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THE TECHNICAL REPORTING AND APPROVAL PROCEDURE FOR MATERIALS, MECHANICAL PARTS AND PROCESSES

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ABSTRACT

This specification provides details concerning the documentation requirements relevant to obtaining ESA approval for the use of materials, processes and mechanical parts in the fabrication of space systems and associated equipment.

DOCUMENT CHANGE RECORD

Issue number and date	Sections affected	Remarks
Issue 1 October 1987	—	New document
Issue 2 August 1993		Harmonisation of ESA & CNES requirements

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SECTION 1. SCOPE

This specification provides details concerning the documentation requirements and the procedure relevant to obtaining ESA approval for the use of materials, processes and mechanical parts in the fabrication of space systems and associated equipment.

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SECTION 2. GENERAL

2.1 INTRODUCTION

The approval process described in this specification shall be employed for all materials, processes and mechanical parts intended for use in any project. Furthermore the format and content requirements for the listing of materials, processes and mechanical parts and the achievement of approval for any given project are those detailed in this specification. The actual documents defined within this specification are:

- Declared Material List : DML
- Material and Mechanical part Request for Approval : RFA
- Material identification card : MIC
- Declared mechanical part list : DMPL
- Declared process list : DPL
- Process Request for Approval : RFA / Process

2.2 APPLICABLE DOCUMENTS

ESA PSS-01-0	Basic requirements for product assurance of ESA spacecraft and associated equipment
ESA PSS-01-11	Configuration management and control for ESA space systems
ESA PSS-01-20	Quality assurance requirements for ESA space systems
ESA PSS-01-70	Materials and process selection and quality control for ESA space systems and associated equipment
ESA PSS-01-701	Data for selection of space materials

2.3 DEFINITIONS / ABBREVIATIONS

The definitions listed in Annex A shall apply.

The following abbreviations are used in this document :

CDR	Critical Design Review
DML	Declared Materials List
DMPL	Declared Mechanical Parts List
DPL	Declared Processes List
EEE	Electric, Electromecanic and Electronic
ESA	European Space Agency
ESTEC	European Space Research & Technology Centre
PDR	Preliminary Design Review
PA	Product Assurance
PML	Preferred Material List
PMP	Parts, Materials and Processes
PSS	Procedures Specifications and Standards
QA	Quality Assurance
RFA	Request For Approval

SECTION 3. APPROVAL OF MATERIALS, PROCESSES AND MECHANICAL PARTS

3.1 APPROVAL OF MATERIALS

3.1.1 Selection criteria

Materials shall be selected on the basis of analysis and / or testing and their functionality shall be proved in accordance with the selection rules set out in ESA PSS-01-70. The justification shall be based on two main points:

- industrial quality control of the materials and associated processes;
- risks of failure in operation.

Particular attention shall be paid to natural and induced environmental constraints:

- mechanical constraints (vibrations, accelerations, shocks),
- chemical constraints (corrosion, contamination, monoatomic oxygen...),
- vacuum,
- radiation (UV , particles...)
- flammability, toxicity (manned flights)
- impacts (debris, micrometeorites)

and to the combined action of the environment and stresses (thermoelastic behaviour, stress corrosion...).

3.1.2 Approval procedure

3.1.2.1 Flow chart of the approval

Each selected material shall be approved by the contractor, a materials, mechanical parts and processes board (PMP board) and its responsible during phase C. The PMP board system and its rules are set up by the Contractor (see Paragraph 4.1). The approval procedure is described in Flow Chart 1 of Annex H.

In order to apply for ESA approval, the Contractor shall in the first instance submit to his customer a Declared Material List (DML). This list shall be initiated from the beginning of design and shall be issued under the responsibility of the Contractor's Product Assurance department.

3.1.2.2 Procedure for approval

The Product Assurance approval for material use shall be given in two steps:

1) *Provisional approval* shall be given by the Contractor when :

- the use of the material and its selection by the supplier have been justified;
- an evaluation programme exists and its content has been approved;
- a procurement specification exists with performance requirements and incoming reception criteria.

The provisional approval will be needed for obtaining authorisation to start procurement of the identification model equipment and part materials.

2) *Definitive approval* shall be given by the Contractor and then by the customer when:

- it has been proved that the material is manufactured in a reproducible way.
- the physical and chemical properties relative to the performances of the material have been evaluated as well as the effects of particular environments (thermal cycling, radiations, stress corrosion, thermal vacuum etc.), the results of this evaluation being satisfactory.

The customer definitive approval will be given after the Contractor definitive approval. The definitive approval is needed before the procurement of qualification and flight-model materials can start.

The approval documents differ, depending on whether the material has or has not had a previous similar use in a space project.

1) Selection of material on basis of previous use.

A material for which widespread and sufficiently constant data are available and which has been successfully used in similar applications (space-proven material) shall be selected whenever possible. It shall be considered approved, provided that all the following criteria are met:

a. Material test/flight data are comparable with its intended application/environment and are assessed to be such that performances under those conditions can be ascertained.
b. Material is included in the Declared Material List with all specified details and is acceptable for its particular project application.

2) Selection of material with an evaluation programme.

The selection of materials for which limited or no test data are available shall be sufficiently justified by submitting a Request For Approval. An evaluation programme taking the project-specific requirements into account shall be proposed, the programme being followed by the customer or by an ESA-approved test house on request. In addition, ESA will vet the proposal and test result for approval in the project application.

3.1.2.3 PMP boards

The Contractor shall set up PMP boards between Preliminary Design Review and Critical Design Review. Management of this board for materials is similar for mechanical parts and processes (see Paragraph 4.1).

3.1.2.4 Deliveries

Deliveries of successive issues of the materials list and the associated documentation for approval by ESA shall begin at Preliminary Design Review and be finalised for Critical Design Review. This procedure is the same for mechanical parts and processes lists (see Paragraph 4.3).

3.1.3 Documentation

Prior to ESA approval, all documents shall be previously approved by the Product Assurance department of the Contractor.

3.1.3.1 *Declared Materials List (DML)*

The compulsory detailed format and contents of the materials list are described in Annex B. In particular, the following data are of prime importance :

- the project name, issue number and group numbers, which shall appear as a title to each page of the DML;
- all the contents of each column;
- the column sorting and numbering.

This format is designed to facilitate the compilation.

For each material mentioned in the materials list, the following information shall be supplied:

- precise identification in terms of procurement (manufacturer/supplier),

- sufficient identification of the material transformed for in-flight use, i.e. processing parameters, environmental and size code,
- reference and issue of the procurement specification,
- reference of justification for approval.
- items which have life limitations, safety implications or other special problems shall be specifically marked.

The declared materials list shall include the materials to be used in flight standard models (prototype, qualification model, protoflight, flight spare, etc.).

3.1.3.2 *Material Request For Approval (RFA)*

For non-space-proven materials, the contractor in charge of the item shall submit a **material request for approval** (Material RFA). Detailed content is given in Annex B. This **material request for approval** may include an evaluation programme proposal and / or test samples.

3.1.3.3 *Evaluation programme proposal (with Material RFAs)*

The evaluation programme shall be so written that the test results will demonstrate that the material meets its design criteria and performs satisfactorily for the duration of the intended mission and in the environment foreseen for that mission. A selection of tests applicable to the respective environments is given in ESA PSS-01-70 and ESA PSSs referring to material testing listed in Annex J.
Other tests may be added as necessary in order to guarantee compliance with specific project requirements.

3.1.3.4 *Material Identification card. (MIC)*

Material samples sent to ESA or any test house, shall be accompanied by a **material identification card** (see Annex B) giving all required information on the material batch concerned. The physical configuration of the samples shall be in accordance with the related test specification taken from the ESA PSS-01-7XX series documents, or other approved test specifications. If the material is made up of several components, it shall be prepared according to the relevant process specification or manufacturer's data in such quantity as to provide representative samples.

3.1.3.5 *Documentation exchange (Software)*

Documentation exchanges for Declared Material List and Requests For Approval shall follow the requirement of Paragraph 4.4.

3.1.4 Granting of approval

Provided that the above-mentioned conditions are met and that ESA accepts the material as being approved for a particular project, the material will then receive an approval identification in Column 10 of the **declared material list** for the project.

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

- Select another material;
- Propose a modified evaluation programme and resubmit for approval;
- Initiate a waiver procedure if the above actions fail to achieve positive results.

This loop shall be repeated if ESA approval is not obtained.

3.2 APPROVAL OF MECHANICAL PARTS

3.2.1 Selection criteria

The selection of mechanical parts shall be justified by analysis, evaluation tests and their qualification shall be demonstrated.

Prior to any order for mechanical parts, technical requirements shall be laid down by the contractor in charge of definition. In these requirements, the manufacturer of the mechanical part shall provide explicit documentation describing:

- the materials constituting the mechanical part,
- the overall external characteristics,
- the functional characteristics
- the nominal values, dispersions normally allowable and margins
- the reliability, FMECA
- the conditions for use and maintainability.

The manufacturer is requested to provide, before the order for the elements intended for qualification and flight tests is placed, one or more components identical to the flight model which will be intended for evaluation.

Mechanical parts shall be covered by procurement specifications detailing the following points:

- measurable criteria with regard to usage
- detailed control requirements and procedures
- protections, packing and storage conditions according to the standards normally used for space programmes (see ESA PSS-01-202).

Materials of the parts shall follow the requirements of ESA PSS-01-70. This check shall be based on the technical data supplied by the manufacturer and/or by appraisal of evaluation samples.

3.2.2 Approval procedure

3.2.2.1 Flow chart of the approval

Each selected mechanical part shall be approved by the Contractor through a materials, mechanical parts and processes board (PMP board) and its responsible during phase C. The PMP board structure and its rules is set up by the Contractor (see Paragraph 4.1). The approval procedure is described in the Flow Chart 2 of Annex H.

In order to apply for ESA approval, the Contractor shall submit to his customer in the first instance a Declared mechanical Parts List (DMPL).

This list shall be initialized from the beginning of design and shall be issued under the responsibility of the Contractor's Product Assurance department.

3.2.2.2 Procedure for approval

As for materials, a two stage approval is required for the mechanical parts. The definitive approval shall be given once the performances of the mechanical part have been evaluated as well as its use in the specified environment. Parts shall be selected among those which have been authorized for use in previous spacecraft projects (space proven) or selected with an evaluation programme. For space proven mechanical parts, the contractor in charge of the item shall demonstrate the similarity of the previous environmental and functional requirements with those of the new project.

3.2.2.3 PMP boards

The Contractor shall set up a materials, parts and processes board between Preliminary Design Review and Critical Design Review. Management of this board for mechanical parts is similar for materials and processes (see Paragraph 4.1).

3.2.2.4 Deliveries

Deliveries of mechanical parts list successive issues and the associated documentation for approval by ESA shall begin at Preliminary Design Review and be finalized for Critical Design Review. The procedure is the same for materials and processes lists (see Paragraph 4.3).

3.2.3 Documentation

Prior to ESA approval, all documents shall be previously approved by the Product Assurance department of the manufacturer.

3.2.3.1 Declared mechanical parts list

The detailed compulsory format and contents of the mechanical parts lists are described in annex C. In particular, the following data are of prime importance :

- titles with project name, issue number, group numbers and names as a minimum per page
- all the content of each column
- the column sorting and numbering

Each mechanical part shall be mentioned in the list with the following information:

- identification of the mechanical part,
- identification of the elementary function and of the main characteristics of the mechanical part,
- reference and issue of the procurement specification,
- reference of justification for approval (evaluation report,...).
- criticality of the function performed

3.2.3.2 Mechanical Part Request For Approval (RFA)

For non space proven parts or space proven parts with dissimilar use or with possible adaptations, the contractor in charge of the item shall submit a *Mechanical Part Request For Approval.* The format and contents of the Mechanical Part Requests For Approval is identical to the Material Request For Approval and given in Annex B.

The Mechanical Part RFA concerning spacing and connecting elements shall be issued by family :

1 family = (1 type of element + 1 material). The size of the elements might be different.

For example, nuts manufactured from the same design standard in TA6V in size ranging from M5 to M10 shall be represented by one line item.

3.2.3.3 Evaluation programme proposals (with Mechanical Part Request For Approval)

The evaluation programme shall be so written that the test results will clearly demonstrate that the mechanical part meets its design criteria and performs satisfactorily for the duration of the intended mission and in the environment foreseen for that mission.

3.2.3.4 Documentation exchange. Software.

Documentation exchanges for Declared mechanical parts List and Request For Approval shall follow the requirement of Paragraph 4.4.

3.2.4 Granting of approval

Provided that the above-mentioned conditions are met and that ESA accepts the part as being approved for a particular project, this part will then receive an approval in the approval column (10) of the **Declared mechanical Parts List** for the project

In cases where approval is not granted, the contractor in charge of the part shall either:

- Select another part
- Propose and perform a modified evaluation programme
- Resubmit for approval
- Initiate a waiver procedure if the above actions fail to achieve positive results.

This loop shall be repeated in case of no ESA approval.

3.3 APPROVAL OF PROCESSES VALIDATION

3.3.1 Selection criteria

Each process shall be subjected to a validation and a Product Assurance control. Manufacturers shall demonstrate that the selected processes enable them to meet the requirements described in the applicable specifications.

Processes shall be selected according to the criteria of ESA PSS-01-70. The following criteria are essential (see also ESA PSS-01-20) :

- suitability of the process to the concept and to the required performance
- facilities utilised: tools, machines, autoclaves,...
- personnel certification
- criticality of process with respect to safety and reliability aspects (see Annex A for critical process definition)
- maintainability
- environment, life duration
- reuse of the process after a prolonged halt in manufacture.

Preference shall be given to the processes already used successfully for other space or aeronautical programmes, whose suitability to meet the programme constraints has been demonstrated. The processes list shall be used to identify all standard and non-standard processes and as an aid in reducing and standardising the overall number of processes.

3.3.2 Approval procedure

3.3.2.1 Flow chart of the approval

Each selected process shall be approved by the contractor through a materials, mechanical parts and processes board (PMP board) and its responsible at beginning of phase C. The PMP board structure is set up by the Contractor (see Paragraph 4.1). The approval procedure is described in the Flow Chart 3 of Annex H.

In order to apply for ESA approval, the Contractor shall submit to his customer in the first instance a Declared Process List (DPL).

This list shall be initialized from the beginning of design and shall be issued under the responsibility of the Contractor's Product Assurance department.

3.3.2.2 Procedure for approval of process validation

Every process used for any ESA space system and associated equipment, shall be validated.

The Product Assurance approval of a process validation will be given when the following guarantees are given:

- the selection of the process is justified : the manufacturing and inspection procedures allow to regularly obtain a product which meets the specifications (resistance to the environment, mechanical, electrical constraints,...).

- the manufacturing and inspection specifications exist and have objective criteria of verification.

- the elements of the manufacturing development associated with this process are recognized as suitable (manufacturing and control means) and are used under appropriate conditions (environment, cleanliness).

- the personnel certification is clearly described (delicate operations, self-inspection).

- the manufacturing and inspection procedures have been demonstrated in the workshop by testing representative samples or validation parts developed under the same conditions as flight parts.

- the validation proof exists and is given either by a justificative file or by positive results in an evaluation programme (see Paragraph 3.3.4.4).

- the industrial documentation exists and has been subjected to the internal approval procedure at the manufacturer's plant.

The approval procedure differs depending on whether the process is / is not validated and/or critical:

1. *Validated critical processes* for which a Process Request for Approval is required (except if an ESA PSS-01-7XX specification is strictly followed, in which case mention in the Declared Processes List of the specification number, is taken as a commitment on the part of the Contractor. ESA PSS referring to processes are listed in Annex J).

2. *Validated non-critical processes* for which limited ESA involvement is generally applied. Reference to the justificative file giving all validation data obtained in the frame of other aeronautic or space programmes (meeting the specific needs of the new ESA programme) shall be given in subcolumn 9.1 of the Declared Processes List.

3. *Non-validated processes* lacking identification and / or application data on which more information is requested in order to pass into Categories (1) and (2) above. For this

category, Process Request for Approval is required with an evaluation programme description and an evaluation report.

Note:
The last issue of a Declared Processes List shall contain (1) and (2) categories only.

All critical processes shall be listed in the Declared Processes List.

Every prolonged halt in manufacture or every subsequent change in manufacturing and inspection means and procedures necessitate a revalidation.

3.3.2.3 PMP boards

The Contractor shall set up a materials, parts and processes board between Preliminary Design Review and Critical Design Review. Management of this board for processes is similar for parts and materials (see Paragraph 4.1).

3.3.2.4 Deliveries:

Processes shall be validated before the manufacturing of qualification models.

The preliminary lists with their approval status shall be presented at the Preliminary Design Review and before manufacturing the elements of the identification model.

The definitive processes lists with the justifications for approval shall be presented at the Critical Design Review (see Paragraph 4.3).

3.3.3 Documentation

Prior to ESA approval, all documents shall be previously approved by the Product Assurance department of the manufacturer.

3.3.3.1 Declared processes list

The detailed compulsory format and content of the Declared Processes List are described in Annex D. In particular, the following data are of prime importance :

- titles with project name, issue number, group numbers and names as a minimum per page
- all the content of each column

- the column sorting and numbering

Each process shall be mentioned in the processes list with the following information:

- adequate identification of the process
- reference and issue of the process specification
- name of the process user
- criticality
- reference of justification for approval

Non critical processes which apply to only one material (one Declared Materials Lists item) and which are defined sufficiently in Column 5 with "processing parameters" (mixture proportions, cure temperature, special cleaning agent, surface treatment, thermal treatment, temperature, etc..) of the Declared Materials Lists shall not appear in the Declared Processes List.

3.3.3.2 Process Request for Approval (RFA/Process)

For critical and / or non validated processes, the contractor in charge of the process shall submit a Process Request for Approval (RFA / Process). Detailed content is given in Annex D. For non validated processes an evaluation programme description and the evaluation report shall also be given in due time.

For a critical and already validated process, the contractor in charge of it shall also submit a Process Request for Approval (RFA/Process). The Process Request for Approval is used to confirm and identify the existing validation file of the process.

Detailed content is given in Annex D.

3.3.3.3 Evaluation programme description

This programme shall define:

- the process and the associated manufacturing and inspections,
- the samples representative of the product to be developed and the associated tests. The results of follow-up test specimens shall be correlated with those of the part samples,
- test methods,
- validation criteria.

3.3.3.4 Evaluation report

This document shall contain the following information:

- results of industrialization tests (test specimens, physical, chemical analyses, inspection results),
- applicability of these results with regard to the required performance,
- actions taken in order to minimize industrial risks.

3.3.3.5 Documentation exchange. Software.

Documentation exchanges for Declared Processes List and associated documents shall follow the requirement of Paragraph 4.4.

3.3.4 Granting of approval

Provided that the above-mentioned conditions are met and that ESA accepts the process validation as being approved for a particular project, the process will then receive an approval identification in the approval column 10 of the **declared processes list** for the project.

In case where approval is not granted, the contractor in charge of the process shall either:

- select another process
- propose and perform a modified process and/or evaluation programme
- resubmit for approval.
- initiate a waiver procedure if the above actions fail to achieve positive results.

This loop shall be repeated in case of no ESA approval.

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SECTION 4. MANAGEMENT

4.1 MATERIALS, MECHANICAL PARTS AND PROCESSES MANAGEMENT

4.1.1 Role of the materials, parts and processes board

The PMP board is a small formal organisation established by the Contractor to assist his sub/co-contractors in managing and controlling the selection, application, procurement and documentation of materials, mechanical parts and processes used in equipment, systems or subsystems.

The PMP boards shall review materials, mechanical parts and processes submitted with **requests for approval** (for materials, mechanical parts and processes respectively), their justification files and waivers and state upon their approval, rejection or needs for further evaluation.

4.1.2 Set-up and composition of the boards

The board's working rules and the person responsible for carrying out the board's decisions are specified by the Contractor in the Parts, Materials and Processes Product assurance requirements applicable to his subcontractors. ESA will make only recommendations on these rules.

ESA has the right to attend the board meetings as an observer.
The PMP board decision-making process and the membership will be defined in accordance with the management rules of each project.

4.2 PRIME CONTRACTOR'S ROLE AND RESPONSIBILITIES

Prime contractors shall be responsible for the following tasks :

- obtaining correct and complete lists from sub- and co-contractors.
- comparing lists and selecting from them any materials which have an identical function in different subsystems and, subsequently, negotiating a reduction of such materials (ideally) to one type only. This task could be facilitated if the Prime Contractor has provided all Sub-and Cocontractors with a common preferred materials list (PML) from the beginning, and if the PML contains a list of equivalent European specifications, where relevant;
- providing provisional and, later, definitive Contractor approval for each list item before submitting lists to ESA;
- consolidating the various lists into a single "Project list" and issuing them (status, evaluation programmes for materials and parts, validation files for processes);

- submitting the project declared lists to ESA for approval prior to initiation of the hardware phase (before Critical Design Review);
- passing the ESA comments on the lists to subcontractors;
- setting up the PMP board rules;
- ensuring correct electronic data flow exchanges.

The lists established by the Contractor and submitted in the standard formats shall include all the informations described in this document (Requests For Approval) . Amendments to the lists shall be implemented only through established change procedures. ESA reserves the right to request justification of type selection and to obtain documented evidence of test results and or status.

4.3 DELIVERIES

On the basis of the preliminary lists, an attempt to impose standardisation shall be made:

- between the programme review deliveries, the Contractor shall issue intermediate lists (the periodicity will be defined by the Contractor in the contract) which will be the working lists for the materials, mechanical parts and processes boards;
- lists shall be updated after Critical Design Review taking into account difficulties and changes coming from qualification tests;
- from the subsystems lists, the Contractor shall issue a consolidated project list submitted to ESA approval.

In particular, materials or mechanical parts with long procurement delays (LLI : Long Lead Items), shall be identified before the formal subsystem PDR, 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.

The following table specifies when PMP documents shall be approved: this implies informal exchanges before delivery for approval so that the potential problems may be discovered preferably before the formal reviews.

Documents :	Delivery :	Events: phase or review				
		B -->	PDR	<-- C -->	CDR	<-- D -->
PMP PA plan	end of phase B	B -->				
PMP requirements from Prime contractor to subcontractors	end of phase B (for comments only)	B -->				
Formats (& software output) for : * DML, DMPL * DPL * Material and part RFA * RFA/Process * Mat. Identification card	end of phase B	B -->				
Preliminary lists for : * Materials and Parts * Processes	Preliminary Design Review		PDR			
Partial lists for : * Materials and Parts * Processes	Between PDR and CDR (working documents)			<-- C -->		
Requests : * Material RFA * mechanical parts RFA * Processes RFA	Between PDR and CDR (working documents)			<-- C -->		
Evaluations (if needed) : * Material and part evaluation * Process evaluation	Between PDR and CDR (working documents)			<-- C -->		
Waivers :	from PDR and at CDR. Ctd after			<----------	CDR	----------
Consolidated lists : * DML * DMPL * DPL and associated above documents	Final approval at CDR				CDR	
Change requests :	from PDR and at CDR. Ctd after			<----------	CDR	----------
Updating of PMP lists	Phase D					<--- D -->

4.4 DOCUMENTATION EXCHANGE (SOFTWARE)

The three declared lists shall be compiled during the design phase of any ESA project and shall be consolidated by the Contractor on the basis of data obtained from his co- and subcontractors. It shall be submitted to ESA in the standard format shown in Annexes B, C and D. The lists can be produced and maintained on a software tool provided the print-out is in the required format.

With the software, it shall be possible to jump without restriction through and across a computer-generated list for commenting purposes. The software shall contain writing space for standard abbreviated comments (refer to list of abbreviations in Annex E, F and G). It shall be possible to establish an electronic dialog between the originator of the list (generally the Contractor), the co- and subcontractors and the approving authority (generally the ESA project group).

It is the Contractor's responsibility to impose;
either the exchange standard:

- the length (number of characters) and the content of each information field of the lists.
- the code used to exchange data

or the software to be used

A simple system shall be used to identify changes within each line from one issue to the next, in order to facilitate a review of the differences (use a different character set or underlining etc. for modified information).

SECTON 5. QUALITY ASSURANCE

The Contractor shall meet the following requirements for all materials, mechanical parts and processes selection, evaluation and control programmes which are defined in ESA PSS-01-70 and the general quality assurance requirements which are defined in ESA PSS-01-20. Of particular concern are:

- procurements
- incoming inspections
- production equipment control
- cleanliness
- critical elements
- personnel certification and training
- supplier following (audits)
- manufacturing and control procedure documents
- documentation control
- stamp control
- traceability, marking
- metrology and calibration
- non-conformance, change and waiver control
- handling, storage and preservation
- transportation

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ANNEX A

DEFINITIONS

CONSOLIDATION OF DECLARED LISTS

A Prime contractor task which consists in :

- sorting by part, material or process group and merging the items from subcontractors' lists into one project list;
- summing up in one item, identical items from different subcontractors. As several lines will be used for the location and application of one item, sub-item numbers can be added;
- negotiating the reduction to one or a few items, where identical functions are performed by an excessive number of items. This might lead to central procurement for specific areas.

CRITICAL MECHANICAL PART

A critical mechanical part is one:

- which in case of failure can adversely affect the performance or destroy a major part or function of the spacecraft;
- the quality of which cannot be assessed solely by simple incoming tests;
- which has caused problems previously;
- with which the contractor has had no previous applications experience.

CRITICAL PROCESS

A critical process is one:

- that in the case of failure can adversely affect the performance or destroy a major part or function of the space system;
- the quality of which cannot be assessed solely by examining the end product;
- that has caused problems previously;
- for which an ESA specification is available but is not being implemented;
- with which the contractor in charge of it has had no previous application experience.

DECLARED MATERIALS LIST (DML)

Consolidated list of all materials used in a project.

DECLARED MECHANICAL PART LIST (DMPL)

Consolidated list of all parts used in a project.

DECLARED PROCESS LIST (DPL)

Consolidated list of all processes used in a project except for non critical processes sufficiently described in the DML.

MECHANICAL PART

A nonelectrical, nonelectronic and nonelectromechanical off-the-shelf piece of hardware 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 broken down without losing this function. Adaptation not impairing the qualification status is possible.

NONASSESSED PROCESS

A process that has no history of previous use in the space environment, and for which no or insufficient data are available relevant to the required project application, is deemed nonassessed.

NONCRITICAL MECHANICAL PART

Any mechanical part that does not fall under the critical mechanical part definition is deemed noncritical.

NONCRITICAL PROCESS

Any process that does not fall under the critical process definition is deemed noncritical.

SPACE-PROVEN MATERIAL/MECHANICAL PART

A space-proven material or mechanical part is one whose properties are well understood and that is produced by means of a stable process, usually confirmed by a history of continuous or frequent production runs. The material or mechanical part must be compliant with a recognized set of specifications. It will have been used in space applications, or will have successfully completed an appropriate evaluation programme.

STANDARD/ESTABLISHED PROCESS

A standard/established process is one that is well documented, has a previous history of use, is well understood and for which standard inspection procedures exist. Such a process would generally be covered by ESA specifications or other international or national documents.

VALIDATION OF PROCESSES

A set of data collected (and/or experiments performed) to demonstrate that a process performs as intended (technical requirements) and that sufficient confidence can be placed on the outcome (quality assurance requirements). Process validation is approved by the Contractor and ESA.

Declared material list

(Programme name)					Group (no) : (title)				Doc. No : Issue/Rev.: Date :							
1	2	3	4	5	6	7		8	9							10
									9.1					9.2	9.3	
Item No :	Commercial identification	* Chemical nature and * type of product	* Procurement Information * Manufacturer/ Supplier * Specification Issue/rev.	Summary of processing parameters	Use and location	Environment code R	A	T	Size code	Cor r	SCC	Fiam	OFG.	OUTG	Justification for approval	Prime App.	ESA app

Compulsory part of heading

The complete heading is needed for the first page of each group only

ANNEX B :

DECLARED MATERIAL LIST FORMAT

ANNEX B (con't)

CONTENTS OF THE DECLARED MATERIALS LIST

GROUPS:

Materials are classified into 20 groups depending on their type or their main use.

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
16. Rubbers and elastomers
17. Thermoplastics (non adhesive tapes, foils (MLI),...)
18. Thermoset plastics
19. Wires and cables (for materials aspects only)
20. Miscellaneous nonmetallic materials (ceramics...)

If for a given project it is deemed necessary and approved by ESA to create new groups, these shall bear numbers over 20.

Primers shall be classified in the group of their associated components.

ANNEX B (con't)

CONTENT

The materials list consists of 10 columns which shall be completed as indicated below. Furthermore, similar materials shall be grouped together as specified above. If a particular item does not apply, write N.A. (Not Applicable).

COLUMN 1: Item number

Identification number in each group. One only per material type. Does not change during the life of the materials list (sub-items permitted when deemed necessary).

COLUMN 2: Commercial identification

Trade name and number (to be completed in full) e.g. "ARALDITE AV 100".
Correct and standard designation.
ESA has chosen :

* Trade name + number. For example, "ARALDITE AY 105"
* If no trade name exists, then the manufacturer's name plus number are entered; e.g. "SCHOTT BK7"
* In the case of metal alloys, the AA system is recommended for aluminium alloys, and the AISI system for steels ; for other metals or alloys, the main constituent will be 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 and/or processing, sub-item numbers shall be added.

COLUMN 3: Chemical nature and type of product

Example: epoxy resin, polyurethane adhesive, or Ti, 6 Al, 4V alloy.

COLUMN 4: Procurement information

Manufacturer/supplier: name of the manufacturer and name of the supplier if different.
Specification: reference of the procurement specification with, if considered useful, issue and revision. It may be replaced by a national specification number if this exists and makes source of procurement irrelevant.

COLUMN 5: Processing parameters (summary):

Give as relevant: mixture proportions, cure temperature, special cleaning agent, surface treatment, thermal treatment, temperature, etc..
NOTE: Specification number is required, but not sufficient for ESA purposes.

COLUMN 6: Use and location

Indicate in what subsystems, box or item the material is used and whether it acts as structural element, thermal control, electrical insulation etc. as relevant.

COLUMN 7: Environmental code

Radiation/UV/ATOX (1) (R)		Ambiance (A)	Temperature (2) (T)
G = Geostationnary L = Low orbit B = Radiation belts I = Interplanetary	S = outside shadow L = outside light	V = Vacuum H = Hermetic M = Manned E = Elevated pressure	1 = 0 to 100 K 2 = 101 to 200 K 3 = 201 to 300 K " " etc.

(1) For materials inside the spacecraft, choose a letter from the left-hand column. For materials on the surface of the spacecraft, combine this letter with "L" or "S".
(2) Thermal cycling to be indicated by two values, e.g. 3/5.

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

Materials which are at a boundary between environments shall be described by two sets of codes.

COLUMN 8: Size code

AREA	A (cm^2)	0 = 0 < 1 1 = 1 < 10 2 = 10 < 100 3 = 100 < 1000 etc.
VOLUME	V (cm^3)	
MASS	W (g)	

Choose an alphanumeric combination from the above mentioned table, e.g. A5 or V2 or W3.

COLUMN 9

All the codes of Column 9 shall be relevant for the project concerned, which implies that they refer to validated data applicable to this project (not too old, same processing, same composition, QC tests run on the same procured lot, etc.) .
Reference of test report and relevant test result code to be given in Subcolumn 9.1.

SUBCOLUMN 9.1

Outgassing (OUT):
P - The material passed the outgassing test detailed in ESA PSS-01-702. Reference of test report to be given in Subcolumn 9.2.
F - The material failed . Waiver reference in Subcolumn 9.2.
U - Materials of which outgassing characteristics are unknown.

Stress Corrosion Cracking (SCC):
A - The material is known to have a high resistance to SCC. Table I document ESA PSS-01-736.
B - Table II and III document ESA PSS-01-736.
Justification for approval (test reference) stated in Subcolumn 9.2 (generally making reference to ESA PSS-01-736).
U - Materials and / or *weldments* for which SCC characteristics are unknown :. An SCC evaluation form is required, based if necessary on tests (see ESA PSS-01-737).

Corrosion (Corr.) :
A - The material does not require a surface treatment or coating for its intended application, otherwise it shall be rated B.
B - Details of the surface treatment to be given in Column 5.

Flammability (Flamm.) (if applicable):
P - The material passed the requirements of document ESA PSS-01-721.
F - The material failed the test of document ESA PSS-01-721 in the applicable atmosphere. Waiver reference in Subcolumn 9.2.
U - Materials of which characteristics are unknown.

Offgassing (OFF) (if applicable):
P - The material passed the requirements of document ESA PSS-01-729.
F - The material failed : waiver reference in Subcolumn 9.2
U - Materials of which offgassing characteristics are unknown.

SUBCOLUMN 9.2: Justification for approval

The purpose of this Subcolumn is to enter any additional information that may be necessary in order to achieve customer approval. This information is reference of the Requests For Approval, reference of justificatory file for materials approved for other space or aeronautical programmes meeting the specific needs of the programme, reference of the evaluation report or waivers etc.. These documents must be made available to ESA on request.

SUBCOLUMN 9.3: Approval status of the Contractor

A : Approved - All Materials classified A may be used without restriction.
Y : Approved with restriction - These materials require the preparation of QC test specimens or a treatment before use: potting, coating, test specimens...

W : Approved with a waiver - These materials do not meet the requirements but are used for functional reasons. The use of such materials shall be reduced to a minimum. All the waivers shall be approved by ESA. The waiver number shall be entered in Subcolumn 9.2.
P : Pending a decision - Materials for which an evaluation report or a waiver is awaiting the Contractor's provisional or definitive approval.
O : Open - New materials or materials for which investigations and qualification are in progress.
D : Deleted - This classification is used for a material which is no longer used .

COLUMN 10: ESA approval and comments

This column will be completed by ESA in accordance with the standard comments listed in Annex E.

ANNEX B (con't)

MATERIAL OR MECHANICAL PART REQUEST FOR APPROVAL (RFA)

Programme Name	Material or mechanical part Request for Approval	Page 1/3
RFA ref.:	Issue :	Date :
System :	Subsystem :	
Equipment :	WBS No :	

Material or non EE part description :

- Materials or mechanical part list item number (reference in Declared Lists) :
- Group :
- Processing (for material only give ref. in DPL) :
- Commercial identification :

Required characteristics (for material) :
(mechanical, physical, chemical, life limitations....)

Material function : **or** **mechanical part function :**

elementary function

safety and/or reliability critical function implying the part

Description of the environment :	On ground :	In flight :
- Pressure - Atmosphere composition - Temperature - Humidity - Radiation - Expected life - Materials in contact		

Programme Name	Material or mechanical part Request for Approval	Page 2/3
RFA ref.:	Issue :	Date :
Company :		

Situation in the spacecraft (append drawings if necessary)

- Mass :

- Location :

- Nearby critical areas :

- Manned volumes : Yes No

Evaluation :

Evaluation programme :

Issue : Rev. :

Evaluation report :

Issue : Rev. :

Evaluation tests :

Thermal vacuum	:	Thermal cycling	:
Radiation	:	Stress corrosion	:
(with radiation type)		Flammability	:
Toxicity	:	Others	:

Evaluation results for material (give a short summary and/or append test data) :
Batch number and serial number of the evaluation element for mechanical part:

Comments of the PA responsible :

Programme Name	**Material or mechanical part Request for Approval**	Page 3/3
RFA ref.:	Issue :	Date :
Company :		

Provisional approval :
Elements taken into account : type, supplier, evaluation plan, specifications

Companies Responsible					Prime contractor
Technical	Date				
	Name				
	Visa				
PMP	Date				
	Name				
	Visa				
PA	Date				
	Name				
	Visa				

Comments :

Definitive approval :
Elements taken into account : supplier, evaluation results, specifications

Companies Responsible					Prime cont.	ESA
Technical	Date					
	Name					
	Visa					
PMP	Date					
	Name					
	Visa					
PA	Date					
	Name					
	Visa					

Comments :

ANNEX B (con't)

MATERIAL IDENTIFICATION CARD:

<table>
<tr><td colspan="5">MATERIAL IDENTIFICATION CARD ESTEC QM Noordwijk</td></tr>
<tr><td rowspan="3">DESCRIPTION AND HISTORY OF SAMPLE :

(a) trade name + number
(b) manufacturer
(c) type of product
(d) chemical nature
(e) processing details e.g. : -
joining methods
- heat treatments
- cure + post cure
- cleaning method
- relevant spec. No</td><td colspan="2">a)</td><td colspan="2">b)</td></tr>
<tr><td colspan="2">c)</td><td colspan="2">d)</td></tr>
<tr><td colspan="4">e)</td></tr>
<tr><td>BATCH NUMBER

SAMPLE QUANTITY

PREPARATION DATE

PREPARED BY</td><td colspan="2"></td><td>DATA USEFUL FOR REQUIRED TEST e.g. :
- material density
- substrate density
- substrate material</td><td></td></tr>
<tr><td rowspan="2">CONTRACTOR EXPERIMENTER :
SAMPLE CODE
(refer to the DML item number of the project)</td><td colspan="2" rowspan="2"></td><td>PROJECT COST CODE *</td><td></td></tr>
<tr><td>ESTEC PA MANAGER OR ORIGINATOR NAME & SIGNATURE *</td><td></td></tr>
<tr><td>APPLICATION</td><td colspan="4"></td></tr>
<tr><td colspan="3">REQUIRED TEST SPEC. NUMBER</td><td>QUALITY CONTROL SAMPLE OR EVALUATION SAMPLE</td><td></td></tr>
<tr><td colspan="5">FOR MATERIAL & PROCESSES DIVISION USE

DATE RECEIVED
RESPONSIBLE SECTION
TRACEABILITY CODE

TEST DATE :
TEST NUMBER :

REPORT NUMBER :
ISSUE DATE :
RESULTS :

REJECT ACCEPT</td></tr>
</table>

*(for ESA use only)

Declared mechanical parts list										
(Programme name)					Group (No) : (title)		Doc. No : Issue/Rev.:	Page : Date :		
1	2	3	4	5	6	7	8	9		10
								9.1	9.2	
Item No.	Commercial identification	Type of part	Procurement Info. : 1) Manufacturer 2) Supplier 3) Proc. Spec. Issue/rev.	1) Elementary functions 2) Main characteristics	1) Use 2) Location	Environment. code 1) Radiation 2) Ambiance 3) Temp.	Criticality and hazards	Justification for approval and Prime comments	Prime App.	ESA app.

Compulsory part of heading

The complete heading is needed for the first page of each group only

ANNEX C :

DECLARED MECHANICAL PARTS LIST FORMAT

ANNEX C (con't)

DECLARED MECHANICAL PARTS LIST

GROUPS

Mechanical parts shall be classified into 11 groups:

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

If for a given project it is deemed necessary and approved by ESA to create new groups, these shall bear numbers over 61.

Items which should appear in the EEE parts list should not be repeated here (e.g. motors (DC, steppers), heaters, some valves, thermostats, relays, transformer coils, solenoids, ferrite cores...).

ANNEX C (con't)

CONTENT OF THE MECHANICAL PART LIST

The mechanical parts list consists of 10 columns which shall be completed as indicated below. If a particular item does not apply, write N.A. (Not Applicable).

COLUMN 1: Item number

Sequential item number in each group of the list. One only per mechanical part type. Does not change during the life of the mechanical parts list.

COLUMN 2: Commercial identification

As required :
* type and number
* specification number (whether national, ESA, company in-house, etc.) and issue status.
  This document must be available for sending to ESA on request.
* material

COLUMN 3: type of part

Use a standard nomenclature, in order to ensure correct grouping of similar parts, e.g.:
valve, one way
valve, two ways
and not one-way valve or two-way valve.

COLUMN 4: Procurement information

As for Declared Materials Lists :
* Manufacturer/supplier: name of the manufacturer and name of the supplier if different.
* Specification : reference of the procurement specification with issue and revision. It may be replaced by a national specification number if this exists and makes source of procurement irrelevant.

COLUMN 5: Elementary function, main characteristics

- function to be ensured by the mechanical part
- main characteristics: e.g. number of revolutions per minute for a ball bearing

COLUMN 6: Use and location

Indicate in which subsystems, equipment or box the mechanical part is used + subcontractor 's name/abbreviation.

COLUMN 7: Environmental code

As for DML :

Radiation/UV/ATOX (1) (R)		Ambiance (A)	Temperature (2) (T)
G = Geostationnary L = Low orbit B = Radiation belts I = Interplanetary	S = outside shadow L = outside light	V = Vacuum H = Hermetic M = Manned E = Elevated pressure	1 = 0 to 100 K 2 = 101 to 200 K 3 = 201 to 300 K " " etc.

(1) For parts inside the spacecraft, choose a letter from the left-hand column. For parts on the surface of the spacecraft, combine this letter with "L" or "S".
(2) Thermal cycling to be indicated by two values, e.g. 3/5.

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

Parts which are at a boundary between environments shall be described by two sets of codes.

COLUMN 8: Criticality and hazards

Mark here all parts participating in a safety-critical and/or reliability-critical function.

SUBCOLUMN 9.1: Justification for approval

The purpose of this subcolumn is to enter any additional information that may be necessary in order to achieve customer approval. This information is reference and issue of the Requests For Approval, reference of justificatory file for parts approved for other space or aeronautical programmes meeting the specific needs of the programme and waivers etc. These documents must be made available to ESA on request.

SUBCOLUMN 9.2: Contractor's approval

A: Approved - All Mechanical parts classified A may be used without restriction.
W: Approved with a waiver - These mechanical parts do not meet the requirements but are used for functional reasons. The use of such mechanical parts shall be reduced to a minimum. The waiver number shall be entered in Subcolumn 9.1.
P: Pending a decision - mechanical parts for which an evaluation report or a waiver is awaiting the Contractor's provisional or definitive approval.
O: Open - New mechanical parts or mechanical parts for which investigations and qualification are in progress.

D : Deleted - This classification is used for a mechanical part which is no longer used in the spacecraft.

COLUMN 10 : ESA approval and comments

This column will be completed by ESA in accordance with the standard comments of Annex F.

ANNEX C (con't)

The Mechanical Part Request For Approval is identical to the Material Request For Approval given in Annex B.

Declared processes list										
(Programme name)				Group (No) : (title)		Doc. No : Issue/Rev.: Date :				
1	2	3	4	5	6	7	8	9		10
								9.1	9.2	
Item No :	Process identification	Specification Issue/rev.	Process description	Use and location	Manufacturer name	Associated items in materials list	Criticality of the process	Justification for validation approval	Prime valid.	ESA valid.

Compulsory part of heading

The complete heading is needed for the first page of each group only

ANNEX D :

DECLARED PROCESSES LIST FORMAT

ANNEX D (con't)

GROUPS

Processes shall be classified into 17 groups:

1. Adhesive bonding
2. Composite manufacture
3. Encapsulation/moulding
4. Painting/coating
5. Cleaning
6. Welding
7. Crimping/Stripping/wire wrapping
8. Soldering / Brazing
9. Surface conversion 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

If for a given project it is deemed necessary and approved by ESA to create new groups, these shall bear numbers over 17.

ANNEX D (con't)

CONTENT OF THE PROCESS LIST

The proces list consists of 10 columns which shall be completed as indicated below. If a particular item does not apply, write N.A. (Not Applicable).

Processes which apply to only one material (one Declared Materials Lists item) and which are sufficiently defined in column 5 of the Declared Materials Lists should not appear in the Declared Processes List (unless they are critical).

COLUMN 1: Item number

Sequential item number in each group of the Declared Processes List. One only per process type. Does not change during the life of the processes list.

COLUMN 2: Process identification

Process name, title, clear identification, etc. Correct and standard identification.

COLUMN 3: Specification

Specification number (whether national, ESA, company in house etc.) and issue status. Only the contractor's/subcontractor's specifications that can be physically transmitted to ESA for review purposes are to be entered on the Declared Processes List.

COLUMN 4: Process description

Brief description of the process.

COLUMN 5: Use and location

Define location in the spacecraft/equipment, use, and purpose of process for the spacecraft.

COLUMN 6: Manufacturer's name

Name/abbreviation (the one who applies the process).

COLUMN 7: Item in materials list or mechanical parts list

Corresponding materials list or mechanical parts list item number.

COLUMN 8: Criticality of process

Indicate here whether process is critical or noncritical. In the case of a critical process, add reason for criticality (see the definition in Annex A).

NOTE : for critical processes other than those performed exactly to an ESA PSS-01-7XX series specification, this form is to be supplemented by a Process Request for Approval (RFA / Process) (in the same Annex).

SUBCOLUMN 9.1: Justification for approval

The purpose of this is to enter any additional information that may be necessary in order to achieve customer's approval. This information comprises reference and issue of the RFA / Approval, processes justification file, evaluation reports and waivers. These documents must be made available to ESA on request.

SUBCOLUMN 9.2: Contractor's approval

The Prime contractor shall complete this subcolumn and by doing so confirms that :

- the line indications are correct and complete
- the process has passed all applicability tests (including quality control testing).

A : Approved - The validation is approved by the Contractor

W : Approved with a waiver - The use of such processes shall be reduced to a minimum. All the waivers shall be approved by ESA. The waiver number shall be entered in Subcolumn 9.1.

P : Pending a decision - processes for which a validation report or a waiver is awaiting the Contractor's decision.

O : Open - New process or process for which investigations and qualification are in progress.

D : Deleted - This classification is used for a process which is no longer used .

Where no approval can be granted, the Process Request for Approval (RFA / Process) shall be submitted to ESA for approval if not yet available. ESA may request a copy of the process specification and an audit of the process.

COLUMN 10: ESA approval

This column will be completed by ESA in accordance with the standard comments listed in Annex G.

ANNEX D (con't)

Programme Name	**Process Request for Approval (RFA/Process)**	Page 1/3
RFA/Process ref.:	Issue :	Date :
Equipment :	WBS No :	
Company :		
		Y / N : Critical Process ?

Process description:

- Process list item number and group number (reference to process list) :

- Process name / identification :

- (in house) specification number

- compatibility with an ESA specification or other :

- Associated items in DML :

- Process description :

Process function (and expected performances) :

Environment, utilisation constraint:

ANNEX D (con't)

Programme Name	**Process Request for Approval (RFA/Process)**	Page 2/3
RFA/Process ref. :	Issue :	Date :
Equipment :	WBS No :	
Company :		

Validation:

Evaluation programme :

Issue : Rev.:

Evaluation report :

Issue : Rev.:

- Serial number of the witness piece (or witness test sample) of the validation :

Comments of the PA responsible:

ANNEX D (con't)

Programme Name	**Process Request for Approval (RFA/Process)**	Page 3/3
RFA/Process ref.:	Issue :	Date :
Equipment :	WBS No :	
Company :		

Approval :

Elements taken into account : Manufacturer's evaluation results, specifications, manufacturing and inspection procedures

Companies Responsible					Prime cont.	ESA
Technical	Date					
	Name					
	Visa					
PMP	Date					
	Name					
	Visa					
PA	Date					
	Name					
	Visa					

Comments :

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ANNEX E

STANDARD COMMENTS ON DECLARED MATERIAL LISTS

agreed* or handwritten "√" in margin	Contractor comment (in Subcolumn 9.3) on list is agreed to by ESA
bake	try bake at highest possible temperature to reduce outgassing.
barrier	at least 3µm of Cu or Ni barrier layer needed under plating.
comp.	composition to be given.
C/Waiver	copy waiver to ESTEC/QM.
data sheet	provide ESTEC with a manufacturer's data sheet.
dust	may give particulate contamination.
finish	describe finish applied on material (thickness is to be indicated in some applications).
fuse	tin plating to be reflowed.
group	material not in the right group. Move at next issue.
hum.	cure is incomplete, probably owing to humidity in base products.
identify	give correct material identification (trade name and no.).
mix/cure	describe mix and cure in the relevant Declared Materials List column.
OK	material is acceptable for the described use.
pcb qual.	material OK, but process to be performed by approved company.
prev. c.	see previous comment and react.
process	material OK, process questionable
qc (XXX)	perform quality control test on the lot used (XXX as for "test").
ref.	give exact reference of the quoted test.
reject	(use: XXX).

RFA	Provide RFA to ESTEC/QM
same as XXX	same material as another Declared Materials List item.
sample	provide ESTEC/QM with sample (XXX as for "test"), plus relevant
(XXX)	documentation (material identification card according to ESA PSS-01-700, certificate of conformance etc.)
scc	material sensitive to stress corrosion; provide ESTEC/QM with a stress-corrosion evaluation form (ESA PSS-01-736).
temper	Heat treatment to be given
test (XXX)	perform the test indicated between parentheses. (XXX) = VCM (outgassing) MECH (mechanical properties) FLA (flammability) TOX (toxicity) SOLD (solderability) MICR (microscopy or metallography) CHEM (chemical analysis) etc.
retest (XXX)	retest when test data doubtful and/or too old.
use	describe application.

ANNEX F

STANDARD COMMENTS ON DECLARED MECHANICAL PARTS LISTS

agreed* or handwriten "√" in margin	Contractor comment (in Subcolumn 9.2) on list is agreed to by ESA
critical	Mechanical parts RFA sheets needed
C/Waiver	copy waiver to ESTEC/QM.
data sheet	provide ESTEC with a manufacturer's data sheet.
dust	may give particulate contamination.
finish	describe finish applied on part (thickness is to be indicated in some applications).
group	part not in the right group. Move at next issue.
OK	part is acceptable for the described use.
prev. c.	see previous comment and react.
ref.	give exact reference of the quoted test.
reject	(use: XXX).
RFA	Provide RFA to ESTEC/QM
same as XXX	same part as another Declared mechanical Parts Lists item.
sample (XXX)	provide ESTEC/QM with sample (XXX as for "test"), plus relevant documentation (part RFA, certificate of conformance etc.)
scc	part material sensitive to stress corrosion;provide ESTEC/QM with a stress-corrosion evaluation form (ESA-PSS-01-736).
temper	Heat treatment to be given for one of the pieces
test (XXX)	perform the test indicated between parentheses on the whole part or a piece of it.
retest (XXX)	retest when test data doubtful and/or too old.
use	describe application.

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ANNEX G

STANDARD COMMENTS ON DECLARED PROCESSES LIST

agreed* or handwriten "√" in margin	Contractor comment (in Subcolumn 9.2) on list is agreed to by ESA
critical	RFA/Process sheets needed or commitment to an ESA specification.
cross/R	indicate Declared Materials List items implied in the process.
C/Waiver	copy waiver to ESTEC/QM.
DML	process is sufficiently described in Declared Materials List (may disappear from Declared Processes List).
group	process not in the right group. Move at next issue.
hum.	process is sensitive to humidity conditions.
I/A	RFA/Process sheets requested.
identify	give correct process title/description.
material	process is OK. Material concerned is questionable or rejected.
OK	process is acceptable for the described application.
prev. c.	see previous comment and react.
PSS	indicate compliance with ESA specification (if noncompliance, RFA/Process sheets to be supplied).
Q.source	ESA-qualified source compulsory.
QC (XXX)	perform quality control test on each production batch (XXX as for "n, Sample").
ref.	give exact reference of quoted data.
reject	unacceptable process
RFA	Provide RFA to ESTEC/QM
same as XXX	same process as another Declared Processes List entry.

n, Sample (XXX) provide n sample to ESTEC/QM, plus relevant documentation for quality assessment of the process.

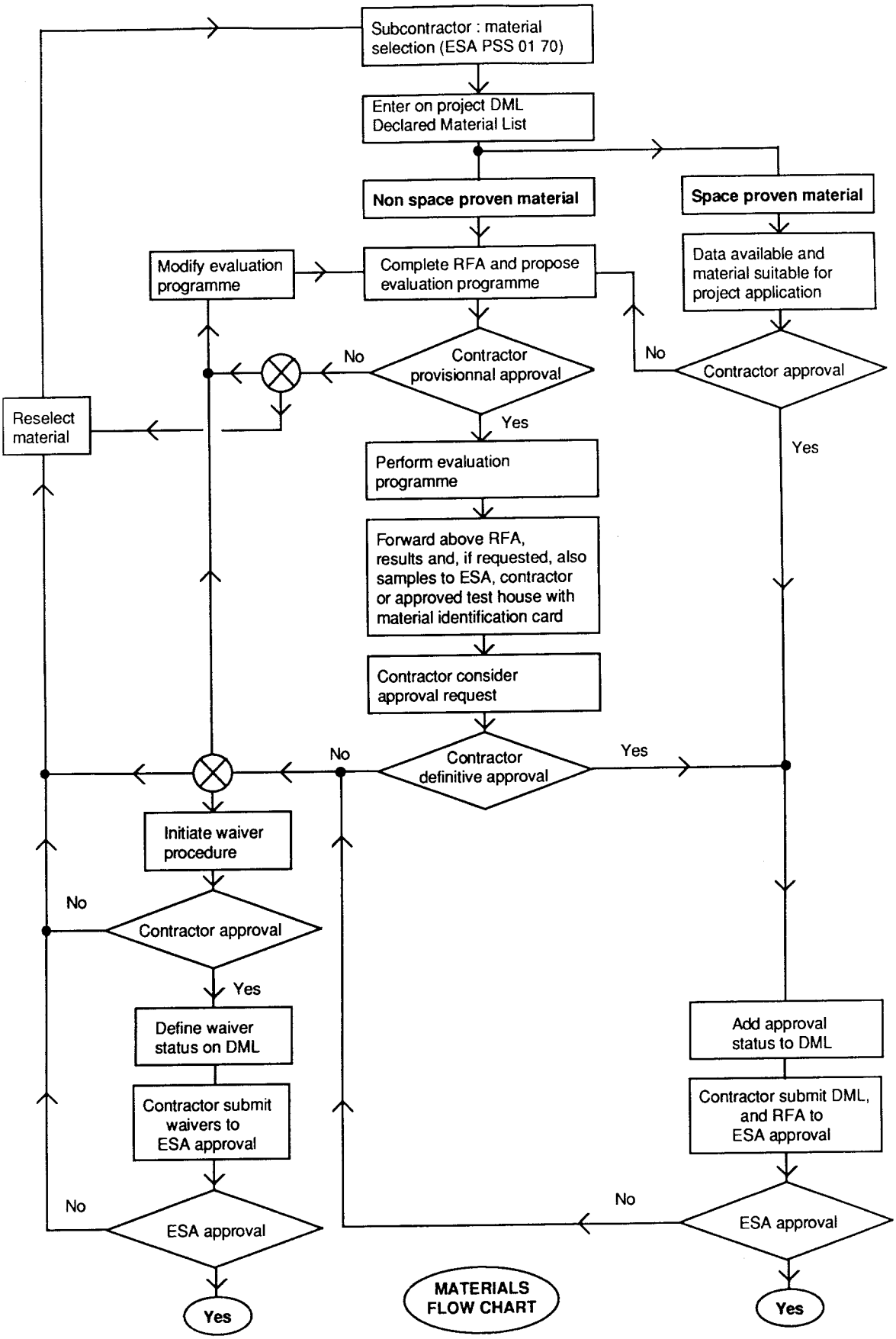
(XXX) = ADH (Adhesion testing)
MECH (mechanical properties)
SOLD (solderability)
TCY (Thermal cycling)
MICR (microscopy or metallography)
CHEM (chemical analysis)
THER (Thermal analysis)
etc.

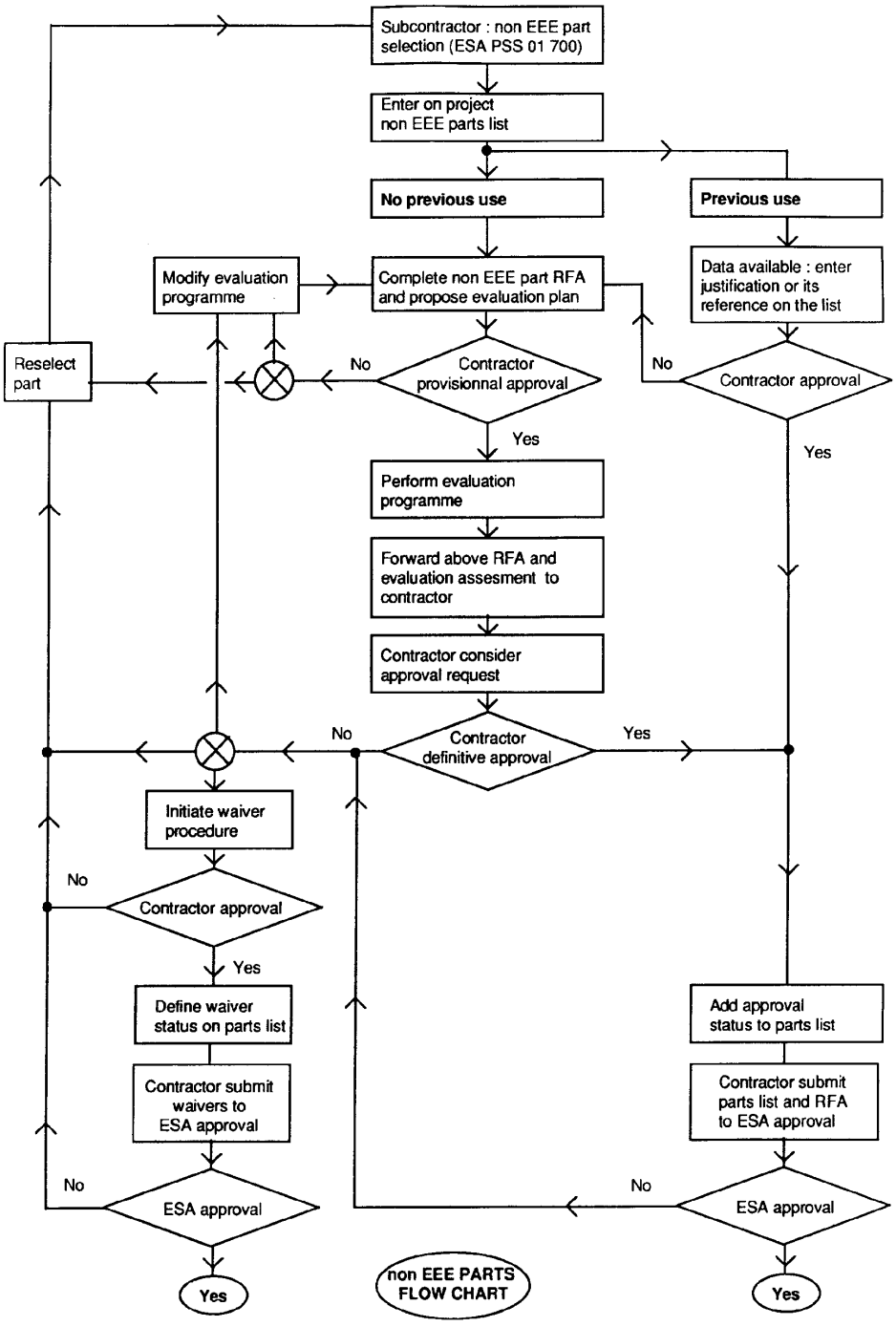
ANNEX H

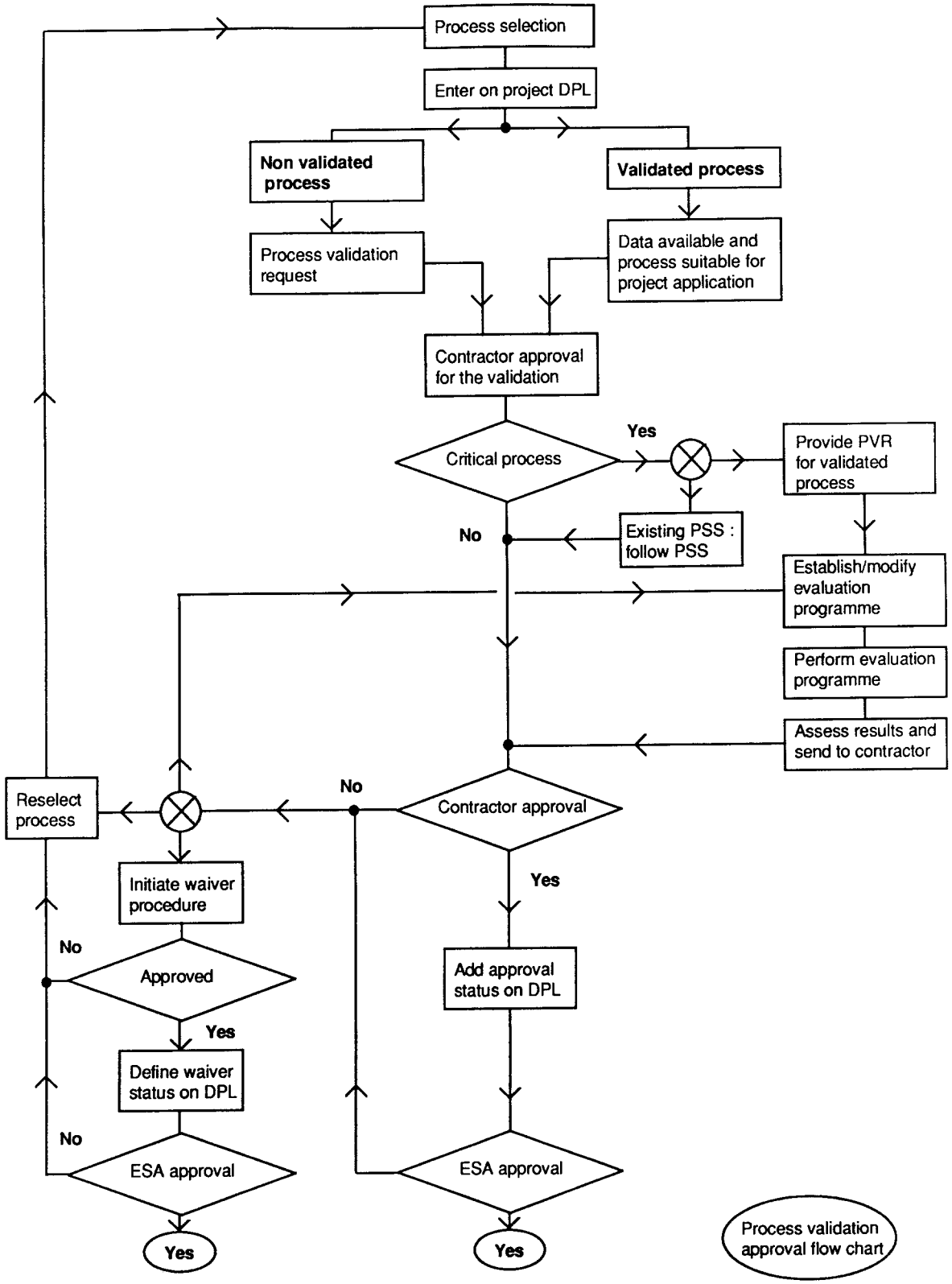
APPROVAL FLOW CHARTS

for

1. MATERIALS
2. MECHANICAL PARTS
3. PROCESSES


Subcontractor : material selection (ESA PSS 01 70)
Enter on project DML Declared Material List
Non space proven material
Space proven material
Modify evaluation programme
Complete RFA and propose evaluation programme
Data available and material suitable for project application
No
Contractor provisionnal approval
No
Contractor approval
Reselect material
Yes
Yes
Perform evaluation programme
Forward above RFA, results and, if requested, also samples to ESA, contractor or approved test house with material identification card
Contractor consider approval request
No
Contractor definitive approval
Yes
Initiate waiver procedure
No
Contractor approval
Yes
Define waiver status on DML
Contractor submit waivers to ESA approval
Add approval status to DML
Contractor submit DML, and RFA to ESA approval
No
ESA approval
No
ESA approval
Yes
Yes
MATERIALS FLOW CHART


Subcontractor : non EEE part selection (ESA PSS 01 700)
Enter on project non EEE parts list
No previous use
Previous use
Modify evaluation programme
Complete non EEE part RFA and propose evaluation plan
Data available : enter justification or its reference on the list
Reselect part
No
Contractor provisionnal approval
No
Contractor approval
Yes
Yes
Perform evaluation programme
Forward above RFA and evaluation assesment to contractor
Contractor consider approval request
No
Contractor definitive approval
Yes
Initiate waiver procedure
No
Contractor approval
Yes
Define waiver status on parts list
Add approval status to parts list
Contractor submit waivers to ESA approval
Contractor submit parts list and RFA to ESA approval
No
ESA approval
No
ESA approval
Yes
non EEE PARTS FLOW CHART
Yes


Process selection
Enter on project DPL
Non validated process
Validated process
Process validation request
Data available and process suitable for project application
Contractor approval for the validation
Critical process
Yes
Provide PVR for validated process
No
Existing PSS : follow PSS
Establish/modify evaluation programme
Perform evaluation programme
Assess results and send to contractor
Reselect process
No
Contractor approval
Initiate waiver procedure
Yes
No
Approved
Add approval status on DPL
Yes
Define waiver status on DPL
No
ESA approval
ESA approval
Yes
Yes
Process validation approval flow chart

ANNEX J

ESA PSS concerning materials, their tests and their processes

ESA PSS-01-201	Contamination and cleanliness control
ESA PSS-01-204	Particulate contamination control in clean rooms by particulate fallout (PFO) measurements
ESA PSS-01-702	A thermal vacuum test for the screening of space materials
ESA PSS-01-703	The black anodising of aluminium with inorganic dyes
ESA PSS-01-704	A thermal cycling test for the screening of space materials and processes
ESA PSS-01-705	The detection of organic contamination of surfaces by infrared spectroscopy
ESA PSS-01-706	The particle and ultraviolet (UV) radiation testing of space materials
ESA PSS-01-707	The evaluation and approval of automatic machine wave soldering for ESA spacecraft hardware
ESA PSS-01-708	The manual soldering of high-reliability electrical connections
ESA PSS-01-709	Measurement of thermo-optical properties of thermal control materials
ESA PSS-01-710	The qualification and procurement of two sided printed circuit boards (fused gold-plated or tin-lead finish)
ESA PSS-01-711	Product assurance requirements for Micro VCM-apparatus and associated equipment
ESA PSS-01-712	The oil impregnation of phenolic-resin-based materials used in the fabrication of ball bearing cages
ESA PSS-01-713	Measurement of the peel and pull-off strength of coatings and finishes with pressure-sensitive tapes
ESA PSS-01-718	The preparation, assemby and mounting of RF coaxial cables
ESA PSS-01-720	Determination of the susceptibility of silver-plated copper wire/cable to "red plague" corrosion

ESA PSS-01-721	Flammability testing for the screening of space materials
ESA PSS-01-722	The control of limited-life materials
ESA PSS-01-725	The application of the black paint Chemglaze Z306
ESA PSS-01-726	The crimping of high-reliability electrical connections
ESA PSS-01-727	The cleaning of ECCOSORB AN foam
ESA PSS-01-728	The repair and modification of printed-circuit board assemblies for space use
ESA PSS-01-729	The determination of offgassing products from materials and assembled articles to be used in manned space vehicle crew compartment
ESA PSS-01-730	The wire wrapping of high-reliability electrical connections
ESA PSS-01-732	The cleaning of GUDE-SPACE D96 tape
ESA PSS-01-733	The application of the thermal-control paint PYROLAC PSG120FD
ESA PSS-01-734	The application of the black electrically conductive coating Chemglaze H322
ESA PSS-01-735	The application of the black electrically conductive coating Chemglaze L300
ESA PSS-01-736	Material selection for controlling stress-corrosion cracking
ESA PSS-01-737	Determination of susceptibility of metals to stress-corrosion cracking
ESA PSS-01-738	High-reliability soldering for surface-mount and mixed technology printed-circuit boards
* ESA PSS-01-746	Aerospace fastener materials
ESA PSS-01-748	Requirements for ESA-approved skills training and certification (electronic assembly techniques)
NASA NHB 8060-1C	Flammability, odor and offgassing requirements and test procedures for materials in environments that support combustion.

* Not yet available