ECSS-S-ST-00-01C
1 October 2012

ECSS system

Glossary of terms

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Foreword

The ECSS Glossary is part of the series of ECSS Standards intended to be applied together for the management, engineering and product assurance in space projects and applications. ECSS is a cooperative effort of the European Space Agency, national space agencies and European industry associations for the purpose of developing and maintaining common standards.

Requirements in ECSS Standards are defined in terms of what shall be accomplished, rather than in terms of how to organize and perform the necessary work. This allows existing organizational structures and methods to be applied where they are effective, and for the structures and methods to evolve as necessary without rewriting the standards.

This document has been prepared by the ECSS Glossary Task Force, reviewed and approved by the ECSS Technical Authority.

Traceability to the previous ECSS Glossary "ECSS-P-001B" is ensured through the matrix given in Annex A.

Disclaimer

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Scope

This document controls the definition of all common terms used in the European Cooperation for Space Standardization (ECSS) Standards System. Terms specific to a particular ECSS Standard are defined in that standard.

This document does not include the definition of terms used with their common meaning. In this case, the definition from the Oxford English Dictionary applies.

2
Terms, definitions and abbreviated terms

2.1 Terms and definitions

When using the ECSS standards, the following is the order of precedence of documents as the source of definition of terms:

1. the standard in question

2. the present Glossary of terms

3. the Oxford English dictionary.

A term used within a definition, which is defined elsewhere in this document is shown in boldface. A boldface term may be replaced within the definition by its own definition.

A concept that has a special meaning in a particular context is indicated by designating the context in angle brackets, < >, before the definition.

A document reference shown after a definition in square brackets, [ ], indicates that this definition is reproduced from the referenced document.

NOTE For example:

> **2.3.17 auditee**
> organization being audited
> [ISO 9000:2005]

All terms and their definitions appear in alphabetic order in clause 2.3 of this Glossary. However, wherever it is considered important to present together a set of terms that are interrelated (i.e. constitute a particular "view"), these terms and their definitions are repeated in standalone sections of this Glossary or in Annexes. For example, clause 2.2 collects together all terms that relate to the breakdown of the overall Space System.

2.2 Space system breakdown

2.2.1 Introduction

ECSS-S-ST-00C defines the highest-level system within a space project – i.e. the one at the mission-level - as the "Space System". The purpose of the present clause is to identify the breakdown of a typical space system and to define a set of standard terms for the constituent levels within the breakdown (see Figure 2-1).

In so doing, it is acknowledged that each distinct domain (i.e. space, ground and launcher) already has its own domain-specific terminology for its internal entities e.g. elements and systems. In the case of the launcher domain, this terminology has been formally defined and agreed at programme-level. It is not the intention to define new terms in this Glossary to supersede those already in universal use. Rather, the intention is to define a standard set of terms for the levels of the space system breakdown and then to show where the domain-specific entities fit into these levels. To this end, Annex B contains examples of entities from the three principal space system segments, mapped to the space system breakdown levels defined below.

The terms are defined in clause 2.2.2 to 2.2.7 and are listed not in alphabetic order but according to the hierarchy defined in Figure 2-1: Space system breakdown below.

- 2.2.2 defines generic terms
- 2.2.3 defines the space system
- 2.2.4 defines terms relating to the space segment
- 2.2.5 defines terms relating to the ground segment
- 2.2.6 defines terms relating to the launch segment
- 2.2.7 defines terms relating to the support segment

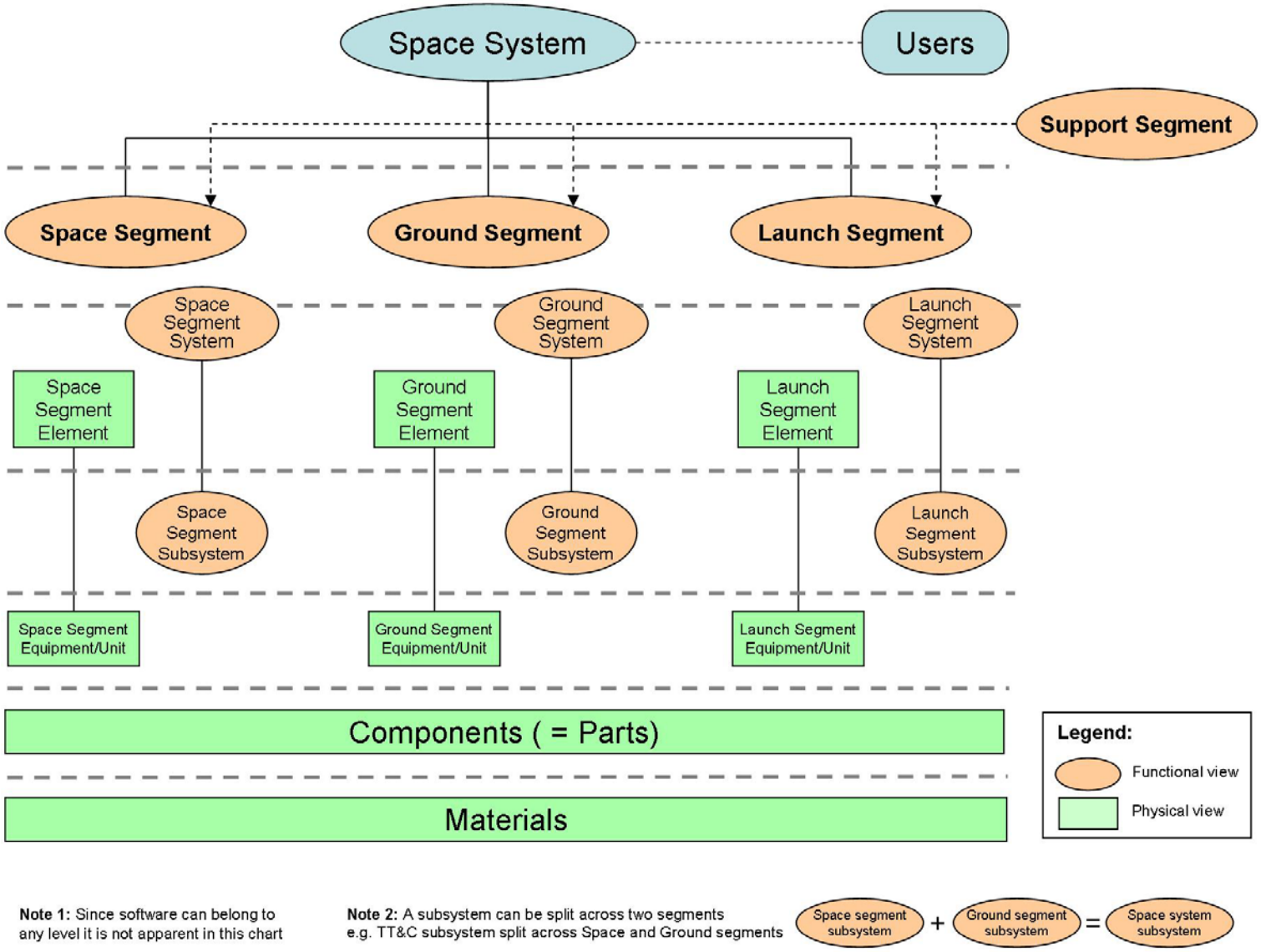


Figure 2-1: Space system breakdown

2.2.2 Definitions for generic terms

system

set of interrelated or interacting **functions** constituted to achieve a specified objective

segment

set of **elements** or combination of **systems** that fulfils a major, self-contained, subset of the **space mission** objectives

Examples are space segment, ground segment, launch segment and support segment.

element

combination of integrated **equipment, components** and **parts**

NOTE An element fulfils a major, self-contained, subset of a segment's objectives.

subsystem

part of a **system** fulfilling one or more of its **functions**

equipment

integrated set of **parts** and **components**

NOTE 1 An equipment accomplishes a specific function.

NOTE 2 An equipment is self-contained and classified as such for the purposes of separate manufacture, procurement, drawings, specification, storage, issue, maintenance or use.

NOTE 3 The term "unit" is synonymous with the term "equipment"

component

set of **materials,** assembled according to defined and controlled **processes,** which cannot be disassembled without destroying its capability and which performs a simple **function** that can be evaluated against expected **performance requirements**

NOTE 1 The term "part" is synonymous.

NOTE 2 The term "part" is preferred when referring to purely mechanical devices.

NOTE 3 The term "component" is preferred for EEE devices.

part

see "component"

material

raw, semi–finished or finished substance (gaseous, liquid, solid) of given characteristics from which processing into a **component** or **part** is undertaken

2.2.3 Definitions for space system

space system

system that contains at least a **space,** a **ground** or a **launch segment**

NOTE Generally a space system is composed of all three segments and is supported by a support segment.

2.2.4 Definitions for space segment

space segment

part of a **space system,** placed in space, to fulfil the **space mission** objectives

space segment system

system within a **space segment**

NOTE Examples are given in Annex B.1.

space segment element

element within a **space segment**

NOTE 1 A space segment element can be composed of several space segment elements, e.g. a spacecraft is composed of instruments, a payload module and a service module.

NOTE 2 Examples are given in Annex B.1.

stand-alone space segment element

space segment element that performs its **mission** autonomously

NOTE For example: satellite, rover, lander.

embedded space segment element

space segment element that performs its **mission** as part of another **space segment element**

NOTE For example: platform, module, instrument, payload.

space segment subsystem

subsystem within a **space segment**

NOTE Examples are given in Annex B.1.

space segment equipment

equipment within a **space segment**

NOTE Examples are given in Annex B.1.

2.2.5 Definitions for ground segment

ground segment

part of a **space system,** located on ground, which monitors and controls **space segment element(s)**

NOTE A ground segment is composed of one or more ground segment elements.

ground segment system

system within a **ground segment**

NOTE Examples are given in Annex B.2.

ground segment element

element within a **ground segment**

NOTE 1 A ground segment element can be composed of several ground segment elements, e.g. a ground station network is a ground segment element that can be composed of a set of ground stations and a communication network.

NOTE 2 Examples are given in Annex B.2.

ground segment subsystem

subsystem within a **ground segment**

NOTE Examples are given in Annex B.2.

ground segment equipment

equipment within a **ground segment**

NOTE Examples are given in Annex B.2.

2.2.6 Definitions for launch segment

launch segment

part of a **space system** which is used to transport **space segment element(s)** into space

NOTE 1 A launch segment is composed of one or more launch segment elements.

NOTE 2 A launch segment is composed of the integrated launcher and the facilities needed for manufacturing, testing and delivering launcher elements.

launch segment system

system within a **launch segment**

NOTE Examples are given in Annex B.3

launch segment element

element within a **launch segment**

NOTE 1 A launch segment element can be composed of several launch segment elements, e.g. a launcher is a launch segment element that is composed of several launch segment elements, such as stage, engine and upper part.

NOTE 2 Examples are given in Annex B.3.

launch segment subsystem

subsystem within a **launch segment**

NOTE Examples are given in Annex B.3.

launch segment equipment

equipment within a **launch segment**

NOTE Examples are given in Annex B.3.

2.2.7 Definitions for support segment

support segment

generic infrastructure and services used to support the **development** and operation of **space system elements**

NOTE 1 Examples are ground stations and associated networks, orbit computing facilities, test centres, astronaut centre, launch facilities (e.g. Plestek, Baikonour, Guiana Space Centre).

NOTE 2 Items can be part of other segments during their development and later become part of the support segment when used (e.g. a tracking network).

2.3 Terms and definitions

2.3.1 acceptance

<act> act by which the **customer** agrees that the **product** is designed and produced according to its **specifications** and the agreed **deviations** and **waivers**, and it is free of **defects** when delivered by the **supplier**

2.3.2 acceptance

<process> that part of the **verification** process which demonstrates that the **product** meets specified **acceptance margins**

2.3.3 accident

undesired event arising from operation of any **project**-specific item that results in

a. human death or injury,

b. loss of, or damage to, **project** hardware, software or facilities that can then affect the accomplishment of the mission,

c. loss of, or damage to, public or private property, or

d. detrimental effects on the **environment**.

NOTE Accident and mishap are synonymous.

2.3.4 active redundancy

redundancy where all entities are operating and the **system** can continue to operate without downtime or defects despite the loss of one or more entities

2.3.5 actuator

device that transforms an input signal into motion

2.3.6 alert

formal notification to users, informing them of **failures** or **nonconformance** of items, already released for use or not, which could also be present on other items already delivered [e.g. items with identical **design** concept, **materials**, **components** or **processes**]

NOTE An alert can also be raised when a deficiency in the specified requirements, which can affect the fitness for purpose in the defined application, has been identified.

2.3.7 allowable load

maximum load that can be permitted in a structural part for a given operating **environment** to prevent rupture, collapse, detrimental deformation or unacceptable crack growth

NOTE Adapted from ISO 14623:2003.

2.3.8 analysis

<verification> **verification** method utilizing techniques and tools to confirm that **verification requirements** have been satisfied

NOTE 1 Examples of techniques and tools are mathematical models, compilation similarity assessments and validation of records.

NOTE 2 Adapted from ISO 10795:2011.

2.3.9 anomaly

any deviation from the expected situation

NOTE An anomaly justifies an investigation that might lead to the discovery of a nonconformance or a defect.

2.3.10 applicable document

document that contains **provisions** which, through reference in the source document, constitute additional **provisions** of the source document

NOTE Adapted from ISO 10795:2011.

2.3.11 approval

formal agreement by a designated management official to use or apply an item or proceed with a proposed course of action

NOTE 1 Approvals must be documented.

NOTE 2 Approval implies that the approving authority has verified that the item conforms to its requirements.

2.3.12 assembly

<act> physically combining **parts**, **components**, **equipment** or **segment elements** to form a larger entity

2.3.13 assurance

planned and systematic activities implemented, and demonstrated as needed, to provide adequate confidence that an entity fulfils its **requirements**

2.3.14 audit

systematic, independent and documented **process** for obtaining **audit evidence** and evaluating it objectively to determine the extent to which **audit criteria** are fulfilled

NOTE 1 Internal audits, sometimes called first-party audits, are conducted by, or on behalf of, the organization itself for management review and other internal purposes, and may form the basis for an organization's declaration of conformity. In many cases, particularly in smaller organizations, independence can be demonstrated by the freedom from responsibility for the activity being audited.

NOTE 2 External audits include those generally termed second- and third-party audits. Second-party

audits are conducted by parties having an interest in the organization, such as customers, or by other persons on their behalf. Third-party audits are conducted by external, independent auditing organizations, such as those providing certification/registration of conformity to ISO 9001 or ISO 14001.

NOTE 3 When quality and environmental management systems are audited together, this is termed "combined audit".

NOTE 4 When two or more auditing organizations cooperate to audit a single auditee jointly, this is termed "joint audit".

[ISO 9000:2005]

2.3.15 audit criteria

set of policies, **procedures** or **requirements**

NOTE Audit criteria are used as a reference against which audit evidence is compared.

[ISO 9000:2005]

2.3.16 audit evidence

records, statements of fact or other information which are relevant to the **audit criteria** and verifiable

NOTE Audit evidence can be qualitative or quantitative.

[ISO 9000:2005]

2.3.17 auditee

organization being audited

[ISO 9000:2005]

2.3.18 auditor

person with the demonstrated personal attributes and competence to conduct an **audit**

NOTE Adapted from ISO 9000:2005.

2.3.19 availability

ability of an item to be in a state to perform a required **function** under given conditions at a given instant of time or over a given time interval, assuming that the required external resources are provided

NOTE 1 This ability depends on the combined aspects of the reliability performance, the maintainability performance and the maintenance support performance.

NOTE 2 Required external resources, other than maintenance resources do not affect the availability performance of the item.

NOTE 3 When referring to the measure for availability, the preferred term is "instantaneous availability".

NOTE 4 Adapted from IEC Multilingual Dictionary: 2001 edition.

2.3.20 backward contamination

contamination of the terrestrial biosphere by extra-terrestrial life forms in the course of spaceflight missions

2.3.21 bakeout

activity of increasing the temperature of hardware to accelerate its **outgassing** rates with the intent of reducing the content of molecular contaminants within the hardware

NOTE Bakeout is usually performed in a vacuum environment, but may be done in a controlled atmosphere.

2.3.22 baseline

set of information which describes exhaustively a situation at a given instant of time or over a given time interval

NOTE A baseline is generally used as a reference for comparison with and analysis of subsequent evolutions of the information.

2.3.23 batch

quantity produced at one operation

2.3.24 black box

representation of an item whereby knowledge of its internal composition is not available to the user, only its **function** and interface characteristics are known

2.3.25 business agreement

legally binding agreement, for the supply of goods or services, between two or more actors in the **customer–supplier** chain

NOTE Business agreements are recorded in a variety of forms, such as:

- Contracts,
- Memoranda of understanding,
- Inter-governmental agreements,
- Inter-agency agreements,
- Partnerships,
- Bartering agreements, and
- Purchase orders.

2.3.26 calibration

all the operations for the purpose of determining the values of the errors and, if necessary, other metrological properties of a measuring instrument

NOTE The metrological use of the term "calibration" is often extended to include operations such as adjustments, scale graduation, etc. This use is deprecated.

[IEC Multilingual Dictionary: 2001 edition]

2.3.27 capability

ability of an organization, **system** or **process** to realize a **product** that will fulfil the **requirements** for that **product**

NOTE Process capability terms in the field of statistics are defined in ISO 3534-2.

[ISO 9000:2005]

2.3.28 catastrophic

<safety> resulting in loss of life, life-threatening, permanently disabling injury or occupational illness, loss of **system**, loss of an interfacing manned flight system, loss of launch site facilities or severe detrimental environmental effects

2.3.29 certification

procedure by which a party gives formal **assurance** that a person or an organization acts, or a **product** is, in compliance with specified **requirements**

NOTE Certification can be carried out by a first, second or third party.

2.3.30 clean area

area under **contamination** control

NOTE Examples of clean areas are cleanrooms, integration tent, gloves box.

2.3.31 cleanliness

level of particulate or molecular **contamination**

2.3.32 cleanroom

clean area controlled according to specified levels

NOTE Specified levels are humidity, temperature, particulates number versus size and volume and chemical contamination.

2.3.33 cold redundancy

redundancy where one entity is operating and the others are powered off

2.3.34 commissioning

verification and **validation** activities conducted after the launch and before the entry into operational service either on the **space segment elements** only or on the overall **system** (including the **ground segment elements**)

2.3.35 common cause failure

failure of multiple items occurring from a single cause that is common to all of them

2.3.36 common mode failure

failure of multiple identical items that fail in the same mode

NOTE Common mode failures are a particular case of common cause failures.

2.3.37 component

set of **materials**, assembled according to defined and controlled **processes**, which cannot be disassembled without destroying its capability and which performs a simple **function** that can be evaluated against expected **performance requirements**

NOTE 1 The term "part" is synonymous.

NOTE 2 The term "part" is preferred when referring to purely mechanical devices.

NOTE 3 The term "component" is preferred for EEE devices.

2.3.38 composite

building block of a **launcher** composed of one or several pre-integrated stages and structural parts (fairing, payload adaptor, dual launch structure, etc.)

NOTE 1 Example-1: A5 Upper Composite includes the cryogenic upper stage (ESC), the vehicle equipment bay (VEB), fairing and payload adaptor.

NOTE 2 Example-2: A5 Lower Composite includes two solid booster stages (EAP) and the main cryogenic stage (EPC).

2.3.39 configuration

interrelated functional and/or physical characteristics of a **product** defined in **configuration documents** subject to **configuration management**

NOTE Adapted from ISO 10007:2003.

2.3.40 configuration baseline

approved status of **requirements** and **design** of a **product** at a **project** key milestone that serves as a reference for activities throughout the **life cycle** of the **product**

NOTE Adapted from ISO 10007:2003.

2.3.41 configuration control

coordinated activities for controlling modifications to a **configuration baseline**

NOTE Requests for deviation are also considered modifications to a baseline.

2.3.42 configuration document

document that defines the **requirements** for **function**, **design**, build, production, and **verification** for a **configuration item**

NOTE For space standards, configuration documents can include documents relating to operation and disposal of the configuration item.

2.3.43 configuration identification

coordinated activities to establish rules for **configuration item** selection, **configuration baseline** content definition, and **product** and document identifiers definition

2.3.44 configuration item

aggregation of hardware, software, processed **materials**, services or any of its discrete portions, that is designated for **configuration management** and treated as a single entity in the **configuration management process**

NOTE A configuration item can contain other configuration item(s).

2.3.45 configuration management

activity for establishing and maintaining consistent records of the **performance** parameters of a **product** and its functional and physical attributes compared to **product design** and operational **requirements**

NOTE 1 Configuration management is applied throughout the entire life cycle of the product (i.e. development, production, deployment, operation and disposal).

NOTE 2 Adapted from ISO 10007:2003.

2.3.46 configuration status accounting

formalized recording and reporting of **product** characteristics and **configuration** information, the status of applicable changes and the status of their implementation

NOTE Adapted from ISO 10007:2003.

2.3.47 configuration verification

coordinated activities to determine the **conformance** of the **configuration item** to its **configuration document(s)**

2.3.48 conformance

fulfilment of a **requirement**

NOTE The term "conformity" is synonymous.

2.3.49 conformity

see "**conformance**"

NOTE The term "conformance" is strongly recommended for use in the ECSS system.

2.3.50 contaminant

undesirable molecular or particulate matter

NOTE This includes microbiological matter.

2.3.51 contamination

introduction of **contaminant** to an item or to the **environment** of interest

2.3.52 contract

legally enforceable **business agreement** in which payment is part of the conditions

2.3.53 corrective action

action to eliminate the cause of a detected **nonconformance**, or other undesirable situation

NOTE 1 There can be more than one cause for a non-conformance.

NOTE 2 Corrective action is taken to prevent recurrence whereas preventive action is taken to prevent occurrence.

2.3.54 COTS

commercial electronic **component** readily available and not manufactured, inspected or tested in accordance with military or space standards

2.3.55 critical

<general> characteristic of a **process**, **process** condition, parameter, **requirement** or item that deserves control and special attention in order to meet the objectives (e.g. of a **mission**) within given constraints

2.3.56 critical

<safety> resulting in temporarily disabling but not life threatening injury, temporary occupational illness, major detrimental environmental effects, major damage to public or private properties, major damage to interfacing flight **systems** or major damage to ground facilities

2.3.57 critical item

potential threat to the schedule, cost, **performance** and **quality** of a **project** or programme that is controlled by a specific action plan in order to mitigate emanating **risks** and to prevent undesirable consequences

NOTE Examples of critical items are:

- item not qualified or validated for the application in question (or has caused problems previously which remained unresolved).
- item for which it is difficult to demonstrate design performance.
- item highly sensitive to the conditions under which it is produced or used (e.g. contamination, radiation).

- item having the potential to degrade the quality of the product significantly, and hence the ability of the end-product to accomplish defined mission objectives.
- item for which major difficulties or uncertainties are expected in the procurement, manufacturing, assembly, inspection, test, handling, storage and transportation, that have the potential to lead to a major degradation in the quality of the product.

2.3.58 critical path

chain of activities that determines the earliest completion of the **project**

NOTE As a consequence, any delay of one task belonging to the critical path extends the project duration.

2.3.59 customer

organization or person that receives a **product** as part of a **business agreement**

NOTE A customer can be internal or external to the supplier organization.

2.3.60 defect

non-fulfilment of a **requirement** related to an intended or specified use

NOTE 1 The distinction between the concepts defect and nonconformance is important as it has legal connotations, particularly those associated with product liability issues. Consequently the term "defect" should be used with extreme caution.

NOTE 2 The intended use as intended by the customer can be affected by the nature of the information, such as operating or maintenance instructions, provided by the supplier.

2.3.61 dependability

the extent to which the fulfilment of a required **function** can be justifiably trusted

NOTE 1 Its main components are reliability, availability and maintainability.

NOTE 2 Dependability shall be considered in conjunction with safety.

2.3.62 derating

action when designing a **product** to limit the **component** stresses to specified levels that are below their ratings in order to increase its **reliability**

2.3.63 design

<result> set of information that defines the characteristics of a **product**

2.3.64 design

<activity> **process** used to generate the set of information defining the characteristics of a **product**

NOTE The design is completed at CDR closure.

2.3.65 development

complete **process** of elaborating a **product** from concept to manufacturing including its **qualification** and final **acceptance**

NOTE Technology development and design production are part of the process (i.e. from phase 0 to phase D).

2.3.66 deviation

formal authorization to depart from the originally specified **requirements** for a **product**, prior to its production

NOTE Waiver is an a posteriori decision whereas deviation is an a priori decision with respect to the production phase.

2.3.67 discipline

specific area of expertise within a general subject

NOTE The name of the discipline normally indicates the type of expertise (e.g. in the ECSS system, system engineering, mechanical engineering, software and communications are disciplines within the engineering domain).

2.3.68 discrepancy

departure from expected **performance**

NOTE 1 A discrepancy can be the result of nonconforming hardware or software, or conditions occurring in test set-up.

NOTE 2 A discrepancy can be momentary, non-repeatable, or permanent.

NOTE 3 Adapted from ISO 10795:2011.

2.3.69 disposal

actions performed by a **spacecraft** or **launch vehicle** orbital stage to permanently reduce its chance of accidental break-up and to achieve its required long-term clearance of the protected regions

[ISO 24113:2011]

2.3.70 effectiveness

extent to which planned activities are realized and planned results achieved

[ISO 9000:2005]

2.3.71 efficiency

relationship between the result achieved and the resources used

[ISO 9000:2005]

2.3.72 element

combination of integrated **equipment**, **components** and **parts**

NOTE An element fulfils a major, self-contained, subset of a segment's objectives.

2.3.73 emergency

situation where **hazardous events** have occurred with potentially **catastrophic** or **critical** consequences requiring an immediate action

2.3.74 embedded space segment element

space segment element that performs its **mission** as part of another **space segment element**

NOTE For example: platform, module, instrument, payload.

2.3.75 end item

product that is deliverable under a **business agreement**

2.3.76 engineering model

flight representative **model** in terms of form, fit and **function** used for functional and **failure** effect **verification**

NOTE 1 The engineering model is usually not equipped with high reliability parts or full redundancy.

NOTE 2 The engineering model is also used for final validation of test facilities, GSE and associated procedures.

NOTE 3 More detailed information on the build standard and the use of this model is given in ECSS-E-HB-10-02.

2.3.77 engineering qualification model

model, which fully reflects the **design** of the **flight model** except for the parts standard, used for functional **performance** and **EMC verification** and possibly for **qualification**

NOTE 1 Military grade or lower-level parts can be used instead of high reliability parts, provided they are procured from the same manufacturer with the same packaging.

NOTE 2 Functional performance qualification includes verification of procedures for failure detection, isolation and recovery and for redundancy management.

NOTE 3 The engineering qualification model may also be used for environmental testing if the customer

accepts the risk, in which case the qualification model rules apply.

NOTE 4 More detailed information on the build standard and the use of this model is given in ECSS-E-HB-10-02.

2.3.78 environment

natural conditions and induced conditions that constrain the **design** definitions or operations of a **product**

NOTE 1 Examples of natural conditions are weather, climate, ocean conditions, terrain, vegetation, dust, light and radiation.

NOTE 2 Examples of induced conditions are electromagnetic interference, heat, vibration, pollution and contamination.

2.3.79 equipment

integrated set of **parts** and **components**

NOTE 1 An equipment accomplishes a specific function.

NOTE 2 An equipment is self-contained and classified as such for the purposes of separate manufacture, procurement, drawings, specification, storage, issue, maintenance or use.

NOTE 3 The term "unit" is synonymous with the term "equipment".

2.3.80 fail-safe

preventing the **failure** of an item from resulting in **catastrophic** or **critical** consequences

2.3.81 failure

the event resulting in an item being no longer able to perform its required **function**

NOTE "Failure" is an event, as distinguished from "fault" which is a state.

2.3.82 failure mode

mechanism through which a **failure** occurs

NOTE 1 For example,. short-circuit, open-circuit, fracture, or excessive wear.

NOTE 2 This term is equivalent to the term “fault mode” in IEC Multilingual Dictionary: 2001 edition.

2.3.83 failure tolerance

attribute of an item that makes it able to perform a required **function** in the presence of certain given sub-item **failures**

2.3.84 fault

state of an item characterized by inability to perform as required

NOTE 1 A fault can be the result of a failure of the item itself or can exist without prior failure.

NOTE 2 A fault can generate a failure.

2.3.85 fault tolerance

attribute of an item that makes it able to perform a required **function** in the presence of certain given sub-item **faults**

2.3.86 firmware

hardware that contains a computer program or data that cannot be changed in its user **environment**

NOTE The computer program and data contained in firmware are classified as software; the circuitry containing the computer program and data is classified as hardware.

2.3.87 flammability

measure of the ease with which a **material** is set on fire

2.3.88 flight model

end **product** that is intended for flight

NOTE 1 The flight model is subjected to formal functional and environmental acceptance testing.

NOTE 2 More detailed information on the build standard and the use of this model is given in ECSS-E-HB-10-02.

2.3.89 flight operations

all activities related to the planning, execution and evaluation of the control of the **space segment** when in orbit

2.3.90 flight spare

spare **flight model** that could be used in place of the **flight model**

NOTE 1 Exceptionally, a refurbished qualification model can be used as a flight spare.

NOTE 2 More detailed information on the build standard and the use of this model is given in ECSS-E-HB-10-02.

2.3.91 forward contamination

contamination of celestial bodies other than the Earth by terrestrial life forms in the course of spaceflight missions

2.3.92 function

intended effect of a **product**

2.3.93 function tree

hierarchical breakdown of a **function** into successive levels of **function**

2.3.94 functional analysis

process that describes completely the **functions** and their relationships, which are systematically characterised, classified and evaluated

2.3.95 ground segment

part of a **space system**, located on ground, which monitors and controls **space segment element(s)**

NOTE A ground segment is composed of one or more ground segment elements.

2.3.96 ground segment element

element within a **ground segment**

NOTE 1 A ground segment element can be composed of several ground segment elements, e.g. a ground station network is a ground segment element that can be composed of a set of ground stations and a communication network.

NOTE 2 Examples are given in Annex B.2.

2.3.97 ground segment equipment

equipment within a **ground segment**

NOTE Examples are given in Annex B.2.

2.3.98 ground segment subsystem

subsystem within a **ground segment**

NOTE Examples are given in Annex B.2.

2.3.99 ground segment system

system within a **ground segment**

NOTE Examples are given in Annex B.2.

2.3.100 ground support equipment

non flight **product** (hardware/software) used on ground to assemble, integrate, **test**, transport, access, handle, maintain, measure, calibrate, verify, protect or service a flight **product** (hardware/software)

2.3.101 handbook

<ECSS> non-**normative** document providing background information, orientation, advice or recommendations related to one specific **discipline** or to a specific technique, technology, **process** or activity

2.3.102 hazard

existing or potential condition that can result in a mishap

NOTE 1 This condition can be associated with the design, manufacturing, operation or environment.

NOTE 2 Hazards are not events but potential threats to safety.

2.3.103 hazardous event

mishap resulting from a **hazard**

2.3.104 hot redundancy

redundancy where all entities are powered on with only one operating

2.3.105 human factors

model of observed human physical and psycho-physiological behaviour in relation to **environment** and **product**

2.3.106 implementation document

formal response from the **supplier** to the **customer**'s **Project Requirements Document** describing how all **requirements** will be met

2.3.107 incident

unexpected event that might be, or could lead to, an operational interruption, disruption, loss, **emergency**, crisis or **accident**

NOTE Incidents are recorded for further assessment.

2.3.108 informative

providing non-**normative** information intended to assist the understanding or use of **requirements**

2.3.109 inhibit

<noun> **design** feature that prevents a **function** from undesirable execution

NOTE An inhibit can be software or hardware.

2.3.110 inspection

conformance evaluation by observation and judgement accompanied as appropriate by measurement, testing or gauging

[ISO 9000:2005]

2.3.111 integration

functionally combining lower-level functional entities (hardware or software) so they operate together to constitute a higher-level functional entity

NOTE Assembly is a pre-requisite for integration.

2.3.112 interchangeability

ability of a **product** to be used in place of another to fulfil the same **requirements**

2.3.113 interface

boundary where two or more **products** meet and interact

2.3.114 launch base

composed of **launch range** and **launch complexes**

2.3.115 launch campaign

launch activities which include:

- Launcher preparation and final integration
- Payload processing and integration on the launcher
- Launch Operations including Flight Data Gathering

2.3.116 launch complex

integration and facilities necessary to carry out the final **integration** of the **launcher** elements as well as the **launch operations**

NOTE A Launch System is associated with its specific Launch Complex, which may include facilities shared with other Launch Systems (e.g.: Lox plant at CSG).

2.3.117 launch operations

all launch related activities taking place after completion of the activities necessary to deliver a fully integrated **launcher** up to reception of post flight data

2.3.118 launch range

systems, facilities and means, not part of the **launch segment**, required to provide the necessary service and support for carrying out a **launch campaign** and to ensure safety and security of persons, assets and protection of the **environment**

NOTE The Launch Range includes in particular the CNES/CSG technical centre, the payload Preparation Facilities as well as the downrange stations for launcher tracking and flight data acquisition.

2.3.119 launch segment

part of a **space system** which is used to transport **space segment element(s)** into space

NOTE 1 A launch segment is composed of one or more launch segment elements.

NOTE 2 A launch segment is composed of the integrated launcher and the facilities needed for manufacturing, testing and delivering launcher elements.

2.3.120 launch segment element

element within a **launch segment**

NOTE 1 A launch segment element can be composed of several launch segment elements, e.g. a launcher is a launch segment element that is composed of several launch segment elements, such as stage, engine and upper part.

NOTE 2 Examples are given in Annex B.3.

2.3.121 launch segment equipment

equipment within a **launch segment**

NOTE Examples are given in Annex B.3.

2.3.122 launch segment subsystem

subsystem within a **launch segment**

NOTE Examples are given in Annex B.3.

2.3.123 launch segment system

system within a **launch segment**

NOTE Examples are given in Annex B.3

2.3.124 launch service

activities required to conclude a launch service contract and to place a **payload** in the orbit, at the time, and under the **payload environment** conditions required by the **customer**

NOTE Launch Service activities cover in particular: Commercialisation, Mission analysis, Procurement of a fully integrated launcher, Procurement of flight programme(s), Procurement of launcher adaptations to meet specific mission requirements, Payload processing and integration on the launcher, Launch Operations including Flight Data Gathering, Launch Range Operations, Post Flight Analysis.

2.3.125 launch system

system comprising the fully integrated **launcher**, the **launch complex** and the needed facilities for manufacturing, testing and delivering the **launcher elements**

NOTE "Fully integrated launcher" means the integrated launcher, including payload, and ready to be launched i.e. all launch control lights on green.

2.3.126 launch vehicle

see "**launcher**"

2.3.127 launcher

vehicle designed to transport **payloads** to space

NOTE The term “launch vehicle” is synonymous.

2.3.128 launcher element

building block of a **launcher**

2.3.129 [launcher] production facilities

launcher element manufacturing facilities and related **launch complex**

NOTE The launcher element manufacturing facilities include the test facilities specific to the launcher elements' manufacturing.

2.3.130 launcher stage

complete **element** of a **launcher** that delivers the defined thrust during dedicated phase of the **launcher mission**

NOTE 1 A launcher stage typically consists of a main propulsion system, a reaction controlled system (sometimes integrated to some extend with the main propulsion system), supporting structure, forward and aft skirts, aerodynamic control and/or stabilized surfaces, a separation system and a destruction system.

NOTE 2 Some of the upper stages are also equipped with an avionics system.

NOTE 3 The Ariane 5 upper stage is made of cryogenic main stage (ESC) and vehicle equipment bay (VEB).

2.3.131 launcher system

fully integrated **launcher** and the needed facilities for manufacturing, testing and delivering the **launcher elements**

NOTE "Fully integrated launcher" means the integrated launcher, including payload, and ready to be launched i.e. all launch control lights on green.

2.3.132 life cycle

all phases in the life of a **product** from needs identification through **disposal**

2.3.133 life profile

conditions to which a **product** is chronologically submitted from its manufacturing to its **disposal**

2.3.134 lifetime

period, or number of cycles, over which a **product** is required to perform according to its **specification**

2.3.135 lot

batch or portion of a **batch**

2.3.136 maintainability

ease of performing **maintenance** on a **product**

NOTE Maintainability can be expressed as the probability that a maintenance action on a product can be

carried out within a defined time interval, using stated procedures and resources.

2.3.137 maintenance

actions needed to retain a **product** in, or restore it to, a state in which it can perform its required **function**

NOTE Actions may include tuning, control, inspection, repair, replacement or redesign.

2.3.138 material

raw, semi–finished or finished substance (gaseous, liquid, solid) of given characteristics from which processing into a **component** or **part** is undertaken

2.3.139 mission

set of tasks, duties or **functions** to be accomplished by an **element**

2.3.140 model

physical or abstract representation used for calculations, predictions or further assessment

NOTE Model can also be used to identify particular instances of the product e.g. flight model.

2.3.141 multipaction

resonant back and forth flow of secondary electrons in a vacuum between two surfaces separated by a distance such that the electron transit time is an odd integral multiple of one half the period of the alternating voltage impressed on the surface

NOTE The effects of multipaction can be loss of output power up to reaching the multipaction breakdown voltage leading to the generation of spark.

2.3.142 nonconformance

non-fulfilment of a **requirement**

NOTE The term “nonconformity” is synonymous but deprecated.

2.3.143 nonconformity

see “**nonconformance**”

NOTE The term “nonconformity” is deprecated.

2.3.144 normative

providing **requirements** for activities or their results

NOTE 1 A “normative document” covers documents such as standards, technical specifications, codes of practice and regulations.

NOTE 2 A “normative reference" incorporates requirements from a cited publication into a normative document.

2.3.145 offgassing

outgassing under atmospheric or near-atmospheric pressure

NOTE Examples are manned and biological missions.

2.3.146 off-the-shelf

procured from the market, even if not developed for space application

2.3.147 orbital debris

see "**space debris**"

NOTE The term "orbital debris" is deprecated.

2.3.148 outage

state of a **product** being unable to perform its required **function**

2.3.149 outgassing

gaseous release from a **material**

NOTE Outgassing occurs in vacuum as well as in higher-pressure environments.

2.3.150 part

see "**component**"

2.3.151 payload

set of **space segment elements**

NOTE 1 A spacecraft payload is a set of instruments or equipment which performs the user mission.

NOTE 2 A launcher payload is a set of space segment elements carried into space in accordance with agreed position, time and environmental conditions.

2.3.152 performance

quantifiable characteristics of a **function**

2.3.153 planetary protection

policy and the technical implementations to prevent to prevent **forward contamination** and **backward contamination**

2.3.154 preventive action

action to eliminate the cause of a potential **nonconformance** or other undesirable potential situation

NOTE 1 There can be more than one cause for a potential non-conformance.

NOTE 2 Preventive action is taken to prevent occurrence whereas corrective action is taken to prevent recurrence.

2.3.155 procedure

documented way to carry out an activity or **process** in a controlled manner

2.3.156 process

set of interrelated or interacting activities which transform inputs into outputs

NOTE Inputs to a process are generally outputs of other processes.

2.3.157 product

result of a **process**

NOTE 1 There are four generic product categories:

- services
- software
- hardware
- processed materials.

NOTE 2 Adapted from ISO 9000:2005.

2.3.158 product assurance

discipline devoted to the study, planning and implementation of activities intended to assure that the **design**, controls, methods and techniques in a **project** result in a satisfactory degree of **quality** in a **product**

2.3.159 product tree

hierarchical breakdown of a **product** into successive levels of **product**

2.3.160 project

set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific **requirements**, including constraints of time, cost and resources

2.3.161 project requirements document

integral part of an ITT, RFP, or RFQ prepared and released by a **customer** to potential **suppliers**, addressing technical and programmatic **requirements**, as well as political, commercial, and industrial constraints

NOTE The response to a PRD is an ID.

2.3.162 protoflight model

flight model on which a partial or complete protoflight **qualification test** campaign is performed before flight

NOTE More detailed information on the build standard and the use of this model is given in ECSS-E-HB-10-02.

2.3.163 provision

expression in the content of a **normative** document, that takes the form of a statement, an instruction, a recommendation or a **requirement**

NOTE These types of provision are distinguished by the form of wording they employ, e.g. instructions are

expressed in the imperative mood, recommendations by the use of the auxiliary "should" and requirements by the use of the auxiliary "shall".

[EN 45020:2006]

2.3.164 qualification

that part of **verification** which demonstrates that the **product** meets specified **qualification margins**

NOTE This can apply to personnel, products, manufacturing and assembly processes.

2.3.165 qualification model

model, which fully reflects all aspects of the **flight model design**, used for complete functional and environmental **qualification testing**

NOTE 1 A qualification model is only necessary for newly-designed hardware or when a delta qualification is performed for adaptation to the project.

NOTE 2 The qualification model is not intended to be used for flight, since it is overtested.

NOTE 3 More detailed information on the build standard and the use of this model is given in ECSS-E-HB-10-02.

2.3.166 quality

degree to which a set of characteristics of a **product** or **process** fulfils **requirements**

2.3.167 quality assurance

part of **quality** management focused on providing confidence that **quality requirements** will be fulfilled

[ISO 9000:2005]

2.3.168 quality control

part of **quality** management focused on fulfilling **quality requirements**

[ISO 9000:2005]

2.3.169 redundancy

existence of more than one means for performing a given **function** with the intention of increasing reliability

NOTE See also definitions for "active redundancy", "hot redundancy" and "cold redundancy".

2.3.170 reliability

the ability of an item to perform a required **function** under given conditions for a given time interval

NOTE 1 It is generally assumed that the item is in a state to perform this required function at the beginning of the time interval.

NOTE 2 Generally, reliability performance is quantified using appropriate measures. In some applications these measures include an expression of reliability performance as a probability, which is also called reliability.

2.3.171 relifing

quality control activity for the extension of the expiry datecode of a EEE **component** which is intended to be used for space application

2.3.172 repair

action to correct a **defect** of a **product** that leads to a **configuration item** change

NOTE 1 Unlike rework, repair affects or modifies parts of the defective product.

NOTE 2 An NCR needs to be raised for the CI change.

2.3.173 requirement

documented demand to be complied with

2.3.174 residual risk

risk remaining after implementation of **risk** reduction measures

[ISO 17666:2003]

2.3.175 review

activity undertaken to determine the suitability, adequacy and effectiveness of the subject matter to achieve established objectives

NOTE 1 Review can also include the determination of efficiency.

NOTE 2 Examples are: management review, design and development review, review of customer requirements and nonconformity review.

[ISO 9000:2005]

2.3.176 rework

action to correct a **defect** of a **product** that does not lead to a **configuration item** change

NOTE 1 Unlike repair, rework does not affect or modify parts of the defective product.

NOTE 2 No NCR needs to be raised.

2.3.177 risk

undesirable situation or circumstance that has both a likelihood of occurring and a potential negative consequence on a **project**

NOTE 1 Risks are inherent to any project, and can arise at any time during the project life cycle.

NOTE 2 Predictability and control of events facilitate risk reduction.

NOTE 3 The terms "risk assessment", "risk mitigation" and "risk control" are in common use in ECSS.

NOTE 4 Adapted from ISO 17666:2003.

2.3.178 safety

state where an acceptable level of **risk** is not exceeded

NOTE Risk relates to:

- fatality,
- injury or occupational illness,
- damage to launcher hardware or launch site facilities,
- damage to an element of an interfacing manned flight system,
- the main functions of a flight system itself,
- pollution of the environment, atmosphere or outer space, and
- damage to public or private property.

2.3.179 safety critical function

function that, if lost or degraded, or as a result of incorrect or inadvertent operation, can result in **catastrophic** or **critical** consequences

2.3.180 safing

action of containment or control of **emergency** and warning situations, or placing a **system** (or part thereof), in a predetermined safe condition

2.3.181 scrap

action on a nonconforming **product** to preclude its originally intended use

NOTE 1 The scrapped product is not recoverable by rework or repair for technical or economic reasons. As a consequence, it will be recycled or destroyed.

NOTE 2 A service is scrapped by being discontinued.

2.3.182 security

state where an acceptable level of **risk** arising from malevolent action is not exceeded

2.3.183 segment

set of **elements** or combination of **systems** that fulfils a major, self-contained, subset of the **space mission** objectives

NOTE Examples are space segment, ground segment, launch segment and support segment.

2.3.184 severity

classification of a **failure** or undesired event according to the magnitude of its possible consequences

2.3.185 single point failure

part of a **product** that, if it fails, will result in the unrecoverable **failure** of that **product**

2.3.186 solar array

assembly of **solar panels** on a supporting structure with associated hardware

NOTE The associated hardware includes mounting features, cables and, in the case of a deployable solar array, a deployment mechanism.

2.3.187 solar cell

photovoltaic **component** that converts solar radiation to electricity

2.3.188 solar cell assembly

solar cell together with interconnector, coverglass and, if used, by-pass diode

2.3.189 solar panel

interconnected **solar cell assemblies** mounted on a substrate

2.3.190 space debris

non-functional fragments of, or residue from, a **space segment element,** or **launch segment element,** in Earth orbit or re-entering the Earth's atmosphere

NOTE The term "orbital debris" is synonymous, but deprecated.

2.3.191 space mission

user-defined **mission** to be achieved by a **space system**

2.3.192 space programme

set of related space **projects** managed in a coordinated way to contribute to an overall objective

2.3.193 space segment

part of a **space system**, placed in space, to fulfil the **space mission** objectives

2.3.194 space segment element

element within a **space segment**

NOTE 1 A space segment element can be composed of several space segment elements, e.g. a spacecraft is composed of instruments, a payload module and a service module.

NOTE 2 Examples are given in Annex B.1.

2.3.195 space segment equipment

equipment within a **space segment**

NOTE Examples are given in Annex B.1.

2.3.196 space segment subsystem

subsystem within a **space segment**

NOTE Examples are given in Annex B.1.

2.3.197 space segment system

system within a **space segment**

NOTE Examples are given in Annex B.1.

2.3.198 space system

system that contains at least a **space**, a **ground** or a **launch segment**

NOTE Generally a space system is composed of all three segments and is supported by a support segment.

2.3.199 spacecraft

manned or unmanned vehicle designed to orbit or travel in space

NOTE A spacecraft is a space segment element.

2.3.200 special process

process where the **quality** cannot be completely ensured by **inspection** of the end article only

2.3.201 specification

document stating **requirements**

NOTE A specification can be related to activities (e.g. procedure document, process specification and test specification), or products (e.g. product specification, performance specification and drawing).

[ISO 9000:2005]

2.3.202 stand-alone space segment element

space segment element that performs its **mission** autonomously

NOTE For example: satellite, rover, lander.

2.3.203 standard

<ECSS> **normative** document for use in invitations to tender and **business agreements** for implementing space related activities

NOTE 1 A standard states verifiable requirements, supported by the minimum descriptive text necessary to understand their context. Each requirement has a unique identification, allowing full traceability and easy verification of compliance.

NOTE 2 A standard is established by consensus amongst all ECSS stakeholders.

NOTE 3 Other Standards Development Organisations (SDOs) use a different definition.

2.3.204 statement of work

contractual document that describes and plans deliverables and activities required to complete a **project**

NOTE The statement of work is issued by the customer at the start of a project for implementation by the supplier.

2.3.205 stress-corrosion

combined action of sustained tensile stress and corrosion that can lead to premature failure of **materials**

2.3.206 structural model

structurally representative **model** of the **flight model** used for **qualification** of the structural **design** and for correlation with structural mathematical **models**

NOTE 1 The system structural model usually consists of a representative structure, with structural dummies of the flight equipment, and also includes representative mechanical parts of other subsystems (e.g. mechanisms and solar panels).

NOTE 2 The system structural model is also used for final validation of test facilities, GSE, and associated procedures.

NOTE 3 More detailed information on the build standard and the use of this model is given in ECSS-E-HB-10-02.

2.3.207 structural-thermal model

structurally and thermally representative **model** of the **flight model** that combines the objectives of the **structural model** and the **thermal model**

NOTE More detailed information on the build standard and the use of this model is given in ECSS-E-HB-10-02.

2.3.208 subsystem

part of a **system** fulfilling one or more of its **functions**

2.3.209 supplier

organization or person that provides a **product** as part of a **business agreement**

NOTE A supplier can be internal or external to the customer organization.

2.3.210 support segment

generic infrastructure and services used to support the **development** and operation of **space system elements**

NOTE 1 Examples are ground stations and associated networks, orbit computing facilities, test centres, astronaut centre, launch facilities (e.g. Plestek, Baikonour, Guiana Space Centre).

NOTE 2 Items can be part of other segments during their development and later become part of the support segment when used (e.g. a tracking network).

2.3.211 support system

see "**support segment**"

NOTE The term "support system" is deprecated.

2.3.212 system

set of interrelated or interacting **functions** constituted to achieve a specified objective

2.3.213 tailoring

process by which **standards** are made applicable to a specific **project** by selection of existing **requirements**, with or without modification, or addition of new ones

2.3.214 technical memorandum

<ECSS> non-**normative** document providing useful information to the space community on a specific subject

NOTE Technical Memoranda are prepared to record and present data which are not the subject for a standard or for a handbook or not yet mature enough to be published as standard or handbook.

2.3.215 test

measurement of **product** characteristics, **performance** or **functions** under representative **environments**

2.3.216 thermal ambient test

test conducted at ambient pressure and under predefined temperature conditions to demonstrate the capability of the test item to operate according to **requirements**

NOTE 1 Temperature conditions can be expressed as temperature level, gradient and variation.

NOTE 2 The ambient pressure can be mission dependent.

2.3.217 thermal balance test

test conducted under steady state conditions to correlate and adjust the thermal mathematical **model** and verify the thermal **design**

2.3.218 thermal model

thermally representative **model** of the **flight model** used for **verification** of the thermal **design** and for correlation with thermal mathematical **models**

NOTE 1 The system thermal model usually consists of a representative structure, with thermal dummies of the flight equipment, and also includes representative thermal parts of other subsystems.

NOTE 2 More detailed information on the build standard and the use of this model is given in ECSS-E-HB-10-02.

2.3.219 thermal vacuum test

test conducted in vacuum under predefined temperature conditions to demonstrate the capability of the test item to operate according to **requirements**

NOTE Temperature conditions can be expressed as temperature level, gradient and variation.

2.3.220 third party

person or body that is recognized as being independent of the parties involved, as concerns the issue in question

NOTE Parties involved are usually supplier (“first party”) and purchaser (“second party”).

[EN 45020:1998]

2.3.221 toxic

characteristic of a substance causing serious, acute or chronic effects, even death, when inhaled, swallowed or absorbed through the skin

2.3.222 traceability

ability to track the history, location or application by means of documented records

NOTE When considering a product, traceability can relate to:

- the origin of materials and parts,
- the processing history, or
- the distribution and location of the product after delivery.

2.3.223 uncertainty

lack of certitude resulting from inaccuracies of input parameters, **analysis process**, or both

2.3.224 unit

see "**equipment**"

NOTE The term “equipment” is strongly recommended for use in the ECSS system.

2.3.225 upper part [A5]

made of all the **payload** adaptor's (ACU), SYLDA or Speltra and Fairing [Ariane 5 launcher]

2.3.226 upper stage [A5]

made of cryogenic main stage (ESC) and vehicle equipment bay (VEB), ending at 1780 diameter interface [Ariane 5 launcher]

2.3.227 validation

process which demonstrates that the **product** is able to accomplish its intended use in the intended operational **environment**

NOTE 1 The status of the product following validation is "validated".

NOTE 2 Verification is a pre-requisite for validation.

2.3.228 verification

process which demonstrates through the provision of objective evidence that the **product** is designed and produced according to its **specifications** and the agreed **deviations** and **waivers**, and is free of **defects**

NOTE 1 A waiver can arise as an output of the verification process.

NOTE 2 Verification can be accomplished by one or more of the following methods: analysis (including similarity), test, inspection, review of design.

NOTE 3 The status of the product following verification is "verified".

2.3.229 waiver

formal authorization to accept **products** which during production, or after having been submitted to inspection or **tests**, are found to depart from specified **requirements**

NOTE 1 Deviation is an a priori decision whereas waiver is an a posteriori decision with respect to the production phase.

NOTE 2 The term "concession" is synonymous and may be used for materials as per Q-ST-70C.

2.3.230 work breakdown structure

hierarchical representation of the activities necessary to complete a **project**

2.3.231 work package

group of related tasks that are defined down to the lowest level within a **work breakdown structure**

2.4 Abbreviated terms

Abbreviation	Meaning
A/D	analogue-to-digital
ABM	apogee boost motor
AC	alternating current
ADC	analogue-to-digital converter
AIT	assembly, integration and test
AIV	assembly, integration and verification
AOCS	attitude and orbit control subsystem
APS	active pixel sensor
AQL	acceptance quality level
AR	acceptance review
ASIC	application specific integrated circuit
ASTM	American Society for Testing and Materials
ATOX	atomic oxygen
AWG	American wire gauge
BOL	beginning-of-life
CAD	computer aided design
CCB	configuration control board
CCD	charge coupled device
CCSDS	Consultative Committee for Space Data Systems
CDR	critical design review
CIDL	configuration item data list
CIL	critical items list
CoG	centre of gravity
CoM	centre of mass
COTS	commercial off-the-shelf
CVCM	collected volatile condensable material
DC	direct current
DDF	design definition file
DDR	detailed design review
DJF	design justification file
DML	declared materials list
DMPL	declared mechanical parts list
DPL	declared processes list

Abbreviation	Meaning
DRB	delivery review board
DRD	document requirements definition
DRL	document requirements list
ECLS	environmental control and life support
ECSS	European Cooperation for Space Standardization
EED	electro-explosive device
EEE	electrical, electronic and electromechanical
EGSE	electrical ground support equipment
EIDP	end item data package
ELR	end-of-life review
EM	engineering model
EMC	electromagnetic compatibility
EMI	electromagnetic interference
EN	European Standard
EOL	end-of-life
ESA	European Space Agency
ESCC	European Space Components Coordination
ESD	electrostatic discharge
FDIR	failure detection isolation and recovery
FM	flight model
FMEA	failure modes and effects analysis
FMECA	failure modes, effects and criticality analysis
FOS	factor of safety
FRR	flight readiness review
FTA	fault tree analysis
GEO	geostationary orbit
GS	ground segment
GSE	ground support equipment
HMI	human-machine interface
HSIA	hardware-software interaction analysis
HW	hardware
ICD	interface control document
ILS	integrated logistic support
IRD	interface requirements document
ISO	International Organization for Standardization
ISS	International Space Station

Abbreviation	Meaning
I/F	interface
I/O	input/output
LEO	low Earth orbit
LEOP	launch and early orbit phase
LRR	launch readiness review
MCR	mission close-out review
MDD	mission description document
MDP	maximum design pressure
MDR	mission definition review
MEOP	maximum expected operating pressure
MGSE	mechanical ground support equipment
MIP	mandatory inspection point
MLI	multi-layer insulation
MMIC	monolithic microwave integrated circuit
MOI	moment of inertia
NASA	National Aeronautics and Space Administration
NCR	nonconformance report
NDI	non-destructive inspection
NDT	non-destructive test
NRB	nonconformance review board
N/A	not applicable
OBDH	on-board data handling
ORR	operational readiness review
OTS	off-the-shelf
PA	product assurance
PCB	printed circuit board
PDR	preliminary design review
PFM	protoflight model
PID	process identification document
PMP	parts, materials and processes
PRR	preliminary requirements review
PTR	post test review
QA	quality assurance
QM	qualification model
QR	qualification review
RAMS	reliability, availability, maintainability and safety

Abbreviation	Meaning
RB	requirements baseline
RF	radio frequency
RFA	request for approval
RFD	request for deviation
RFW	request for waiver
RH	relative humidity
RID	review item discrepancy
ROD	review of design
r.m.s.	root-mean-square
SCC	stress-corrosion cracking
SEE	single event effect
SEP	system engineering plan
SRR	system requirements review
STM	structural-thermal model
SVT	system validation test
S/C	spacecraft
SW	software
TC	telecommand
TCS	thermal control subsystem
TM	telemetry
TM/TC	telemetry/telecommand
TML	total mass loss
TRB	test review board
TRL	technology readiness level
TRR	test readiness review
TS	technical specification
TT&C	telemetry, tracking and command
UTC	coordinated universal time
UV	ultraviolet
VCD	verification control document
VP	verification plan
WBS	work breakdown structure

Annex A
Traceability with respect to ECSS-P-001B

The following table shows the differences between ECSS-P-001B and this document.

Deleted terms (terms that appeared in ECSS-P-001B but do not appear in the current document) are listed after this table.

Term	Type of modification (No change, Added, Modified)
2.3.1 acceptance <act>	**Modified**
2.3.2 acceptance <process>	**Added**
2.3.3 accident	**No change**
2.3.4 active redundancy	**Added**
2.3.5 actuator	**Added**
2.3.6 alert	**Modified**
2.3.7 allowable load	**No change**
2.3.8 analysis	**Added**
2.3.9 anomaly	**No change**
2.3.10 applicable document	**Modified**
2.3.11 approval	**Modified**
2.3.12 assembly <act>	**Added**
2.3.13 assurance	**No change**
2.3.14 audit	**Modified**
2.3.15 audit criteria	**Modified**
2.3.16 audit evidence	**No change**
2.3.17 auditee	**No change**
2.3.18 auditor	**Modified**
2.3.19 availability	**No change**
2.3.20 backward contamination	**Added**
2.3.21 bakeout	**No change**
2.3.22 baseline	**No change**

Term	Type of modification (No change, Added, Modified)
2.3.23 batch	**Added**
2.3.24 black box	**Modified**
2.3.25 business agreement	**Modified**
2.3.26 calibration	**No change**
2.3.27 capability	**No change**
2.3.28 catastrophic	**Added**
2.3.29 certification	**Modified**
2.3.30 clean area	**Modified**
2.3.31 cleanliness	**Added**
2.3.32 cleanroom	**Added**
2.3.33 cold redundancy	**Added**
2.3.34 commissioning	**Added**
2.3.35 common cause failure	**No change**
2.3.36 common mode failure	**No change**
2.3.37 component	**Added**
2.3.38 composite	**Added**
2.3.39 configuration	**Modified**
2.3.40 configuration baseline	**No change**
2.3.41 configuration control	**No change**
2.3.42 configuration document	**No change**
2.3.43 configuration identification	**No change**
2.3.44 configuration item	**No change**
2.3.45 configuration management	**No change**
2.3.46 configuration status accounting	**No change**
2.3.47 configuration verification	**Modified**
2.3.48 conformance	**Added**
2.3.49 conformity	**Modified**
2.3.50 contaminant	**Added**
2.3.51 contamination	**No change**
2.3.52 contract	**Modified**
2.3.53 corrective action	**Modified**
2.3.54 COTS	**Added**
2.3.55 critical <general>	**Added**
2.3.56 critical <safety>	**Added**
2.3.57 critical item	**Modified**
2.3.58 critical path	**Modified**

Term	Type of modification (No change, Added, Modified)
2.3.59 customer	**Modified**
2.3.60 defect	**Modified**
2.3.61 dependability	**Modified**
2.3.62 derating	**Modified**
2.3.63 design <result>	**No change**
2.3.64 design <activity>	**No change**
2.3.65 development	**Modified**
2.3.66 deviation	**Added**
2.3.67 discipline	**Added**
2.3.68 discrepancy	**Added**
2.3.69 disposal	**Added**
2.3.70 effectiveness	**No change**
2.3.71 efficiency	**No change**
2.3.72 element	**Added**
2.3.73 emergency	**Modified**
2.3.74 embedded space segment element	**Added**
2.3.75 end item	**Added**
2.3.76 engineering model	**Added**
2.3.77 engineering qualification model	**Added**
2.3.78 environment	**Modified**
2.3.79 equipment	**Modified**
2.3.80 fail-safe	**Modified**
2.3.81 failure	**Modified**
2.3.82 failure mode	**Modified**
2.3.83 failure tolerance	**No change**
2.3.84 fault	**Modified**
2.3.85 fault tolerance	**No change**
2.3.86 firmware	**No change**
2.3.87 flammability	**No change**
2.3.88 flight model	**Added**
2.3.89 flight operations	**Modified**
2.3.90 flight spare	**Added**
2.3.91 forward contamination	**Added**
2.3.92 function	**Modified**
2.3.93 function tree	**Modified**
2.3.94 functional analysis	**Modified**

Term	Type of modification (No change, Added, Modified)
2.3.95 ground segment	**Added**
2.3.96 ground segment element	**Added**
2.3.97 ground segment equipment	**Added**
2.3.98 ground segment subsystem	**Added**
2.3.99 ground segment system	**Added**
2.3.100 ground support equipment	**Added**
2.3.101 handbook <ECSS>	**Added**
2.3.102 hazard	**Modified**
2.3.103 hazardous event	**Modified**
2.3.104 hot redundancy	**Added**
2.3.105 human factors	**Added**
2.3.106 implementation document	**Modified**
2.3.107 incident	**Modified**
2.3.108 informative	**Added**
2.3.109 inhibit	**Modified**
2.3.110 inspection	**Modified**
2.3.111 integration	**Modified**
2.3.112 interchangeability	**Added**
2.3.113 interface	**Modified**
2.3.114 launch base	**Added**
2.3.115 launch campaign	**Added**
2.3.116 launch complex	**Added**
2.3.117 launch operations	**Added**
2.3.118 launch range	**Added**
2.3.119 launch segment	**Added**
2.3.120 launch segment element	**Added**
2.3.121 launch segment equipment	**Added**
2.3.122 launch segment subsystem	**Added**
2.3.123 launch segment system	**Added**
2.3.124 launch service	**Added**
2.3.125 launch system	**Added**
2.3.126 launch vehicle	**Added**
2.3.127 launcher	**Modified**
2.3.128 launcher element	**Added**
2.3.129 [launcher] production facilities	**Added**
2.3.130 launcher stage	**Added**

Term	Type of modification (No change, Added, Modified)
2.3.131 launcher system	**Added**
2.3.132 life cycle	**Modified**
2.3.133 life profile	**Modified**
2.3.134 lifetime	**Modified**
2.3.135 lot	**Added**
2.3.136 maintainability	**Modified**
2.3.137 maintenance	**Modified**
2.3.138 material	**Modified**
2.3.139 mission	**Modified**
2.3.140 model	**Modified**
2.3.141 multipaction	**Added**
2.3.142 nonconformance	**Modified**
2.3.143 nonconformity	**Modified**
2.3.144 normative	**Added**
2.3.145 offgassing	**Added**
2.3.146 off-the-shelf	**Added**
2.3.147 orbital debris	**Added**
2.3.148 outage	**Modified**
2.3.149 outgassing	**Added**
2.3.150 part	**Modified**
2.3.151 payload	**Modified**
2.3.152 performance	**Modified**
2.3.153 planetary protection	**Added**
2.3.154 preventive action	**Modified**
2.3.155 procedure	**Modified**
2.3.156 process	**Modified**
2.3.157 product	**Modified**
2.3.158 product assurance	**No change**
2.3.159 product tree	**Modified**
2.3.160 project	**Modified**
2.3.161 project requirements document	**Modified**
2.3.162 protoflight model	**Added**
2.3.163 provision	**No change**
2.3.164 qualification	**Added**
2.3.165 qualification model	**Added**
2.3.166 quality	**Modified**

Term	Type of modification (No change, Added, Modified)
2.3.167 quality assurance	**No change**
2.3.168 quality control	**No change**
2.3.169 redundancy	**Modified**
2.3.170 reliability	**No change**
2.3.171 relifing	**Added**
2.3.172 repair	**Modified**
2.3.173 requirement	**Modified**
2.3.174 residual risk	**No change**
2.3.175 review	**Modified**
2.3.176 rework	**Modified**
2.3.177 risk	**Modified**
2.3.178 safety	**Modified**
2.3.179 safety critical function	**No change**
2.3.180 safing	**No change**
2.3.181 scrap	**Modified**
2.3.182 security	**Modified**
2.3.183 segment	**Added**
2.3.184 severity	**No change**
2.3.185 single point failure	**Modified**
2.3.186 solar array	**Added**
2.3.187 solar cell	**Added**
2.3.188 solar cell assembly	**Added**
2.3.189 solar panel	**Added**
2.3.190 space debris	**Modified**
2.3.191 space mission	**Added**
2.3.192 space programme	**Added**
2.3.193 space segment	**Added**
2.3.194 space segment element	**Added**
2.3.195 space segment equipment	**Added**
2.3.196 space segment subsystem	**Added**
2.3.197 space segment system	**Added**
2.3.198 space system	**Modified**
2.3.199 spacecraft	**Modified**
2.3.200 special process	**Added**
2.3.201 specification	**No change**
2.3.202 stand-alone space segment element	**Added**

Term	Type of modification (No change, Added, Modified)
2.3.203 standard <ECSS>	**Modified**
2.3.204 statement of work	**Modified**
2.3.205 stress-corrosion	**No change**
2.3.206 structural model	**Added**
2.3.207 structural-thermal model	**Added**
2.3.208 subsystem	**Modified**
2.3.209 supplier	**Modified**
2.3.210 support segment	**Added**
2.3.211 support system	**Modified**
2.3.212 system	**Modified**
2.3.213 tailoring	**Modified**
2.3.214 technical memorandum <ECSS>	**Added**
2.3.215 test	**Modified**
2.3.216 thermal ambient test	**Added**
2.3.217 thermal balance test	**Added**
2.3.218 thermal model	**Added**
2.3.219 thermal vacuum test	**Added**
2.3.220 third party	**Modified**
2.3.221 toxic	**No change**
2.3.222 traceability	**Modified**
2.3.223 uncertainty	**No change**
2.3.224 unit	**Modified**
2.3.225 upper part [A5]	**Added**
2.3.226 upper stage [A5]	**Added**
2.3.227 validation	**Modified**
2.3.228 verification	**Modified**
2.3.229 waiver	**Added**
2.3.230 work breakdown structure	**No change**
2.3.231 work package	**Modified**

Terms deleted with respect to the previous issue of the glossary (ECSS-P-001B):

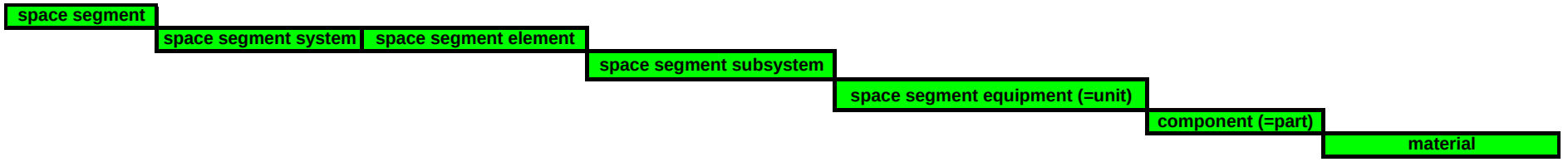
acceptance stage
acceptance test
allowable stress
assembly <noun>
audit client
audit conclusion
audit findings
audit programme
audit team
caution condition
characteristic
common mode fault
competence
concession
constraint
contingency procedure
continual improvement
contractor
correction
corrosion
cost breakdown structure
customer satisfaction
design and development
design to minimum risk
deviation permit
document
EEE component
error
estimate at completion
estimate to completion
fault <event>
flashpoint
grade
ground operations
ground systems
human error
information
infrastructure
instantaneous availability
integrity
item
life cycle cost
management
management system
matériel
mean time between failures
measurement control system
measurement process
measuring equipment
mechanical part
metrological characteristic
metrological confirmation
metrological function
need
normative document
normative reference
objective evidence
organization
organizational structure
product state
programme
project phase
purchaser
qualification process
quality characteristic
quality improvement
quality manual
quality plan
quality planning
record
recurrent cost
regrade
required function
risk management
risk management policy
series production
software module
software product
software product assurance
space element
space project
subcontract
supported system
technical expert
technical specification
top management
undesirable event
warning condition
work environment

Annex B
Segment trees

This annex includes example for the terms defined in paragraph 2.1 and Figure 2-1: Space system breakdown:

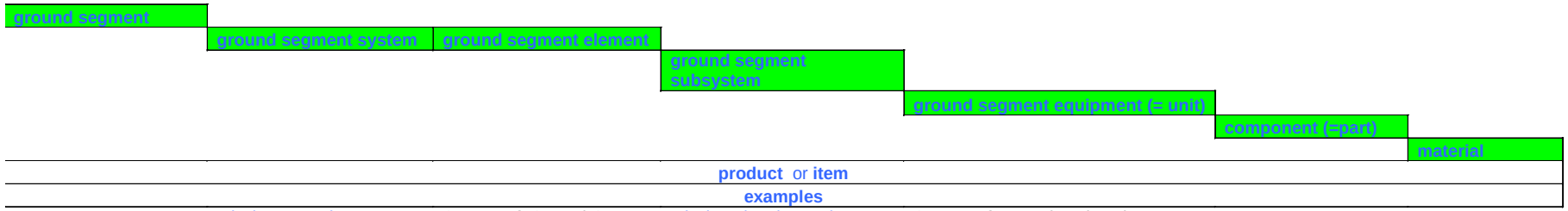
- Space segment
- Ground segment
- Launch segment
- Support segment

B.1 Space segment



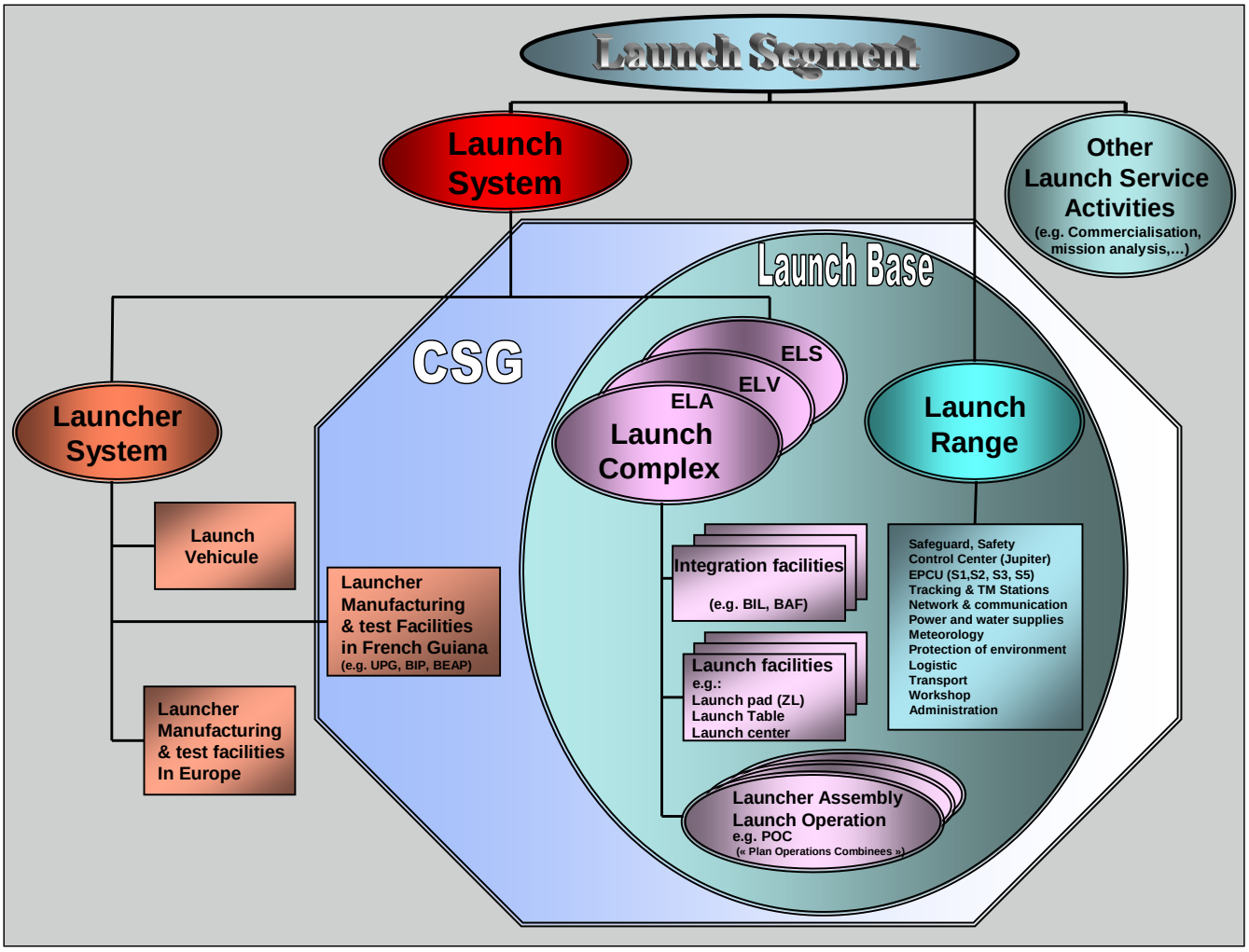
product or **item**					
examples					
Data Relay Satellite System	spacecraft (physical view)	power	electronic unit (e.g. DHU, PCSU, PDU, ICU)	ASIC	Alumiunium
Navigation Satellite System	satellite (physical view)	propulsion	thruster	hybrid	to be taken from Q60 & Q70
spacecraft (functional view)	payload	data handling	valve	integrated circuit	
satellite (functional view)	platform	thermal	battery	heat-pipe	
	instrument	structure	reflector	MLI	
	orbiter	AOCS	mechanism (when fully assembled)	structural panel	
	lander	Tm&Tc	vessel/tank	optical array	
	bay	optical	mirror/lenses/filters (assembly)	pyro components	
	module	RF	solar array (assembly)	PCB	
		communication	antenna (assembly)	mirror	
			focal plane assembly	solar cell	
			telescope (assembly)	insert	
			solar panel (equipped)	resistor	
			pressure vessels	diode	
			optical bench	transistor	
			RF filters	capacitor	
			LNA	thermistor	
			IMUX/OMUX	heater	
			OMT	propulsion fluidic	
			feeds		

B.2 Ground segment



Mission operations system	Spacecraft Control Centre	Mission planning and scheduling	Spacecraft control workstation
		Monitoring and control	Simulator control workstation
		Flight Dynamics	
		Performance analysis and reporting	
Payload operations and data system	Payload/instrument control centre	Payload data processing	Payload operations planning workstation
		User services	
Ground station system	Ground station network	Telemetry reception, storage and distribution	
	Ground station	Telecommand transmission	Ground station antenna
		Station monitoring and control	TM receiver
		Time management	TC transmitter
			Demodulator, Decoder/Modulator, Encoder
Ground communications system	Ground communications network	Data distribution	Communication Node
		Voice and video communication	Flight data recorder
MGSE		CCS (Command & Control Subsystem)	
		SDP (Science Data Processor)	

B.3 Launch segment



B.4 Support segment

Systems		Elements
Examples		
Data Relay Satellite System		Data Relay Satellite
Navigation Satellite System		ISS
Concurrent Design Facility (CDF)		Astronaut training centre
Generic Flight Dynamics system (e.g. ORATOS)		Ground Statin Network Control Centre
		Main Control room
LEOP Ground Station Network		Briefing Room
Deep Space Ground Station Network		Test Centre
		MGSE
		TGSE
		FGSE
		Launch complex

Annex C
Launch segment-specific terms

The following terms are specific to the launcher domain and are cross-referenced from clause 2.3.

composite

building block of a **launcher** composed of one or several pre-integrated stages and structural parts (fairing, payload adaptor, dual launch structure, etc.)

NOTE 1 Example-1: A5 Upper Composite includes the cryogenic upper stage (ESC), the vehicle equipment bay (VEB), fairing and payload adaptor.

NOTE 2 Example-2: A5 Lower Composite includes two solid booster stages (EAP) and the main cryogenic stage (EPC).

launch base

composed of **launch range** and **launch complexes**

launch campaign

launch activities which include:

- Launcher preparation and final integration
- Payload processing and integration on the launcher
- Launch Operations including Flight Data Gathering

launch complex

integration and facilities necessary to carry out the final **integration** of the **launcher** elements as well as the **launch operations**

NOTE A Launch System is associated with its specific Launch Complex, which may include facilities shared with other Launch Systems (e.g.: Lox plant at CSG).

launch operations

all launch related activities taking place after completion of the activities necessary to deliver a fully integrated **launcher** up to reception of post flight data

launch range

systems, facilities and means, not part of the **launch segment,** required to provide the necessary service and support for carrying out a **launch campaign** and to ensure safety and security of persons, assets and protection of the **environment**

NOTE The Launch Range includes in particular the CNES/CSG technical centre, the payload Preparation Facilities as well as the downrange stations for launcher tracking and flight data acquisition.

launch service

activities required to conclude a launch service contract and to place a **payload** in the orbit, at the time, and under the **payload environment** conditions required by the **customer**

NOTE Launch Service activities cover in particular: Commercialisation, Mission analysis, Procurement of a fully integrated launcher, Procurement of flight programme(s), Procurement of launcher adaptations to meet specific mission requirements, Payload processing and integration on the launcher, Launch Operations including Flight Data Gathering, Launch Range Operations, Post Flight Analysis.

launch system

system comprising the fully integrated **launcher,** the **launch complex** and the needed facilities for manufacturing, testing and delivering the **launcher elements**

NOTE "Fully integrated launcher" means the integrated launcher, including payload, and ready to be launched i.e. all launch control lights on green.

launch vehicle

see "**launcher**"

launcher

vehicle designed to transport **payloads** to space

NOTE The term “launch vehicle” is synonymous.

launcher element

building block of a **launcher**

[launcher] production facilities

launcher element manufacturing facilities and related **launch complex**

NOTE The launcher element manufacturing facilities include the test facilities specific to the launcher elements' manufacturing.

launcher stage

complete **element** of a **launcher** that delivers the defined thrust during dedicated phase of the **launcher mission**

NOTE 1 A launcher stage typically consists of a main propulsion system, a reaction controlled system (sometimes integrated to some extend with the main propulsion system), supporting structure, forward and aft skirts, aerodynamic control and/or stabilized surfaces, a separation system and a destruction system.

NOTE 2 Some of the upper stages are also equipped with an avionics system.

NOTE 3 The Ariane 5 upper stage is made of cryogenic main stage (ESC) and vehicle equipment bay (VEB).

launcher system

fully integrated **launcher** and the needed facilities for manufacturing, testing and delivering the **launcher elements**

NOTE "Fully integrated launcher" means the integrated launcher, including payload, and ready to be launched i.e. all launch control lights on green.

upper part [A5]

made of all the **payload** adaptor's (ACU), SYLDA or Speltra and Fairing [Ariane 5 launcher]

upper stage [A5]

made of cryogenic main stage (ESC) and vehicle equipment bay (VEB), ending at 1780 diameter interface [Ariane 5 launcher]

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