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# ***Introduction to the ECSS-Q-80B Standard***

*Space Software Product Assurance*

## Abstract

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*ECSS-Q-80B is the Standard for space software product assurance. This module introduces the participant to the Standard: its structure; its role in the overall context of space project engineering; the requirements for the implementation of a space software product assurance programme; the quality assurance requirements for both process and product; the organization of software documentation and the concept of tailoring as applied to the Standard.*

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# ***Status and Origins of the ECSS-Q-80B Standard***

## ECSS-Q-80 Status

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*ECSS-Q-80A      April 1996*  
*First approved issue*

*ECSS-Q-80B      Draft April 2000*  
*Intermediate draft applicable to several ESA projects*

*ECSS-Q-80B      Draft May 2002*  
*Submitted to Public Review*  
*Applicable to several ESA projects*


**ECSS-Q-80B      October 2003**  
**Currently approved issue**

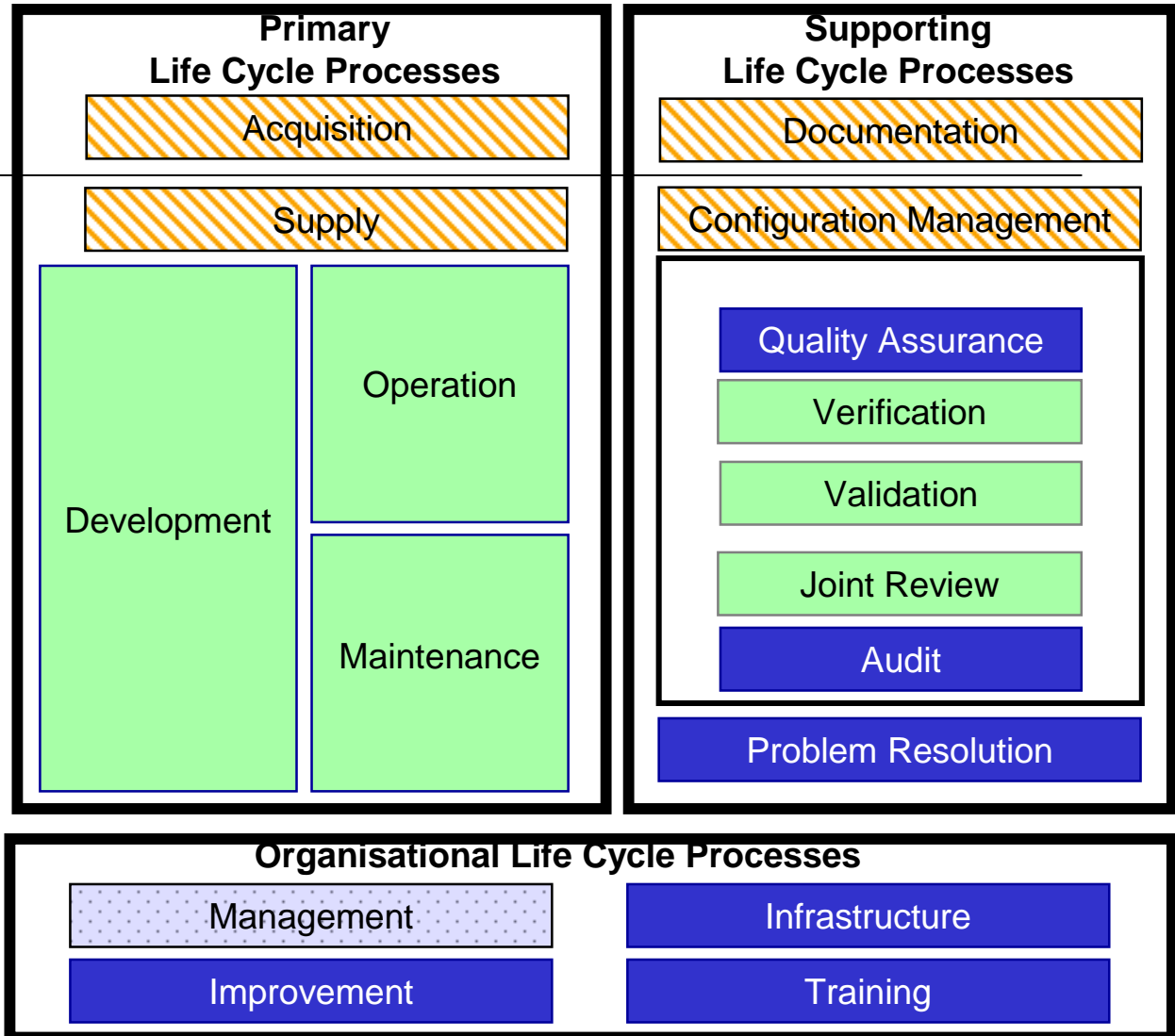
ECSS  
Covers the  
ISO / IEC  
12207  
Standard

Other ECSS 

E-40B 

Q-80B 

Details for SPA  
and/or SWE 



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# ***The Context and Objectives of Software Product Assurance***

## Definition of Software Product Assurance

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*A **Software Product** is a set of computer programs, procedures, documentation and their associated data*

***Software Product Assurance (SPA)** is the totality of activities, standards, controls and procedures in the lifetime of a software product which establishes confidence that the delivered software product, or software affecting the quality of the delivered product, conforms to customer requirements*

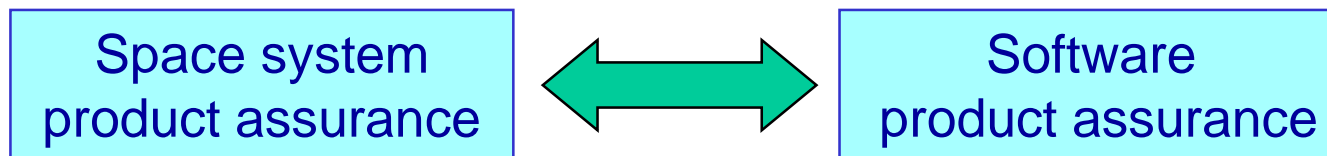
# The Objectives of Software Product Assurance

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- The objectives of software product assurance are to provide adequate confidence to the **customer** and to the **suppliers** that developed or reused software satisfies the requirements throughout the system lifetime
  - In particular the software is developed to perform **properly** and **safely** in the operational environment, while meeting the quality objectives agreed for the project
- SPA consists in both:
  - The assurance of the **process** (software process assurance)
  - The assurance of the quality of the **product** (software product quality assurance)

# The Context of Software Product Assurance

- **ECSS-Q-80B** context is the overall space system product assurance process and the space software engineering processes
- **ECSS-Q-80B** covers all aspects of space software product assurance, including the implementation aspects of the software product assurance process and both software process and product related assurance activities
- **ECSS-Q-80B** defines the scope of the SPA process and its interfaces with management, engineering, and other system level PA activities, which are addressed in the management (-M), engineering (-E) and product assurance (-Q) branches of ECSS standards, explaining how they relate to the software PA process

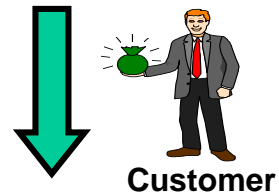
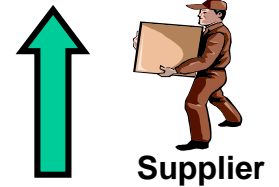
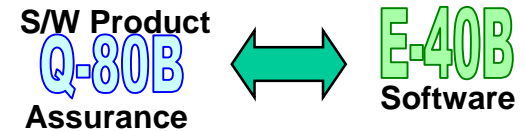


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# ***Key Concepts in the ECSS-Q-80B Standard***

# The Key concepts of the ECSS-Q-80B Standard

- The relation to the ECSS M-series, E-series and Q-series standards
- The recursive customer-supplier relationship
- Requirements and expected output
- Expected output and files
- Files and reviews
- The concept and considerations for tailoring



# The Relationship of Q-80B with the M-Series

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- The M-series standards define requirements applicable to management of all space projects
- Some of the M-standards are particularly relevant to PA of software projects
  - **ECSS-M-00** defines the terms “customer” and “supplier”
  - **ECSS-M-30** defines the phasing and planning with a system view of the entire project
  - **ECSS-M-40** defines configuration management requirements, whereas **ECSS-Q-80B** defines specific SPA activities for software CM
  - **ECSS-M-50** defines requirements to ensure coherence and accessibility of information to all parties of the project; **ECSS-Q-80B** defines SPA requirements for information/documentation management of the software

Policy &  
**M-00**  
Principles

Project Phasing  
**M-30**  
And Planning

Configuration  
**M-40**  
Management

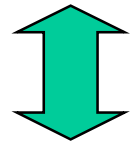
Info / Doc  
**M-50**  
Management

# The Relationship of Q-80B with the E-Series

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- Q-80B specifies SPA requirements on software engineering processes and product-related assurance over all the activities specified in **ECSS-E-40B**
- **ECSS-E-40B** covers all aspects of space software engineering from requirements definition to retirement
- Each of these two standards interfaces the other to its respective branch
  - The interface of **ECSS-Q-80B** to the ECSS-E branch is via **ECSS-E-40B**
  - Equally, the interface of **ECSS-E-40B** to the ECSS-Q branch is via **ECSS-Q-80B**
- Together the two standards either specify or refer to definition of all software relevant requirements for space projects

S/W Product  
**Q-80B**  
Assurance



**E-40B**  
Software

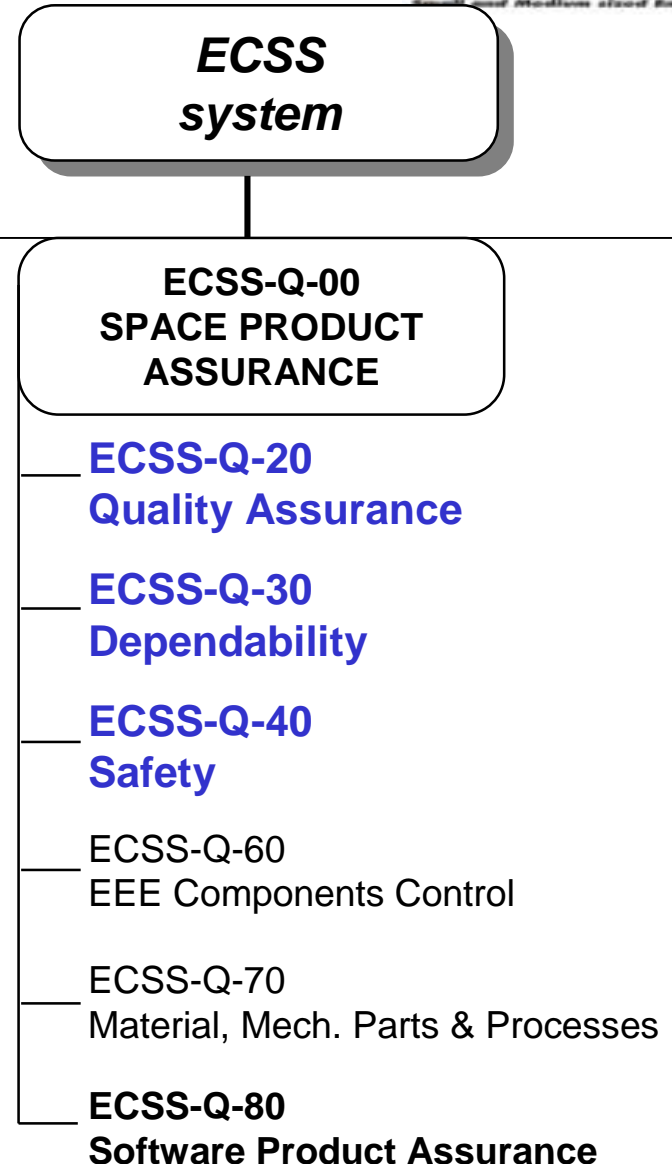
# The Key Q - Level-2 Standards

Quality  
**Q-20B**  
Assurance

**Q-30B**  
Dependability

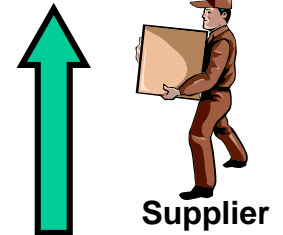
**Q-40B**  
Safety

*Three Level-2 standards in the Q-Series are particularly relevant to the Q-80B standard. Their presence in Q-80B is pervasive.*

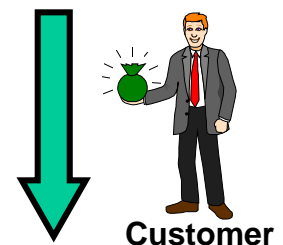


## The Recursive Customer-Supplier Relationship

- The concept of the customer-supplier relationship is applied **recursively**
- The software customer therefore has **two interfaces**
  - The customer has an interface to his **suppliers**
  - The customer has an interface to his own “higher-level” **customers**
- The **customer** ensures that the SPA requirements derived from Q-80 by tailoring process express his/her requirements completely and unambiguously
- The **supplier** demonstrates compliance with the SPA requirements and provides the specified evidence of compliance

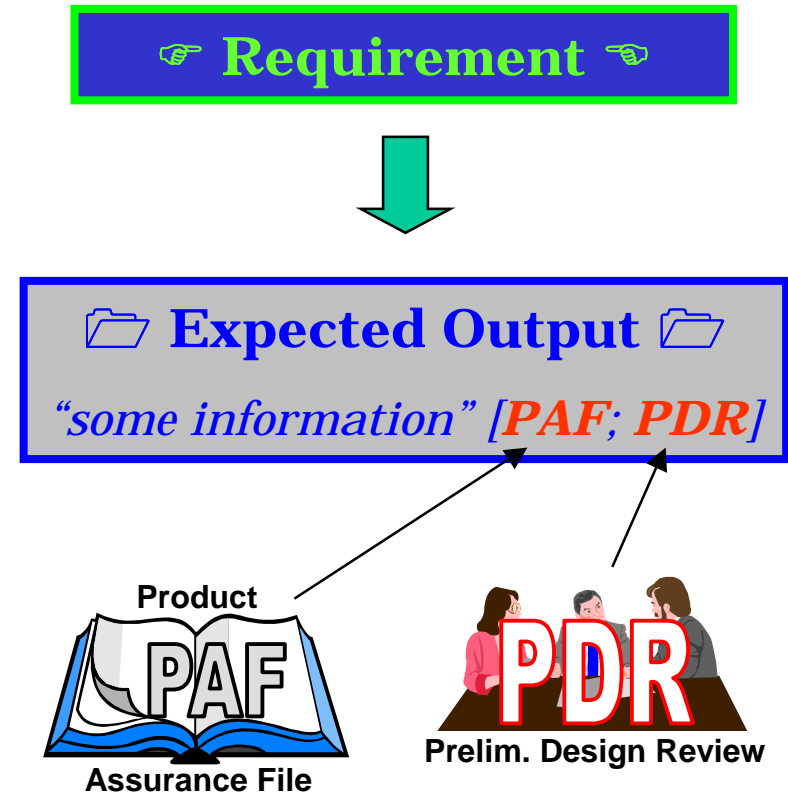


*Two  
roles*



# Requirements and Expected Outputs

- Each Q-80B **requirement** is identified by a hierarchical number
- For each requirement, the associated **Expected Output** is given in the relevant section.
- For each output, the **destination folder** of that output is indicated in brackets, together with the corresponding **reviews**



# Software Documentation

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Requirements Baseline



Technical Specification



Design Definition File



Justification File



Operational Documentation



Maintenance File



Management File



Assurance File

**Annex A** of ECSS-E-40 Part 1B summarizes the Expected Output of Q-80 requirements by milestone reviews

ECSS-E-40 Part 2B (**DRDs**) defines the expected structure of the main documents of each folder

## Considerations for Tailoring ECSS-Q-80B

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- There are several drivers for **tailoring Q-80B**, such as
  - dependability and safety aspects
  - software development constraints
  - product quality objectives and commercial consideration
- For each type of tailoring, different considerations:
  - **Tailoring for dependability and safety aspects** is based on the selection of requirements which are related to the verification, validation and levels of proofs demanded by the *critical software*.
  - **Tailoring for product quality objectives** requires the *customer* to specify the quality objectives for the product

*“One size does not fit all”*



*Tailoring is influenced by many drivers*

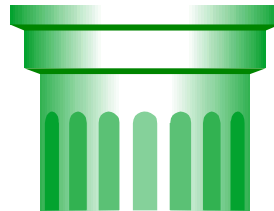
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# ***The Organisation of the ECSS-Q-80B Standard***

## The Three Pillars of the ECSS-Q-80B Standard

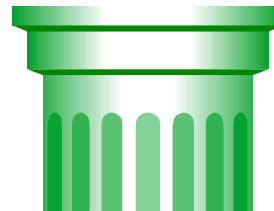
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**Software product assurance programme implementation**



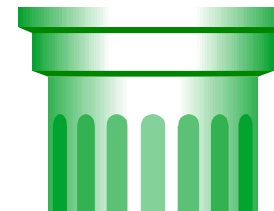
*Focus on issues in setting up and running an SPA programme*

**Software process assurance**



*Focus on adequate definition and execution of software engineering processes and activities*

**Software product quality assurance**



*Focus on software product quality requirement definitions and achievements*

# Structure of the ECSS-Q-80B Standard

## Software product assurance process implementation

5.2 Organisation and responsibility

5.3 Contractual aspects

5.4 SPA programme management

5.5 Risk management and critical item control

5.6 Supplier selection and control

5.7 Procurement

5.8 Tools and supporting environment

5.9 Assessment and improvement process

## Software process assurance

6.1 Software development life-cycle

6.2 Requirements applicable to all software engineering processes

6.3 Requirements applicable to individual software engineering processes or activities

## Software product quality assurance

7.1 Product quality objectives and metrication

7.2 Product quality requirements

7.3 Supporting documentation

7.4 Standard hardware for operational system

7.5 Firmware

## Summary

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- **ECSS-Q-80B** is the standard for space software product assurance.
- **ECSS-Q-80B** is organized into **three main parts**:
  1. Software product assurance programme implementation
  2. Software process assurance
  3. Software product quality assurance
- **ECSS-Q-80B** defines requirements in terms of **what shall be accomplished** rather than how to perform the work
- **ECSS-Q-80B** and **ECSS-E-40B** together specify or refer to definition of all software relevant requirements for space projects