of the system. In particular, the Contractor shall consider the following aspects in the selection process:

- Operating margins and de-rating of mission-critical components
- Radiation tolerance (both total ionising dose and Single Event Effects)
- Outgassing properties in vacuum (both TML and CVCM values) in order to control any contamination of sensitive surfaces (e.g. optics)
- Avoidance of materials known to degrade significantly in the space environment (e.g. atomic oxygen, UV, vacuum), leading to failure

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If any of the selected EEE components lack sufficient data in the above areas and are deemed to be mission-critical, then they shall be tested such that the test results allow to judge their suitability for the mission. This shall include early irradiation testing with results available at CDR (note: the Agency facilities may be used if the Contractor does not have access to such facilities).
The declared components list shall be reviewed by the Agency at major project reviews.

4.14.2 Prohibited components

Components containing materials that may constitute a safety hazard are prohibited from being used without prior approval by ASI for each individual application.
Use of components with the following characteristics shall be prohibited except where specifically agreed on a case-by-case basis:
a) Limited life;
b) Known instability;
c) May cause a safety hazard;
d) May create a reliability risk.

Example of such components are:
• Wet slug tantalum capacitors (except for CLR79 construction using double seals and a tantalum case);
• Hollow core resistors;
• Wire-link fuses;
• Potentiometers;
• Non-metallurgically bonded diodes;

Non-solid tantalum capacitors with silver case;
• Dice with no glassivation;
• Unpassivated power transistors;
• Any component whose internal construction uses metallurgic bonding with a melting temperature not compatible with the end-application mounting conditions;
• Components containing: cadmium, lithium, magnesium, mercury, radioactive material, pure tin (electroplated or fused), beryllium oxide (except if the health and safety hazards are identified in the specifications).

4.14.3 COTS Components

Components from stocks that have a lot/date code which indicates that more than 7 years will have elapsed from date of manufacture to date of intended installation in equipment shall be reviewed for their suitability for flight, and shall undergo visual inspection and additional 100% electrical measurement of critical parameters.

ENXT-PAR -0014 ‘Declared Component List’

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A DCL in an editable electronic format, identifying all component types needed, shall be issued.

Required output:

Delivery schedule	(no specific DRDs are required)
CDR, TRR, QAR and as required by the contract/SoW	**Declared Component List (DCL) as part of Declared Lists Document (DLs)** (reference format described in ECSS-Q-ST-60C, Annex B)

4.15 Materials, Parts & Processes

The objectives associated to Materials, Mechanical Parts and Processes (MMPP) selection is to ensure that they will satisfy the performance requirements during the intended life-time of the "EARTHNEXT" 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 "EARTHNEXT" PA requirements

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

The Contractor shall be responsible for the selection of materials, mechanical parts and processes and for demonstrating that they are capable of meeting the operating, environmental, physical, chemical, safety, quality and reliability conditions defined in the applicable specifications.
Particular attention shall be paid to the risks of failure in operation and the natural and induced environmental constraints such as for example:
• mechanical constraints (vibrations, accelerations, shocks),
• chemical constraints (corrosion, contamination, monatomic oxygen...),
• and to the combined action of the environment and stresses (thermoplastic behaviour, stress corrosion...).

The Contractor shall submit the declared materials and processes lists to ASI for major project reviews.
Each type of material and mechanical-part used shall be covered by a specification or standard.
The Contractor shall make maximum use of approved specifications/standards produced by national or international organisations

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ENXT-PAR-0016 'Declared Process List'
The Contractor shall establish and maintain a declared processes list [AD3]

ENXT-PAR-0017 'Declared Material List'
The Contractor shall establish and maintain a declared materials list [AD3]

ENXT-PAR-0018 'Declared Mechanical Parts List'
The Contractor shall establish and maintain a declared mechanical parts list [AD3]

Expected output:

Delivery schedule	(no specific DRDs are required)
CDR, TRR, QAR or as required by the contract/SoW	**Declared Process List (DPL) as part of Declared Lists Document (DLs)**
CDR, TRR, QAR or as required by the contract/SoW	**Declared Material List (DML) as part of Declared Lists Document (DLs)**
CDR, TRR, QAR or as required by the contract/SoW	**Declared Mechanical Parts List (DMPL) as part of Declared Lists Document (DLs)**

4.16 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.

ENXT-PAR-0019 'Safety programme plan'
The supplier shall establish and maintain a safety programme plan that could be part of the overall Product Assurance/Mission Assurance Plan.

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Required output:

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

4.17 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.

4.17.1 Software Configuration Control

The contractor shall:
• Identify the documentation and the computer software media containing code, documentation, or both to be placed under configuration control.
• Identify each Computer Software Configuration Item (CSCI) and its components and units.
• Identify the version, release, change status, and any other identification details of each CSCI.
• Identify the specific version of software contained on a deliverable medium, including any change incorporated since a previous release.

Software configuration changes performed by the contractor shall:
• Establish a developmental configuration for each CSCI to maintain internal configuration management during software development;
• Maintain current copies of the deliverable documentation and code;
• Control the preparation and dissemination of changes to the master copies of deliverable software and documents.

Software configuration status accounting performed by the contractor shall:
• Provide trace ability of changes to controlled software products.
• Serve as a basis for communicating the status of configuration documentation and associated software.

4.17.2 Software Criticality

Software shall be classified according to its functional criticality. The classification system should also take into consideration other factors such as complexity, size language and type of application (e.g., non-deliverable software used for verification of mission software).
The Contractor shall issue and maintain an updated list of software and the resulting criticality classification of each unit/component item.

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4.17.3 Software Verification

The Contractor shall perform a complete and thorough testing (up to full branch coverage) of software items classified as critical to mission success. This includes the introduction of realistic failure cases, and test coverage of critical FDIR functions (without Hardware in the loop).
A minimum level of regression testing shall be performed to confirm the reliability of on-board software and changes to the on-board software via uplinked patches.
The Contractor shall maintain a Bug tracking system during software development and maintenance in order to record known bugs in the software configuration.
The Contractor shall issue Software Problem Reports in case of test failures on critical software. Such reports shall be handled as part of the Non-conformance tracking procedures and system

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ATTACHMENTS:

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1. SCOPE

The purpose of this document is to provide the requirements for the content of all documentation specified in the PA requirements and Deliverable Items List for the EarthNext project.
It is an applicable document to the "Capitolato Tecnico" and shall be complied with by the Contractor during the project execution.

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2. DEFINITIONS

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

2.1 ACRONYMS

ABCL	As-Built Configuration List
AD	Applicable Document
AIT	Assembly Integration and Testing
AIV	Assembly Integration and Verification
AIVT	Assembly Integration Verification and Testing
AOCS	Attitude and Orbit Control System
ASI	Agenzia Spaziale Italiana
BB	BreadBoard
CCN	Contract Change Notice
CIL	Critical Item List
CIDL	Configuration Item Data List
CoC	Certificate of Conformance
COTS	Commercial Off-The-Shelf
DCL	Declared Component List
DDF	Design Definition File
DDP	Design Development Plan
DLs	Declared Lists
DML	Declared Material List
DMPL	Declared Mechanical Part List
DRD	Document Requirements Descriptions
ECP	Engineering Change Proposal
ECSS	European Cooperation for Space Standardization
EIDP	End-Item Data Package
EM	Engineering Model
EMC	Electro-Magnetic Compatibility
EQM	Engineering Qualification Model
FDIR	Failure, Detection, Isolation and Recovery
FM	Flight Model
FMEA	Failure Modes, Effects and Analysis
GSRD	Ground Segment Requirements Document

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ICD	Interface Control Document
I/F	InterFace
IOT	In-Orbit Testing
KIP	Key Inspection Point
LEOP	Launch and Early Orbit Phase
LIRD	Launcher Interface Requirements Document
MAR	Mission Analysis Report
MRD	Mission Requirements Document
PA	Product Assurance
PAP	Product Assurance Plan
PFM	Proto-Flight Model
PLRS	PayLoad Requirements Specification
PMP	Project Management Plan
PRS	Platform Requirements Specification
QA	Quality Assurance
QM	Qualification Model
QSL	Qualification Status List
RD	Reference Document
SDR	System Design Report
SDMP	Space Debris Mitigation Plan
SDMR	Space Debris Mitigation Report
SEP	System Engineering Plan
SGICD	Space-to-Ground Interface Control Document
SRD	System Requirements Document
STOM	Structurale, Thermal and Optical Model
SWRD	SoftWare Requirements Document
TM/TC	TeleMetry and TeleCommand
TRP	Thermal Reference Point
VCD	Verification Control Document
WPD	Work Package Description

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3. DOCUMENTS

3.1 APPLICABLE DOCUMENTS

[AD 01] ECSS-S-ST-00-01C, Glossary of terms

3.2 REFERENCE DOCUMENTS

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

[RD01] DC-SQA-2025-005 EarthNext SMA&E Objectives
[RD02] DC-SQA-2025-006 EarthNext PA Requirements
[RD03] ECSS tree, 2025 version, https://ecss.nl/standards/ecss-tree/

4. DOCUMENT REQUIREMENTS DESCRIPTION

4.1.1 DELIVERABLES

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

Title	Purpose	Content
Project Management Plan (PMP)	The purpose of a Project Management Plan (PMP) is to provide a detailed guide on how the project will be planned, executed, monitored, and controlled.	The Project Management Plan (PMP) shall outlines the key aspects of a project. It serves as a comprehensive guide for project execution and control, ensuring a systematic approach to achieve project goals. It shall include at least: • objectives and constraints of the project • the project organization approach • project breakdown structures and WPD • product tree • configuration, information and documentation management (if configuration management is not delivered) • cost and schedule management • integrated logistic support • risk management plan
Design Development Plan (DDP)	To define the planning for the detailed activities to be performed on new development items.	DDP shall include: • hardware development plan (covering design, analyses, manufacturing, assembly/integration and verification plans per development item)

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	Including the System Engineering Plan (SEP).	• software development plan (covering coding and verification testing per development item) • software re-use and criticality list • hardware/software co-engineering approach (e.g. EM flatsat, simulators) • radiation hardness plan for items without radiation test or flight data in a representative environment • engineering tools and facilities used to support developments (hardware and software) • engineering management as System Engineering Plan (SEP)
Product Assurance Plan (PAP)	Ensure that the organization, requirements, methods, tools, resources and responsibilities for the product assurance and safety disciplines are well defined before development and implemented at each project level. When applicable it includes the Audit Plan.	The PA plan shall describe the resources, tasks, responsibilities, methods and procedures adopted by the Contractor for the implementation of the PA&S requirements and for the achievement of the PA objectives. The PA plan shall include the following major elements: • scope, applicability • PA management: objectives, policies, implementation approach, responsibilities, organization, reporting • applicable and reference documents • tasks and activities to be performed for compliance with PA/QA requirements • cleanliness plan • Key Inspection Points (KIP) of workmanship quality • list of KIP-MIP (if not included in the AIT/AIV Plan) The Audit Plan shall contain at least the following basic elements: • identification of company (department) / sub-contractor / supplier to be audited • date (or reference to a program milestone) of audit(s) • description of audit objectives and field • audit baseline identification • audit check-list identification • audit team composition • audit schedule and agenda • audit report format and distribution • audit actions control In addition, the PA Plan should include also: • Software PA Plan • Safety Program Plan • Dependability Plan • Product Assurance Implementation Matrix.
Satellite User Manual	The objective of the Satellite User Manual is to provide the	See ECSS-E-ST-70C.

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	space segment design and operational information and data that is used by the ground segment supplier and operations supplier to prepare and implement mission operations. It provides also satellite instruction for the operations before launch. *Including Supplier User Manual for COTS.*	The document shall also provide the instruction to use the spacecraft and provide the instruction for the proper handling of the product after its final delivery, including procedures for: • packing • handling • storage • transportation • safety • cleanliness The document shall provide also user manuals by suppliers of all the COTS products to be used in the spacecraft, including: • option sheets and clear selection of options used in the spacecraft • electronic circuit diagrams (if available) • interface definitions (if available) • user instructions (if available) • acceptance tests performed by the supplier prior to delivery (if available) If a user manual is not available for a particular COTS product, then as a minimum a product data sheet shall be provided.
STOM AIVT Plan	To define and control all assembly, integration, verification and transportation activities associated with the CubeSat STOM.	CubeSat STOM definition, purpose and relative AIVT overall plan.
EM AIVT Plan	To define and control all assembly, integration, verification and transportation activities associated with the CubeSat EM.	CubeSat EM definition, purpose and relative AIVT overall plan.
EQM/QMs AIVT Plan	To define and control all assembly, integration, verification and transportation activities associated with the EQM/QMs.	EQM/QMs definition, purpose and relative AIVT overall plan.
PFM AIVT Plan	To define and control all assembly, integration, verification and transportation activities associated with the CubeSat PFM.	CubeSat PFM definition, purpose and relative AIVT overall plan.
Ground Segment AIVT Plan	To define and control all assembly, integration, verification and transportation	Ground Segment AIVT overall plan.

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	activities associated with the Ground Segment.	
Ground Segment Test Procedure	To establish the objectives, organization, set-up and constraints of verification tests. To establish the procedures/success criteria used in verification tests and the requirements to be verified.	As per ECSS-E-ST-10-03C Annex C
PFM Test Procedure	To establish the objectives, organization, set-up and constraints of verification tests. To establish the procedures/success criteria used in verification tests and the requirements to be verified.	As per ECSS-E-ST-10-03C Annex C
STOM Test Report	To describe the results of the verification tests against the specified requirements for the CubeSat STOM.	The document shall include for each test performed on the CubeSat STOM: • test method • test equipment and set-up description • as-ran test procedure • pass/fail criteria • test results including pre- and post-processed test data in the form of tables and graphs • interpretation of the test results with respect to the criteria • conclusion regarding test outcome and identification of any remedial measures in case of test failure
EM Test Report	To describe the results of the verification tests against the specified requirements for the CubeSat EM.	The document shall include for each test: • test method • test equipment and set-up description • as-ran test procedure • pass/fail criteria • test results including pre- and post-processed test data in the form of tables and graphs • interpretation of the test results with respect to the criteria • conclusion regarding test outcome and identification of any remedial measures in case of test failure
EQM/QMs Test Report	To describe the results of the verification tests against the specified requirements for EQM/QMs.	The document shall include for each test performed on the EQM/QMs: • test method • test equipment and set-up description • as-ran test procedure • pass/fail criteria • test results including pre- and post-processed test data in the form of tables and graphs • interpretation of the test results with respect to

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		the criteria • conclusion regarding test outcome and identification of any remedial measures in case of test failure
PFM Test Report	To describe the results of the verification tests against the specified requirements for the CubeSat PFM.	The document shall include for each test: • test method • test equipment and set-up description • as-ran test procedure • pass/fail criteria • test results including pre- and post-processed test data in the form of tables and graphs • interpretation of the test results with respect to the criteria • conclusion regarding test outcome and identification of any remedial measures in case of test failure
Ground Segment Test Report	To describe the results of the verification tests against the specified requirements for the Ground Segment.	The document shall include for each test: • test method • test equipment and set-up description • as-ran test procedure • pass/fail criteria • test results including pre- and post-processed test data in the form of tables and graphs • interpretation of the test results with respect to the criteria • conclusion regarding test outcome and identification of any remedial measures in case of test failure
Mission Operations Plan	To define the full plan of activities immediately preceding and during the mission operations phase, including the Mission Timeline. It shall cover all mission phases, from lift-off from the launch pad until and including the Spacecraft end of life disposal, covering nominal and contingency recovery operations.	The document shall include: • pre-launch mission rehearsals planning • mission timeline including all mission events and telecommand/telemetry flows • mission planning activities and work flow (including flight dynamics and simulator activities) • payload operations planning and work flow including payload data processing • operations personnel, operator responsibilities & lines of authority • operations work schedule and flow • support services and emergency contact points in case of ground systems failure FMEA
Mission Requirement Document (MRD)	To specify the mission requirements and constraints, and high-level payload user requirements.	The MRD shall include as a minimum: • mission objectives • mission constraints (launcher, orbit, target launch date, duration, comms coverage) • science observation requirements • payload requirements, including operational and data • mission phases and operational modes requirements

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		• autonomy requirements • ground segment requirements • mission data acquisition, storage and dissemination requirements
System Requirement Document (SRD)	To specify the system requirements.	The SRD shall include as a minimum: • system functional, performance and interface requirements • requirements for environment, cleanliness and ground handling, AIV, EMC, interfaces, modes and on-board autonomy/FDIR • on-board software requirements • ground segment requirements for ground stations, flight dynamics and simulation support, ground systems automation • programmatics requirements (project cost and schedule) • verification method for each requirement
Platform Requirements Specification (PRS)	To specify the platform requirements.	The PRS shall include as a minimum: • platform functional, performance and interface requirements • requirements for environment, cleanliness and ground handling, AIV, EMC, interfaces, modes and on-board autonomy/FDIR • on-board software requirements • programmatics requirements (project cost and schedule) • verification method for each requirement
Payload Requirements Specification (PLRS)	To specify the payload requirements.	The PLRS shall include as a minimum: • payload functional, performance and interface requirements • requirements for environment, cleanliness and ground handling, AIV, EMC, interfaces, modes and on-board autonomy/FDIR • on-board software requirements • programmatics requirements (project cost and schedule) • verification method for each requirement
Software Requirement Document (SWRD)	To specify the software requirements.	The SWRD shall include as a minimum: • software functional, performance and interface requirements • software system, operation, maintenance, verification, validation, dependability requirements • software programmatics requirements (project cost and schedule) • verification method for each requirement
Ground Segment Requirements Document (GSRD)	To specify the Ground Segment requirements.	The GSRD shall include as a minimum: • Ground Segment functional, performance and interface requirements • ground segment requirements for ground stations, flight dynamics and simulation support, ground systems automation

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		• programmatics requirements (project cost and schedule) • verification method for each requirement
Design Definition File	The objective of the design definition file (DDF) is to establish the technical definition of a system or product that complies with its technical requirements specification. *Including technical budgets.*	See ECSS-E-ST-10C Rev. 1.
Verification Control Document (VCD)	To identify verification methods to track verification status with respect to requirements during the project lifecycle. *Compliance matrix only.*	For each system requirement: • requirement identifier • requirement description • design configuration item • verification method (review/ analysis/inspection/demonstration/test • verification status • reference to supporting documentation (i.e. inspection/analysis/test reports)

Mission Analysis Report (MAR)	To describe all of the analysis performed in support of the mission planning prior to launch. It includes also how the project plans to fulfil the ESA space debris mitigation requirements, and report on analysis results demonstrating compliance.	The document includes:
		Mission design:
		• mission profile including mission duration, phases, spacecraft operational modes
		• orbit and pointing profiles during the phases/modes
		• available ground segment resources, including ground stations
		• degree of ground segment automation and spacecraft on-board autonomy
		• mission operations concept
		  • mission phases and operations scenario in each phase
		  • experiment execution performance
		  • mission data products
		Mission analysis:
		• launch/operational orbit trade-offs and selection
		• orbit/trajectory predictions throughout the mission
		• payload operations planning and analysis (e.g. imaging revisit analysis)
		• ground track and ground station visibility analysis
		• solar eclipse analysis
		• contingency analysis with respect to mission recovery in cases of failures during critical periods

System Design Report (SDR)	To provide a summary technical description of the overall baseline mission, spacecraft system and ground	Technical description, to include: • introduction, • launch, LEOP and on-orbit configurations • spacecraft operational modes

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	segment, including external interfaces and system budgets.	• spacecraft design concepts & trade-offs
		• system performance overview
		• baseline spacecraft description, including product tree, electrical architecture, mechanical and thermal design configurations
		• on-board software architecture (static and dynamic)
		• for each subsystem and payload:
		  • functional block diagram/schematic
		  • description of key design features, performances and hardware/software interfaces
		• system budgets (mass, power, link, data)
		• FMEA and FDIR design
		• spacecraft external interfaces (Launcher, GSE, Ground Segment)
		• Ground segment architecture

Risk Assessment Report	To identify, analyze, and evaluate potential risks associated with the project.	The report shall include at least: • a detailed analysis of identified risks, risk classification • risk potential impact, proposed mitigation strategies to minimize the likelihood or severity of adverse events. • the purpose and objective of the report • a brief description of what was done during the identification and assessment exercise, and its outcome • identification of organizations that contributed to the preparation of the document • method of assessment • principle of identification and assessment • consolidation approach • assessment report of each identified risk • comparison with earlier assessments • conclusions drawn from the identification and assessment, including any statements for future assessments and follow-up actions.
Space Debris Mitigation Document	To define how the project plans to fulfil the space debris mitigation requirements, and report on analysis results demonstrating compliance	The Space Debris Mitigation Document contents, as required by ECSS-U-AS-10C Rev.1, shall be comprehensive of a Space Debris Mitigation Plan (SDMP) and a Space Debris Mitigation Report (SDMR). The SDMP shall contain as a minimum: • the programme management overview • the mission overview • the space system description • the procured launch service description • the space debris mitigation implementation and verification plan • the launch service compliance information • the compliance and verification information The SDMR shall contain as a minimum: • description of the design and operational

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		measures implementation for achieving compliance with the space debris mitigation requirements • analysis and test reports in support of the implementation of the space debris mitigation requirements • list of objects (mission-related objects or space debris) planned to be released as part of the nominal mission, including physical characteristics, orbital characteristics and predicted orbital lifetime • list of events which can cause violation of the requirements and relevant consequences (e.g. description and characteristics of debris generated, etc.) • Verification Control Document covering all space debris mitigation requirements with related justification • assessment of the compliance of the selected launch services with the space • debris mitigation technical requirements in the standard

Space-to-Ground Interface Control Document (SGICD)	To define the interfaces between the spacecraft and the ground segment, including all ground stations.	The main interfaces to be addressed are at the level of command and control, mission data and telecommunications aspects for which format, content and RF transmission need to be described.
		Spacecraft to Ground Segment I/F definition, including:
		• system overview
		• spacecraft and orbit, range definition
		• data formats and rates, coding scheme and modulation
		• encryption, authentication
		• reference profile assumptions
		• telecommunications:
		  • frequencies
		  • link budgets, indicating worst case link margins expressed in dB for meeting the bit error rate requirements expressed in the SRD
		  • PFD calculation showing compliance with the ITU policy WRC-19 for the best-case link
		• data formats
		• TM/TC formats
		• ground station front-end interfaces
		• ranging interfaces
		• database interface
		• spacecraft to Ground Segment verification

Satellite Interface Control Document (ICD)	The purpose of the ICD is to define the design of the interface(s) ensuring compatibility among involved	See ECSS-E-ST-10-24C.

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	interface ends by documenting form, fit, and function. *Including the Payload-Platform Interfaces*	
Launcher Interface Requirements Document (LIRD)	To define the interface requirements of the mission/system towards the launcher and launch service.	The Launcher Interface Requirement Document, shall contain as a minimum the following content: • orbit injection parameters • spacecraft separation conditions • mechanical interfaces (dimensions, mass properties, deployer constraints) • environmental requirements (structural, thermal, pressure) • launch site operations (including propellant filling, battery maintenance, safety, cleanliness, logistics) • launcher reliability (in case of new launch vehicle)
Declared Lists Document (DLs)	To identify all types of mechanical parts and materials, electrical components and process needed for the current design for all system-level models. *Including DCL, DML, DMPL, DPL. COTS category A/B in QSL exclueded.*	The DCL part shall include at least the following information: • item number • commercial identification or standardized designation • component number (commercial equivalent designation) • procurement information • family (ESCC group code) • package • value or range of values with tolerance for non-qualified parts • validation references, justification for approval and prime comments and prime approval • customer approval status code and comments • indication if the item is a candidate for the Critical item list • specification amendment (including issue and revision) • name of the procurement agents (CPPA, supplier, distributor) • quality level and lot test (ESCC LAT or LVT, MIL TCI or QCI or CI) • space qualified status (yes or no) • RVT (yes or no) • reference of the PAD or Justification Document, where required • approval status of the part • change identification between each DCL issue • date-code (only for “as built” DCL)The DCL part shall include at least the following information: The DML part shall include at least the following

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		information: • item number • commercial identification or standardized designation • chemical nature and product type • procurement information • processing parameters • use and location • environmental code • size code • validation references, justification for approval and prime comments and prime approval • customer approval status code and comments • indication if the item is a candidate for the Critical item list • The DMPL shall include at least the following information: • item number • commercial identification • type of part • procurement information • elementary function, main characteristics • use and location • environmental code • criticality • supplier reference, prime comments and prime approval status • the customer approval status code and comments • indication if the item is a candidate for the Critical item list
Configuration Item Data List (CIDL)	The configuration item data list (CIDL) is a document generated from the central database giving the current design status of a configuration item (CI), at any point of time in sufficient detail, providing its complete definition.	See ECSS-M-ST-40C Rev.1.
As-Built Configuration List (ABCL)	To identify and report the as-build configuration.	As per reference document ECSS-M-ST-40C Rev. 1 annex D
Critical Item List (CIL)	To identify specific items likely to cause problems (critical items).	Format and expected content in line with as ECSS-Q-ST-10-04C, format reference ECSS-Q-ST-10-04C annex A.
Qualification Status List (QSL)	The purpose and objective of the QSL document is to summarize for each configuration item the status	Qualification Status List of all equipments, subsystems, systems, with respect to the mission/system requirements.

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	achieved with respect to the planned qualification. A Qualification Status List (QSL) is issued at equipment, subsystem and system levels.	
Failure Modes, Effects and Analysis (FMEA)	To identify potential critical process steps and to determine their effects on safety, product, process itself and programmatic aspects. *At satellite level only.*	The objective of the process FMEA is to initiate measures to eliminate the potential critical process steps or to reduce their criticality to an acceptable value. The document shall include at system and module level: • identification of failure modes • analysis of effects • determination of severity • assessment of likelihood • evaluation of detectability The FMEA shall include also the output of the radiation analysis.
Part Stress Analysis	Part stress analysis shall provide, for each EEE part, the maximum expected applied stress in terms of temperature, power and voltage and demonstrate that the expected derating margins are still satisfied. *COTS category A/B in QSL excluded.*	The PSA shall contain as minimum: • derating margins for each component (specified in ECSS-Q-ST-30-11C Rev 1 'Derating EEE components', or higher in case of COTS EEE) • the results for each EEE part, of the analysis in terms of the maximum expected applied stress (in terms of temperature, power and voltage)
Spacecraft Mechanical Analysis Report	To describe the S/C mass properties, structural analysis set-up, assumptions, and analysis results in relation to the relevant requirements.	Mass Properties Analysis The document shall contain (based on analysis of the spacecraft 3D CAD model): • overview of the stowed and deployed spacecraft configurations • spacecraft total mass • spacecraft centre of gravity position (& uncertainties) in spacecraft coordinate system – stowed and deployed configurations • spacecraft moments of inertia – stowed and deployed configurations Structural Analysis The document shall contain: • input loads description (sine, random, shock) and deployer transfer functions • analysis cases • FEM description and underlying assumptions and approximations • materials properties • model cross-checks • analysis tool description & outputs • FEA results, including margins of safety on structural elements • conclusion with respect to requirements

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		compliancy and areas of further work
		
		Mechanisms Analysis
		The document shall contain (for each mechanism):
		• design overview and description of operation in flight for all mechanisms, including hold-down, release, deployment and actuation functions
		• identification of worst case operational and environmental conditions
		• for new developments:
		  • pre-load & tolerance budget analysis
		  • actuation torque or force analysis including dissipative effects
		  • performance analysis
		  • analysis of lubrication selection & sizing for the application & lifetime
		• prediction of the number of on-ground and in-orbit cycles
		• power demand of electrically actuated mechanisms

Spacecraft Thermal Analysis Report	To describe the thermal analysis set-up, assumptions, and analysis results in relation to the relevant requirements.	The document shall contain: • input parameters and assumptions • analysis cases (hot, cold, transient, etc.) • TMM description and underlying assumptions and approximations • materials properties • Thermal Reference Point (TRP) definitions • model checks • analysis tool description and outputs • analysis results, including temperatures of spacecraft equipment respecting modelling uncertainties • temperature margin and model uncertainty approach • sensitivity analysis • correlation of the TMM with thermal balance test results (when available) • conclusion with respect to requirements compliancy and areas of further work
Spacecraft AOCS Analysis Report	To describe the AOCS analysis set-up, assumptions, and analysis results in relation to the relevant requirements.	The document shall contain: • S/C design configuration relevant to AOCS • input parameters and assumptions (sensor/actuator noise, controller bandwidth) • analysis cases (pointing modes, orbits/trajectories, stowed/deployed configurations) • AOCS performance model description and assumptions • AOCS stability and performance analysis results, including pointing error budget, as well as transition between pointing modes

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		• conclusion with respect to requirements compliancy and areas of further work

Spacecraft Integration Logbook	To record the actual events of the spacecraft integration process.	The document shall contain:
		• integration methods and equipment used
		• ambient conditions during the integration
		• cleanliness conditions, including clean room and clothing of the AIV personnel
		• condition of the incoming hardware
		• integration as-run procedure
		• fasteners, adhesives and harness tie-downs used
		• notable events during integration:
		  • anomalies
		  • discrepancies
		  • errors
		  • any corrective measures

End-Item Data Package (EIDP)	The purpose of the End Item Data Package (EIDP) is to formally document the conformity and acceptance status of a deliverable space item, providing traceable evidence of compliance with contractual and technical requirements. It serves as the basis for formal acceptance reviews (and supports the integration into higher-level systems if foreseen).	The EIDP shall include the following information and documentation: • the DRB minutes • the customer acceptance certificate if not covered in DRB minutes • cover page • table of contents • change record • the product certificate of conformity • NCR list and copies of major NCRs • ABCL • summary and status of RFDs and RFWs raised and processed on the product • the product logbook • product definition documents to be used for further integration, testing and operation in higher level assemblies including the software used to operate the item and the product user or operating manuals • procedures to be used for the proper handling of the product after its final delivery, including procedures for: packing, handling, storage, transportation, safety, cleanliness • test report list • list of delivered ground support equipment (e.g.: MGSE, EGSE, FGSE, OGSE) with the reference to their corresponding EIDPs and software product • list of EIDPs or logbooks of units and subsystem supplied by lower tier suppliers • list of the loose items and not installed items supplied with the product
Certificate of Conformity (CoC)	To provide to the customer the assurance that the deliverable item has been designed, manufactured and tested in	The CoC shall contain the following elements: • title: including references to identify the product and the relevant applicable documents

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	accordance with the technical and quality requirements established by the business agreement and the statement of work.	• document number in accordance with project configuration control rules • EIDP reference number • intended use, specifying the item objective (i.e. BB, QM, FM) • reference of conformity (calling for example the documents reference number of: design spec., logbooks, manuals, ICD, EIDP or other contractual documents, i.e. MRD; ATG; deliverable documents • statement of conformity; • list of waivers or deviations or other remarks • full name and function of the signing person(s) authorised by the issuer's management to sign on his behalf
LEOP, IOT and Commissioning Operation Plan	To define and control all LEOP, IOT and Commissioning operations.	The document shall include the plan for LEOP, IOT and commissioning operations.
LEOP, IOT and Commissioning Operation Procedure	To establish the objectives, organization, set-up and constraints of verification tests during LEOP, IOT and Commissioning. To establish the procedures/success criteria used in verification tests and the requirements to be verified during LEOP, IOT and Commissioning.	The document shall include the procedures for LEOP, IOT and commissioning operations.

LEOP, IOT and Commissioning Operation Report	To summarise the main results of the mission based on the data acquired, and describe the lessons learned.	The document shall include:
		• overview of the actual mission as performed, including the payload operations and any interruption in the mission due to in-orbit anomalies/failures (if any)
		• overview of the data post-processing
		• post-processed results of the mission operational data (including any failure analysis if failures occurred)
		• thermal model correlation using flight data
		• outcome and achievements of the in-orbit demonstration mission with respect to the mission objectives
		• lessons learned from the mission operations for:
		  • application of the IOD items to future missions
		  • future missions using CubeSats

Progress Report	To periodically report on the Project advancements.	The document shall include: • scope • executive summary • program management (description of progress, elements of attention on the schedule)

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		• system engineering (engineering activities, technical overview of the program) • documentation (documentation released and expected for the next period) • risks (risk summary table and mitigation actions) • status of actions (status of program reviews, status of actions complete with closing references) • contractual aspects (including milestone status, payments, ECP/CCN) • product assurance Report • status of team members • program schedule • meeting plan.

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PREPARAZIONE DELL'OFFERTA DA PARTE DI CONTRAENTI INDUSTRIALI, UNIVERSITA' ED ENTI PUBBLICI DI RICERCA

	UNITA' / NOME	FIRMA	DATA
PREPARATO	*Unità Organizzativa Qualità e Processi - UPQ*		
VERIFICATO	*N.A.*		
APPROVATO	*Responsabile UPQ*	Pedicini Francesco Firmato digitalmente da Pedicini Francesco ND: c=IT, o=Agenzia Spaziale Italiana, cn=Pedicini Francesco, serialNumber=ITPDCFNC56A09D644G, givenName=Francesco, sn=Pedicini, dnQualifier=14939333 Data: 2016.06.14 15:58:17 +02'00'	

Stato delle Revisioni

Data	Sezione del documento / Motivo della revisione	Revisione
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ALLEGATI:

DISTRIBUZIONE DEL DOCUMENTO:

Server Pubblico

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1. SCOPO

Il presente documento descrive le modalità di preparazione dell'offerta all'ASI da parte di contraenti industriali, Università ed Enti pubblici di ricerca.

Il documento individua anche il contenuto minimo d'informazione richiesto dall'ASI per la valutazione di congruità dell'offerta.

L'ASI garantisce che tutti i dati e le informazioni di cui venga a conoscenza attraverso l'offerta, saranno trattati con la massima riservatezza e segretezza nel rispetto delle prescrizioni della normativa in materia.

2. DEFINIZIONI ED ACRONIMI

ASI	Agenzia Spaziale Italiana
CS	Cost Sheet
ECSS	European Cooperation for Space Standardization
ECOS	ESA COsting Software
ECP	Engineering Change Proposal
SOW	Statement of Work
WBS	Work Breakdown Structure, struttura delle attività relative ad un progetto
WP	Work Package, elemento di più basso livello della WBS
WPD	Work Package Description, descrizione del WP

3. DOCUMENTI APPLICABILI E DI RIFERIMENTO

3.1 Documenti di Riferimento (DR)

[DR 1] ECSS-S-ST-00-01C, Glossary of terms (*)

[DR 2] ECSS-M-ST-80-C, Risk Assessment (*)

[DR 3] ECSS-M-ST-10C, Project Planning And Implementation (*)

[DR 4] ECSS-M-ST-10-01C, Organization And Conduct of Reviews

[DR 5] ECSS-M-ST-60C, Cost and schedule management (*)

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

4. COMPOSIZIONE E DESCRIZIONE DELL'OFFERTA

4.1 OFFERTA TECNICO-GESTIONALE

Contenuti della sezione Tecnico-Gestionale

La sezione Tecnico-Gestionale dovrà contenere:

- un apposito capitolo contenente le definizioni, gli acronimi e le abbreviazioni utilizzate;
- le scelte tecnico-gestionali proposte dall'offerente e la struttura gestionale, esprimente un'unica interfaccia contrattuale nei confronti dell'ASI, con l'indicazione delle attività che si ritiene necessario affidare a sottocontraenti;
- l'evidenziazione dell'adeguatezza della struttura organizzativa proposta in relazione alla complessità del progetto ed ai necessari adempimenti amministrativi;
- l'albero del prodotto, riferito alla struttura eventualmente fornita da ASI per il progetto specifico e sviluppato dall'offerente fino al livello di dettaglio ritenuto utile per caratterizzare il prodotto oggetto dell'offerta, con l'indicazione dei dettagli tecnici di realizzazione dell'oggetto della fornitura;
- la struttura e la descrizione delle attività che verranno svolte, che deve essere esauriente, completa e coerente con quanto contenuto nelle restanti parti dell'offerta;
- gli ulteriori elementi descritti nei paragrafi successivi

Analisi del Rischio

L'offerta dovrà contenere un'analisi del rischio che identifichi le fonti di rischio del progetto e ne quantifichi l'impatto sui costi ed i tempi di riferimento del progetto. L'analisi dovrà basarsi sui principi dello standard ECSS di cui in [DR2 e DR5].

Descrizione dei Pacchi di Lavoro (Work Package Description)

L'offerta conterrà la definizione della Work Breakdown Structure (WBS) che sarà finalizzata al soddisfacimento delle esigenze di pianificazione e controllo di ciascuna attività da svolgere per la realizzazione degli elementi dell'albero del prodotto. La struttura della WBS d'offerta dovrà essere conforme ai requisiti indicati nel capitolato Generale ASI, oltre a riferirsi alla struttura eventualmente fornita da ASI nello stesso Capitolato Tecnico per il progetto specifico. L'elemento di più basso livello della WBS è costituito dai pacchi di lavoro (WP, Work Package). La descrizione dei WP dovrà fornire le informazioni necessarie all'individuazione ed alla definizione delle attività previste nel WP e tutti gli elementi utili alla migliore comprensione della quotazione risultante nell'offerta economica (capitolo successivo).

L'offerente dovrà astenersi dal ripetere gli stessi contenuti descrittivi dei singoli Pacchi di Lavoro anche nella parte illustrativa che precede la descrizione dei pacchi di lavoro stessi. Pertanto detta parte illustrativa dovrà contenere solo i dettagli tecnici sull'oggetto del programma e spiegare le scelte tecnico-gestionali proposte dall'offerente. La descrizione delle attività che verranno svolte deve quindi essere posta unicamente nei WPD, in maniera esauriente, completa e coerente con quanto illustrato nella parte precedente.

Per ciascun WP, oltre gli elementi di individuazione (codice e titolo), si dovrà esplicitare:

- organizzazione che esegue le attività, esplicitando anche la dicitura "*prime*" o "*subcontractor*" o "*foreign subcontractor*";
- nominativo del responsabile del WP;
- data di inizio e termine delle attività;
- vincoli di interfaccia;
- elementi necessari all'avvio (input) dell'attività;
- descrizione dell'attività;
- prodotti (output) dell'attività

Inoltre, nel caso di addebito di costi per materiali, semilavorati, external services, external major product o eventuali "altri costi", la ditta dovrà fornirne all'interno della stessa descrizione del pacco di lavoro una spiegazione dettagliata **(Nota: I relativi costi dovranno essere riportati solo nell'Offerta Economica).**

Nel caso in cui sia previsto il cofinanziamento dovranno essere descritte ed evidenziate, per ogni WPD interessato, le attività che si cofinanziano inserendo tra parentesi, alla fine della descrizione, la parola **<Cofin>.**

Nella Tabella 1, in annesso, è indicato uno schema tipo per il WPD.

Pianificazione

L'offerta dovrà contenere la pianificazione proposta per lo svolgimento delle attività, in forma di:

- pianificazione globale (master schedule)
- pianificazione di dettaglio (diagramma Gantt) che mostri le connessioni temporali tra i WP.

Nel caso di Engineering Change Proposal (ECP), il legame tra la pianificazione dell'ECP e quella dell'intero programma dovrà essere chiaramente evidenziato.

4.2 OFFERTA ECONOMICA

Contenuti della sezione Economica

L'offerta economica relativa al totale delle attività dovrà essere formulata utilizzando le definizioni e la modulistica standard ESA (PSS-A). **Al documento cartaceo dovrà essere allegato il relativo supporto informatico contenete l'offerta economica in ECOS.**

Al fine di agevolare l'attività di controllo e di valutazione da parte dell'ASI, la formulazione dell'offerta in ECOS dovrà essere presentata come back-up a livello di **"Integration"** e come back-up al livello di **"Data Entry" (Sia del Prime che degli eventuali Sottocontraenti)**.

Nel caso in cui l'ITT (Invitation To Tender) non sia generato dall'ASI, sarà cura dell'offerente fornirlo su supporto informatico.

Inoltre, nella formulazione dell'offerta in ECOS (se non disponibile il SW può essere richiesto all'ASI o all'ESA), l'offerente è tenuto a fornire le informazioni sulle caratteristiche tecniche dei vari prodotti di cui al PT (Product Tree) secondo quanto previsto nella finestra "PT Tech/Parameter Data Entry".

NB: **Nel caso non si è utenti ECOS** l'offerta potrà essere preparata utilizzato i PSS-A forniti da ASI su richiesta.

Quotazione dei pacchi di lavori (Work Package, WP)

Ad ogni WP della WBS (sia del Prime che degli eventuali Sottocontraenti) dovrà corrispondere un Cost Sheet (CS) nel formato PSS-A della modulistica ESA (report da ECOS).

Per le attività eventualmente affidate a Sottocontraenti esteri occorre fornire idonea documentazione (offerta, contratto o altro) esplicativa del prezzo formulato nell'apposita voce di costo "sub-contract - CWAC" del PSS-A2.

Nel caso in cui sia richiesto da ASI il cofinanziamento da parte dell'offerente, dovranno essere riportati nel CS, dettagliando, anche i costi relativi (in ECOS voce co-funding + dettaglio PSS a parte).

I WPD ed i CS sono tra loro complementari e quindi dovrà essere verificata la loro perfetta corrispondenza.

Nota: Tutti i costi inseriti nei Cost Sheet devono essere IVA esclusa.

4.2.1.1 Personale - Costi Orari

Il personale dipendente impegnato dovrà essere esposto per ogni WP della WBS (di responsabilità sia del Prime, sia dei sottocontraenti) in ore dirette vendibili valorizzate, per ciascuna tipologia di attività, secondo quanto prescritto dall'ultima certificazione ASI.

In assenza di tale certificazione:

- i **contraenti industriali,** nel caso d'utilizzo di certificazione di altro Ente governativo e/o internazionale, dovranno allegare copia della lettera di certificazione delle tariffe riconosciute fornendo anche un sufficiente supporto informativo a chiarimento dei risultati riportati nella lettera di certificazione. **In assenza della certificazione** di cui sopra i contraenti dovranno fornire il calcolo dei costi orari e dei ricarichi posti in offerta, conformemente **alla metodologia ed alla modulistica da richiedersi all'ASI mediante il Responsabile del Procedimento**; Il Prime si farà carico di trasmettere la metodologia e la modulistica agli eventuali sottocontraenti.
- gli **Enti** ed **Istituti Pubblici di Ricerca** effettueranno la valorizzazione delle ore dirette vendibili nel seguente modo:
  - per ogni persona impegnata nel progetto **(solo personale tecnico-scientifico, non amministrativo)** sarà preso come base il costo effettivo annuo lordo (retribuzione effettiva annua lorda, con esclusione dei compensi per lavoro straordinario e diarie, maggiorata degli oneri di legge o contrattuali);
  - il Costo Orario sarà calcolato per ogni persona dividendo tale costo annuo lordo per il numero di ore lavorabili, poste *convenzionalmente* pari a 1.600. Il numero delle ore annue potenzialmente vendibili per i docenti e i ricercatori è pari a 1.250 ore/anno, ottenuto considerando le ore lavorabili (poste pari mediamente a 1.600) meno 350 ore di docenza.

    La **Tabella 4** allegata riporta lo schema EXCEL in cui riportare i dati relativi al calcolo del costo orario per le Università e gli Enti Pubblici di Ricerca .

Per gli assegni di ricerca si farà riferimento alla legge 449/97 art.51, comma 6 e successivi decreti (in particolare il Decreto Ministeriale del 26 febbraio 2004 prot. n. 45/2004).

Dovranno inoltre essere indicati i nominativi delle persone impegnate nell'attività oggetto dell'offerta ed il tipo di rapporto contrattuale (es. personale dipendente, non dipendente, etc).

Non sono ammessi costi a carico dell'ASI per il Responsabile Scientifico.

L'ASI, in assenza di propria certificazione o di certificazione non più applicabile, **si riserva comunque il diritto di effettuare appositi "audit".**

4.2.1.2 Altri costi

I Costi attribuiti all'acquisto di elementi che ricadono nelle categorie di costo del punto 3 dei PSS-A (i.e. External Major Products, Miscellaneous, ….) dovranno essere dettagliati in un FORM il cui schema è riportato nella **Tabella 3** allegata. Nel caso siano disponibili preventivi di costo, il contraente allegherà la documentazione in suo possesso.

4.2.1.3 Viaggi e Trasferte

Il piano viaggi indicherà le missioni previste, esplicitando per ognuna di esse il collegamento al relativo pacco di lavoro, e dovrà essere dettagliato per scopo, destinazione, mezzo di trasporto, numero di persone, durata, etc. come da **Tabella 2** allegata.

Per le missioni all'estero che riguardano il personale dello Stato e delle Università si farà riferimento alle diarie pubblicate sulla Gazzetta Ufficiale.

4.2.1.4 Utile

Per i contratti stipulati con contraenti industriali l'aliquota di utile sarà riconosciuta nella misura non superiore al 5%, applicata ai costi esposti in offerta e rientranti nell'oggetto sociale della ditta, con l'esclusione delle spese per viaggi e trasferte e dei costi dei sottocontraenti. L'aliquota di utile non sarà riconosciuta nei casi di offerte spontanee, nei casi riguardanti studi di dichiarato interesse dell'offerente e nei casi di attività per le quali è proposta una quota di cofinanziamento.

Per i contratti stipulati con Università ed Enti Pubblici di Ricerca non viene riconosciuta da ASI nessuna aliquota di utile.

Condizioni economiche e prezzo offerto

Le condizioni economiche del prezzo delle attività complessivamente previste, andranno riferite al mese risultante dalla media ponderale dei baricentri delle durate dei WP (Pacchi di Lavoro), avendo assunto come pesi gli importi dei WP relativi. Nel caso di ECP si rimanda al paragrafo dedicato.

In caso di cofinanziamento, il prezzo totale offerto dovrà essere esplicitato in prezzo a carico ASI e prezzo cofinanziato/partecipato.

Per le Opzioni vale quanto indicato per la descrizione dei WP e la definizione della pianificazione. La WBS sarà quindi unica e conterrà al suo interno anche i WP relativi alle opzioni, collocati nella posizione opportuna.

Nel caso di Opzioni, dovranno essere forniti due supporti elettronici distinti:

- una versione "baseline", in cui i WP delle opzioni sono al valore 0

- una versione "opzioni", in cui tutti i WP, compresi quelli delle opzioni, hanno il loro valore.

In particolare, qualora l'opzione consista nella estensione o contrazione di attività di uno o più WP presenti nella "baseline", occorre inserire nella WBS i WP's estesi o contratti, in aggiunta ai corrispondenti WP's "baseline", collocandoli allo stesso livello di quest'ultimi. Pertanto nella configurazione "baseline" i costi dei WP's estesi o contratti saranno posti uguali a zero, mentre nella configurazione "opzioni" i costi dei WP's estesi o contratti avranno il loro valore e i costi dei corrispondenti WP's "baseline " saranno posti uguale a zero.

4.3 ENGINEERING CHANGE PROPOSALS

Con l'introduzione di ECP, che possono derivare da una richiesta dell'ASI o da una proposta diretta del contraente, il progetto assume una nuova configurazione. Nel caso di offerta riguardante una ECP, oltre a quanto descritto nei precedenti capitoli, l'offerente dovrà rispondere anche ai requisiti di seguito elencati:

- nella WBS dell'intero progetto in nuova configurazione saranno contenuti tutti i pacchi di lavoro (quelli inalterati, quelli eliminati, quelli modificati e quelli nuovi) e saranno evidenziate adeguatamente le variazioni come da esempio in annesso, Tabella 5;
- dovranno essere forniti i WPD modificati e nuovi integrabili nell'edizione dell'offerta avente la configurazione precedente; nei WPD modificati saranno, inoltre, evidenziate le attività cancellate e quelle nuove; le attività cancellate saranno barrate, le attività nuove saranno sottolineate;
- dovrà essere fornita una tabella riassuntiva ECP come quella riportata in annesso, Tabella 5;
- dovrà essere emessa la pianificazione dell'intero progetto corrispondente alla WBS, completa di tutte le attività, in MS PROJECT;
- nell'offerta economica dell'intero progetto in nuova configurazione, i WP rimasti inalterati conterranno gli elementi di costo, le quotazioni economiche e la pianificazione già oggetto della valutazione di congruità propedeutica al contratto in essere;
- le condizioni economiche della proposta dovranno essere quelle dell'offerta relativa al progetto avente la configurazione precedente.

4.4 PREVENTIVO DEI COSTI E DEI TEMPI

Qualora siano previsti in uscita dal progetto preventivi dei costi e tempi di future fasi e/o del progetto a finire, tali preventivi dovranno attenersi a quanto specificato nello standard ECSS [DR5]. Il preventivo dovrà identificare come minimo:

1. La descrizione del processo attraverso il quale il preventivo è stato generato.
2. La metodologia adottata
3. Le ipotesi sulle quali si basa il preventivo
4. Il livello di confidenza/incertezza del preventivo indicando l'intervallo minimo e massimo previsto sia per i tempi che per i costi

ANNESSI

Tabella 1 – Esempio di Work Package Description, WPD (PSS-A-20)

Tabella 2 – Esempio per Viaggi e trasferte *(inserire solo nell'Offerta Economica)*

Tabella 3 – Esempio di Altri Costi *(inserire solo nell'Offerta Economica)*

Tabella 4 – Esempio di Schema dei Costi Orari da riempire solo da Università ed Enti di ricerca *(inserire solo nell' Offerta Economica)*

Tabella 5 - Formato WBS con ECP e Tabella Riassuntiva ECP *(inserire solo nell' Offerta Economica)*

Tabella 1 – Esempio di Work Package Description, WPD (PSS-A-20)

INSERT LOGO	**Program** INSERT ONLY ECP - ENGINEERING CHANGE PROPOSA / CONTRACT CHANGE NOTICE	N°:: **S1-AAA-CCN-001** Issue: **2** Date: **XX.XX.20XX** Page **2** of **20**

Name Project:: TEST			**W.P.: 1B22-AC**
W.P. Title:	**Support Satellite PFM Product Assurance**		Sheet 1 of 1
Contractor:	**Ditta Anonima SpA**		
Major Constituent:	**Support Satellite PFM Project Office**		Issue: **2**
Start Event:	**KO**	Date: **T1**	
End Event:	**FAR**	Planned Date: **T1 + 59m**	Date: **XX/XXX/20XX**
W. P. Manager:	**Giovanni Rossi**		

Objectives

SS Product Assurance project implementation.

Inputs

- *Applicable and Reference Documents.*
- *Contract.*
- *ECP*
- *PA & Safety Plan (output from WP 1B1A-AC1).*

Tasks

- *Assure that the SS design and development processes are in compliance with the PA & Safety Plan.*
- *Apply the necessary control during throughout the SS Manufacturing, Assembly, Integration and Testing for achievement of the required quality level.*
- *Approve and check structure and completeness of the technical documentation.*
- *Certify the test results and authorize documentation and items delivery.*
- *Inspect the technical activities and verify their conformity with product assurance requirements.*
- *Call a dedicated meeting in case of product assurance problems.*
- ***Manage contractual changes for product assurance and safety matters.***
- ……..
- *Issue of SS Mechanical Part List. **(Cofin)***
- *Issue of SS Processes List.*
- *Procurement specifications approval of parts and material under quality control.*
- ~~***Issue of Specific Process Procedures, if any.***~~

Outputs;

- *SS Inspection Plan (input to IS S/S documentation)*
- *SS Inspection Reports (input to IS S/S documentation)*
- ……
- *SS Declared Material List, (~~**final**~~ **second** issue)*
- *SS Declared Mechanical Part List, (input to S/S documentation)*

Note:
New tasks are highlighted as underlined text;
removed tasks are highlighted as ~~crossed text~~.

Tabella 2 – Esempio per Viaggi e trasferte

VIAGGI (Dettaglio) - costi in EURO

W.P.	SCOPO VIAGGIO	LUOGO DI PARTENZA	LUOGO DI DESTINAZIONE	MEZZO DI TRASPORTO	NUMERO VIAGGI (A)	NUMERO PERSONE (B)	NUMERO GIORNI (C)	(AxBxC)	VITTO E ALLOGGIO	NOLO AUTO/TAXI	COSTO BIGLIETTO	COSTO TOTALE
1100	riunione di KO	Milano	Roma	Aereo	1	2	2	4	578.44	56.81	619.74	1,254.99
								0				0.00
								0				0.00
								0				0.00
								0				0.00
								0				0.00
								0				0.00
								0				0.00
								0				0.00
								0				0.00
								0				0.00
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								0				0.00
								0				0.00
								0				0.00
								0				0.00
								0				0.00
								0				0.00
								0				0.00
								0				0.00
								0				0.00
								0				0.00
								TOTALE	578.44	56.81	619.74	1,254.99

NOTA: I dati inseriti nella tabella sono solo di esempio

Tabella 3 – Esempio per Altri Costi

DETTAGLIO ALTRI COSTI - Costi in EURO o in Valuta)

W.P.	ALTRI COSTI (punti da 3.1 a 3.10 del PSS-A)	DESCRIZIONE	FORNITORE	QUANTITA'	COSTO UNITARIO	COSTO TOTALE
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
						€ 0.00
					TOTALE	**€ 0.00**

Tabella 4 – Esempio di Schema dei Costi Orari (solo per Università ed Enti Pubblici di Ricerca)

COSTO ORARIO PERSONALE ENTI SCIENTIFICI

ENTE	CATEGORIA PERSONALE	LIVELLO/FASCIA RETRIBUTIVA	RETRIBUZIONE TOTALE ANNUA (stipendio + tredicesima + Indennità, etc)	ONERI SOCIALI A CARICO ENTE	ACCANTONAMENTO ANNUO TFR/TFS	ALTRI ONERI A CARICO ENTE	COSTO TOTALE ANNUO DELLA RETRIBUZIONE	ORE LAVORABILI ANNUE	COSTO ORARIO	NOTE E RIFERIMENTI
UNI-RM	RICERCATORE TP	Classe V TP I progr.econ.	38,889.00	12,447.00	2,028.67	0.00	**53,364.67**	**1,600**	**33.35**	Retribuzioni pers universitario
INAF	ASSEGNO DI RICERCA		16,138.00	1,958.00			**18,096.00**	**1,600**	**11.31**	DM 26-02-04 rivalutazione assegni di ricerca
							0.00	**1,600**	**0.00**	
							0.00	**1,600**	**0.00**	
							0.00	**1,600**	**0.00**

Tabella 5 - Formato WBS con ECP

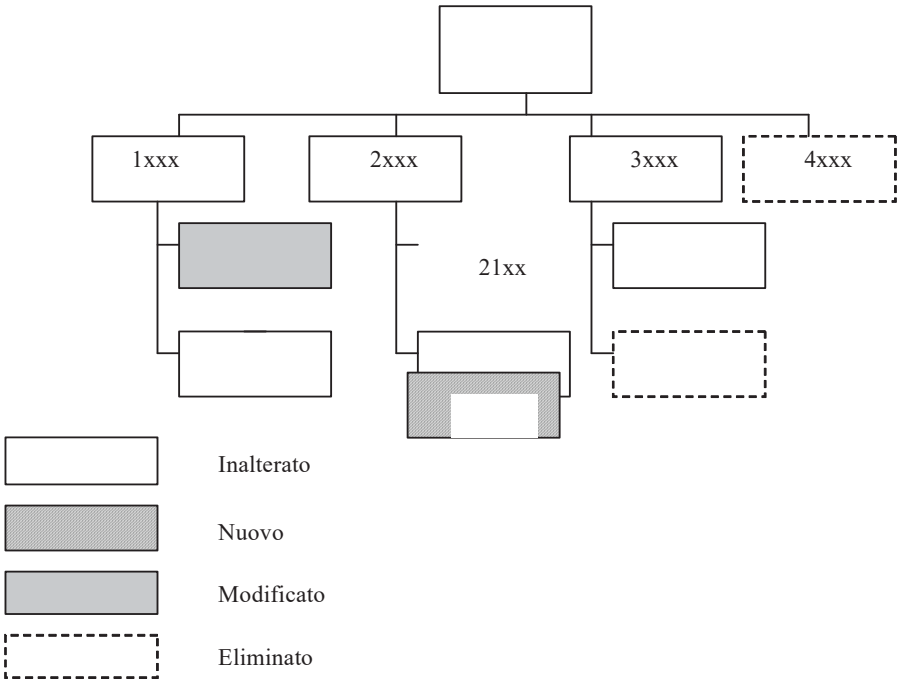

Fig. A - Formato WBS con ECP

cod. WP offerta c.p.	cod. WP contratto c.p.	titolo WP c.p.	Ditta resp c.p.	cod. WP offerta c.n.	titolo WP c.n.	Ditta resp. c.n.	tipologia	prezzo WP offerta c.p.	prezzo WP congruito c.p.	prezzo WP offerta c.n.	prezzo WP offerta ECP
								a	***b***	***c***	***d = c-b***
1100	1100	manag.	X	1100	manag.	X	M	100	90	100	10
				2100	system..	X	N	0	0	150	150
3100	A000	integr…	X	3100	integr…	X	I	120	110	110	0
3200	A310	fornitura..	Y				E	30	30	0	-30
4020	B020	specif….	X	4020	specif….	Y	M	50	50	80	30
4150	B150	test…	Z	4150	proc. + test	Z	M	80	80	130	50
ecc..				ecc..							
							totali	**380**	**360**	**570**	**210**

legenda

c.p.	configurazione precedente	**c.n.**	configurazione nuova
I	inalterato	**E**	eliminato
N	nuovo	**M**	modificato

Tabella Riassuntiva ECP

FAC-SIMILE DI LETTERA DI TRASMISSIONE OFFERTA

Spett. **ASI - Agenzia Spaziale Italiana**
Via del Politecnico, snc
00133 ROMA

PEC: ***asi@asi.postacert.it***

Att.ne:

<Responsabile Unico del Procedimento, verificare il nome e l'Unità sulla lettera di richiesta d'offerta>

Copia lettera: **Unità Contratti – UO CTR**
Unità Qualità e Processi – UO UPQ

Data: [gg/mm/aaaa]

Ns. Rif. No.: **[…….]**

Vs. Rif. No.: Richiesta d'Offerta ASI, Prot. n [XXXXXXX sette cifre] del [gg/mm/aaaa]

Oggetto: **[……]**

In risposta alla Vostra Richiesta di Offerta in riferimento, [offerente] è lieta di sottoporVi la proposta [titolo del progetto] relativa a [brevissima descrizione del progetto].

L'offerta è presentata in un **originale rilegato** *[le offerte non rilegate verranno respinte]*, siglato in tutte le pagine dal [nome e cognome] in qualità di rappresentante legale dell'offerente [o suo delegato] e tre **(3)** copie complete su supporto informatico come da Voi richiesto.

(Nel caso di offerta inviata e firmata in formato digitale via PEC il paragrafo sopra riportato va eliminato)

L'offerta è articolata in 2 volumi:

A) Offerta Tecnico–Gestionale inclusiva di:

- Scopo del documento
- Documentazione applicabile e di riferimento
- Definizione ed Acronimi
- Struttura Industriale *[profilo e competenze del Prime e dei Subco]*
- Attività svolte dalle PMI
- Organizzazione di gestione del progetto
- Curriculum vitae persone chiave
- Work Breakdown Structure
- Work Package Description
- Pianificazione di dettaglio

- Albero del prodotto *[cancellare se non applicabile]*
- Fornitura contrattuale (HW, SW, Documentazione)
- Analisi del rischio
- Lista degli allegati

B) Offerta Economica inclusiva di tutti i dettagli analitici degli elementi di costo offerti

Altre indicazioni relative all'offerta:

- **Prezzo Offerto**

Il Prezzo Totale offerto è:

€ ……,00	*IVA esclusa*

ed è così suddiviso:

	A CARICO ASI					EVENTUALE COFINANZIAMENTO			
Ente/ Ditta/ Università	*baseline*		*opzioni*		TOTALE ASI	*baseline*	*Opzioni*	TOTALE COFIN	TOTALE OFFERTO
	PFF	*RC/CC*	*PFF*	*RC/CC*					
	A	B	C	D	E = A+B+C+D	F	G	H = F +G	L=E +H
PRIME	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	**0.00**	**0.00**
SUBCO 1	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	**0.00**	**0.00**
SUBCO 2	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	**0.00**	**0.00**
SUBCO n	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	**0.00**	**0.00**
TOTALE	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Dove:

PPF = Prezzo Fermo e Fisso

RC/CC= Prezzo a Rimborso Costi/Controllo Costi

Tutti i prezzi offerti si intendono al **netto di IVA**.

[L'eventuale importo da sottoporre a rimborso/controllo costi deve essere esplicitato come costi diretti, più eventuali ricarichi, più eventuale utile come riportato nell'esempio della tabella sottostante.]

WP	*Ditta/Ente Responsabile WP*	*Baseline (B) / Opzioni (O)*	*Voce del PSS-A3*	*Importo (€)*	*Eventuale ricarico (€)*	eventuale Utile (€)	*TOTALE IMPORTO DA SOTTOPORRE A RC/CC (€)*
				A	*B*	C	D=A+B+C
1000	**Pippo**	**B**	**Raw material**	0.00	0.00	0.00	**0.00**
2000	**Pluto**	**B**	**Travels**	0.00	0.00	0.00	**0.00**
NNN	**XXX**	**O**	**xxxxx**	0.00	0.00	0.00	**0.00**
			TOTALE	**0.00**	**0.00**	**0.00**	**0.00**

I prezzi offerti sono fermi e fissi alle condizioni economiche di [mese e anno, baricentro economico delle attività offerte]

- **Durata delle attività**

Le attività avranno la durata di [numero dei mesi] mesi a far data dal Kick Off Meeting (tempo To).

- **Validità dell'offerta**

  La validità della presente offerta è di sei mesi dalla data di ricezione della medesima da parte dell'ASI.

- **Conformità**

  La presente offerta è conforme a quanto indicato nei documenti della Richiesta di Offerta dell'ASI.

- **Supporto informatico**

  Il supporto elettronico allegato contiene:

- la proposta tecnico-gestionale in formato WORD
- la proposta economica in formato ECOS [*files con estensione .ECS e .TEN*] [*casi particolari verranno gestiti con file excel* ***necessariamente*** *da richiedere ad ASI]*
- la Pianificazione corrispondente ai WP offerti in formato WINPROJECT

- **Piano dei pagamenti**

  Il piano dei pagamenti e le relative milestones (importo associato, percentuale e deliverables) sono riportati al punto [**……**] dell'offerta economica.

- **Preventivo dei Costi e Tempi** [cancellare se non applicabile]

Per informazioni e/o chiarimenti riguardanti la presente offerta, si prega far riferimento:

- per gli aspetti tecnico-programmatici: [titolo, nome, cognome]
  (tel.: ……..)
  (fax: ……..)
  (e-mail:……...)

- per gli aspetti commerciali-contrattuali: [titolo, nome, cognome]
  (tel.: ……..……)
  (fax : ……..……)
  (e-mail: ……..……)

Distinti saluti.

[Nome e Cognome del Rappresentante Legale o suo delegato]
[Posizione nell'organizzazione]