ECSS Space project management standards

Presented by
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The object of this session

What this session is about…

This is a session on "Project management **standardization**"

What this session is NOT about

This session is NOT about "Project management techniques"

What is the difference?…

A clue: ECSS standards are for **use in contracts**…

The approach followed

After a brief introduction to project management:

- An "ECSS universal principle" will be introduced
  - In this presentation it is called the "**ODSI**" principle
- Then the M books "will be open", to confirm how much this principle is applied

Therefore, the objective of this presentation is

- To familiarize with the content of the ECSS-M standards
- To be able to quickly identify key requirements

Table of Content

1 - Introduction – PM activities

Project Management Functions

What is Project Management, and why is it needed?

- Project Management is an integrated process for documenting, monitoring, and controlling complex projects from conception, through design, development, manufacturing, operations and disposal (i.e. throughout the life cycle of a project)

PM is about documenting, monitoring & controlling… (everybody involved)

During all Project Phases (from A to F)

the actors of the ECSS M standards are
all the personnel involved in the project
top-down and from Phase A to F
coordinated by the project management team

- The key objective of any Project Management system is to continuously **"keep in balance" 4 key parameters** common to all projects. These are:
  - **Project Risk**
  - **Project Scope**
  - **Project Schedule**
  - **Project Cost**

1 - Introduction – PM activities

Project Management Overview

- These 4 key parameters (**Risk, Scope, Schedule, Cost**) are directly linked to each other and interact continuously throughout the project life cycle. Any change in any one of the 4 will automatically have an impact on at least one of the other three

- For example, the measures needed to resolve an unforeseen problem can easily lead to one, several, or all the following:
  - need for additional resources to correct the problem
  - modifications to the scope
  - a change in the perceived risk associated with the project
  - a need to extend the project schedule

- Any, or all of the above will have an impact on cost

The 4 parameters cannot be improved all at the same time

1 - Introduction – PM activities

Project Management – Project Content & Schedule

- **The scope** of a project essentially comprises:
  - the **products and services** to be delivered by the project
  - the **facilities and resources** needed to create products and services
  - a **detailed breakdown of all of the major tasks** to be performed to implement the project

- **The schedule** of a project is the accumulated **time needed** to:
  - Phase A: Establish the project objectives, define the Mission Statement and Organise the project
  - Phase B, C & D: Design, develop, manufacture, qualify and deliver the project's products, based on detailed planning and a logical flow of all tasks to be completed, within the available resources and facilities
  - Phase E: Utilise the project deliverables during their operational lifetime
  - Phase F: Safely dispose of project products at their end of life

1 - Introduction – PM activities

Project Management – Project Cost

- **The cost** of a project is the **total cost incurred** during the life cycle of the project for all:
  - Parts, materials and services
  - Labour
  - Facilities
  - External support
  - Launch, operations and disposal
  - Any other unforeseen expenditures needed to complete the project within the allocated timescale

1 - Introduction – PM activities

Project Management – Project Risk

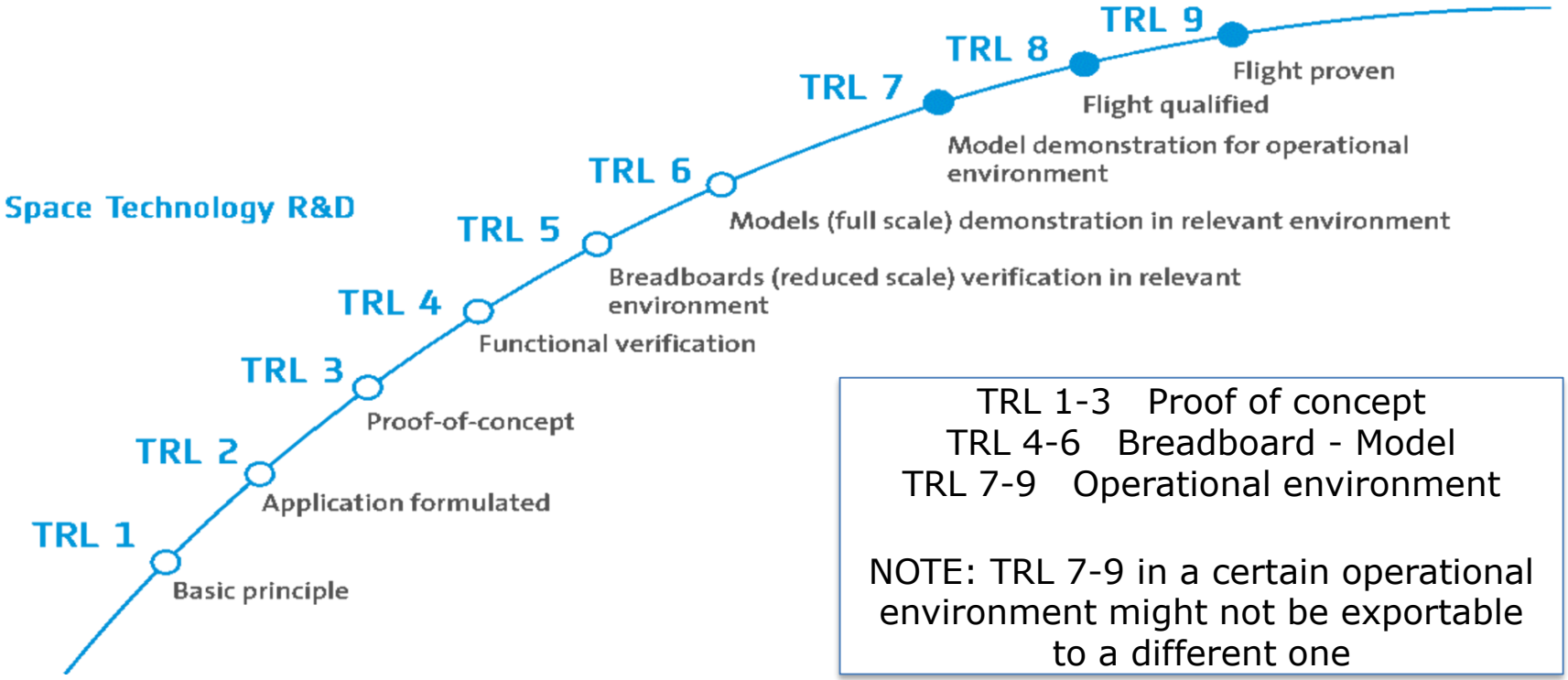
- **The risk** associated with implementing a project has to be determined very early in setting up the project
- This level of perceived risk is based on an assessment of:
  - the **complexity** of the project (including comparisons with similar projects)
  - the **technology** to be used → TRL is an useful tool
  - any **known constraints** or limitations to be imposed
  - any **other factors** that may apply
- The initial risk assessment is one key input for finalising the project content, schedule and funding, including any reserves considered necessary
- Errors in initial risk assessment are likely to lead to cost and schedule increase beyond the margin planned

Technology Readiness Level used by project managers assessed by engineering team Is covered in the E-10 "System Engineering"

acceptable level of risk needs to be known to do the tailoring

before selecting prime

Technology Readiness Level (TRL)

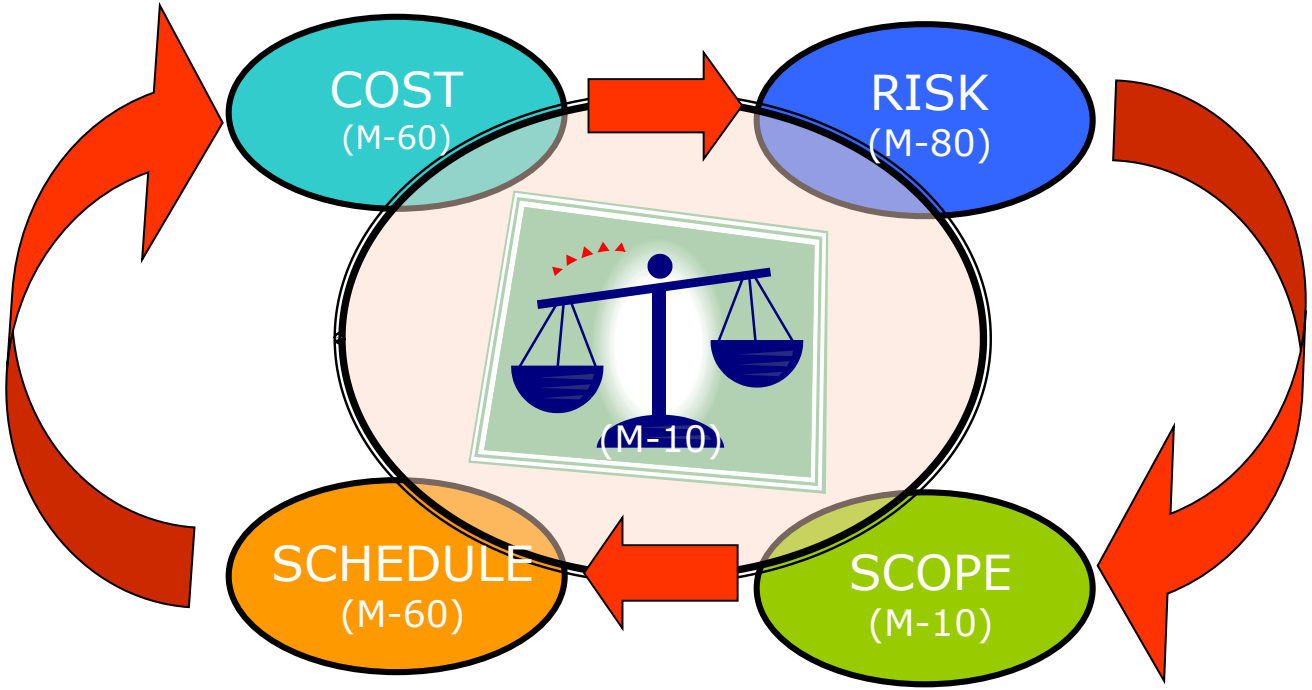


TRL 1-3 Proof of concept
TRL 4-6 Breadboard - Model
TRL 7-9 Operational environment

NOTE: TRL 7-9 in a certain operational environment might not be exportable to a different one

1 - Introduction – PM activities

Project Management – Interaction & Balance



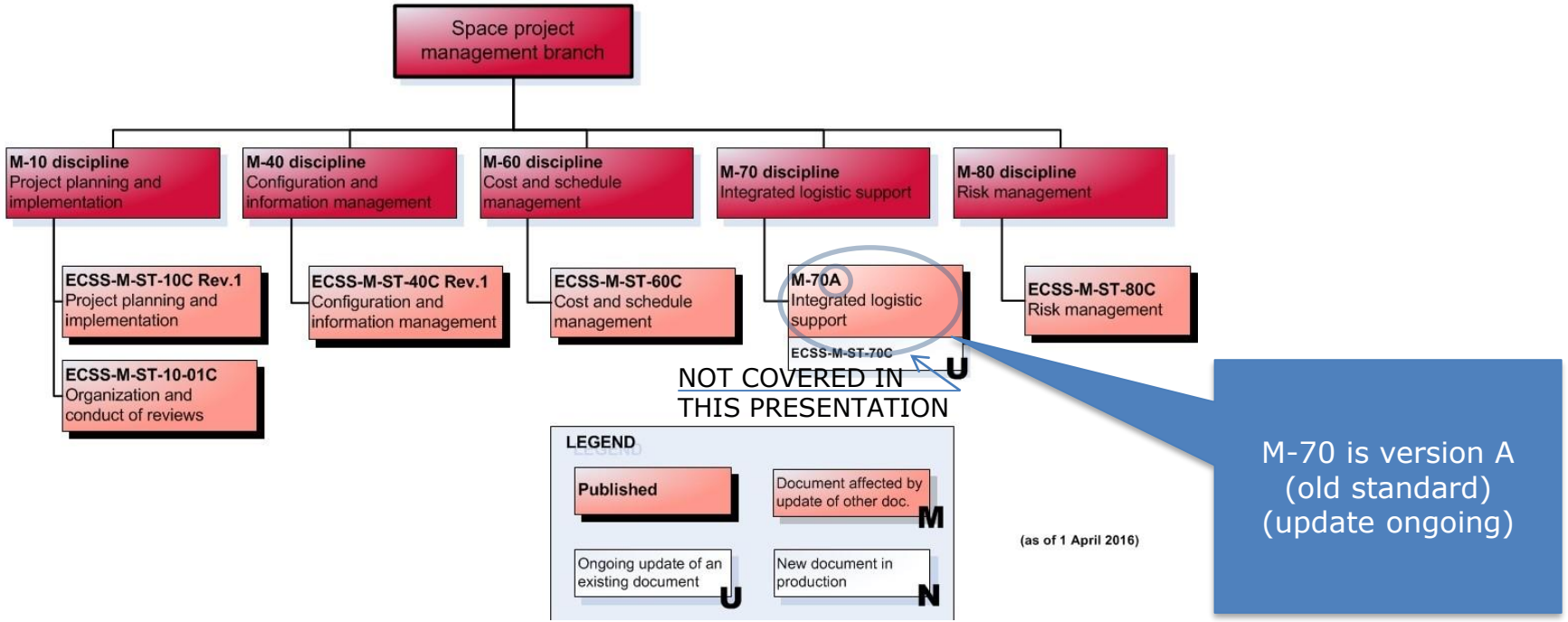
PM

cannot improve the 4 parameters at the same time

but it can keep them in balance

2 – ECSS-M structure & approach

ECSS Management Tree



2 – ECSS-M structure & approach

ECSS Management disciplines description (1/3)

Discipline	Title & (Document)	Scope / Objective
M-10	Project Planning and Implementation (ECSS-M-ST-10 and ECSS-M-ST-10-01)	Set of processes/requirements for *minimizing* technical, scheduling and economic *risks* of the project In particular this is done by: • introducing **phases and formal milestones** • defining **project breakdown structures**, used as unique reference system for the project to: • identify the **tasks and responsibilities** of each actor • ensure the **coherence between all activities** (technical, documentary, administrative and financial) of the whole project • perform **scheduling and costing** activities • setting up a **project organization** to implement a structured and complete approach to perform all necessary activities on the project

2 – ECSS-M structure & approach

ECSS Management disciplines description (2/3)

Discipline	Title & (Document)	Scope / Objective
M-40	Configuration and Information Management (ECSS-M-ST-40)	Set of processes for: • identifying, describing and controlling the **technical description of a system** in a logical and consistent manner throughout the system's life cycle • ensuring that the **information** necessary for execution of all management processes is recorded, retrieved, distributed, modified and used in a traceable manner
M-60	Cost and Schedule Management (ECSS-M-ST-60)	Set of processes for verifying the compliance of project planning and organization ➔ to ensure the **consistent use of resources** (human, facilities, materials and funds) ➔ to complete the space project within its established goals: costs, schedule and performance Provides alerts to trigger necessary adaptations (e.g. re-planning, resource reallocation, …)

2 – ECSS-M structure & approach

ECSS Management disciplines description (3/3)

Discipline	Document & Title	Scope / Objective
M-70	Integrated Logistic support (ILS)	NOT COVERED IN THIS PRESENTATION
M-80	Risk Management (ECSS-M-ST-80)	Risk management discipline • identifies all risks (including new opportunities) • **keeps these risks within defined and accepted boundaries** that are defined in the risk policy of the project Risk management encompasses **all aspects of the programme** including: • Technical and Quality performance • Programmatic (e.g. funding, political environment) • Cost (e.g. contract type, project cost) • Schedule and Operation (e.g. logistic support, security)

2 – ECSS-M structure & approach

A map of the contents of ECSS-M standards

	Clauses									Annexes		Bib
	1	2	3	4	5	6	7	8	9	Normative (DRDs)	Informative	
M-ST-10C	SCOPE		Terms and definitions	#	@					@ 5 DRDs	3	BIBLIOGRAPHY
M-ST-10-01C		Normative References		#	@					@ 4DRDs	2	
M-ST-40C				#	@					@ 10 DRDs	3	
M-ST-60C				#	#	#	@	@	@	@ 15 DRDs	3	
M-ST-70C				#	@	@	@	@				
M-ST-80C				#	#	#	@			@ 3 DRDs	2	

Informative Normative

Principles @ Requirements

Note that Clauses 4
(and for M-ST-60 and M-ST-80, also Clauses 5 and 6)
describe the principles, i.e.
how the activities are performed in a typical project

2 – ECSS-M structure & approach

General approach followed in ECSS-M standards (1/2)

- Many high level requirements (mainly in the 5 Level-2 standards) are drafted following the "**ODSI**" principle:

  a. – **O**rganize yourself in your own way
  b. – **D**ocument how you have organized yourself
  c. – **S**ubmit this document to your customer for approval
  d. – **I**mplement this organization (once approved)

- This philosophy is very convenient for already established suppliers, but newcomers may have difficulties in understanding what it is required from them. To help them, some information is available. Therefore, the ODSI principle can be extended to:

  e. – If you don't know how to comply with a. above [**O**rganise], informative material may be available in Chapter 4, informative annexes or handbooks.

2 – ECSS-M structure & approach

General approach followed in ECSS-M standards (2/2)

- This "To document" normally implies that a **DRD** is required
- Approval by the customer is important for 2 reasons:
  - To ensure correctness
  - To ensure consistency through the whole project
- Example: M-ST-10C "Project planning and implementation, # 5.1.3:

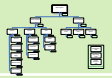
h. "The supplier shall establish the Work Breakdown Structure (WBS) for his work share incorporating the WBS of his lower tier suppliers in conformance with Annex C DRD (Work breakdown structures)

k. The WBS shall be subject to customer approval"

In the next slides, anything with the background in green is following this ODSI principle

3 - ECSS M-standards content

M-ST-10: Project Planning & Implementation

Clause & Req	Content of the requirements	DRD (Annex)	Supporting information
5.1 Project planning			
5.1.1	Tailoring by the customer	-	Will be described in S-ST-00-02
5.1.2	Project management Plan (PMP)	A	General guidelines in 4.1
5.2 Project organization			
5.2.1	Organization structure	Part of PMP	General guidelines in 4.2.1 & 4.2.2
5.2.2	Communication & reporting		General guidelines in 4.2.3
5.2.3	Audits		*Basic* guidelines in 4.2.4
5.3 Project breakdown structures			
5.3 a to g	Product tree	B	4.3.4 
5.3 h to l	Work Breakdown Structures (WBS)	C	4.3.5, Annex H NOTE: WBS refers to Functional responsibilities 
5.3 m to o	Work Packages (WP) Descriptions	D	4.3.6 NOTE: A WP is any WBS element(s) that can be measured and managed for planning, monitoring and control
5.3 p to r	Organization Breakdown Structure (OBS)	Part of WBS	4.3.7 NOTE: OBS refers to responsible parties for each work package in the WBS.
5.4 Project phasing			
5.4 a to d	Project phases & reviews (including criteria to next phase)	-	4.4 

3 - ECSS M-standards content

M-ST-10 "Project Planning & Implementation" – Supporting material (1/4)

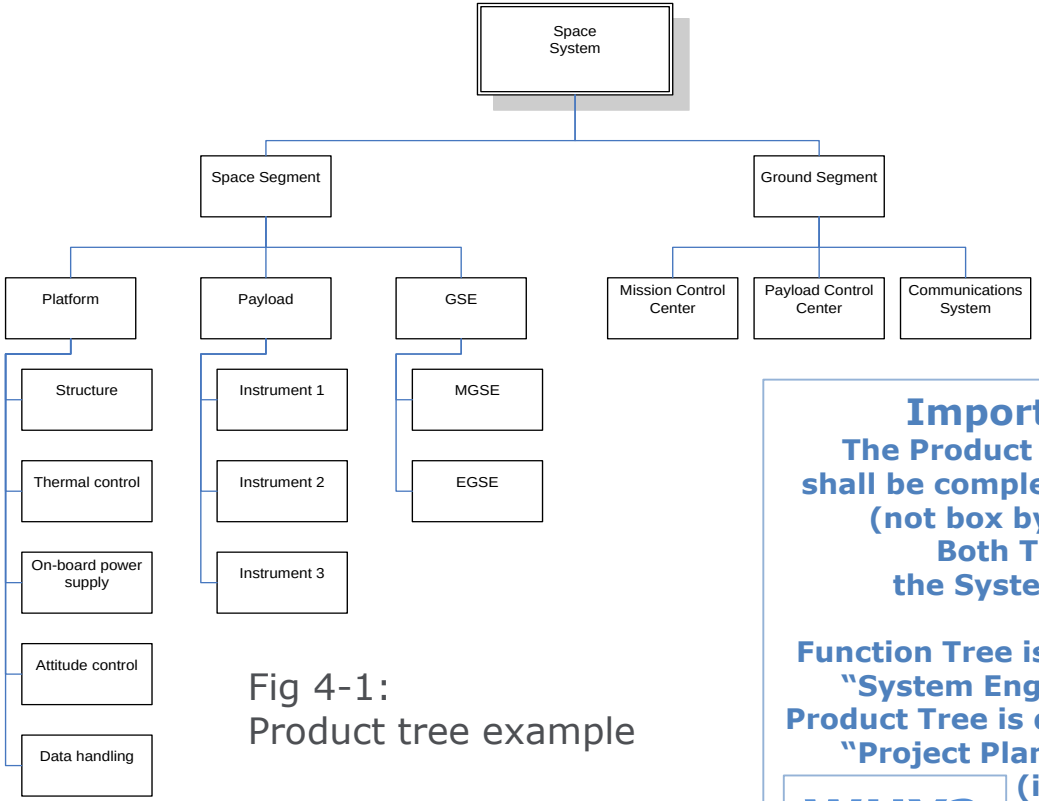


Fig 4-1:
Product tree example

Important consideration

The Product Tree and the Function Tree shall be completely mapped one to the other (not box by box, but many to many)
Both Trees are produced by the System Engineering Function

Function Tree is described by DRD in E-ST-10 "System Engineering" (in the E branch)
Product Tree is described by a DRD in M-ST-10 "Project Planning and Implementation" (in the M branch)

WHY?

3 - ECSS M-standards content

M-ST-10 "Project Planning & Implementation" – Supporting material (2/4)

Important consideration

The WBS is fully based on the product tree

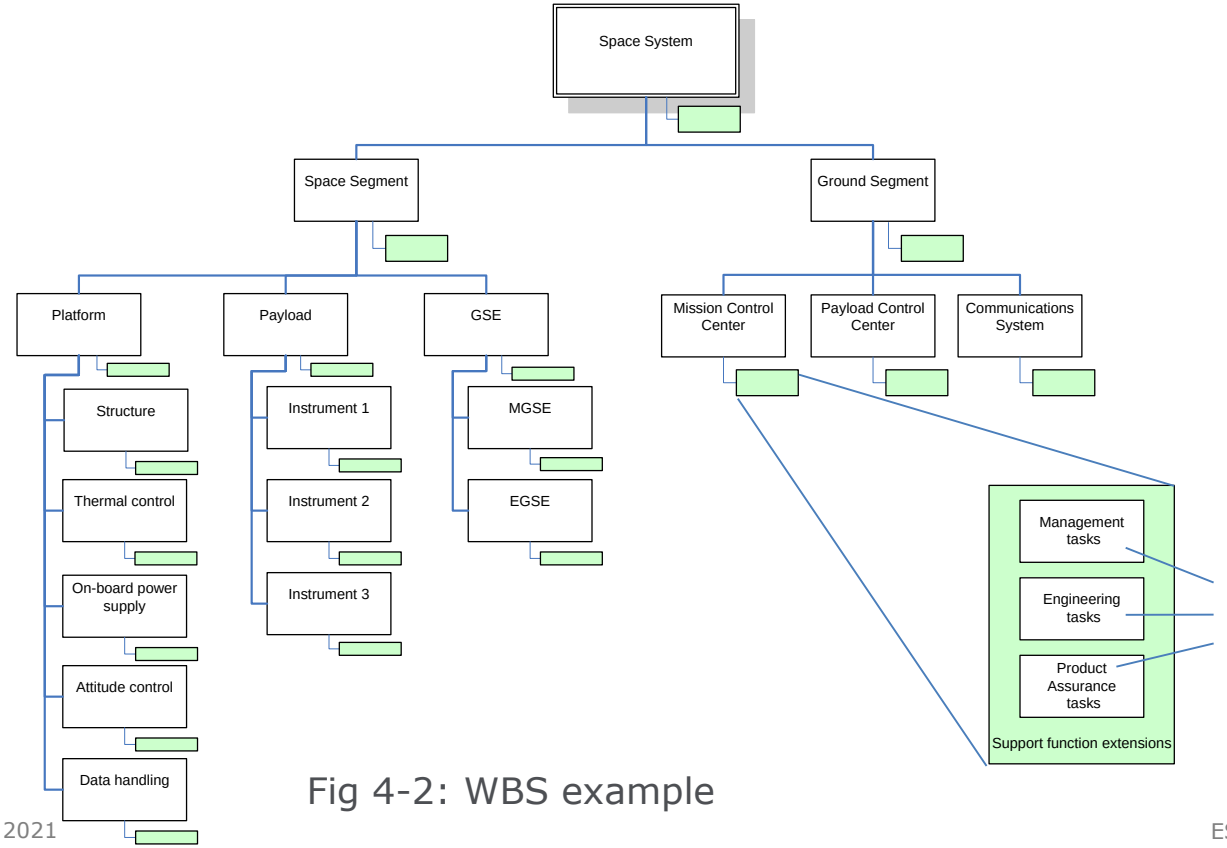


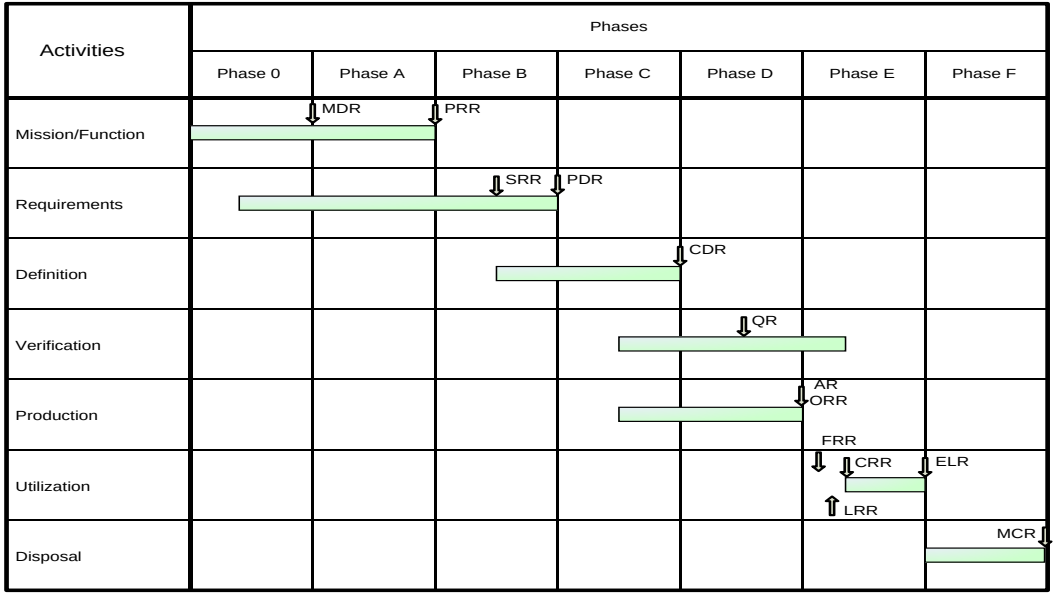
Fig 4-2: WBS example

3 - ECSS M-standards content

M-ST-10 "Project Planning & Implementation" – Supporting material (3/4)

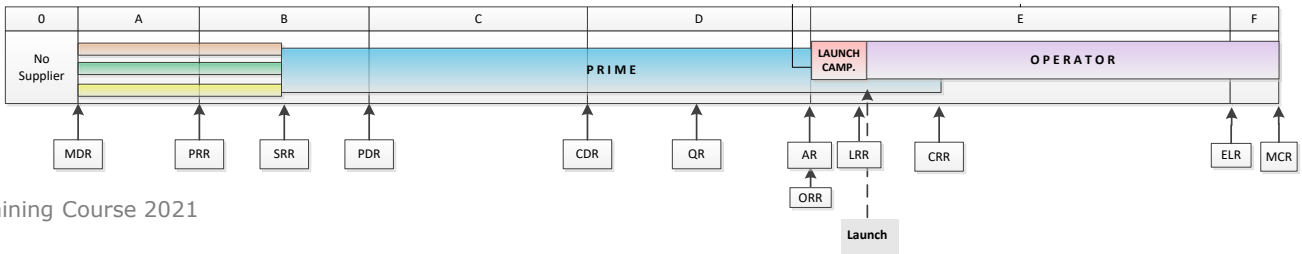
REVIEWS

- MDR=Mission Definition
- PRR=Preliminary req.
- SRR=System req.
- PDR=Preliminary design
- CDR=Critical design
- QR=Qualification
- AR=Acceptance
- ORR=Operational readiness
- FRR=Flight readiness
- LRR=Launch readiness
- CRR=Commissioning result
- ELR=End-of-life
- MCR=Mission close-out



PHASES

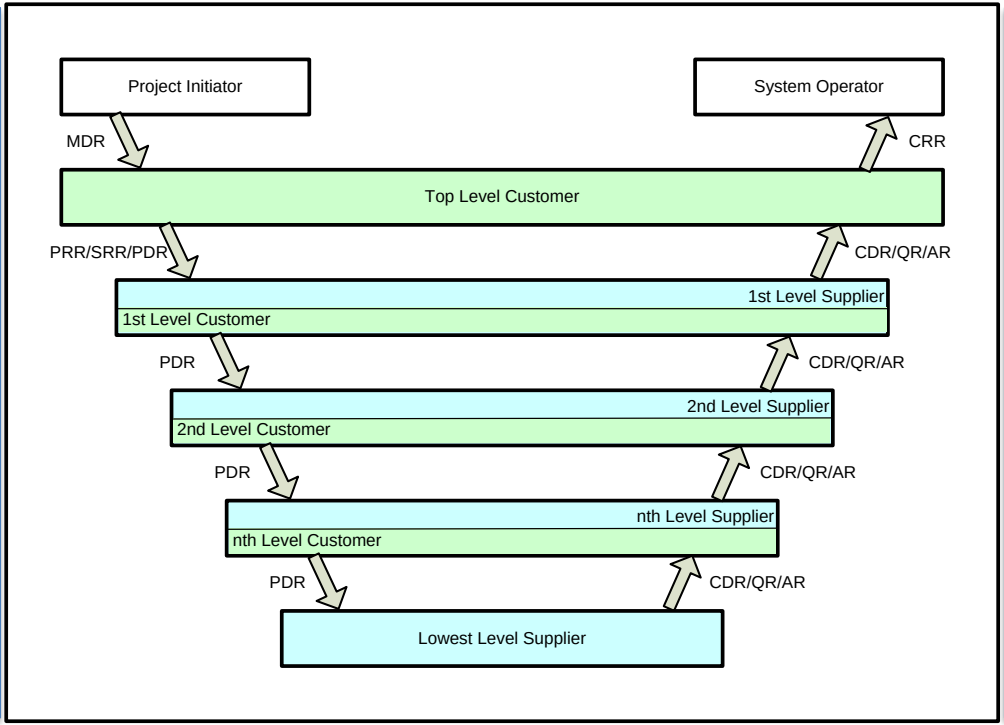
- 0 – Mission analysis / needs identification
- A – Feasibility
- B – Preliminary definition
- C – Detailed definition
- D – Qualification & production
- E – Utilization
- F – Disposal



3 - ECSS M-standards content

M-ST-10 "Project Planning & Implementation" – Supporting material (4/4)

From the PRR to the PDR the sequence of the reviews is "top down" starting with the top level customer and his top level supplier and continuing down the customer-supplier chain to the lowest level supplier



From the CDR to the AR the sequence of reviews is reversed to "bottom up" starting with the lowest level supplier and its customer and continuing up through the customer-supplier chain to the 1st level supplier and the top level customer

This is the so called "V model"

Figure 4-4: Review life cycle

3 - ECSS M-standards content

M-ST-10-01 "Organization & conduct of reviews"

Clause & Req	Content of the requirements	DRD (Annex)
5.1 General – customer responsibilities, objective & coverage documentation		
5.2 Review bodies – Review authority (consumer), review team, project team (customer & supplier)		
5.3 Roles & tasks		
5.3.1	**Review authority (RA)**: Approve procedure, endorse team recommendation, make recommendations to customer report findings	D (Review Authority Report)
5.3.2	**Customer**: Propose procedure, event organization, data management system	A (Review Procedure)
5.3.3	**Supplier:** Support the customer for: logistics, documentation, and RID responses/action schedule	
5.3.5	**Review team (RT):** Review doc, produce RIDs, assess RIDs responses, help with the report	B (RID content)
5.3.4	**Review team leader (RTL):** Confirm prerequisite, approve RIDs & dispositions, produce the report	C (Review team report)
5.4 Prerequisite conditions – defined in the procedure by the customer, and agreed by supplier		
5.5 Review meetings		
5.5.1	**Prerequisite key point** - See above	
5.5.2	**K.O. meeting** – All bodies, for present the docs and authorize review	
5.5.3	**Coordination meeting** – As defined by RTL, for review inputs, release RIDs	
5.5.4	**Collocation meeting:** As defined by the RTL, for review RIDs, agree dispositions, identify actions/dates	
5.5.5	**RT close-out meeting**: As defined by the RTL, for results, inputs to report, and major issues	
5.5.6	**RA meeting**: RA & RT, for "blessing" the review, endorse team recommendations, make decisions, issue RA report	
5.6 RID processing and A.I. follow-up – Major & Minor RIDs, originators informed, RID closed = disposed/action agreed, open RIDs to be dispositioned by RA INFO IN ANNEX E (Logic diagram for RID processing)		

Important consideration

Why ODSI principle is not used at all in this standard?

RA = Review Authority

RID = Review Item Discrepancy

RTL = Review Team Leader

3 - ECSS M-standards content

M-ST-40 "Configuration and information management"

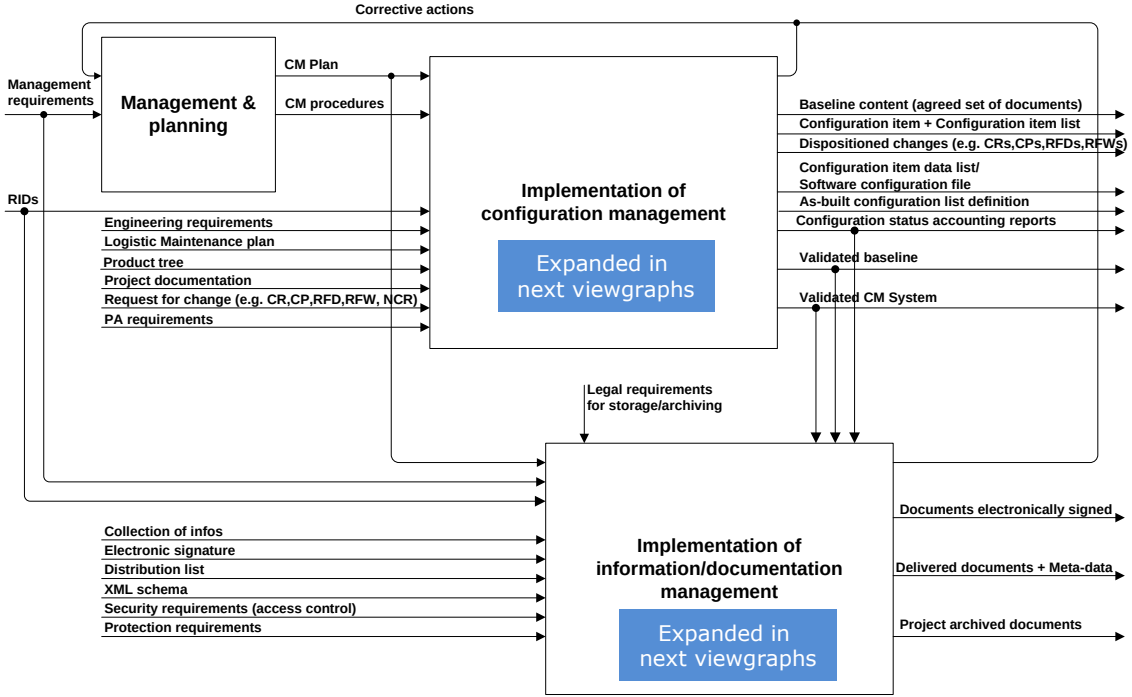
NOTE 1: For general process descriptions see Figures 4-1, 4-4, 4-5, 4-7, and 4-8

Clause & Req	Content of the requirements	DRD (Annex)	Supporting information
5.2 Configuration Management (CM) planning			
5.2.1	**CM plan (CMP)** - (including information security & classification)	A	General guidelines in 4.1.2
5.2.2	**CM interfaces** - (with Project management, Engineering, PA, Inf/Doc Management, …)	-	4.2.2 
5.3 Configuration Management (CM) implementation			
5.3.1	**Configuration identification** - (C.I. definition, selection, baseline, marking, …)	**Part of CMP**	4.3.2 & Annex K (C.I. Selection) 
	Configuration Item List (CIL)	B	
5.3.2	**Configuration control** - (Change process, classification, disposition, …)	**Part of CMP**	4.3.3 (change process, classification, CCB…)
	Change request	G	
	Change proposal	H	
	RFD & RFW	I & J	
5.3.3	**Configuration status accounting (record, store & retrieve data)**	**Part of CMP**	General guidelines in 4.3.4 (including as-designed and as-build data lists)
	Conf. Status accounting report (incl. Documents, Drawings, RFW, RFD, CRs, …)	F	
	As designed: Configuration Item Data List (CIDL)	C	
	As designed: SW Configuration File (SCF)	E	
	As-build Configuration List	D	
5.3.4	**Configuration verification** - (AsBuilt<->AsDesign @ various reviews)	**Part of CMP**	
5.3.5	**Audits of the CM system**		
5.3.6	**CM for operational phases** – (Activities during phases E & F)		
5.3.7	**Implementation of info/doc management** (including creation, review, delivery, archiving, retrieval)		4.3.8 (including TDP) & Annex L (Technical data) Annex M (Digital Signature) 

IDM = Info & Doc Management CCB = Configuration Control Board TDP = Technical Data Package

3 - ECSS M-standards content

M-ST-40 "Configuration and information management" – Supporting material



NOTE to Fig 4-1: Corrective actions are improvements on the process itself as a consequence of lessons learned and any feedback provided on the project

Fig 4-1: Configuration Management

3 - ECSS M-standards content

M-ST-40 "Configuration and information management" – Supporting material

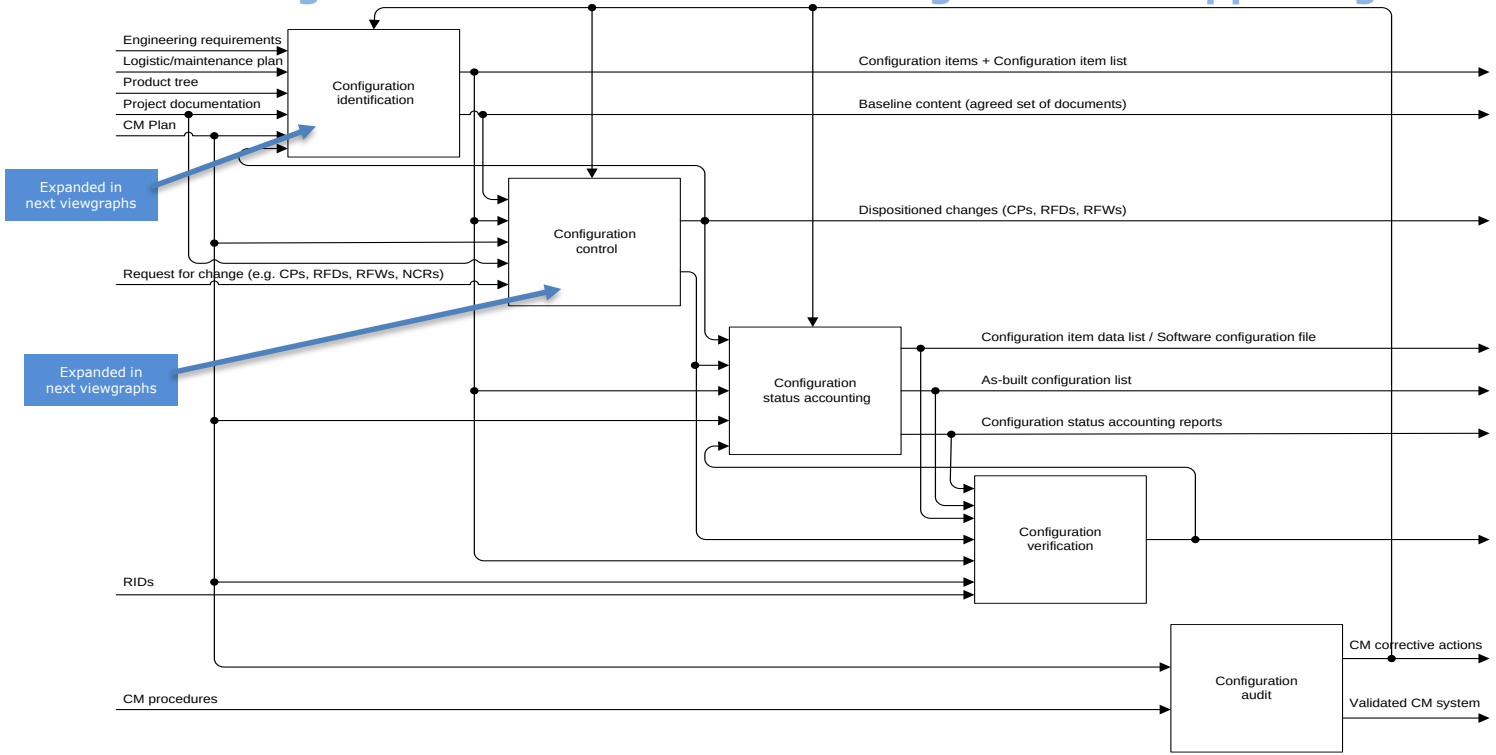


Fig 4-4: Implementation of Configuration Management

3 - ECSS M-standards content

M-ST-40 "Configuration and information management" – Supporting material

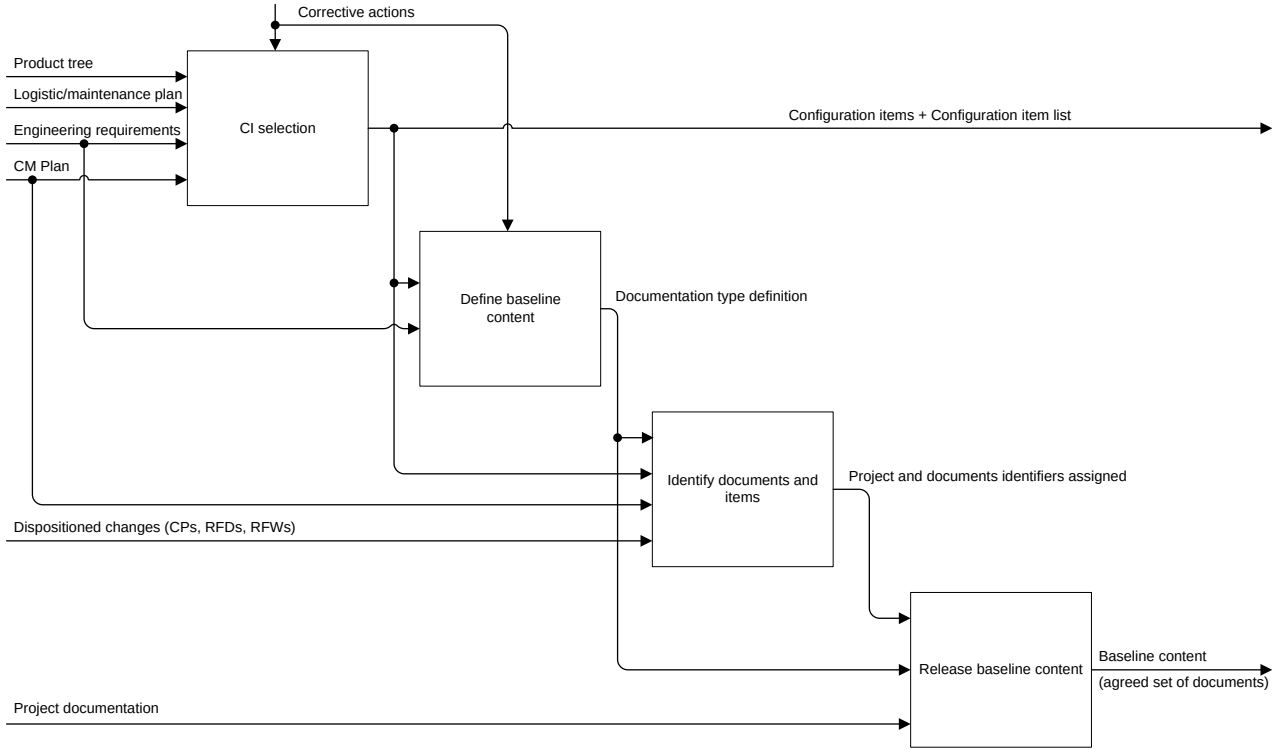


Fig 4-5: Configuration Identification

3 - ECSS M-standards content

M-ST-40 "Configuration and information management" – Supporting material

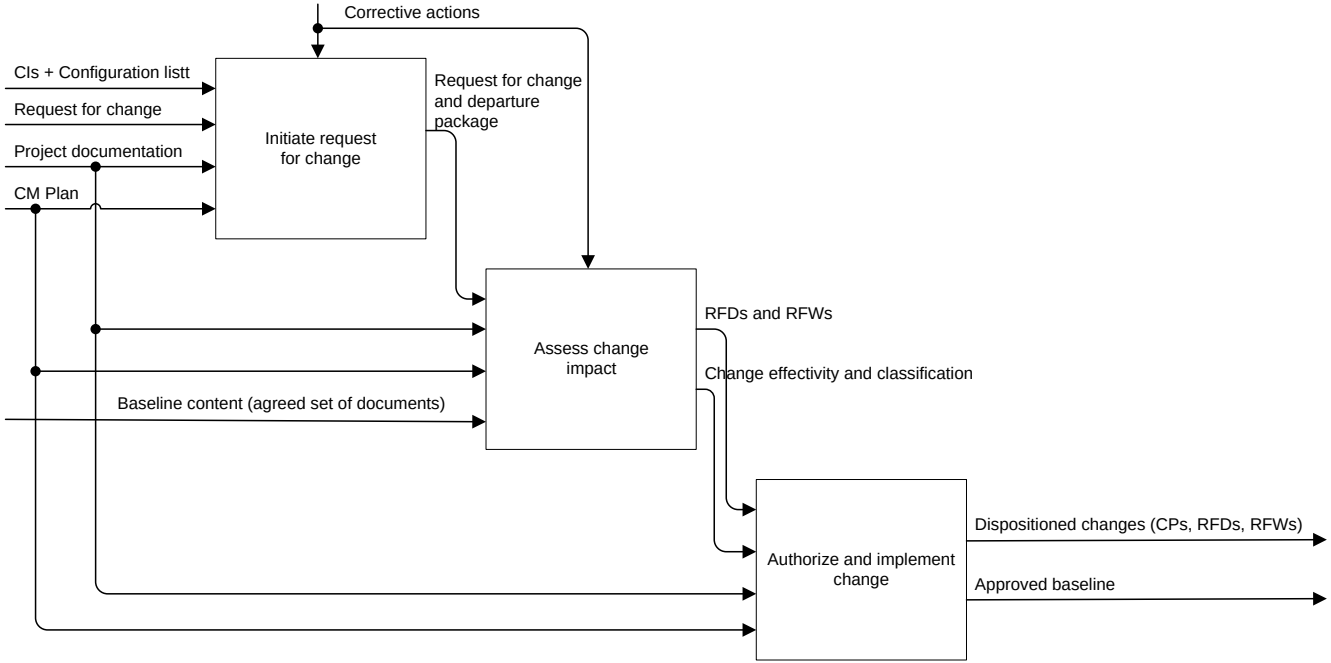


Fig 4-7: Configuration Control

3 - ECSS M-standards content

M-ST-40 "Configuration and information management" – Supporting material

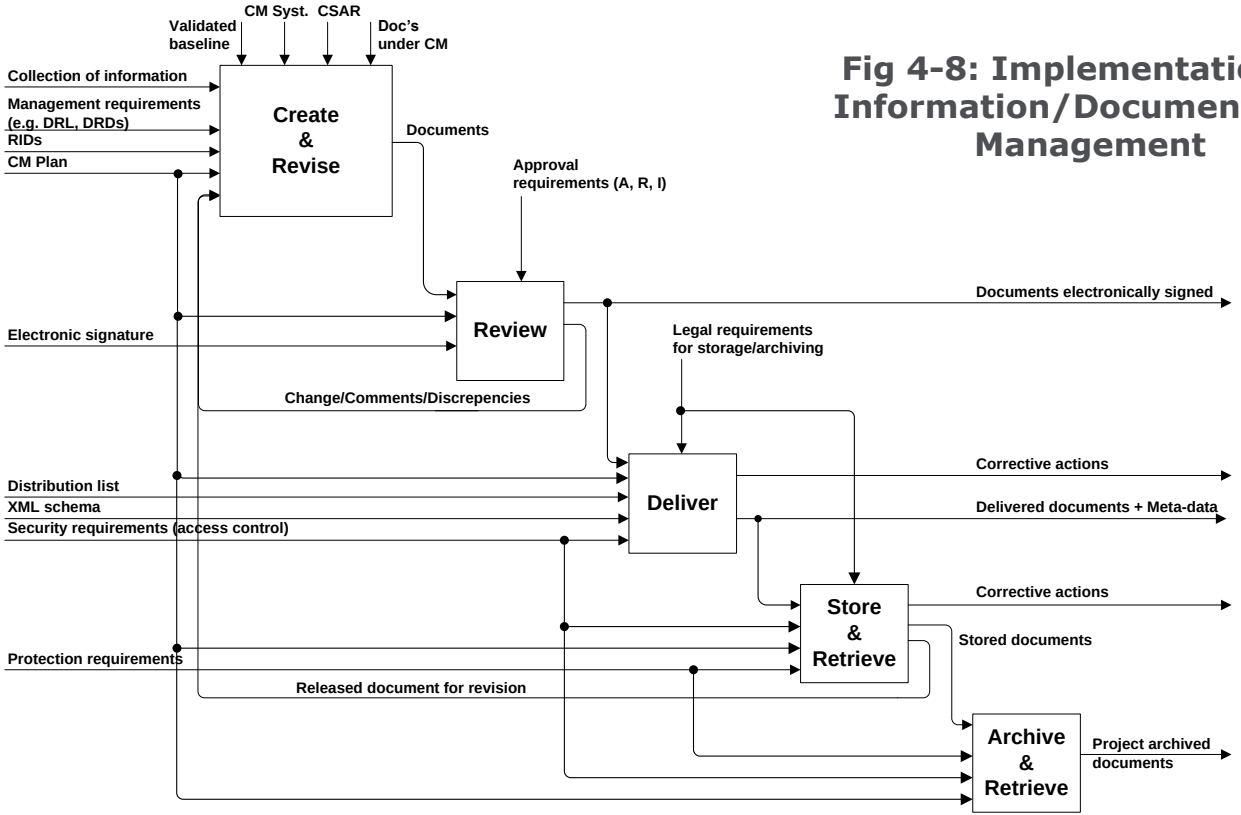


Fig 4-8: Implementation of Information/Documentation Management

3 - ECSS M-standards content

M-ST-40 "Configuration and information management" – Supporting material

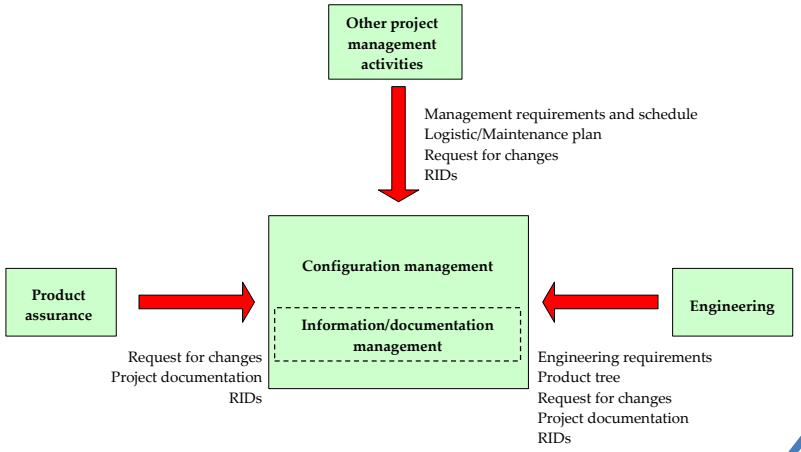
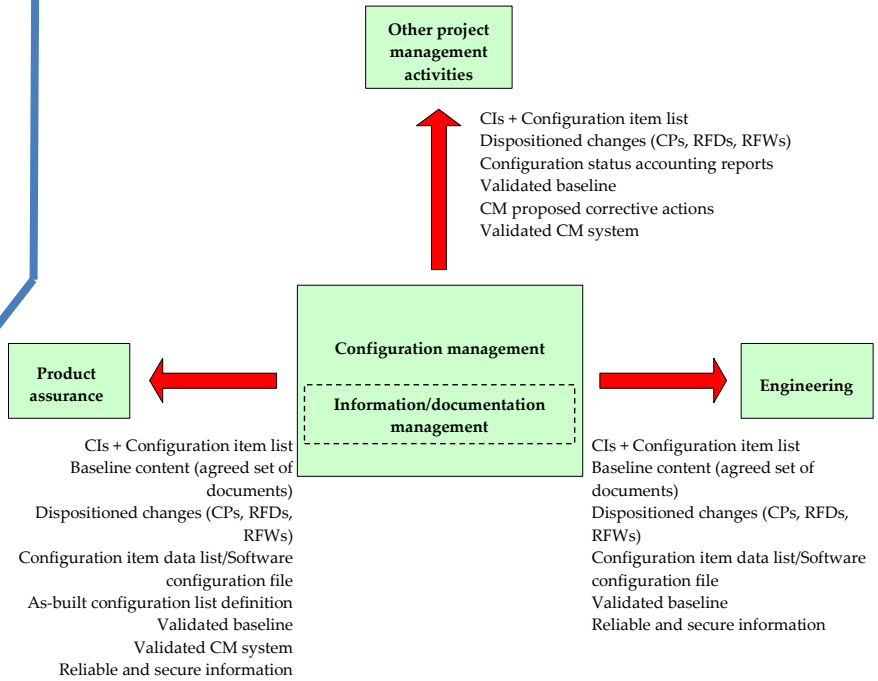


Fig 4-2:
C.M. interfaces (inputs)

Fig 4-3:
C.M. interfaces (outputs)



3 - ECSS M-standards content

M-ST-40 "Configuration and information management" – Supporting material

Derived from Product Tree
Configuration item (CI) identification, performed by the customer
Trade-off C.M. ←→ cost
Annex K contains guidelines

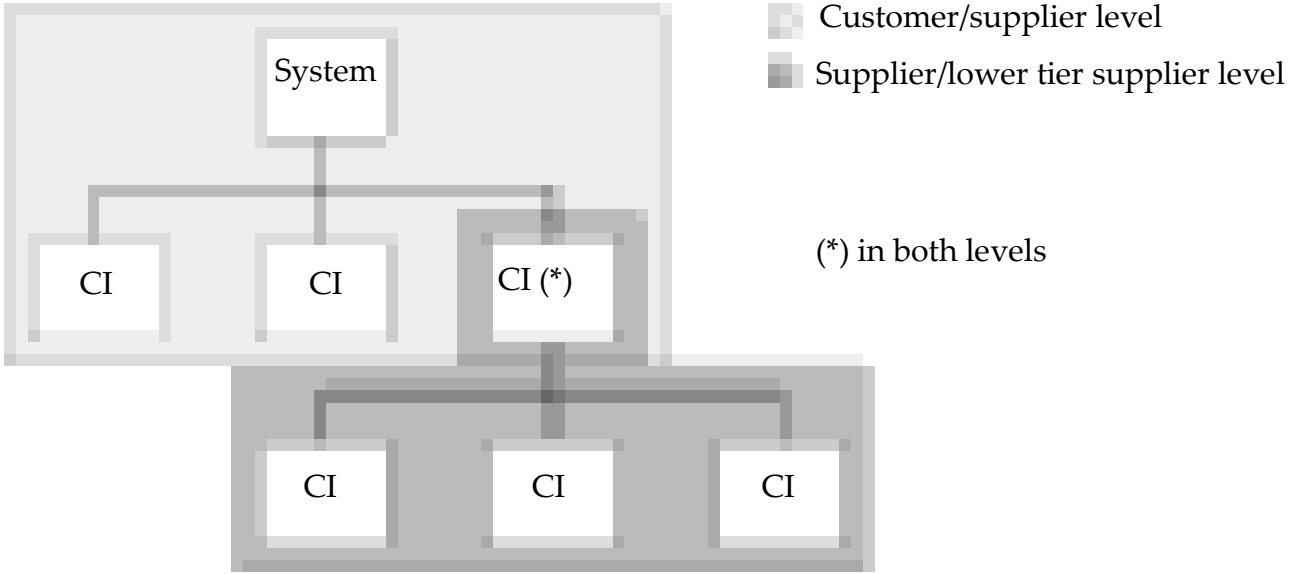


Fig 4-6: Configuration Item (CI) product tree structure

3 - ECSS M-standards content

M-ST-40 "Configuration and information management" – Supporting material

TDP format defines the way to exchange content files and their related metadata and the way to structure them within folders

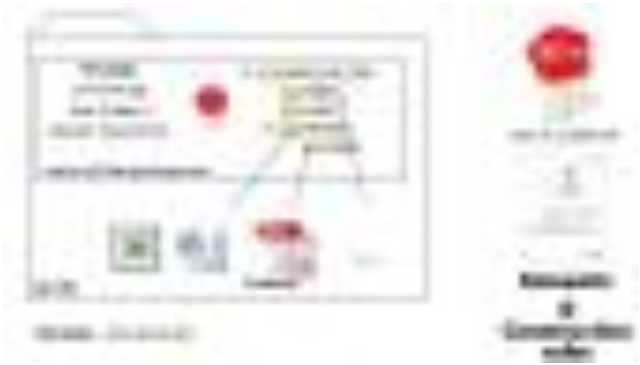


Fig 4-9: Technical Data Package (TDP) contents

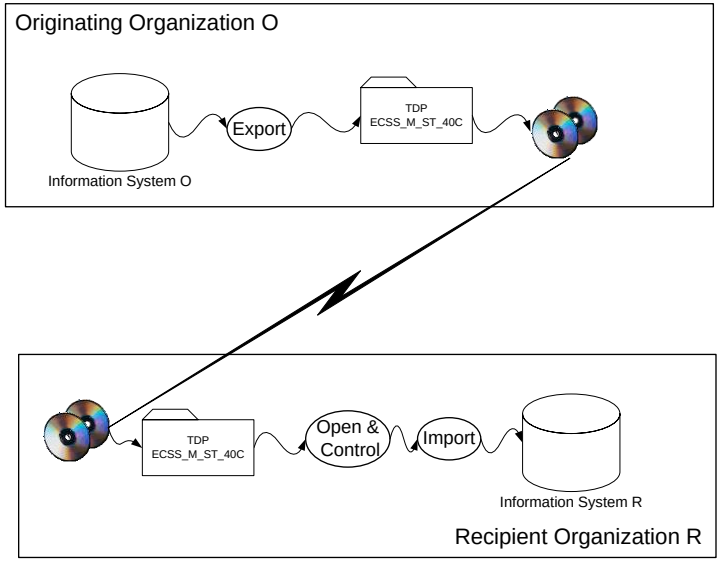


Fig 4-10: Delivery process for TDP

3 - ECSS M-standards content

M-ST-80 "Risk management"

Clause & Req	Content of the requirements	DRD (Annex)	Supporting information
7 – Risk management requirements			
7.2	**Risk management process**		
	7.2.1 Risk policy	A	
	- Resources, goals & constraints		Info in 5.1
	- Strategy, approach and goal ranking		Info in 5.1 and 5.2.1
	- Risk scoring and index scheme, and action criteria		Info in 5.2.1 and 5.2.2
	- Decision		Info in 5.2.3
	- Communication and monitorization		Info in 5.2.4
	7.2.2 Risk management plan (RMP)	B	
	- Organization and responsibilities		Info and guidelines in 6.2 and 6.3
	- Decision, criteria and tools		Info in 6.4
	- Documentation and processes		Info in 6.5
	7.2.3 to 7.2.5 Risk scenarios – To be identified, assessed & analyzed for acceptability		Risk register example in Annex D
	7.2.6 Risk reduction – i.a.w. the risk policy in Annex A		
	7.2.7 Determination of reduced risk – To understand the impact of mitigation actions		
	7.2.8 Resolved, acceptable & overall risk assessment – i.a.w. RMP (Annex B)		
	7.2.9 Unresolved risk – Disposed as in the RMP (Annex B)		
	7.2.10 Residual risk – Accepted/disposed as in the RMP (Annex B)		
	7.2.11 Risk report	C	
7.3	**Risk management implementation**		
	7.3.1 Risk implementation (at any level customer-supplier) and integration		Summary: Implement your RMP (Risk management plan)
	7.3.2 Cost effective, at project level		
	9.3.3 Risk management process - to be monitored		
	9.3.5 Lessons Learnt on Risk management - to be performed		

3 - ECSS M-standards content

M-ST-80 "Risk management" – Supporting material

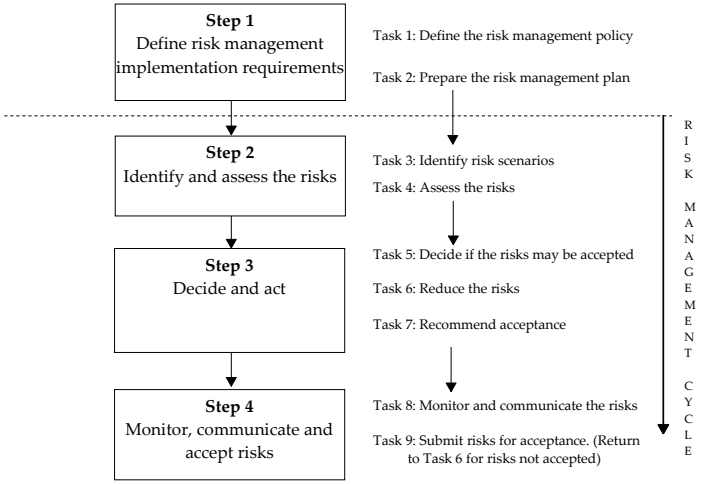


Fig 5-2: Task associated to the steps

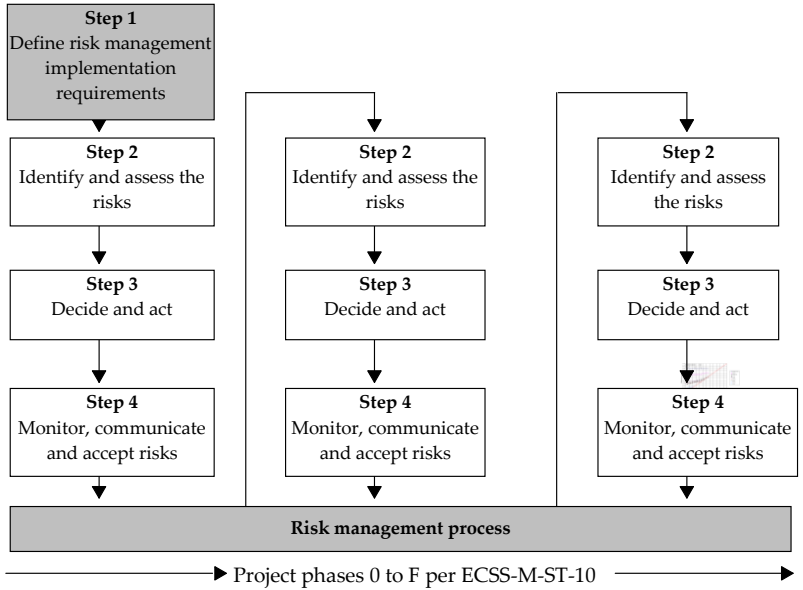


Fig 5-1: Steps & cycles in the risk management process

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M-ST-80 "Risk management" – Supporting material

Score	Severity	Severity of consequence: impact on (for example) cost
5	Catastrophic	Leads to termination of the project
4	Critical	Project cost increase > tbd %
3	Major	Project cost increase > tbd %
2	Significant	Project cost increase < tbd %
1	Negligible	Minimal or no impact

Fig 5-3: Example of a severity-of-consequence scoring scheme

Score	Likelihood	Likelihood of occurrence
E	Maximum	Certain to occur, will occur one or more times per project
D	High	Will occur frequently, about 1 in 10 projects
C	Medium	Will occur sometimes, about 1 in 100 projects
B	Low	Will seldom occur, about 1 in 1000 projects
A	Minimum	Will almost never occur, 1 of 10 000 or more projects

Fig 5-4: Example of likelihood scoring scheme

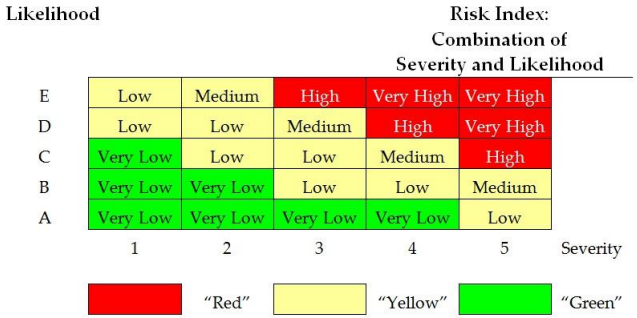

Fig 5-5: Example of risk index & magnitude scheme

Risk index	Risk magnitude	Proposed actions
E4, E5, D5	Very High risk	Unacceptable risk: implement new team process or change baseline – seek project management attention at appropriate high management level as defined in the risk management plan.
E3, D4, C5	High risk	Unacceptable risk: see above.
E2, D3, C4, B5	Medium risk	Unacceptable risk: aggressively manage, consider alternative team process or baseline – seek attention at appropriate management level as defined in the risk management plan.
E1, D1, D2, C2, C3, B3, B4, A5	Low risk	Acceptable risk: control, monitor – seek responsible work package management attention.
C1, B1, A1, B2, A2, A3, A4	Very Low risk	Acceptable risk: see above.

Fig 5-6: Example of risk magnitude designation & proposed actions for individual risks

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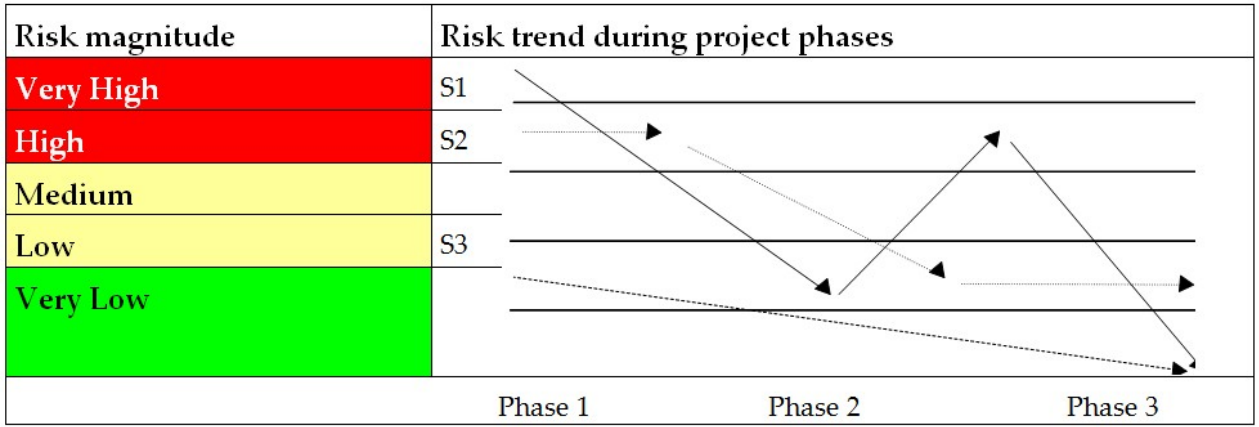

Fig 5-7: Example of a risk trend

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M-ST-80 "Risk management" – Supporting material

Annex D: Example of risk register

RISK REGISTER (Example)

Project: WBS Ref.:	Organization:	Source: Controlled by: Supported by:	Date: Issue:

RISK SCENARIO and MAGNITUDE

No.	Risk scenario title:
Cause and consequence:	

Severity (S)					Likelihood (L)					Risk index	RED	YELLOW	GREEN	Risk domain
Negligible 1	Significant 2	Major 3	Critical 4	Catastrophic 5	Minimum A	Low B	Medium C	High D	Maximum E		(*)	(*)	(*)	(**)

RISK DECISION and ACTION

Accept risk ❑		Reduce risk ❑
Risk reduction measures:	Verification means:	Expected risk reduction (severity, likelihood, risk index):
Action:		Status:
Agreed by project management: Name: Signature: Date:		Risk rank:

Project:	Organization:	Date: Issue:

Rank	No.	Risk scenario title	Red	Yellow	Green	Risk domain	Actions and status
			(*)	(*)	(*)	(**)	

4 – The DRDs in the ECSS-M standards

Annex F of M-ST-10 is a very interesting INFORMATIVE annex

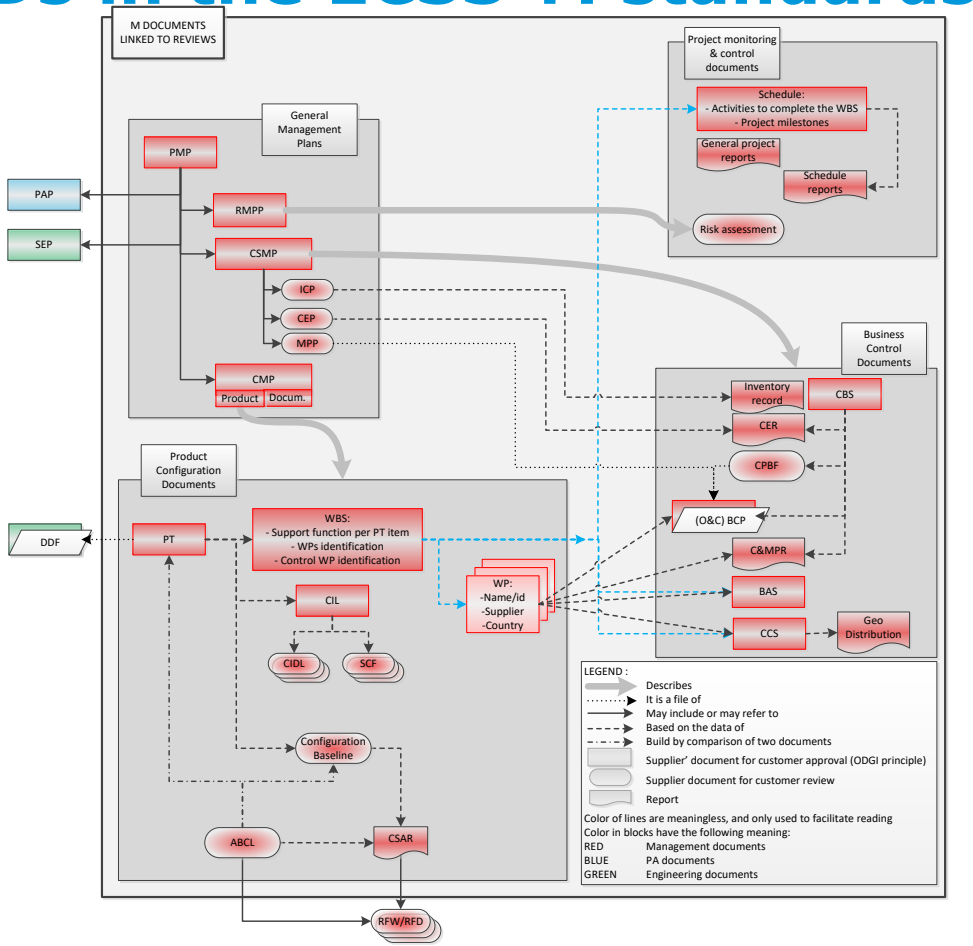
It covers the MAIN DRDs in the M branch

Table F-1: Management documents delivery per review

Document Title	Phase													DRD ref.
	0	A	B		C	D		E					F	
	MDR	PRR	SRR	PDR	CDR	QR	AR	ORR	FRR	LRR	CRR	ELR	MCR	
Project management plan		X	X	X										ECSS-M-ST-10, Annex A
Product tree		X	X	X	X	X	X							ECSS-M-ST-10, Annex B
Work breakdown structure		X	X	X										ECSS-M-ST-10, Annex C
Work package description		X	X	X										ECSS-M-ST-10, Annex D
Schedule	X	X	X	X	X	X	X	X	X					ECSS-M-ST-60, Annex B
Cost estimate report		X	X	X										ECSS-M-ST-60, Annex G
Configuration management plan		X	X	X										ECSS-M-ST-40, Annex A
Configuration item list				X	X									ECSS-M-ST-40, Annex B
Configuration item data list				X	X	X	X							ECSS-M-ST-40, Annex C
As-built configuration list						X	X							ECSS-M-ST-40, Annex D
Software configuration file				X	X	X	X							ECSS-M-ST-40, Annex E
Configuration status accounting reports				X	X	X	X							ECSS-M-ST-40, Annex F
Risk management policy document	X	X	X	X										ECSS-M-ST-80, Annex A
Risk management plan	X	X	X	X										ECSS-M-ST-80, Annex B
Risk assessment report		X	X	X	X	X	X	X	X					ECSS-M-ST-80, Annex C

4 – The DRDs in the ECSS-M standards

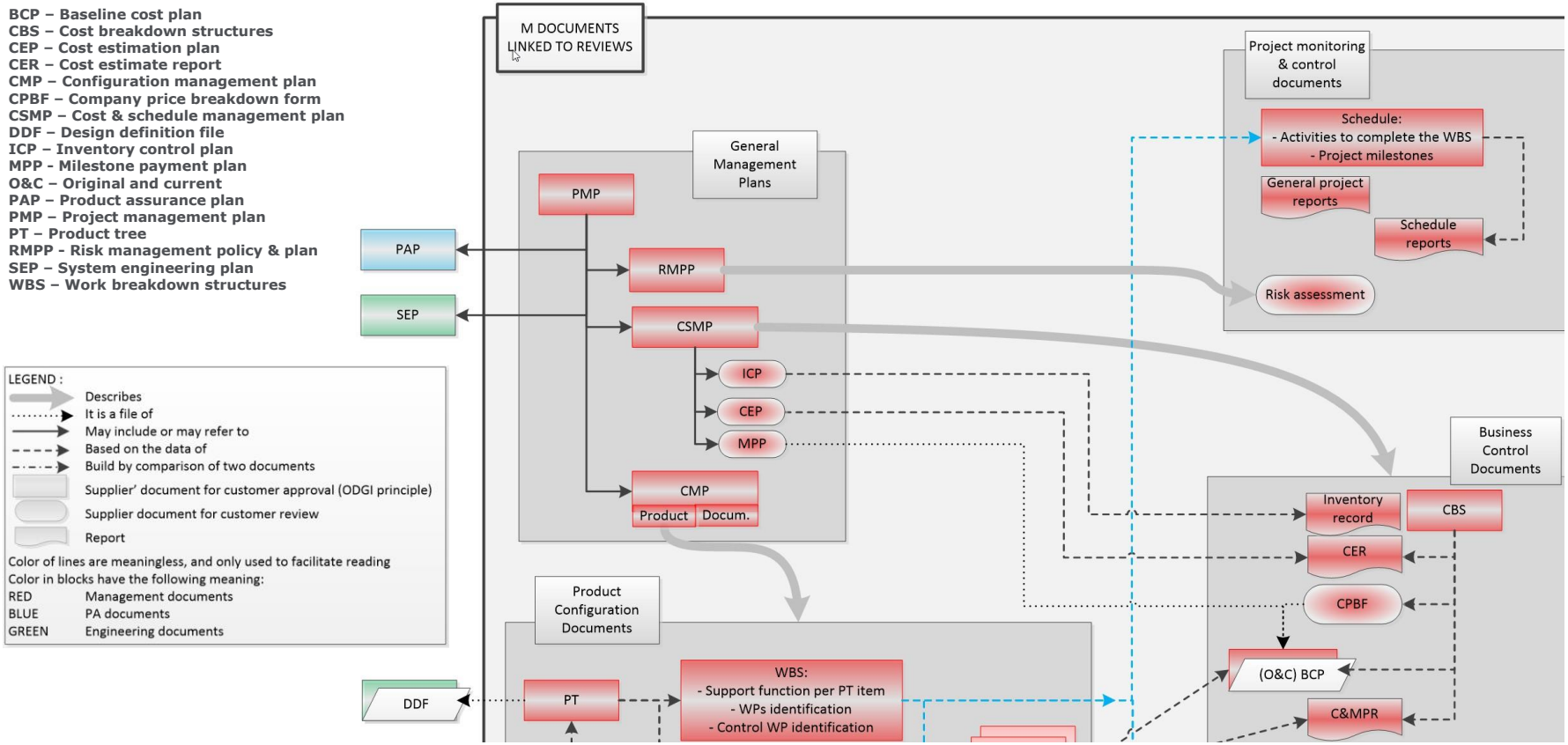
ABCL – As-built configuration list
BAS – Business agreement structure
BCP – Baseline cost plan
C&MPR – Cost & manpower report
CBS – Cost breakdown structures
CCS – Company/country structure
CEP – Cost estimation plan
CER – Cost estimate report
CIDL – Configuration item data list
CIL – Configuration item list
CMP – Configuration management plan
CPBF – Company price breakdown form
CSAR – Configuration status accounting report
CSMP – Cost & schedule management plan
DDF – Design definition file
ICP – Inventory control plan
MPP – Milestone payment plan
O&C – Original and current
PAP – Product assurance plan
PMP – Project management plan
PT – Product tree
RFD – Request for deviation
RFW – Request for waiver
RMPP - Risk management policy & plan
SCF – SW configuration file
SEP – System engineering plan
WBS – Work breakdown structures
WP – Work package



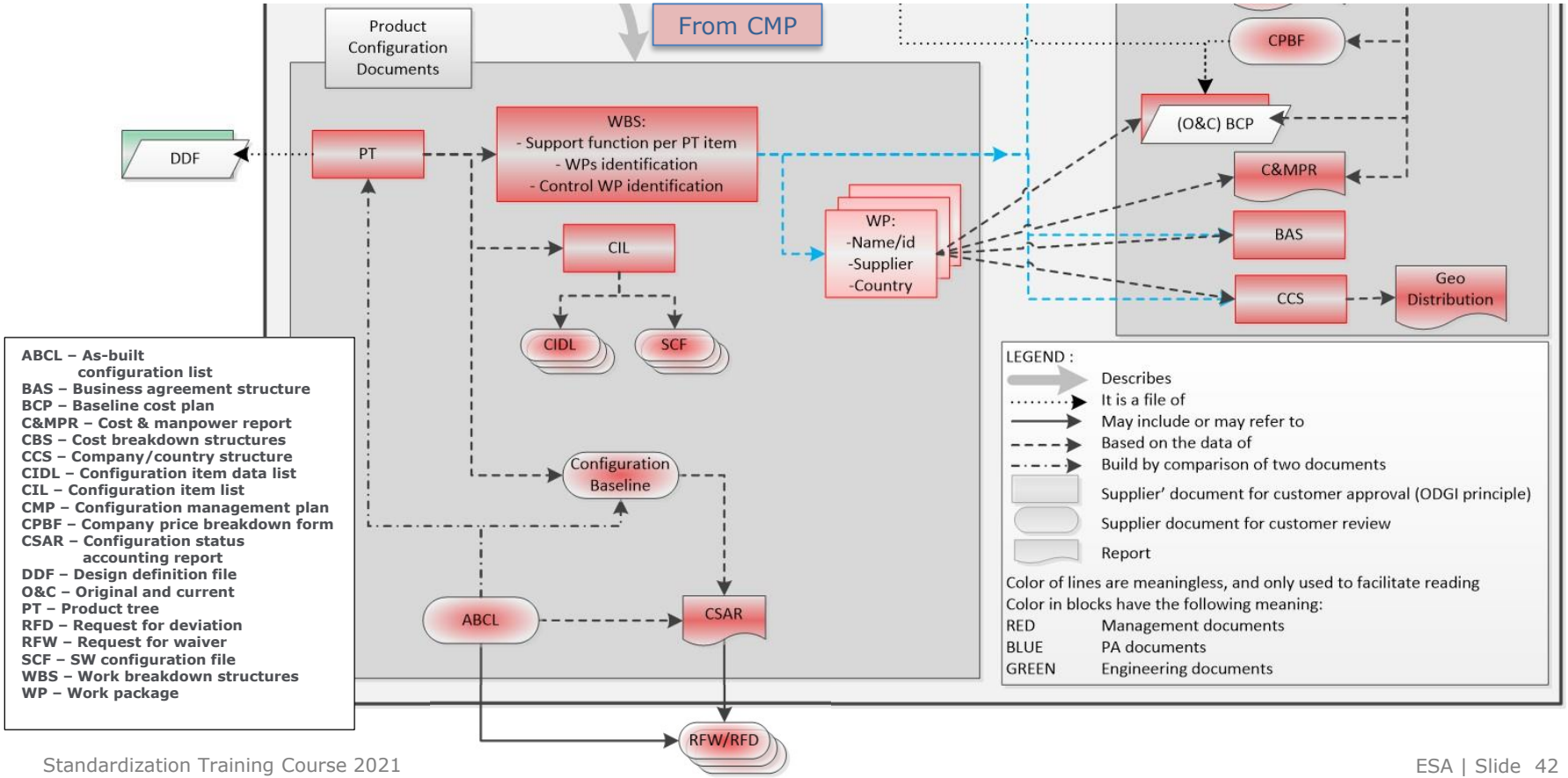
NOTE:
Full explanation in the last 4 viewgraphs

4 – The DRDs in the ECSS-M standards

BCP – Baseline cost plan
CBS – Cost breakdown structures
CEP – Cost estimation plan
CER – Cost estimate report
CMP – Configuration management plan
CPBF – Company price breakdown form
CSMP – Cost & schedule management plan
DDF – Design definition file
ICP – Inventory control plan
MPP - Milestone payment plan
O&C – Original and current
PAP – Product assurance plan
PMP – Project management plan
PT – Product tree
RMPP - Risk management policy & plan
SEP – System engineering plan
WBS – Work breakdown structures



4 – The DRDs in the ECSS-M standards



4 – The DRDs in the ECSS-M standards

a. **The General management plans, including:**
   1. **The PMP** "Project Management Plan", which is the highest M deliverable, and includes:
      a) General management issues:
         1) Objectives and constrains of the project
         2) Project organization, including project manager, key personnel, specialists, authority and hierarchy, roles and responsibilities, interface with suppliers and other projects.
         3) Project breakdown structures, describing the approach to define the project WBS, and pointing the document describing the WBS themselves.
         4) A description of the ILS approach [Integrated Logistic Support – not covered here]
      b) Interfaces with other management areas, including the following documents or pointers to them: the Configuration management Plan (CMP, see 2 below), the Cost and schedule management plan (CSMP, see 3 below), ILS approach (see 4 below), the Risk management and plan (RMPP, see 5 below).
      c) Interfaces with other project areas, including the following documents or pointers to them: the Product Assurance Plan (PAP) and the System Engineering Plan (SEP).

   2. **The CMP**, or Configuration Management Plan, describing how all the configuration management activities, both for the product and for the documentation and information, will be performed.

   3. **The CSMP**, or Cost & Schedule Management Plan, describing the approach used to ensure cost and schedule management. It may include or point to the following documents:
      a) The CEP or Cost Estimating Plan, explaining the organization and processes for cost estimation
      b) The MPP or Milestone Payment Plan, defining the plan for payment events.

   4. **The ILS approach**, defining the approach use for ILS.

   5. **The RMPP** or Risk Management Policy and Plan composed of two documents which can be released together or independently:
      a) The Risk management policy, defining the resources, goals, strategy, margins, ranking/scoring/index schemes, action/acceptance criteria and communication approach.
      b) The Risk management plan, describing the processes and metrics to apply the risk management policy.

4 – The DRDs in the ECSS-M standards

b. The Product Configuration documents, including:

1. **The Product Tree** (PT), is a description of the hierarchical partitioning of a deliverable product down to an agreed level. Important remarks are:
   a) Each item in the tree is identified by its name, an identification code, the supplier and the applicable spec.
   b) Items may include HW or SW.
   c) All the items of the PT selected to be under configuration control are so identified (see 4 below)
   d) All items which are recurrent products are so identified.

2. **The WBS**, that:
   a) For each of the items in the PT, includes a sub-tree with the support functions defined by the customer, and the necessary services and tasks to produce the deliverables. For example, defining for each item in the PT the management, the PA and engineering tasks.
   b) Identifies the Work packages (WP) by referring the items in the WBS in each WP, ensuring that that the WPs cover the total work scope. Detailed description of each WP is not done here (see 3 below).

3. The description of each **Work Packages** identified in the WBS (see 2.b above), including among others the name of the package, manager in charge, supplier and supplier country, description of the included (and excluded) tasks, deliverables, location and start and end dates.

4. The **Configuration Item List** (CIL), listing the items (HW or SW) of the PT which have been identified to be under configuration control [see b.1.(b) above]., with name, code, quantity, supplier and applicable specification.

5. Each item in the CIL is described in a **Configuration Item Data List** (CIDL), listing all the relevant data of the item under configuration control.

6. Each item SW in the CIL is described in the **SW Configuration File** (SCF)

7. **The Configuration Baseline** (CB), is a set of documents, to be agreed between customer and supplier, reflecting the actual configuration of the product. The initial CB refers to the "as-design" product, but it will need to be updated to refer to the "as-built" product when the latter differs from the former.

8. The **As-Built Configuration List** (ABCL), reflecting the actual status of the product "as-built", listing the differences with the "as design", and justifying these differences by making reference to the corresponding RFW/RFD.

9. The **Configuration Status Accounting Report** (CSAR), collecting and summarizing the necessary information to support a meaningful configuration management.

4 – The DRDs in the ECSS-M standards

c. The **Business control documents**, including:

1. The **Cost Breakdown Structure** (CBS), that is the breakdown of all the cost concepts of the project to categories to be used for cost management, with clear differentiation between direct and indirect costs.

2. **The CPBF** (Company Price Breakdown Forms), which shows the manpower and cost data broken down according to the categories defined in the CBS.

3. **The BAS** (Business Agreement Structure) [called Contract Structure in ESA/REG/001 Annex IV], is a breakdown structure of the of suppliers indicating their reporting lines and the WPs assigned to each supplier. It has to be completely mapped to the WBS and fully consistent with the defined Work packages (since the WP also contain information on suppliers).

4. **The CCS** (Country/Company structure), which shows the relationship between suppliers in the BAS and the Country where the work is performed. If this relationship is simple, the CCS is normally combined with the BAS in a single document.

5. The **Cost Estimate Report**, which reports, for each of the cost items identified in the CBS, the estimation method, quality of the estimate, hypothesis, sensitivity analysis (influence to the total cost), cost risk analysis, and recommendations.

6. The actual **Cost and Manpower Report** is only necessary for cost reimbursement contracts. It gives a detailed status on the expenses incurred by the supplier.

7. The **Baseline Cost Plans** (BCP) document the contractually agreed cost and manpower.

4 – The DRDs in the ECSS-M standards

d. The **Project Monitoring, schedule and control** documents, including:

1. The **Project Schedule**, which consist on a timed network of activities (showing their interdependencies) against defined milestones, preferably in a Gant-Chart, and identifying the critical path:
   a) The network of activities are derived from the **WBS**.
   b) The milestones depend on the project, but typically include the start and end of each phase and the project reviews (see **PMP**), production/test/delivery reviews (see **PMP**), payment milestones (see **payment plan**), and CFE delivery dates.

2. The progress reports (not relevant for the contract), including:
   a) General Project **Progress Reports**,
   b) The **Schedule Progress Report**, including the work actually performed against the original Project Schedule, trend analysis for the milestones, justification of deviations, remedy actions and status of deliverable items.

3. **Risk Assessment Report**, explaining how the **Risk Policy and Plan** has been applied and followed for the identification and mitigation of risks, and listing all the registered risks, with their rank, rating and trend.

Thanks for your attention

List of acronyms

AR	Acceptance Review
CCB	Configuration Control Board
CDR	Critical Design Review
CI	Configuration Item
CIL	CI list
CM	Configuration Management
CMP	CM Plan
CP	Change Process
CR	Change Request
CRR	Commissioning Result Review
Doc	Document, documentation
DRL	Document Requirement List
DRD	Document Requirement Definition
ECSS	European Cooperation for Space Standardization
e.g.	Exempli gratia (for example [Lat])
ELR	End-of-life Review
ESA	European Space Agency
FRR	Flight Readiness Review
i.a.w.	in accordance with
IDM	Info & Doc Management
i.e.	id est (that is [Lat])
Incl.	Including
Inf, info	Information
LRR	Launch Readiness Review
M	Management
MCR	Mission Close-out Review
MDR	Mission Definition Review
N	Number
NCR	Non Conformance Report
ORR	Operational Readiness Review
PA	Product Assurance
PDR	Preliminary Design Review
PM	Project Management
PRR	Preliminary Requirements Review
QR	Qualification Review
RA	Review Authority
RID	Review Item Discrepancy
Ref	Reference
Req	Requirement
RFD	Request For Deviation
RFW	Request For Waiver
RMP	Risk Management Plan
RTL	Review Team Leader
SRR	System Requirements Review
SW	Software
Syst	System
Tbd	To Be Defined (Determined)
TDP	Technical Data Package
TRL	Technology Readiness Level
WBS	Work Breakdown Structures
XML	Extensible Markup Language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