ECSS-Q-70B
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Space product assurance

Materials, mechanical parts and processes

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Foreword

This Standard is one 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 this Standard 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.

The formulation of this Standard takes into account the existing ISO 9000 family of documents.

Significant changes between this version and the previous version are:

- addition of the Document requirements definitions (DRDs), and
- update of subclause 4.2.3 “Management of the lists” in connection with the new DRDs.

This Standard has been prepared by the ECSS-Q-70 Group, reviewed by the ECSS Product Assurance Panel and approved by the ECSS Steering Board.

This version B cancels and replaces ECSS-Q-70A.

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Scope

The purpose of this Standard is to define the requirements and statements applicable to materials, mechanical parts and processes to satisfy the mission performance requirements.

This Standard also defines the documentation requirements and the procedures relevant to obtaining approval for the use of materials, mechanical parts and processes in the fabrication of space systems and associated equipment.

This Standard covers the following:

- management, including organization, reviews, acceptance status and documentation control;
- selection criteria and rules;
- evaluation, validation and qualification, or verification testing;
- procurement and receiving inspection;
- utilization criteria and rules.

The relationship between activities and programme phases is defined in Annex A.

The provisions of this Standard apply to all factors involved at all levels in the production of space systems. These can include manned and unmanned spacecraft, launchers, satellites, payloads, experiments, electrical ground support equipment, mechanical ground support equipment, and their corresponding organizations.

For specific projects, the requirements defined in this Standard should be tailored to match the true requirements of a particular profile and circumstances of a project.

NOTE Tailoring is a process by which individual requirements of specifications, standards and related documents are evaluated, and made applicable to a specific project by selection, and in some exceptional cases, modification of existing or addition of new requirements.
[ECSS-M-00-02A, Clause 3]

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Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this ECSS Standard. For dated references, subsequent amendments to, or revisions of any of these publications do not apply. However, parties to agreements based on this ECSS Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the publication referred to applies.

ECSS-P-001	Glossary of terms
ECSS-Q-00	Space product assurance — Policy and principles
ECSS-Q-20B	Space product assurance — Quality assurance
ECSS-Q-40	Space product assurance — Safety

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Terms, definitions and abbreviated terms

3.1 Terms and definitions

The following terms and definitions are specific to this Standard in the sense that they are complementary or additional to those contained in ECSS-P-001.

3.1.1
critical mechanical part
mechanical part that requires specific attention or control due to fracture mechanics aspects and limited-life aspects, or with which the contractor has no previous experience of using the mechanical part in the specific application and environment or that are new or non-qualified

3.1.2
critical process
process is declared critical when it is new to an individual company or non-verified for the application in question or has caused problems during previous use that remain unresolved

3.1.3
critical material
material that is new to an individual company or non-validated for the particular application and environment

3.1.4
material
raw or semi-finished product or compound (gaseous, liquid, or solid) of specific characteristics, which is processed to form a part or a finished product

3.1.5
mechanical part
piece of hardware that is not electrical, electronic or electromechanical, and which performs a simple (elementary) function or part of a function in such a way that it can be evaluated as a whole against expected performance requirements and cannot be disassembled without destroying this capability

NOTE 1 In this Standard, the term "part" is used to mean mechanical part.

NOTE 2 Only standard parts are subject to the mechanical parts lists; non-standard parts are described through their materials

and processes in the materials lists and process lists, respectively.

3.1.6
process
set of inter-related resources and activities which transforms a material or semi-finished product into a semi-finished product or final product

3.1.7
request for approval (RFA)
document with which the supplier or user asks the competent body for permission to use a critical material, part or process

3.1.8
special process
process where quality cannot be completely ensured by inspection of the end article only

3.2 Abbreviated terms

The following abbreviated terms are defined and used within this Standard.

Abbreviation	Meaning
AA	Aluminium Association
AOCS	attitude and orbit control system
ATOX	atomic oxygen
AISI	American Iron and Steel Institute
CDA	Copper Development Association
CDR	critical design review
CFRP	carbon fibre reinforced polymer
CI	configuration item number (as per project definition)
DML	declared material list
DMPL	declared mechanical part list
DPL	declared process list
DRD	document requirements definition
EEE	electrical, electronic and electromechanical
ESA	European Space Agency
GOX	gaseous oxygen
GSE	ground support equipment
LEO	low Earth orbit
LOX	liquid oxygen
MAPTIS	Materials and Processes Technical Information System
MIP	mandatory inspection point
MMPP	Materials, mechanical parts and processes
NASA	National Aeronautics and Space Administration
NCR	nonconformance report
NRB	nonconformance review board
PA	product assurance
PDR	preliminary design review
PID	process identification document
PMP	parts, materials, processes

QR	qualification review
QRR	qualification review report
RFA	request for approval
SCC	stress-corrosion cracking

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General requirements

4.1 Materials, mechanical parts and processes programme management

4.1.1 Materials, mechanical parts and processes activity diagram

The general activity within the framework of a project is summarized by the flow chart shown in Figures 1 and 2.

4.1.2 Product assurance plan

Suppliers shall provide a material, mechanical parts and processes plan in accordance with ECSS-Q-00 and this Standard.

NOTE This can form part of the overall project product assurance plan, or exist as a separate document.

4.1.3 Management

a. The supplier shall appoint a materials, mechanical parts and processes manager who ensures that the requirements laid out in this Standard are satisfied.

b. This manager shall be the customers contact as far as application of this Standard is concerned within the overall PA reporting system.

c. The manager shall periodically inform the customer of the progress of tasks relating to its application.

d. The manager shall ensure conformance to technical and scheduling aspects of the various actions undertaken (status of material validation, part qualification and process verification).

e. The manager shall ensure that all suppliers apply the requirements of this Standard.

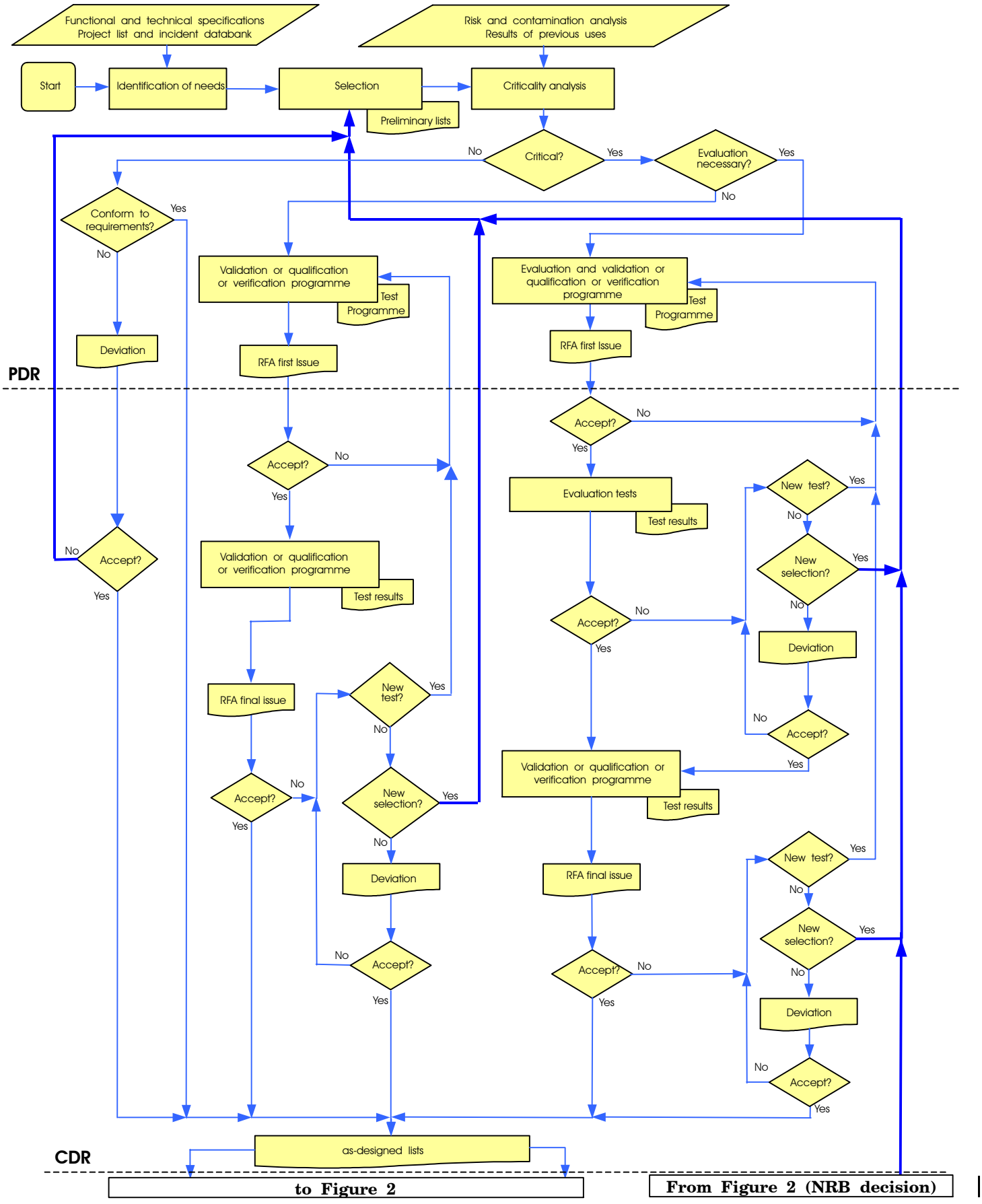

Figure 1: Materials, mechanical parts and processes flow chart (continued in Figure 2)

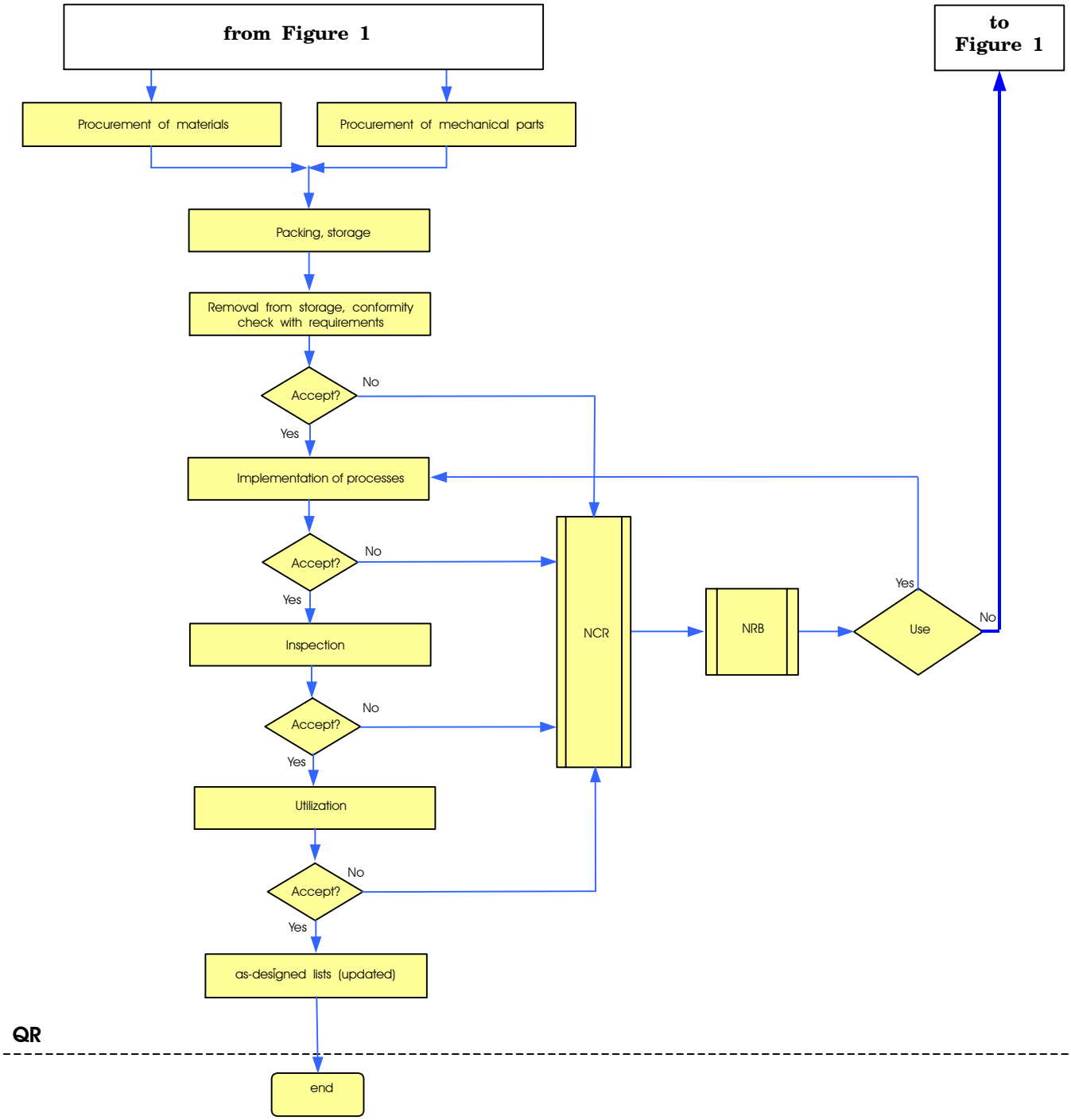

Figure 2: Materials, mechanical parts and processes flow chart (continued from Figure 1)

Table 1: Steps to be taken to get approval for materials, mechanical parts and processes (MMPP)

Phase	Materials		Mechanical parts		Processes	
	Step	**Comments**	**Step**	**Comments**	**Step**	**Comments**
Critical Analysis	1		1		1	
Evaluation (usually by test methods defined by ECSS standards)	2	Critical materials are tested, e.g. outgassing, SCC, flammability.	2	Mechanical parts are tested by, for example, vibration, thermal analysis, off-gassing and life test.	2	Critical processes are evaluated by testing "technology samples" including all, for example, electrical interconnection processes and painting, adhesive bonding.
Verification	Not applicable		Not applicable		3	Verification tests usually defined in ECSS standards
Validation	3		Not applicable		Not applicable	
Qualification	Not applicable		3		Not applicable	
Approval		By RFA (Annex E) or DML		By RFA (Annex E) or DMPL/DPL		By RFA (Annex E) or DPL

NOTE 1 Project approval is always by means of the Request for Approval (RFA) form and the projects' declared materials list (DML), declared mechanical parts list (DMPL) and declared processes list (DPL).

NOTE 2 The details for Approvals of MMPP lists are contained in this Standard.

NOTE 3 To summarize: Materials are Validated.
Mechanical parts are Qualified.
Processes are Verified.
And in addition: Skills training schools are ESA-approved.
Outside test or evaluation laboratories are ESA-approved.
Operators and inspectors for critical processes are Trained, Certified and Monitored.

4.1.4 Customer reviews

a. To obtain the validation status for materials and qualification status for parts and verification status for processes, the materials, mechanical parts and processes manager shall present to the customer those activities which were performed in order to comply with this Standard together with results obtained.

b. The materials, mechanical parts and processes manager shall organize technical review meetings with his suppliers at all levels, as appropriate.

4.2 Management and consolidation of the activities

4.2.1 Relationship

The relationship between materials and processes activities and programme phases is shown in Annex A.

4.2.2 Establishing and processing of lists

a. Each supplier and sub-supplier shall establish, collect, review and deliver the declared materials, mechanical parts and processes lists including all the items intended for use in the flight equipment.

b. The lists shall reflect the current design at the time of issue.

c. These lists shall contain the materials, mechanical parts and processes used in the current design. The objectives are as follows:

1. compliance with all requirements of the programme;
2. to verify the results of equipment supplier activities;

3. to control and monitor the status of materials, mechanical parts and processes in accordance with programme milestones, as shown in Annex A.

d. The following constraints should be taken into account:
   1. requirements originating from the functional specifications;
   2. requirements and conditions specific to the project;
   3. maximum use of the materials and processes described in approved data sources, e.g. ECSS-Q-70-71, and items already approved on similar projects;
   4. use of project related preferred lists, if available.

e. An analysis of the criticality of these preliminary lists shall, after checking the conformity of the materials, mechanical parts and processes, against all the project requirements, allow them to be classified into three categories:
   1. Critical items, subject to evaluation, validation, qualification, or verification programmes, for which a request for approval should be drafted according to the method and the formats defined in RFA DRD, see Annex E.
   2. Items that are not critical but which do not conform to one or more project requirements (a justified deviation request should be drafted for this category).
   3. Non-critical items.

4.2.3 Management of the lists

a. The supplier shall document all the MMPP used in the project in accordance with the DRD.

b. The MMPP lists shall be provided in a form that is exchangeable, searchable, sortable and suitable for storage and retrieval (in accordance with the business agreement).

c. The customer shall process the lists for suppliers as necessary to achieve the objectives of exchangeabililty, searchability, sortability, storability and retrievability for that set of lists, before releasing it for use by the higher level customer.

d. These lists shall be updated during the course of the project.

e. The preliminary lists shall include the items from suppliers' preliminary needs and are used to identify those that are critical (available for the PDR).

f. The as-designed lists shall include the items from the baselines various design files (available for the CDR).

g. Any change after CDR or QR shall be reflected in the list and shall be in accordance with Figure 2.

NOTE 1 The materials, mechanical parts and processes manager is responsible within the programme to ensure that all the information needed is given and that the approval status is consistent with technical and scheduling objectives and data is exchangeable.

NOTE 2 Where no project requirements exist for a separate DMPL, the mechanical parts can be entered into a separate section of the DML.

NOTE 3 The materials of, for example, screws and nuts that are made up of a few materials can be listed in the DMPL. The materials (metals and plastics) of complex parts can be listed in the DML with, for example, outgassing, toxicity, flamma-

bility, corrosion and stress corrosion values and reference to the DMPL item.

4.2.4 Supplier role and responsibilities

a. The supplier shall be responsible for the following tasks:
   1. obtaining the correct and complete lists from lower level suppliers;
   2. providing provisional and, later, definitive approval for each list;
   3. submitting the project declared lists for approval prior to initiation of the hardware phase (before critical design review).

b. The lists established by the suppliers shall include all the information described in this Standard.

c. Amendments to the lists shall be implemented only through established change procedures.

d. Any of the following documentation shall be made available to the final customer upon request:
   - RFA (reference and issue);
   - material, mechanical parts or processes justification files;
   - evaluation reports;
   - deviation requests.

4.3 Technical constraints

a. Parts and materials shall satisfy the mission's functional constraints.

b. They shall also satisfy both ground environment constraints (e.g. manufacture, tests, storage, maintenance, transport and integration) and flight constraints (launch and orbit).

c. The technical criteria from clause 5.1 shall be taken into account, according to the mission.

d. The estimated availability of the parts and products obtained from materials and processes used shall be compatible with the final system's life cycle (tests, storage and mission).

4.4 Cleanliness and contamination control

a. The supplier shall establish and maintain an effective contamination and cleanliness control programme including, as a minimum:
   1. cleaning procedures, and
   2. cleanliness monitoring procedures or methods.

b. The risks of chemical or particle pollution generated by parts, materials or processes used shall be identified and reduced in accordance with mission requirements (cleanliness or contamination analysis).

c. For cleanliness- or contamination-critical applications, a specific cleanliness control plan and requirement specification (chemical and particle) shall be established, see ECSS-Q-70-01

4.5 Safety hazardous parts and materials

Parts and materials with hazardous characteristics shall be identified, managed and processed according to ECSS-Q-40.

4.6 Optical, mechanical or electrical GSE hardware

When optical, mechanical or electrical GSE materials are used in thermal vacuum or interfacing with flight hardware, possible degradation shall be taken into account (e.g. contamination, surface degradation, electro-mechanical and chemical effects).

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Materials control

5.1 Technical criteria for selection of materials

The following requirements shall only be taken into account if the environmental conditions of the mission require their application. The specific requirements, test methods and accept or reject criteria are presented in the ECSS Q-70 series of documents.

a. Temperature

Material properties shall be compatible with the thermal environment to which they are exposed.

b. Thermal cycling

Materials subject to thermal cycling shall be assessed for their ability to withstand induced thermal stress and shall be tested according to approved procedures, see ECSS-Q-70-04.

c. Vacuum

1. Materials selection shall be made in accordance with approved data sources, see ECSS-Q-70-71.
2. Outgassing tests shall be carried out according to approved procedures, see ECSS-Q-70-02.

d. Offgassing, toxicity, bacterial and fungus growth

Spacecraft and associated equipment shall be manufactured from materials and by processes that shall not cause an unacceptable hazard to personnel or hardware, whether on the ground or in space, according to ECSS-Q-70-29 subclause 5.2.6.

NOTE MAPTIS and MIL-HDBK-454 test method is not space relevant.

e. Flammability

The materials flammability resistance shall be evaluated for the most hazardous environment envisaged for their use, i.e. NASA STS payloads see NASA STD-6001 and ECSS-Q-70-21.

f. Radiation

Materials used on the spacecraft external surfaces shall be assessed to determine their resistance to the radiation dosage expected during the mission, see ECSS-Q-70-06.

g. Electrical charge and discharge

External surfaces of the spacecraft shall be sufficiently conductive, interconnected and grounded to the spacecraft structure to avoid the build-up of differential charges.

h. Lightning strike

Provision shall be made in the design to ensure that the safety and functionality of the vehicle are not compromised by the occurrence of a lightning strike during launch or return.

i. Corrosion

For all materials that come into contact with atmospheric gases, cleaning fluids or other chemicals, it shall be demonstrated that the degradation of properties during their anticipated service-life is acceptable in terms of the performance and integrity requirements.

j. Stress-corrosion

1. Materials used for structural and load-bearing applications (subject to tensile stress) shall be chosen in conformance with approved data sources, see Table 1 of ECSS-Q-70-36A.
2. Any material not covered by standard ECSS-Q-70-36 shall be tested according to approved procedures, see ECSS-Q-70-37.

k. Fluid compatibility

1. Materials within the system exposed to liquid oxygen (LOX), gaseous oxygen (GOX) or other reactive fluids, both directly and as a result of single point failures shall be compatible with that fluid in their application.
2. The possibility of hydrogen embrittlement occurring during component manufacture or use shall be assessed. An appropriate material evaluation shall be undertaken, including the assessment of adequate protection and control.

l. Galvanic compatibility

When bimetallic contacts are used, the choice of the pair of metallic materials used shall be taken into account. This also includes metal-to-conductive fibre-reinforced materials contacts.

m. Atomic oxygen

1. All materials considered for use on the external surfaces of spacecraft intended for use in Low Earth Orbit (LEO) altitudes (between 200 km and 700 km) shall be evaluated for their resistance to atomic oxygen (ATOX).
2. Test procedures shall be subject to the approval of the customer.

n. Micrometeoroids and debris

The effect of impacts by micrometeoroids and debris on materials shall be reviewed and assessed on a case by case basis and that their use shall comply with safety evaluation and assessment results concerning design and application criteria or details.

o. Moisture absorption and desorption

Precautions shall be taken to avoid moisture absorption during manufacture and storage of CFRP-type materials, see ECSS-Q-70-01 and ECSS-Q-70-22.

p. Mechanical contact surface effects (cold welding, fretting, wear)

For all solid surfaces in moving contact with other solid surfaces, it shall be demonstrated that the degradation of surface properties over the complete mission is acceptable from a performance point of view.

q. Life

Materials shall be selected to ensure sufficient life with respect to the intended application.

5.2 Selection

a. Materials shall be chosen giving preference to the following:

- those successfully used for an identical application in other space programmes similar with respect to environment constraints and lifetime to the proposed application;
- those for which satisfactory evaluation results are obtained on samples representative of the application with a sufficient margin as regards conditions of use;
- those included in approved data sources, for example ECSS-Q-70-71, ESA and NASA data banks.

b. Whether the materials are already validated or remain to be validated, their selection shall take into account the following criteria:

- continuity of supply;
- reproducibility of characteristics.

5.3 Declared materials list (DML) content

a. DML shall be broken down into clear categories to facilitate locating each item in the documentation (an example of such a breakdown is given in DML DRD, see Annex B).

b. The DML shall include the following information:

- Issue status of DML.
- Unique item number (as the reference of the material in the DML) that shall be the same throughout the duration of the project.
- Material designation (commercial identification).
- Material keys, e.g. AISI; AA; CDA.
- Chemical nature and type of product.
- Manufacturers' name and procurement specifications or standards.
- Summary of processing parameters (e.g. finish, temper condition, mix ratio and curing).
- Use and location.
- Environmental code.
- Size code, test data (e.g. outgassing, stress corrosion cracking , corrosion and test data references).
- Approval status (with reference to the approval authority, to test report and similar previous applications).

c. Use of codes: any coding or acronyms used within the list shall be defined within the document.

NOTE An example of a suitable completed DML format is given in Table B-6 in the DML DRD, see Annex B.

5.4 Criticality analysis

To conform to mission requirements, the objective of the analysis is to identify whether further data are required.

a. The supplier shall analyse all the materials contained in his preliminary lists with respect to criticality and in correlation with the risk analysis performed.

b. Any material not meeting the project requirements shall be the subject of a RFA to be submitted to the next customer.

NOTE Any material when specifically required, marking inks can be excluded.

c. The RFA shall include the reason and details of the subsequent evaluation and validation to be performed; see Annex E and 4.2.2.e.

5.5 Evaluation and validation phases

5.5.1 General

a. Depending on the results of the criticality analysis, the supplier shall perform either evaluation and qualification phases, or a qualification phase only for all critical parts. The choice between these two approaches takes into account:

- knowledge of the part (e.g. new part, new use or change of configuration), and
- extension of the application.

b. Procurement and validation results, together with associated documents, shall be available for review at the contractor's premises before the start of evaluation or qualification phases.

5.5.2 Evaluation phase

a. The evaluation shall consider the following as a minimum for each material with unknown characteristics:

- the limits of use;
- the materials physical, chemical or functional characteristics along with their values and tolerances;
- behavioural tendencies and degradation processes depending on environmental parameters (including sensitivity to pollution);
- acceptance criteria.

b. When evaluation is performed an evaluation programme (available at PDR, according to Figures 1 and 2) shall be drawn up, implemented and an evaluation report (available before CDR, according to Figures 1 and 2 and Table 1) shall be drawn up.

5.5.3 Validation phase

a. For all materials with unknown characteristics, a validation programme (available at PDR) shall be drawn up by the supplier and then implemented to check or confirm that the materials satisfy the mission requirements with appropriate margins as necessary to obtain validation status.

b. Validation status shall depend on the results obtained (validation report) and the review of corresponding documentation (available at CDR).

5.5.4 Approval phase

Provided that the requirements in 5.5.2 and 5.5.3 are satisfied, the material then receives an approval identification in the declared material list for the project.

If approval is not granted, the supplier in charge of the item shall either:

- select another material;
- propose a modified evaluation programme and resubmit for approval; or
- initiate a deviation procedure if the above actions fail to achieve positive results.

5.5.5 Deviation request

All materials not conforming to project requirements, whether at the end of criticality analysis or of evaluation and validation tests, shall form the subject of a duly justified deviation request in accordance with ECSS-Q-20.

5.6 Procurement of materials

5.6.1 Procurement specifications

a. All materials shall be procured to an internationally or nationally recognized specification or an in-house fully configured procurement specification which defines the materials properties, the materials requirements, the test methods, the acceptance criteria for the specific applications, source inspection and receipt tests and incoming inspection.

b. Where suppliers do not accept specifications and procurement is by means of a datasheet the contractor shall introduce internal, in-house receipt inspection to ensure that the validation status of the material is maintained during the subsequent procurements.

c. Materials with long lead times or long procurement delays (versus the project schedule) shall be identified before the formal subsystem PDR. Procurement shall be thoroughly planned, documented and implemented in a timely manner to obtain reliable product assurance provision at CDR. Back-up plans shall be prepared and initiated whenever there is evidence of possible delays or technical problems.

d. The material requirements should be explicitly accepted by the material vendor or manufacturer.

5.6.2 Incoming inspection procedure

a. All materials shall be submitted to an incoming inspection.

b. If necessary, an incoming inspection procedure shall define the inspections and tests to be carried out, particularly for materials that are known to be variable in their final properties.

5.7 Use of materials

5.7.1 Validation status of materials

The supplier shall verify that all materials with unknown characteristics are validated before being used in the manufacture of qualification or flight products. Any modification, change of condition or configuration of application can invalidate the use of the material and require additional validation testing.

5.7.2 Traceability of materials

a. The supplier shall apply the traceability rules defined in ECSS-Q-20 to all materials.

b. Materials should be identified by a unique reference number, code or a lot number to provide traceability should there be an incident or nonconformance, or a need for a technical investigation following failure or damage, to reconstruct the materials history, either individually (individual traceability) or by the manufacturing lot of which it was a part (lot traceability).

5.7.3 Packaging, storage, removal from storage

a. The supplier shall define provisions for packaging, storage and removal from storage for materials.

b. Measurements and inspections used to guarantee the material integrity and monitoring during storage and removal from storage shall be identified.

5.7.4 Limited-life materials before implementation

a. The supplier shall ensure that all materials which have limited-life characteristics have their date of manufacture (when available, otherwise date of delivery) and shelf-life expiry date accurately identified and clearly marked on each lot or batch.

b. Materials which have exceeded their shelf-life expiry date may be re-certified only after the physical and chemical characteristics are inspected and the parameters, subject to deterioration, are evaluated for continued acceptability according to the accept and reject criteria such as given in ECSS-Q-70-22.

5.7.5 Limited-life materials after implementation

Materials with limited-life after implementation (such as propellant) shall be identified and controlled, storage and mission life being taken into account. These materials shall be assessed as candidates for the critical items list, see ECSS-Q-20.

5.7.6 Materials nonconformances and alerts

Nonconformances and alerts shall be in accordance with ECSS-Q-20.

5.7.7 Health and safety

Material safety data sheet or equivalent shall be available for all materials.

6

Mechanical parts control

6.1 Selection of mechanical parts

The supplier shall verify that all materials and processes used in the manufacture of parts satisfy the mission technical requirements.

6.2 Selection

a. Parts shall be chosen from those successfully used for an identical application in other space programmes similar with respect to environment constraints and lifetime whenever those parts exist.

b. Type reduction actions shall be implemented at all levels of the programme.

c. Whether the parts are already qualified or remain to be qualified, their selection shall take into account the following criteria:

- durability of supply;
- reproducibility of characteristics.

6.3 Declared mechanical parts list (DMPL) content

a. The DMPL shall be broken down into distinct categories to enable each item in the documentation to be easily identified (a breakdown is given in the DMPL DRD, see Annex C).

b. The DMPL format shall include the following information:

- item number (as the reference of the part in the DMPL); it shall be the same throughout the duration of the project;
- part designation (commercial identification);
- type of parts;
- manufacturer and procurement specifications or standards;
- summary of functions and characteristics;
- use and location;
- environmental code;
- approval status (with reference to the approval authority, to test report and similar previous applications).

c. Use of codes: any coding or acronyms used within the list shall be defined within the document.

d. Only those mechanical parts procured to a specification as a finished product shall be entered on the DMPL.

An example of a suitable DMPL format is given in the DMPL DRD, see Annex C.

6.4 Criticality analysis

To conform to mission requirements, the objective of the analysis is to identify whether further data are required.

a. The supplier shall analyse all the parts contained in their preliminary lists with respect to criticality and in correlation with the risk analyses performed (see ECSS-Q-20-04).

b. Critical parts shall be identified in the DMPL and included in the critical items list.

c. Any critical part shall be the subject of a RFA.

d. The RFA shall include the reason and the details of the subsequent evaluations and validations to be performed, see Annex E and 4.2.2.e.

6.5 Evaluation and qualification phases

6.5.1 General

a. Depending on the results of the criticality analysis, the supplier shall perform either evaluation and qualification phases, or a qualification phase only for all critical parts. The choice between these two approaches shall take into account:

- knowledge of the part (e.g. new part, new use or change of configuration), and
- extension of the application.

b. Procurement and verification methods, together with associated documents, shall be available for review at the contractor's premises before the start of evaluation or qualification phases.

NOTE Refer to Table 1 for an explanation of the steps involved.

6.5.2 Evaluation phase

a. The evaluation shall consider the following, as a minimum, for each critical part:

- the limits of use,
- the part's physical or functional characteristics, along with its values and tolerances,
- behavioural tendencies and degradation processes depending on environment parameters (including sensitivity to pollution), and
- acceptance criteria.

b. When an evaluation is performed an evaluation programme (available at PDR) shall be drawn up, implemented, and an evaluation report (available before CDR) shall be drawn up.

c. The behaviour of the parameters to be monitored (e.g. variation and change over time) which were also recorded during the evaluation programme tests, shall serve as a reference for the analysis of qualification test results.

6.5.3 Qualification phase

a. For each critical part, a qualification programme shall be drawn up by the contractor and then implemented to check or confirm whether the parts satisfy mission requirements with appropriate margins.

b. Qualification status shall depend on the results obtained (qualification report) and the reviews of corresponding documentation (available at CDR).

6.5.4 Approval phase

Provided that the requirements in 6.5.2 and 6.5.3 are satisfied, the mechanical parts then receive an approval identification in the declared mechanical parts list for the project.

If approval is not granted, the supplier in charge of the item shall either:

- select another mechanical part,
- propose a modified evaluation programme and resubmit for approval, or
- initiate a deviation procedure if the above actions fail to achieve positive results.

6.5.5 Deviation request

All parts not conforming to project requirements, whether at the end of criticality analysis or of evaluation and qualification tests, shall form the subject of a duly justified deviation request, according to ECSS-Q-20.

6.6 Procurement of mechanical parts

6.6.1 General

a. Mechanical parts with long lead times or procurement delays (versus the project schedule) shall be identified before the formal subsystem PDR.

b. Procurement shall be thoroughly planned, documented and implemented in a timely manner to obtain reliable product assurance provision at CDR.

c. Back-up plans shall be prepared and initiated whenever there is evidence of possible delays or technical problems.

6.6.2 Procurement specification

a. Each part shall be covered by a procurement specification or a standard.

b. These specifications shall define the part characteristics, requirements, tests methods, acceptance criteria, lot acceptance testing, source inspection, receiving inspection tests.

c. The procurement specifications shall be explicitly accepted by the part manufacturer.

6.6.3 Source inspection

a. For complex parts related to a specific project development, each supplier shall define the nature and frequency of their own source inspection points.

b. Source inspection shall be carried out by the supplier on the premises of the part manufacturer according to ECSS-Q-20.

6.6.4 Incoming inspection procedure

a. Each part or batch of parts shall be submitted to an incoming inspection.

b. An incoming inspection procedure shall define the inspections and tests to be carried out.

6.7 Use of mechanical parts

6.7.1 Qualification status of parts

a. The supplier shall ensure that all critical parts are qualified before being used in the manufacture of qualification or flight products.

b. Any modification, change in condition or configuration of application shall invalidate the use of the part and require additional qualification testing

6.7.2 Traceability of parts

a. The supplier shall apply the traceability rules defined in ECSS-Q-20 to his parts.

b. Parts should be identified by a unique reference number or code and a lot number to provide traceability - where there is an incident or nonconformance, or for the purposes of technical investigations following failure or damage - to reconstruct the parts history, either individually (individual traceability) or by the manufacturing lot it was part of (lot traceability).

6.7.3 Packaging, storage, removal from storage

a. The supplier shall define provisions for packaging, storage and removal from storage for parts.

b. Measurements and inspections used to guarantee the part integrity and monitoring during storage and removal from storage shall be identified.

6.7.4 Limited-life parts or parts subject to wearout

a. Limited-life parts after implementation or subject to wear out, e.g. mechanisms, pyro initiators and O-rings; shall be identified and controlled, storage and mission life being taken into account.

b. These parts shall be assessed as candidates to the critical items list, see ECSS-Q-20.

6.7.5 Parts nonconformance and alerts

Nonconformances and alerts shall be in accordance with ECSS-Q-20.

7

Process control

7.1 Specifications or procedures

a. Each process to be used in the manufacturing or assembly of a product shall be identified by a specification or procedure.

b. Reference shall be made to accept and reject criteria.

7.2 Associated materials and mechanical parts

The supplier shall verify that the materials and the mechanical parts used during the implementation of processes satisfy the requirements of this Standard.

7.3 Selection

a. Processes shall be chosen from those already verified according to the order of preference and priority given below, i.e.:

- those covered by space agencies or other governmental organization certification for identical conditions of use;
- those for which satisfactory evaluation and verification results are obtained on samples representative of the application with a sufficient margin as regards conditions of use;
- those already successfully used by the same manufacturer for other space programmes in the same conditions of use.

b. Whether the processes are already verified or remain to be verified, their selection shall take into account the following criteria:

- reliability;
- inspectability;
- re-workability of the process item;
- reproducibility.

7.4 Declared processes list (DPL) content

a. DPL shall be broken down into clear categories to facilitate locating each item in the documentation (a breakdown is given in the DPL DRD, see Annex D).

b. The DPL format shall include the following information:

- item number (as the reference of the process in the DPL): it shall be the same throughout the duration of the project;
- process identification;.
- process specification (including specification issue, revision or date);
- process description (with associated materials designation if possible);
- use and location;
- process supplier;
- associated DML item numbers;
- approval status (with reference to the approval authority, to the test report and similar previous applications).

c. Use of codes: any coding or acronyms used within the list shall be defined within the document.

An example of a suitable DPL format is given in the DPL DRD, see Annex D.

7.5 Criticality analysis

To conform to mission requirements, the objective of the analysis is to identify whether further data is required.

a. The supplier shall analyse all the processes contained in their preliminary lists with respect to criticality and in correlation with the risk analyses performed.

b. Critical processes shall be identified in the DPL and included in the list of critical items.

c. Any critical process shall be the subject of an RFA.

d. The RFA shall include the reason and the details of the subsequent evaluation and validation to be performed, see Annex E and 4.2.2.e.

e. Special processes can be identified and controlled. Process control shall be ensured by means of adequate procedures or personnel certification or inline process control. Whenever feasible a statistical process may be carried out.

NOTE Typical critical processes include soldering, brazing, and welding.

7.6 Evaluation and verification phase

7.6.1 General

a. Depending on the results of the criticality analysis, the supplier shall perform either evaluation and verification phases, or a verification phase only for all critical processes. The choice between these two approaches shall take into account

- knowledge of the process, e.g. new process, new use or configuration extension, and
- extension of the application.

b. For confidential processes, the supplier shall prove that the process has been verified, e.g. by presenting a verification certificate from space agencies or

other governmental organization that shall check the applicability of this verification.

NOTE Refer to Table 1 for an explanation of the steps involved.

7.6.2 Evaluation phase

a. The evaluation shall consider the following as a minimum for each critical process:
   - the limits of use,
   - the values, determined by test samples or technology samples, of relevant parameters and their tolerances, and
   - acceptance criteria.

b. When an evaluation is performed, an evaluation programme (available at PDR) shall be drawn up, implemented, an evaluation report (available before CDR) shall be drawn up.

7.6.3 Verification phase

a. For each critical process, a verification programme shall be drawn up by the contractor and then implemented.

b. The verification programme shall be defined in conformance with existing ECSS or national agency standards of verification.

c. This programme shall check or confirm that the processes satisfy the mission requirements with appropriate margins and that the parameters needed for the product design are defined so as to obtain verification status.

d. Verification status shall depend on the results obtained (verification report) and the review of corresponding documentation (available at CDR).

7.6.4 Approval phase

Provided that the requirements in 7.6.2 and 7.6.3 are satisfied, the processes then receive an approval identification in the declared processes list for the project.

If approval is not granted, the supplier in charge of the item shall either

- select other processes,
- propose a modified evaluation programme and resubmit for approval, or
- initiate a deviation procedure if the above actions fail to achieve positive results.

7.6.5 Deviation request

All processes not conforming to project requirements, whether at the end of criticality analysis or of evaluation and verification tests, shall form the subject of a duly justified deviation request, according to ECSS-Q-20.

7.7 Use of a process

7.7.1 Verification status of a process

The supplier shall confirm that all critical processes have been verified before being used in the manufacture of qualification or flight products. Any modification, change in condition or configuration of application can invalidate the use of the process and require additional verification testing.

7.7.2 Re-verification of a process

Any prolonged stoppage in manufacturing, any major change of the facilities or procedures or any transfer of production to another entity can invalidate partially or completely the initial verification of a process.

a. When a process needs to be re-verified, a request for approval shall be established and a re-verification programme shall be implemented. The RFA format shall include the following information:
   - identification details (e.g. when there is a change to the PID);
   - characteristics or function;
   - location and environment;
   - reference of evaluation or verification programmes and reports;
   - approval status.

7.7.3 Implementation of a process

a. Before implementation of a process, the supplier shall ensure that personnel are trained and that environment, means and documentation are adequate.

b. This verification shall ensure that:
   - manufacturing and quality control tools associated with the process are adequate, calibrated and properly maintained are used under appropriate environmental and cleanliness conditions, see subclause 4.4,
   - personnel are properly trained and certified when applicable, and
   - the processes specifications, manufacturing and inspection procedures and workmanship standards including clear definition of manufacturing operations and clear acceptance criteria exist.

   NOTE 1 Photographically documented if possible for visual acceptance criteria at the appropriate work and inspection stations.

   NOTE 2 For planning of manufacturing, assembly and integration operation and inspection see ECSS-Q-20B Clause 8.2.2.

7.7.4 Traceability of processes

Traceability of processes shall be in accordance with ECSS-Q-20.

7.7.5 Process nonconformances and alerts

Nonconformances and alerts shall be in accordance with ECSS-Q-20.

7.7.6 Mandatory inspection points (MIP)

MIPs shall be in accordance with ECSS-Q-20.

7.7.7 Packaging, storage, removal from storage

The supplier shall define provisions for packaging, storage, and removal from storage for products or semi-finished products before and after implementation of processes.

Annex A (informative)

Relationship between materials, mechanical parts, processes activities and programme phases

A.1 Feasibility phase (phase A)

In phase A, the materials, mechanical parts and processes product assurance tasks shall be carried out in order to:

a. identify main programme constraints on materials, mechanical parts and processes,

b. define the policy, and

c. plan the product assurance tasks for the project definition phase.

A.2 Preliminary definition phase (phase B)

In phase B, the materials, mechanical parts and processes product assurance tasks shall be carried out in order to:

a. define or identify requirements,

b. identify main new items needed and plan corresponding necessary actions for phase C,

c. plan the product assurance tasks for the detailed design, development, manufacturing, integration and test phase and prepare the materials, mechanical parts and processes plan as part of the PA plan, and

d. support preliminary design review.

A.3 Detailed definition and production phase (phase C or D)

In phase C or D, the materials, mechanical parts and processes product assurance tasks shall be carried out in order to:

a. identify materials, mechanical parts and processes;

b. issue preliminary lists;

c. identify critical items;

d. establish or review RFA;

e. support mandatory inspection points identification;

f. establish evaluation programme, perform test or review test results;

g. establish validation, qualification, or verification programmes (e.g. perform tests or review test results);

h. support nonconformance processing (NRB, failure review board);

i. establish the as-designed lists;

j. support the critical design review;

k. support the qualification review;

l. establish the final as-designed (updated) lists;

m. support release of manufacture of flight hardware;

n. support final acceptance review.

A.4 Utilization phase (phase E)

In phase E, the materials, mechanical parts and processes product assurance tasks shall be carried out in order to:

a. support the series manufacturing of recurring products,

b. support the investigation of operational phase anomalies, and

c. update the as-flown materials lists to incorporate the new materials that might have been added or changed as a result of NCR activities. In particular, the PMP lists should include the actual materials flown on manned and reusable spacecraft and their payloads.

Annex B (normative)

Declared materials list (DML) — Document requirements definition (DRD)

B.1 Introduction

This DRD defines the standard for establishing and managing the declared material list (DML).

It recommends the format, and defines the content within the framework of a project or a programme.

B.2 Scope and applicability

B.2.1 Scope

This document requirements definition (DRD) establishes the data content requirement for the declared material list.

This DRD does not define format, presentation or delivery requirements for the DML. Format is provided as example only.

B.2.2 Applicability

This DRD is applicable to all projects using the ECSS Standards.

B.3 References

B.3.1 Glossary and dictionary

This DRD uses terminology and definitions controlled by:

ECSS-P-001 Glossary of terms

B.3.2 Source document

This DRD defines data requirements of a DML as controlled by:

ECSS-Q-70B Space product assurance — Materials, mechanical parts and processes

B.4 Terms and definitions

For the purpose of this DRD, the terms and definitions given in ECSS-P-001 and ECSS-Q-70 apply.

B.5 Description and purposes

The purpose of the DML is to have a detailed record of all the materials used to produce the products of a project or programme.

The data in the DML shall make it possible to assess whether the materials are suitable for a specific application, at the supplier and the customer levels (in the approval status column).

The DRD defines the content of a standardized DML.

B.6 Application and interrelationship

The DML is prepared for each "Configuration item" at the relevant stages (e.g. at the start, PDR, CDR and QRR) as defined in the flow chart given in Figures 1 and 2 of ECSS-Q-70B.

The following documents are linked to the DML:

- the declared process list (DPL);
- request for approval (RFA) materials.

B.7 DML preliminary elements

B.7.1 Title

This document shall be titled:

[insert the configuration item name] "Declared materials list".

For example: Battery assembly declared materials list (DML)

AOCS declared materials list (DML)

B.7.2 Title page

The title page of this document shall identify the project document identification number, title for the document, documents issue and (where relevant) revision status, date of release and release authority.

B.7.3 Change record

The change record shall list the successive issues and their release dates since the first formal issue of the document. This record shall include a brief description of the updates which contributed to each issue or revision.

B.7.4 Content list

The content list shall identify the title and location of every clause, major subclause, figure, table and annex contained in the document.

B.7.5 Foreword

A foreword shall be included in the document, which describes as many of the following items as appropriate:

- identification of the organization that prepared the document;
- information regarding the approval of the document;
- identification of other organizations that contributed to the preparation of the document;
- a statement of effectiveness identifying the documents that are cancelled and replaced in whole or in part;
- a statement of significant technical differences between this document and any previous release;
- the relationship of the document to other standards or documents.

B.7.6 Introduction

An introduction shall be included to provide specific information or commentary about the technical content.

B.8 Content

B.8.1 Scope and applicability

This clause shall be numbered 1 and shall describe the scope, applicability and purpose of the DML.

B.8.1.1 Scope

This subclause shall be numbered 1.1 and shall contain the following statement:

> "This DML contains all the materials" or "This DML contains all the materials and mechanical parts intended for use in the flight [insert the configuration item name]. It reflects the current design at the time of issue."

B.8.1.2 Purpose

This subclause shall be numbered 1.2 and shall contain the following statements:

> "This DML provides a listing of all the materials (and mechanical parts) for review and evaluation for PDR, CDR or QRR (as appropriate). In addition, it is an input to internal or customer review."

B.8.2 References

This clause shall be numbered 2.

B.8.2.1 Normative references

This subclause shall be numbered 2.1 and shall contain the following statements:

> "This document incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at appropriate places in the text and publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these apply to this document only when incorporated into it by amendment or revision. For undated references, the latest edition of the publication referred to applies. [insert document identifier] [insert document title]."

NOTE Typically, the reference documents are the product assurance requirements, and the material mechanical part and processes requirements and lower level DMLs.

B.8.2.2 Informative references

This subclause shall be numbered 2.2 and shall contain the following statements:

> "The following documents, although not a part of this DML, amplify or classify its contents:
>
> [insert document identifier] [insert document title]."

B.8.3 Definitions and abbreviations

This clause shall be numbered 3 and shall contain the following subclauses.

B.8.3.1 Definitions

This subclause shall be numbered 3.1 and shall list any applicable project dictionary or glossary, and all unusual terms with a meaning specific to the DML with a definition for each term.

If a project dictionary or glossary is applicable, insert the following sentence:

> "The definitions of [insert title and identifier of applicable dictionaries or glossaries] apply to this document."

Insert the following sentence:

> "The following terms and definitions are specific to this document.
>
> [insert term] [insert definition] "

B.8.3.2 Abbreviations

This subclause shall be numbered 3.2 and shall list all abbreviations used in the DML with a fully spelled-out meaning or phrase for each abbreviation.

B.8.4 Declared material list

This clause shall be numbered 4 and shall be established as follows:

a. **Materials groups**

1. This clause shall contain the following statements:

   "Materials are classified into 20 groups depending on their type or their main use, see Table B-1".

   Primers are classified in the group of their associated component.

   Where no project requirement exists for a separate DMPL, mechanical parts are entered on the DML as a separate group with the corresponding numbers.

2. If new groups are created, for a given project, these shall have numbers over 21.

Table B-1: Material group numbers

Group number	Description
1	Aluminium and aluminium alloys
2	Copper and copper alloys
3	Nickel and nickel alloys
4	Titanium and titanium alloys
5	Steels
6	Stainless steels
7	Filler metals: welding, brazing soldering
8	Miscellaneous metallic materials
9	Optical materials
10	Adhesives, coatings, varnishes
11	Adhesive tapes
12	Paints and inks
13	Lubricants
14	Potting compounds, sealants, foams
15	Reinforced plastics (including PCBs)
16	Rubbers and elastomers
17	Thermoplastics (e.g. non-adhesive tapes and foils [MLI])
18	Thermoset plastics (including PCBs)
19	Material aspects of wires and cables
20	Miscellaneous non-metallic materials, e.g. ceramics

b. **Contents of the DML**

This subclause refers to the information which shall be included in the DML (see Table B-5).

The header information identifies the list as the declared materials list and includes the issue number and date of issue. It may include the relevant CI number (configuration item number as per project definition). The materials group number may also be included here.

The numbers below refer to the column numbers in Table B-5.

1. **Item number**

   This consists of the material group identifier and the user code. It takes the form of:

   <group number>.<identifier within the group>.<running number>.<user code>

   e.g. 11.5.1.KOF.

   Characteristics of the item number are:

   — The user shall be identified by an agreed user code for the in the project.

   — One only per material type.

   — Does not change during the life of the materials list (sub-items are permitted when deemed necessary).

2. **Commercial identification or standardized designation**

   The correct and standard designation shall be entered such as the trade name plus number, e.g. “ARALDITE AY 105”.

   If no trade name exists, then the manufacturer’s name plus number shall be entered, e.g. “SCHOTT BK7”.

   For metal alloys, the Aluminium Association (AA) system is recommended for aluminium alloys, and the American Iron and Steel Institute (AISI) system for steel. For other metals or alloys, the main constituent is entered first except in the case of a traditional name (e.g. brass or bronze).

   For each material, as designated above, a unique item number shall be given. If several lines are used for different applications or processing, sub-item numbers shall be added.

3. **Chemical nature and product type**

   Examples of chemical nature are: epoxy resin, polyurethane adhesive, Ti6Al4V.

   For metallic materials, the condition as procured (e.g. rolled and heat treatment) shall be added, if applicable. Where a semi-finished product is procured the relevant state (e.g. form, plate and sheet) shall be given.

   The thickness of the material can be an important parameter and shall be given.

4. **Procurement information**

   Manufacturer or distributor: name of the manufacturer and name of the distributor if different.

   Procurement specification: reference of the procurement specification with issue, revision and date. It may be replaced by a national or international specification or standard, if this exists, and identifies the source of procurement, if relevant. Indication of issue or date is not applicable when datasheets are used according to 6.6.1.b.

5. **Processing parameters**

   A summary of the process parameters applied by the user of the process shall be listed, e.g. mixture proportions, cure temperature, special cleaning agent, surface treatment, thermal treatment and temperature, and reference to specification number.

6. **Use and location**

   The codes entered shall define the location of the material with respect to the:

   — subsystem;

   — particular piece of equipment (box or item);

   — use of the equipment, e.g. a structural element, thermal control, electrical insulation.

   NOTE If the CI number is not included in the list header, then a suitable abbreviation of the relevant subsystem is included.

   Any restrictions that apply to the use of a particular material shall be included in the corresponding comment column.

7. **Environmental code**

   The environmental code is defined using Table B-2.

Table B-2: Environmental code

Radiation/UV/ATOX (R)[a]		Ambience (A)	Temperature (T)[b,c]
G: Geostationary	S: Outside shadow	V: Vacuum	1: 0 to 100K
L: Low orbit	L: Outside light	H: Hermetic	2: 101 to 200K
B: Radiation belt		M: Manned	3: 201 to 300K
I: Interplanetary		E: Elevated pressure	…
P: Planetary			

a For all materials, a letter is selected from the left-hand column. For materials on the surface of the spacecraft, the letter "L" or "S" is added.

b Thermal cycling to be indicated by two values, e.g. 3/5.

c "RT" (room temperature) can be accepted as a code between 283 K (10 °C) and 313 K (40 °C). Materials that are at a boundary between environments shall be described by two sets of codes.

8. **Size code**

   The size code is indicated by an alphanumeric combination, such as A5, V2 or M3.

Table B-3: Size code

Size code	Value
0	0 < A or V or M ≤ 1
1	1 < A or V or M ≤ 10
2	10 < A or V or M ≤ 100
3	100 < A or V or M ≤ 1000
4	...
where:	A is the area, in cm^2 V is the volume, in cm^3 M is the mass, in g

9. **Validation references, justification for approval and prime comments and prime approval**

   Reference shall be made to relevant test data that demonstrates the acceptability of the material under the environmental conditions and the application relevant to the particular project concerned. Specifically, in column 9.1, corrosion (CORR), stress corrosion (SCC), flammability (FLAM), offgassing (OFFG) and outgassing (OUTG) data or report-references are entered.

   Standard abbreviations shall be used to summarize the acceptance status of a material for a particular property.

   The justification for approval (9.2) and prime approval (9.3) columns shall be used for any additional information to obtain customer approval.

   Standard abbreviations are used to summarize the acceptability or otherwise of a material for a specific property. These are defined for the project.

   The supplier approval status code shall be selected from Table B-4.

Table B-4: Approval status

Code	Description
A	Approved. All materials classified "A" may be used without restriction.
X	Approved with an RFA. These materials shall be subjected to an evaluation or validation programme. The RFA number shall be entered as a comment.
W	Approved with a concession. These materials do not meet the requirements but are used for functional reasons. The concession number shall be entered as a comment.
P	Pending a decision. Materials for which an evaluation report or a concession is waiting for the contractor's provisional or definitive approval.
O	Open. New materials or materials for which investigations and validations are in progress.
R	Rejected.
D	Deleted. This classification is used for a material that is no longer used.
If approval cannot be given and one of the other codes are entered, comments shall be entered in the appropriate column.	

10. **Customer approval status code and comments**

    This code shall be selected from Table B-4.

    Additional comments shall be included where appropriate.

Table B-5: Example of a realized DML

DECLARED MATERIALS LIST (DML)											
Programme name: ABCDEFG				CI no.: 12345676890 Group (Title): abcdefg		Doc no.: 001 Issue/Revision: 1/4				Date: 01.10.2000 Page: 1	
								9			
1	2	3	4	5	6	7	8	9.1	9.2	9.3	10
Item no. and user code	Commercial identification or standardized designation	1) Chemical nature 2) Product type	1) Manufacturer/ supplier name 2) Procurement spec. Issue/RevDate	Summary of process parameters	1) Subsystem 2) Equipment 3) Use	1) R 2) A 3) T	1) A 2) V 3) M	Acronym/ rating/ Validation Ref. for applicable properties	1) Justification for approval 2) Prime comments	Prime approval status	Customer approval status/ comments
1.2.1.TXES	AZ5GU	1) Al.Zn5.6 Mg2.5 Cdu1.6, Cr0.3 eq. AA7075 2) Plate	1) Almet Pechiney 2) CRB 527 01/02/01.02.1996	T7351 and Iridit 14 heat treatment	1) PL 2) E4 package 3) Structure	1) LS 2) V 3) 3	1) 2) 3) M3		1) Used on ETS2 2)	A	A
10.1.1.ETC A	DC93500	1) Silicon 2) Two parts	1) Dow Corning 2) E3846MC10S 02/02/1984	Mixture: 10/1 in g Curing: 4h/65 °C	1) PCU 2) Experiment tray 3) Part potting	1) G 2) V 3) 3-4	1) 2) 3) M3		1) ECSS-Q-70-01 2)	A	A
11.5.1.KOF	ECCOFOAM EPH	1) Polyurethane 2) Resin/Catalyst 1202H	1) Emerson and Cuming 2) SP/FOK/05/684 03/01/25.06.1992	Resin/ Cat: 100/65g 4h/40 °C +48h/100 °C	1) GP 2) Platform 3) Package potting	1) LS 2) M 3) 3-4	1) 2) V3 3)		1) DU–96–352 2) Used at T > 100 °C (Risk of distortion beyond)	A	A

Annex C (normative)

Declared mechanical parts list (DMPL) — Document requirements definition (DRD)

C.1 Introduction

This DRD defines the standard for establishing and managing the declared mechanical parts list (DMPL).

It recommends the format, and defines the content within the framework of a project or a programme.

C.2 Scope and applicability

C.2.1 Scope

This document requirements definition (DRD) establishes the data content requirement for the declared mechanical parts list (DMPL).

This DRD does not define format, presentation or delivery requirements for the DMPL. Format is provided as example only.

C.2.2 Applicability

This DRD is applicable to all projects using the ECSS Standards.

C.3 References

C.3.1 Glossary and dictionary

This DRD uses terminology and definitions controlled by:

ECSS-P-001 Glossary of terms

C.3.2 Source document

This DRD defines data requirements of a DMPL as controlled by:

ECSS-Q-70B Space product assurance — Materials, mechanical parts and processes

C.4 Terms and definitions

C.4.1 Definitions

For the purpose of this DRD, the terms and definitions given in ECSS-P-001 and ECSS-Q-70 apply.

C.5 Description and purposes

The purpose of the DMPL is to have detailed record of all the mechanical parts used to produce the products of a project or programme.

The data in the DMPL shall make it possible to assess whether the mechanical parts are suitable for a specific application, at the supplier and customer levels (in the approval status column).

The DRD defines the content of a standardized DMPL.

C.6 Application and interrelationship

The DMPL is prepared for each "Configuration item" at the relevant stages (e.g. Start, PDR, CDR and QRR) as defined in the flow chart given in Figures 1 and 2 of ECSS-Q-70B.

The following document is linked to the DMPL: request for approval (RFA) mechanical parts.

C.7 DMPL preliminary elements

C.7.1 Title

This document shall be titled:

[insert the configuration item name] "Declared mechanical parts list".

For example: Battery assembly declared mechanical parts list (DMPL)

AOCS declared mechanical parts list (DMPL)

C.7.2 Title page

The title page of this document shall identify the project document identification number, title for the document, documents issue and (where relevant) revision status date of release and release authority.

C.7.3 Change record

The change record shall list the successive issues and their release dates since the first formal issue of the document. This record shall include a brief description of the updates which contributed to each issue or revision.

C.7.4 Content list

The content list shall identify the title and location of every clause major subclause, figure, table and annex contained in the document.

C.7.5 Foreword

A foreword shall be included in the document that describes as many of the following items as appropriate:

- identification of the organization that prepared the document;
- information regarding the approval of the document;
- identification of other organizations that contributed to the preparation of the document;

- information regarding the status and wider implications of the document, identifying the documents that are cancelled and replaced in whole or in part;
- a statement of significant technical differences between this document and any previous release;
- the relationship of the document to other standards or documents.

C.7.6 Introduction

An introduction shall be included to provide specific information or commentary about the technical content.

C.8 Content

C.8.1 Scope and applicability

This clause shall be numbered 1 and shall describe the scope, applicability and purpose of the DMPL.

C.8.1.1 Scope

This subclause shall be numbered 1.1 and shall contain the following statement:

> "This DMPL contains all the mechanical parts intended for use in the flight [insert the configuration item name]. It reflects the current design at the time of issue."

C.8.1.2 Purpose

This subclause shall be numbered 1.2 and shall contain the following statements:

> "This DMPL provides a listing of all the mechanical parts for review and evaluation for PDR, CDR or QRR (as appropriate). In addition, it is an input to internal or customer review."

C.8.2 References

This clause shall be numbered 2.

C.8.2.1 Normative references

This subclause shall be numbered 2.1 and shall contain the following statements:

> "This document incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at appropriate places in the text and publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these apply to this document only when incorporated into it by amendment or revision. For undated references, the latest edition of the publication referred to applies.
>
> [insert document identifier] [insert document title]."

NOTE Typically, the reference documents are the product assurance requirements, and the material mechanical part and processes requirements and lower level DMPL's.

C.8.2.2 Informative references

This subclause shall be numbered 2.2 and shall contain the following statements:

> "The following documents, although not a part of this DMPL, amplify or classify its contents:
>
> [insert document identifier] [insert document title]."

C.8.3 Definitions and abbreviations

This clause shall be numbered 3 and shall contain the following subclauses.

C.8.3.1 Definitions

This subclause shall be numbered 3.1 and shall list any applicable project dictionary or glossary, and all unusual terms with a meaning specific to the DMPL with a definition for each term.

If a project dictionary or glossary is applicable, insert the following sentence :

> "The definitions of [insert title and identifier of applicable dictionaries or glossaries] apply to this document."

Insert the following sentence:

> "The following terms and definitions are specific to this document. [insert term] [insert definition]"

C.8.3.2 Abbreviations

This subclause shall be numbered 3.2 and shall list all abbreviations used in the DMPL with a fully spelled-out meaning or phrase for each abbreviation.

C.8.4 Declared mechanical parts lists

This clause shall be numbered 4 and shall be established as follows:

a. **Mechanical parts groups**

1. This clause shall contain the following statements:

   "Mechanical parts are classified into 11 groups depending on their type or their main use" (see Table C-1).

2. If, for a given project it is considered necessary to create new groups, these shall have numbers over 61.

3. Items that appear in the EEE parts list should not be repeated here, e.g. heaters, some valves, thermostats, relays, transformer coils and solenoids.

Table C-1: Mechanical part group numbers

Group number	Description
51	Spacing parts (e.g. washers and spacers)
52	Connecting parts (e.g. bolts, nuts, rivets, inserts and clips)
53	Bearing parts (e.g. ball-bearings and needle bearings)
54	Separating parts (e.g. pyrotechnics, springs and cutters)
55	Control parts (e.g. gears)
56	Fluid handling parts (e.g. diffusers)
57	Heating parts
58	Measuring instruments (e.g. gauges and thermocouples)
59	Optical passive equipment
60	Magnetic parts
61	Other parts

b. **Contents of the DMPL**

This subclause refers to the information that shall be included in the DMPL (see Table C-4).

The header information identifies the list as the declared materials list and includes the issue number and date of issue. It may include the relevant CI number (configuration item number as per project definition). The materials group number may also be included here.

The numbers below refer to the column numbers in Table C-4.

1. **Item number**

   This consists of the mechanical part identifier and the user code. It takes the form of:

   <group number>.<identifier within the group>.<running number>.<user code>

   e.g. 7.2.1.ACSA.

   Characteristics of the item number are:

   — The subcontractor shall be identified by an agreed user code for the project.

   — One only per mechanical part type.

   — Does not change during the life of the mechanical parts list.

2. **Commercial identification**

   The correct and standard designation shall be entered such as tradename plus number. If no tradename exists then the manufacturers' name and number shall be entered.

3. **Type of part**

   Material and surface treatment (if applicable) shall be described.

4. **Procurement information**

   Manufacturer or distributor: name of the manufacturer and name of the distributor if different.

   Procurement specification: reference of the procurement specification with issue, revision and date. It may be replaced by a national or international specification or standard if this exists and identifies the source of procurement if relevant.

5. **Elementary function, main characteristics**

   The function of the mechanical part shall be entered.

   The main characteristics of the mechanical part shall be entered, e.g. number of revolutions per minute for a ball bearing.

6. **Use and location**

   The codes entered shall define the location of the mechanical part with respect to the:

   — subsystem;

   — particular piece of equipment (box or item);

   — use of the equipment.

7. **Environmental code**

   The environmental code is defined using Table C-2.

Table C-2: Environmental code

Radiation/UV/ATOX (R)[a]		Ambience (A)	Temperature (T)[b,c]
G: Geostationary	S: Outside shadow	V: Vacuum	1: 0 to 100K
L: Low orbit	L: Outside light	H: Hermetic	2: 101 to 200K
B: Radiation belt		M: Manned	3: 201 to 300K
I: Interplanetary		E: Elevated pressure	…
P: Planetary			

a For all mechanical parts, a letter is selected from the left-hand column. For mechanical parts on the surface of the spacecraft, the letter "L" or "S" is added.

b Thermal cycling to be indicated by two values, e.g. 3/5.

c "RT" (room temperature) can be accepted as a code between 283K (10 °C) and 313K (40 °C).

8. **Criticality**

   Enter "C" for critical or "N" for non-critical. If a mechanical part is considered critical the reason for the criticality and methods of control shall be entered.

9. **Supplier reference, prime comments and prime approval status**

   The supplier reference, prime comments and approval columns shall be used to enter any additional information that may be necessary in order to obtain customer approval.

   This information comprises reference and issue of the RFA or approval, mechanical parts justification file, evaluation reports and deviation requests.

   Reference shall be made to the relevant test data that demonstrates acceptability of the mechanical part under the environment conditions and the application relevant to the particular project concerned.

   Standard abbreviations shall be used to summarize the acceptance status of a mechanical part for a particular property. These shall be defined by the customer.

   In order to justify the use of a material for flammability resistance the material thickness and height of oxygen share shall be listed.

   The prime approval status code shall be selected from Table C-3.

10. **The customer approval status code and comments**

    This code shall be selected from Table C-3.

    Additional comments shall be included where appropriate.

Table C-3: Approval status

Code	Description
A	Approved All mechanical parts classified “A” may be used without restriction.
X	Approved with an RFA These mechanical parts shall be subjected to an evaluation or validation programme. The RFA number shall be entered as a comment.
W	Approved with a concession These mechanical parts do not meet the requirements but are used for functional reasons. The use of such mechanical parts shall be approved by the customer. The concession number shall be entered as a comment.
P	Pending a decision Mechanical parts for which an evaluation report or a concession is waiting for the contractor’s provisional or definitive approval.
O	Open New mechanical parts or mechanical parts for which investigations and validations are in progress.
R	Rejected.
D	Deleted This classification is used for a mechanical part that is no longer used.
If approval cannot be given and one of the other codes are entered, comments shall be entered in the appropriate column.	

Table C-4: Example of realized DMPL

DECLARED MECHANICAL PARTS LIST (DMPL)										
Programme name: ABCDEFG				CI no.: 12345676890 Group (Title): abcdefg		Doc no.: 001 Issue/Revision: 1/4			Date: 01.10.2000 Page: 1	
								9		
1	2	3	4	5	6	7	8	9.1	9.2	10
Item no. and user code	Commercial identification	Type of part	1) Procurement specification 2) Issue/Revision/ Date	1) Elementary function 2) Main characteristics	1) Subsystem 2) Equipment 3) Use	1) R 2) A 3) T	1) Criticality 2) Reason and method of control	1) Supplier Reference 2) prime comments	Prime approval status	Customer approval status/comments
51.2.1.ACSA	ESA00352100 0120	Copper/AL bimetal ring	1) AIEV 2) From catalogue	1) Separator ring 2) Heat conductor	1) TC 2) Plate interface 3) Spacing and heat inspection	1) G 2) V 3) 3-4	1) N 2)	1) Used on all projects 2)	A	A
52.2.1.ASAD	A0090TX...XA	Ti6Al4V screws > M4	1) White areo 2) ASNA0090 DSN2413	1) assembly 2)	1) PTANK 2) plate 3) fixing	1) G 2) V 3) 3-4	1) N 2)	1) Used on TC2 2)	A	A
60.1.1.ACSA	42908TC/F	Ferrite cores magnetic	1) Magnetics, Data sheet 2) SP/MAGN/003 01.02/03.06.1999	1) Coil core of transformer 2) Magnetic component	1) TC 2) South face 3) Heat regulation	1) G 2) V 3) 3-4	1) C 2) to be qualified	1) 2)		

Annex D (normative)

Declared process list (DPL) — document requirements definition (DRD)

D.1 Introduction

This DRD defines the standard for establishing and managing the declared process list (DPL).

It recommends the format, and defines the content within the framework of a project or a programme.

D.2 Scope and applicability

D.2.1 Scope

This document requirements definition (DRD) establishes the data content requirement for the declared process list.

This DRD does not define format, presentation or delivery requirements for the DPL. The format is provided as example only.

D.2.2 Applicability

This DRD is applicable to all projects using the ECSS Standards.

D.3 References

D.3.1 Glossary and dictionary

This DRD uses terminology and definitions controlled by:

ECSS-P-001 Glossary of terms

D.3.2 Source document

This DRD defines data requirements of a DPL as controlled by:

ECSS-Q-70B Space product assurance — Materials, mechanical parts and processes

D.4 Terms and definitions

D.4.1 Definitions

For the purpose of this DRD, the terms and definitions given in ECSS-P-001 and ECSS-Q-70 apply.

D.5 Description and purposes

The purpose of the DPL is to have a detailed record of all the processes used to produce the products of a project or programme.

The data in the DPL shall make it possible to assess whether the processes are suitable for a specific application, at the supplier and customer levels (in the approval status column).

The DRD defines the content of a standardized DPL.

D.6 Application and interrelationship

The DPL is prepared for each "Configuration item" at the relevant stages (e.g. Start, PDR, CDR and QRR) as defined in the flow chart given in Figures 1 and 2 of ECSS-Q-70B.

The following documents are linked to the DPL:

- declared material list (DPL),
- request for approval (RFA) processes.

D.7 DPL preliminary elements

D.7.1 Title

This document shall be titled:

[insert the configuration item name] "Declared process list".

For example: Battery assembly declared process list (DPL)
AOCS DPL

D.7.2 Title page

The title page of this document shall identify the project document identification number, title for the document, document issue and (when applicable) revision status, date of release and release authority.

D.7.3 Change record

The change record shall list the successive issues and their release dates since the first formal issue of the document. This record shall include a brief description of the updates which contributed to each issue or revision.

D.7.4 Content list

The content list shall identify the title and location of every clause major subclause, figure, table and annex contained in the document.

D.7.5 Foreword

A foreword shall be included in the document that describes as many of the following items as appropriate:

- identification of the organization that prepared the document;
- information regarding the approval of the document;
- identification of other organizations that contributed to the preparation of the document;

- information regarding the status and wider implications of the document, identifying the documents are cancelled and replaced in whole or in part;
- a statement of significant technical differences between this document and any previous release;
- the relationship of the document to other standards or documents.

D.7.6 Introduction

An introduction shall be included to provide specific information or commentary about the technical content.

D.8 Content

D.8.1 Scope and applicability

This clause shall be numbered 1 and shall describe the scope, applicability and purpose of the DPL.

D.8.1.1 Scope

This subclause shall be numbered 1.1 and shall contain the following statement:

> "This DPL contains all the processes intended for use in the flight [insert the configuration item name]. It reflects the current design at the time of issue."

D.8.1.2 Purpose

This subclause shall be numbered 1.2 and shall contain the following statements:

> "This DPL provides a listing of all the processes for review and evaluation for PDR/CDR/QRR (as appropriate). In addition, it is an input to internal or customer review."

D.8.2 References

This clause shall be numbered 2.

D.8.2.1 Normative references

This subclause shall be numbered 2.1 and shall contain the following statements:

> "This document incorporates, by dated or undated reference, provisions from other publications . These normative references are cited at appropriate places in the text and publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these apply to this document only when incorporated into it by amendment or revision. For undated references, the latest edition of the publication referred to applies."
>
> [insert document identifier] [insert document title].
>
> NOTE Typically, the reference documents are the product assurance requirements, and the material mechanical part and process requirements and lower level DPLs.

D.8.2.2 Informative references

This subclause shall be numbered 2.2 and shall contain the following statements:

> "The following documents, although not a part of this DPL, amplify or classify its contents."
>
> [insert document identifier] [insert document title].

D.8.3 Definitions and abbreviations

This clause shall be numbered 3 and shall contain the following subclauses.

D.8.3.1 Definitions

This subclause shall be numbered 3.1 and shall list any applicable project dictionary or glossary, and all unusual terms with a meaning specific to the DPL with a definition for each term.

If a project dictionary or glossary is applicable, insert the following sentence:

> "The definitions of [insert title and identifier of applicable dictionaries or glossaries] apply to this document."

Insert the following sentence:

> "The following terms and definitions are specific to this document."
>
> [insert term] [insert definition]

D.8.3.2 Abbreviations

This subclause shall be numbered 3.2 and shall list all abbreviations used in the DPL with a fully spelled-out meaning or phrase for each abbreviation.

D.8.4 Declared process list

This clause shall be numbered 4 and shall be established as follows:

a. **Process groups**

1. This clause shall contain the following statements:

   Processes are classified into 17 groups depending on their type or their main use, see Table D-1.

2. If, for a given project it is considered necessary to create new groups, these shall have numbers over 17.

Table D-1: Process group numbers

Group number	Description
1	Adhesive bonding
2	Composite manufacture
3	Encapsulation/moulding
4	Painting/coating
5	Cleaning
6	Welding/brazing
7	Crimping/stripping/wire wrapping
8	Soldering
9	Surface treatments
10	Plating
11	Machining
12	Forming
13	Heat treatment
14	Special fabrication: processes developed specifically for the programme
15	Marking
16	Miscellaneous processes
17	Inspection procedures

b. **Contents of the DPL**

This subclause refers to the information which shall be included in the DPL (see Table D-3).

The header information identifies the list as the declared materials list and includes the issue number and date of issue. It may include the relevant CI number (configuration item number as per project definition). The materials group number may also be included here.

The numbers below refer to the column numbers in Table D-3.

1. **Item number**

   This consists of the process identifier and the user code. It takes the form of

   <group number>.<identifier within the group>.<running number>.<user code>

   e.g. 1.2.1.SSEX

   Characteristics of the item number are:

   — The subcontractor shall be identified by an agreed user code for the project.

   — One only per process type.

   — Does not change during the life of the process list.

2. **Process identification**

   The correct and standard identification of the process shall be indicated, e.g. the process name or title: bonding, coating or soldering.

3. **Specification**

   The name or abbreviation of the process executor shall be identified.

   A reference shall be made to the associated procedure, e.g. national, international, EN, ISO, ECSS or company in-house, together with the issue, revision and date.

4. **Process description**

   A short description of the process shall be entered.

5. **Use and location**

   The codes entered shall define the location of the process with respect to the:

   — subsystem,

   — particular piece of equipment (box or item),

   — use of the equipment (e.g. a structural element, thermal control, electrical insulation).

6. This column number is not used.

7. **Associated item numbers**

   The associated material list (DML) or mechanical parts list (DMPL) with the process shall be entered.

8. **Criticality**

   Enter “C” for critical or “N” for non-critical.

   If a process is considered to be critical, references to the relevant RFA shall be entered.

9. **Supplier reference, prime comments and approval**

   The supplier reference and approval columns shall be used to enter any additional information that can be necessary to obtain customer approval.

   The supplier approval status code shall be selected from Table D-2.

Table D-2: Approval status

Code	Description
A	Approved All processes classified “A” may be used without restriction.
X	Approved with an RFA These processes shall be subjected to an evaluation or validation programme. The RFA number shall be entered as a comment.
W	Approved with a concession These processes do not meet the requirements but are used for functional reasons. The use of such processes shall be reduced to a minimum. All deviation requests shall be approved by the customer. The concession number shall be entered as a comment.
P	Pending a decision Processes for which an evaluation report or a concession is waiting for the contractor’s provisional or definitive approval.
O	Open New processes or processes for which investigations and validations are in progress.
R	Rejected.
D	Deleted This classification is used for a process that is no longer used.
If approval cannot be given and one of the other codes are entered, comments shall be entered in the appropriate column.	

10. **The customer approval status code and comments**

    This code shall be selected from Table D-2.

    Additional comments shall be included where appropriate.

Table D-3: Example of realized DPL

DECLARED PROCESS LIST (DPL)									
Programme name: ABCDEFG		CI no.: 1234567890 Group (Title): abcdefg		Doc no.: 001 Issue/Revision: 1/5			Date: 14.05.2000 Page: 1		
							9		
1	2	3	4	5	7	8	9.1	9.2	10
Item no. and user code	Process identification	1) User name 2) Associated procedure issue/revision/ date	Process description	1) Subsystem code 2) Equipment code 3) Use	Associated DML or DMPL item number	1) Criticality 2) Reason for criticality	1) Supplier Reference 2) Prime comments	Prime approval status	Customer approval status/ comments
1.2.1.SSEX	Bonding	1) EREMS 2) E/SQ/PI/012 02/01/02.08.1984	Applying a spot of glue with a stainless steel dispenser	1) BE3 2) C5 board 3) To fix parts	6.1.2.ETC	1) N 2)	1) Used on ANTARES 2)	A	A
4.3.1.KOF	Coating	1) CERCO 2) E/SQ/PI/023 02/01/08.12.1985	Coating by paintbrush or by immersion in the resin	1) BE3 2) C1 C2 boards 3) Protection of CI and EEE parts	2.1.1.KOF	1) N 2)	1) Used on PASTEC, ANTARES 2)	A	A
8.3.1.KOF	Vapour phase soldering of SMDs	1) EREMS 2) E/SQ/PI/026 01/02/09.09.1997	ECSS-Q-70-38	1) BE3 2) C3 3)	15.1.1.AST	1) C 2)	1) QM/04L123/ BD/MH Table 1 2)	A	A

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Annex E (normative)

Request for approval (RFA) — Document requirements definition (DRD)

E.1 Introduction

This DRD defines the standard for establishing and managing a request for approval (RFA).

It recommends the format, and defines the content within the framework of a project or a programme.

E.2 Scope and applicability

E.2.1 Scope

This document requirement definition (DRD) establishes the data content requirement for a request for approval.

This DRD does not define format, presentation or delivery requirements for the RFA. Format is provided as an example only.

E.2.2 Applicability

This DRD is applicable to all projects using the ECSS Standards.

E.3 References

E.3.1 Glossary and dictionary

This DRD uses terminology and definitions controlled by:

ECSS-P-001 Glossary of terms

E.3.2 Source document

This DRD defines data requirements of a RFA as controlled by:

ECSS-Q-70B Space product assurance — Materials, mechanical parts and processes

E.4 Terms and definitions

For the purpose of this DRD, the terms and definitions given in ECSS-P-001 and ECSS-Q-70 apply.

E.5 Description and purposes

The objective of an RFA is to enable the supplier to request from the customer permission to use a critical mechanical part, material or process.

The information provided by the supplier shall make it possible for the customer to assess whether the critical mechanical part, material or process is suitable for a specific application.

E.6 Application and interrelationship

The RFA is prepared for each critical mechanical part, material or process at the relevant stages as defined in the in flow chart given in Figures 1 and 2 of ECSS-Q-70B.

The following documents are linked to the RFA:

- declared mechanical parts list;
- declared materials list;
- declared process list.

E.7 Content of the RFA

E.7.1 Content of the RFA

The RFA shall be completed by the supplier (parts 1 to 10, 13 and 14) and the customer (parts 11 12 and 15). Refer to Figures E-1 and E-2 for an example RFA.

1. **The header information** shall identify the document as a request for approval together with the project logo and project name, RFA reference, issue revision and date.
2. **Originator**

   Originator's name and reference.
3. **Location**

   Subsystem and equipment codes.
4. **Item description**

   Brief description of the item.
5. **PMP information**

   The DML, DMPL or DPL item number and list reference.
6. **Item status** shall be entered for:
   - manufacturers' name and qualification reference;
   - suppliers' name and qualification status;
   - product or material specification;
   - procurement specification;
   - process or handling specification;
   - other related process or handling specifications;
   - verification or qualification specification;
   - report on verification or qualification.
7. **Reason for RFA**

   The reason for the RFA shall be entered.
8. **Application and location details**

   The details of the application and exact location of the item shall be entered here.

   The reference in the CIL shall be given.

9. **Evaluation and validation programme**

   Reference and details of main tests.

10. **Subcontractor supplier approval** for the first issue of the RFA.

11. **Customer initial decision** shall be entered on first issue of the RFA providing:

    — the decision concerning the proposed material,

    — the requirement to perform tests (deviation request as necessary), and

    — the decision concerning the proposed test programme.

12. **Customer's and final customer's (if applicable) signature**

13. **Justification results** obtained with reference to the supplier's validation report and conclusion.

14. **Subcontractor supplier approval** on RFA final issue.

15. **Final approval status** at all the levels of the final issue of the RFA by the Customer and final customer (if defined in the contract).

1	**Company:**	**Project:**	**Reference: RFA-**							Page 1 of 2
			Issue							
			Revision							
			Date							

Request for approval (RFA)

2	Originator: Originator reference:	3	Subsystem: Equipment:
4	Item description:	5	PMP list item number: PMP list reference:

6	**Item status**	
Manufacturer:		Manufacturer qualification reference:
Supplier:		Qualification status:
Product/material specification:		Procurement specification:
Process/handling specification:		Related specification:
Verification/qualification specification:		Report:

7	**Reason for RFA**

8	Application/location details:	CIL Reference:
9	**Evaluation/validation programme (title, reference)**	
	Tests	
	Plan, procedures, schedule to be attached	

Figure E-1: Example of RFA (Page 1 of 2)

1	**Company:**	**Project:**	**Reference: RFA-**							Page 2 of 2
			Issue							
			Revision							
			Date							

Request for approval (RFA)

10		**Materials and processes responsible**	**PA responsible**	**Project responsible**
	Supplier approval on RFA first issue			

11 Decision on RFA first issue: Comments:

- Request refused:
- Submit deviation:
- Proceed with validation programme:

12	**Decision**	**Materials and processes responsible**	**PA responsible**	**Project responsible**
	Customer agree/disagree			
	Final customer (if applicable) agree/disagree			

13 **Justification results**

Validation report (title and reference)

Conclusion:

Validation report to be attached

14		**Materials and processes responsible**	**PA responsible**	**Project responsible**
	Supplier approval on RFA final issue			

15	Decision on RFA final issue	**Materials and processes responsible**	**PA responsible**	**Project responsible**
	Customer agree/disagree			
	Final customer (if defined in the contract) agree/disagree			

Figure E-2: Example of RFA (Page 2 of 2)

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Bibliography

ECSS-M-30	Space project management — Project phasing and planning
ECSS-M-00-02A	Space project management — Tailoring of space standards
ECSS-Q-70-01	Space product assurance — Contamination and cleanliness control
ECSS-Q-70-02	Space product assurance — Thermal vacuum outgassing test for the screening of space materials
ECSS-Q-70-04	Space product assurance — Thermal cycling test for the screening of space materials and processes
ECSS-Q-70-06 [1)]	Space product assurance — Particle and UV radiation testing of space materials
ECSS-Q-70-21	Space product assurance — Flammability testing for screening of space materials
ECSS-Q-70-22	Space product assurance — The control of limited shelf-life materials
ECSS-Q-70-29	Space product assurance — The determination of off-gassing products from materials and assembled articles to be used in a manned space vehicle crew compartment
ECSS-Q-70-36A	Space product assurance — Material selection for controlling stress-corrosion cracking
ECSS-Q-70-37	Space product assurance — Determination of the susceptibility of metals to stress-corrosion cracking
ECSS-Q-70-71	Space product assurance — Data for selection of space materials and processes
ASTM E 595-90	Total mass loss and collected volatile condensable materials from outgassing in a vacuum environment
MIL-HDBK-454	General Guidelines for Electronic Equipment
NASA MAPTIS	Materials and Processes Technical Information System
NASA STD-6001	Flammability, odour, offgassing and compatibility requirements and test procedures for materials in environments that support combustion. (previously NHB 8060 1C).
MSFC-SPEC-250	Protective finishes for space vehicle structures.

1) To be published.

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ECSS Document Improvement Proposal

1. Document I.D.	2. Document date	3. Document title
ECSS-Q-70B	14 December 2004	Materials, mechanical parts and processes

4. Recommended improvement (identify clauses, subclauses and include modified text or graphic, attach pages as necessary)

5. Reason for recommendation

6. Originator of recommendation

Name:	Organization:	
Address:	Phone: Fax: e-mail:	**7. Date of submission:**

8. Send to ECSS Secretariat

Name:	Address:	Phone: +31-71-565-3952
W. Kriedte ESA-TEC/QR	ESTEC, P.O. Box 299 2200 AG Noordwijk The Netherlands	Fax: +31-71-565-6839 e-mail: Werner.Kriedte@esa.int

Note: The originator of the submission should complete items 4, 5, 6 and 7.

An electronic version of this form is available in the ECSS website at: http://www.ecss.nl/
At the website, select “Standards” - “ECSS forms” - “ECSS Document Improvement Proposal”

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