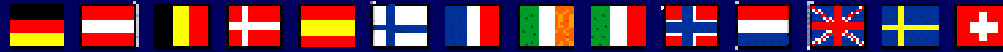


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Tailoring the E40-B Standard

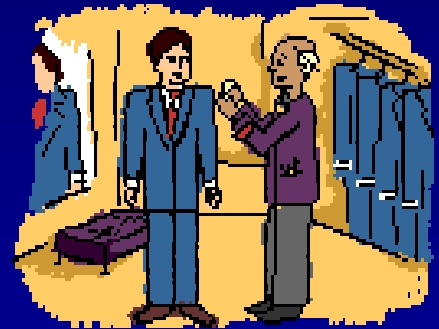
Abstract

Tailoring is one of the key concepts in the ECSS standards framework, and applies in full to the E-40B standard. After a brief introduction to the concept of tailoring, the approach to tailoring taken in E-40B is presented.

- tailoring all ECSS family for a big project*
- tailoring E40B: why, how, who*

What does Tailoring Mean?

- The Oxford English Dictionary defines the word **tailor** in the following ways:
 - ✧ “Tailor” (*noun*) – a maker of men’s clothes, especially to order
 - ✧ “Tailor” (*verb*) – to make clothes as a tailor, to make in a simple smoothly-fitting design
 - ✧ “Tailor” (*verb*) – **to make or adapt for a specific purpose**, as in “the new factory is tailored to our needs”
- The last definition is closest to the interpretation used in the ECSS standards
 - ✧ The concept of tailoring is not new with the ECSS standards
 - ✧ The concept appeared as early as the 1980s in the German V quality standards, and in the IEEE Software Engineering standards



The Nine General Principles of Tailoring

1. Identification of Applicable Standards
2. Establishment of applicable requirements
3. Tailoring at all levels
4. A systematic tailoring method
5. Tailoring is performed for each phase
6. Overall programme requirements always considered
7. Exceptional mandatory requirements (no waiver at any level)
8. Introduction of new requirements (if any, must be justified)
9. Harmonize selected requirements

The overall Tailoring process (M-00-02)

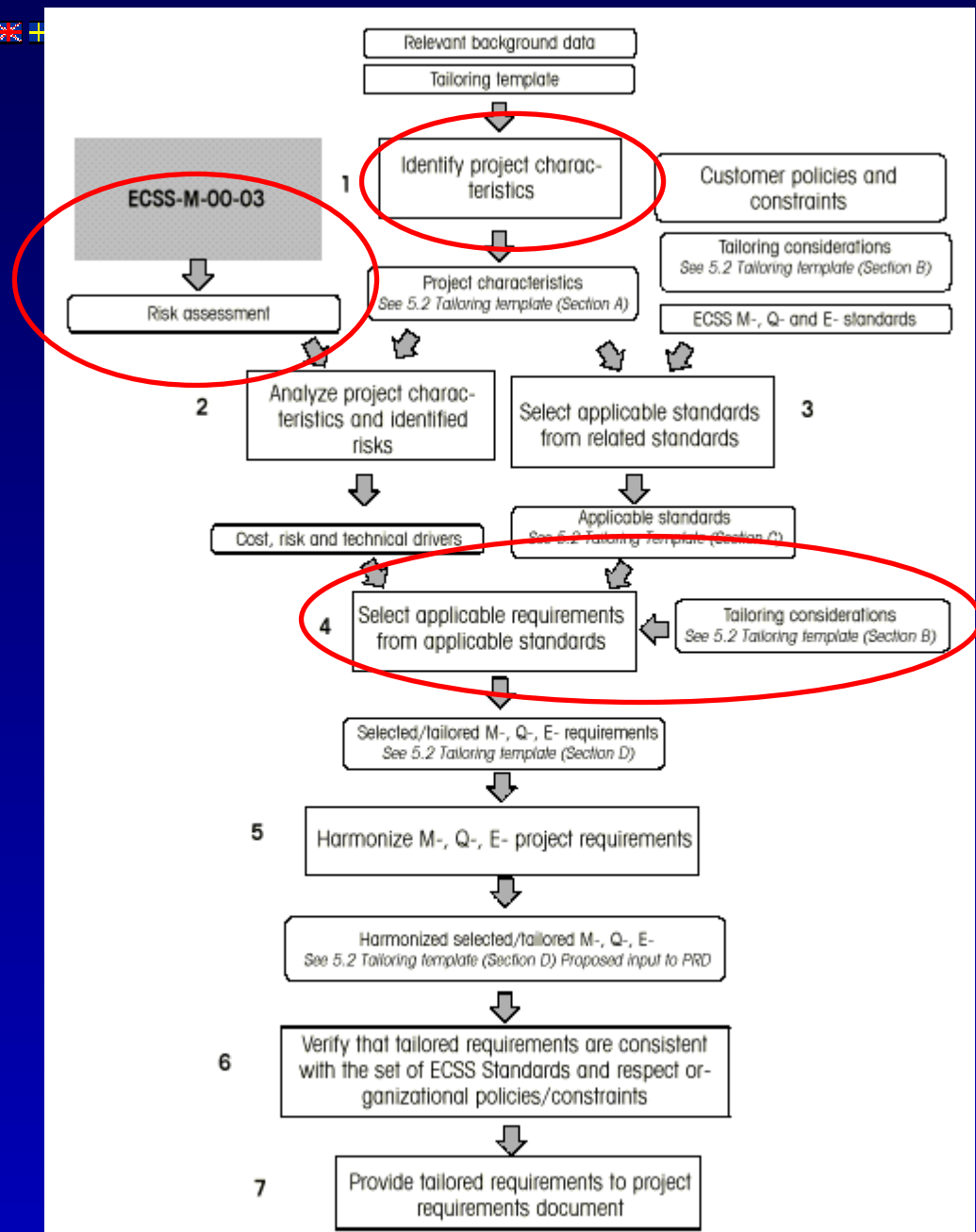
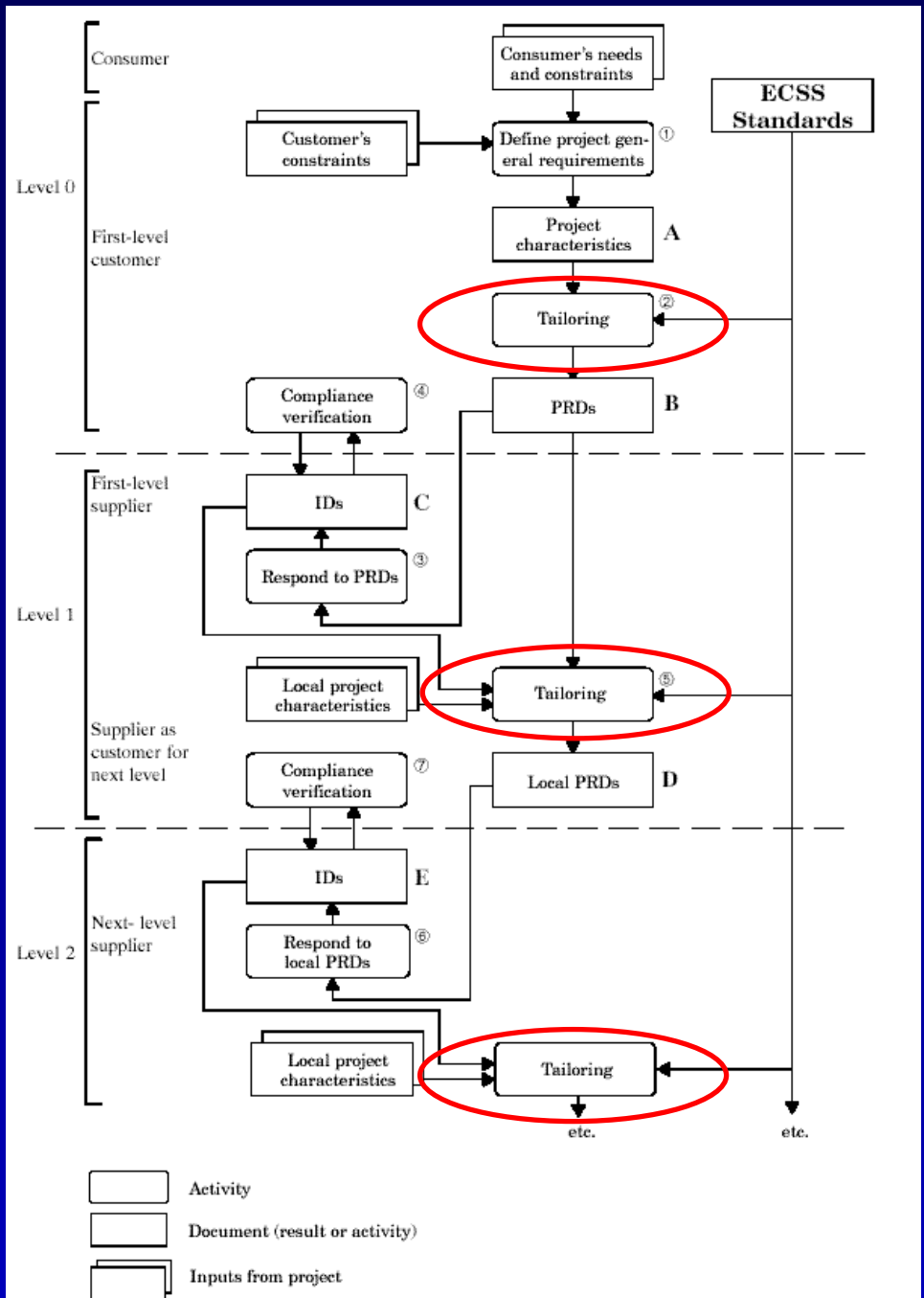


Figure 1: Tailoring process flowchart

The recursive Tailoring Process in the Customer-Supplier Hierarchy (M-00)



Tailoring E40B

Introduction to Tailoring E-40B

- ❑ The ECSS-E-40B lists **exhaustively** the requirements for the **best practices** in space software engineering
 - ✧ that is, it covers *all possible types* of space software engineering projects
- ❑ Therefore, E-40B must also be tailored for each individual project
 - ✧ Focus the effort, target the budget

*Tailoring
guidelines
for E-40B*



E-40B

Software

E-40B
C.1

Introduction to Tailoring E-40B

□ Benefits:

- ✧ to **help** the customer to prepare the project
- ✧ to verify the **completeness** of the statement of work,
- ✧ to **clarify** the software project to the suppliers/bidders
- ✧ to **help** making better (or evaluating) proposals

*Tailoring
guidelines
for E-40B*



E-40B

Software

E-40B
C.1

Contents of E-40B Annex C

Annex C: Tailoring Guidelines

C.1 Introduction

C.2 How to tailor

C.3 Who tailors?

Tailoring Software Engineering Projects

- The first step is to understand the requested **level of quality** for the project. This involves
 - ✧ the characterization of the *project*
 - ✧ the characterization of the *product*
 - ✧ the identification of the needed *processes*

- We have seen that M-00-02 provides an example set of **tailoring considerations** for programmatic and technical factors
 - ✧ but they are generic



“What are the tailoring factors for my software project”?

- *technical*
- *operational*
- *management*

Technical Tailoring Factors for E-40B

Some examples:

- Novelty of the domain of application
- Complexity of the software and the system
- Criticality level
- Size of the software
- Reusability required of the software being developed
- Interface to system development projects
- Degree of use of COTS or existing software
- Maturity of the COTS and completeness or stability of the user requirements
- Nature of the software (embedded, real-time, ...)
- ... etc.

Operational Tailoring Factors for E-40B

Some examples:

- Type of application (platform, payload, experiment)
- Number of potential users of the software
- Criticality of the software as measured by the consequences of its failure
- Expected lifetime of the software
- Number of sites where the software is used
- Operation, maintenance, migration, and retirement constraints
- ... etc.

Management Tailoring Factors for E-40B

Some examples:

- Amount of time and effort required to develop the software
- Budget requirements for implementing and operating the software
- Accepted risk level of the project
- Type of life-cycle
- Schedule requirements for delivering the software
- Number of people needed to develop, operate and maintain the SW
- Complexity of the organisation
- Experience of the potential supplier
- Financial resources
- ... etc.

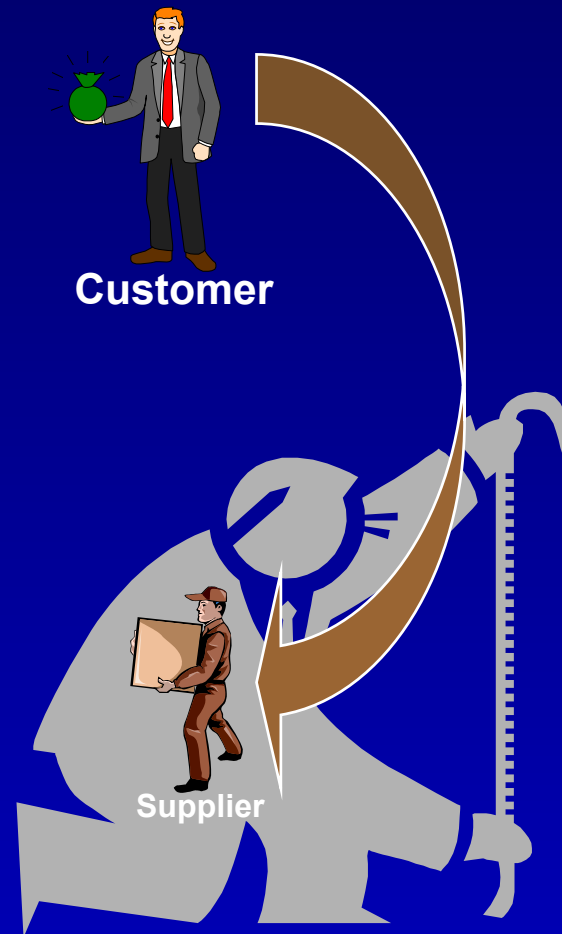
Responsibility for E-40B Tailoring

- ❑ The tailoring of E-40B is implicitly a task of the **Customer**
 - ✧ just as specified in the M-00-02 standard for general tailoring of ECSS Standards
 - ✧ since the project requirements generally fall under the responsibility of the Customer, this is natural and appropriate
- ❑ When preparing the Invitation to Tender, the Customer may propose a tailored version of E-40B
 - ✧ as an indication of the level of software engineering required for the project



The Supplier Participates in Tailoring

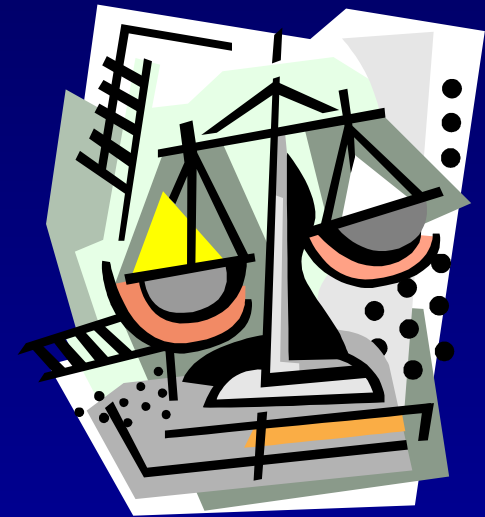
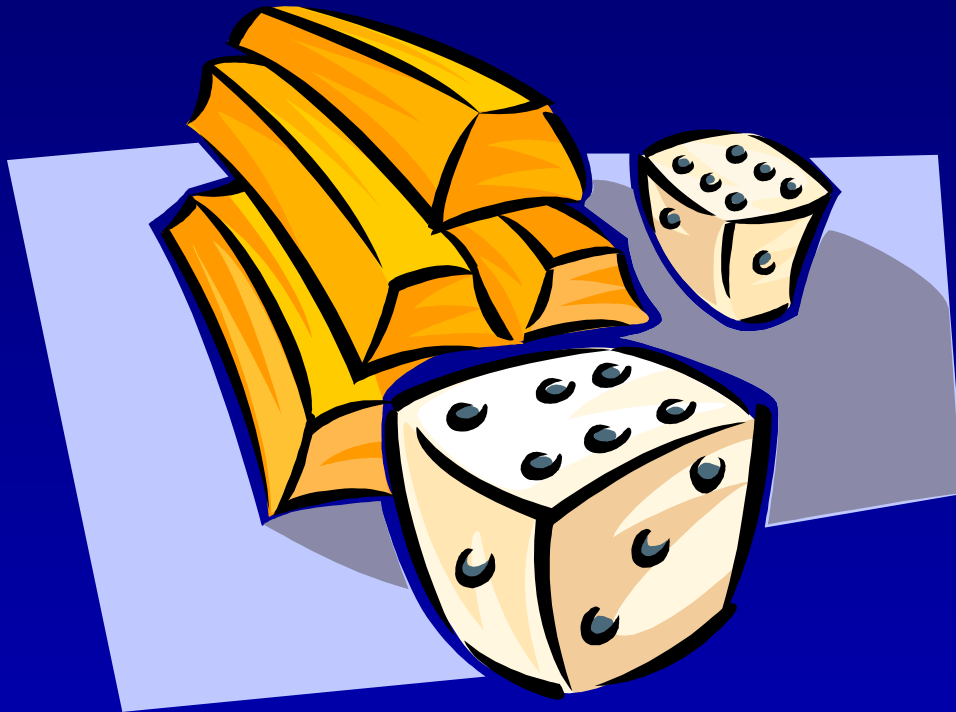
- ❑ The **Supplier** will also have to participate in the tailoring process
 - ✧ Why? Because some of the tailoring factors (e.g. criticality or detailed design complexity) may only be known after the grant of the contract
- ❑ The Customer may also **subcontract** the tailoring to the Supplier, then review and accept the tailored version



The customer may also choose to subcontract the tailoring to the Supplier

Risk Tradeoff in Tailoring the E-40B

RISK !!!



TRADE OFF !!!

M-00B
4.4

Documenting the Results of Tailoring

- Each subclause is reviewed, on the basis of the identified factors at project level
 - ✦ producing a **tailoring table** listing which requirements are applicable

- The tailoring process results in a short document including
 - ✦ the project characteristics (as a justification for the tailoring)
 - ✦ the tailoring table

- The tailoring document is baselined in the **Requirements Baseline** and reviewed at the **System Requirements Review**



E40 Tailoring tool:

<http://www.estec.esa.nl/wmwww/EME/ecss/ecss.htm>

Tailoring Exercises

Tailoring Exercise 1

ON-BOARD SOFTWARE:
a slight adaptation of E40

Exercise 1: On-Board Software

- ❑ A prime of a satellite is preparing the RFQ to subcontract the on-board Data Handling software (Phase C), also called ASW (Application Software).
- ❑ The software is not directly interfacing the Hardware but the customer provides the interfacing software layer (BSW Basic Software).
- ❑ If the software misses a telecommand, the satellite can be lost. This was demonstrated by a system FMECA.
- ❑ In order to fit the schedule, the sub-contractor shall incrementally deliver the system in 3 versions (V0, V1, V2).
- ❑ The ASW needs a user manual to clarify how it works, what are its mode of operation, the behaviour of some telecommands, etc. The satellite will be operated by ESOC.

Tailoring Exercise 2

CAD TOOL:

a severe tailoring of E40

Exercise 2: CAD Tool

- The customer, a mechanical company developing telecommunication payloads, needs a tool to model in 3D some microwave guides of various shapes, and to model the propagation of the waves into the guides.
- He has also other tools doing similar things, and he would like that the new tool has more or less the same ergonomics. He has no more requirements, but would like to make sure that the Supplier has well understood the needs before developing the tool.
- He will distribute the tool to 50 users all around Europe, he does not want any bug in the tool that might ruin his reputation.
- The tool runs under Windows and comes on a CD-ROM with a Setup.exe to install it and a User Manual.

Summary

- ❑ Tailoring is a fundamental aspect of using the ECSS standards in an **efficient** way
 - ✧ Help the Customer preparing the project
 - ✧ Help the Supplier bidding and executing the project

- ❑ Annex C is the primary source of information on the proper approach to tailoring to be taken with respect to the E-40B standard
 - ➔ *but requires thinking and adaptation*
 - ✧ *Characterize the project*
 - ✧ *Evaluate the risk of waiving requirements*
 - ✧ *Evaluate each requirement*