



# Technical Reviews



- **Programm Reviews**
- **Data Package**
- **Review Proceedings**
- **Change Implementation**



## Introduction



- **Phase C/D Technical Reviews** are formal events to synchronize (approve in some cases)
  - **Definitions and Planing**
  - **Design**
  - **Verification Data**
- **Reviewer: Customer Under Review: Contractor**
- **Proceedings defined in Customer Statement of Work; implementation details in Contractor Design and Development Plan**
- **Payment Milestones**



# Phase C/D Review Objectives



Event	Objective
• PDR (Prelim. Design Review)	• Engineering Model Manufacturing Release
• Crew Station Reviews	• Comments from Astronauts )
• CDR (Critical Design Review)	• Flight Model Manufacturing Release
• QR (Qualification Review)	• Proof that all Requirements are met
• FAR (Final Acceptance Review)	• Acceptance of Deliverable Item(s) by Customer



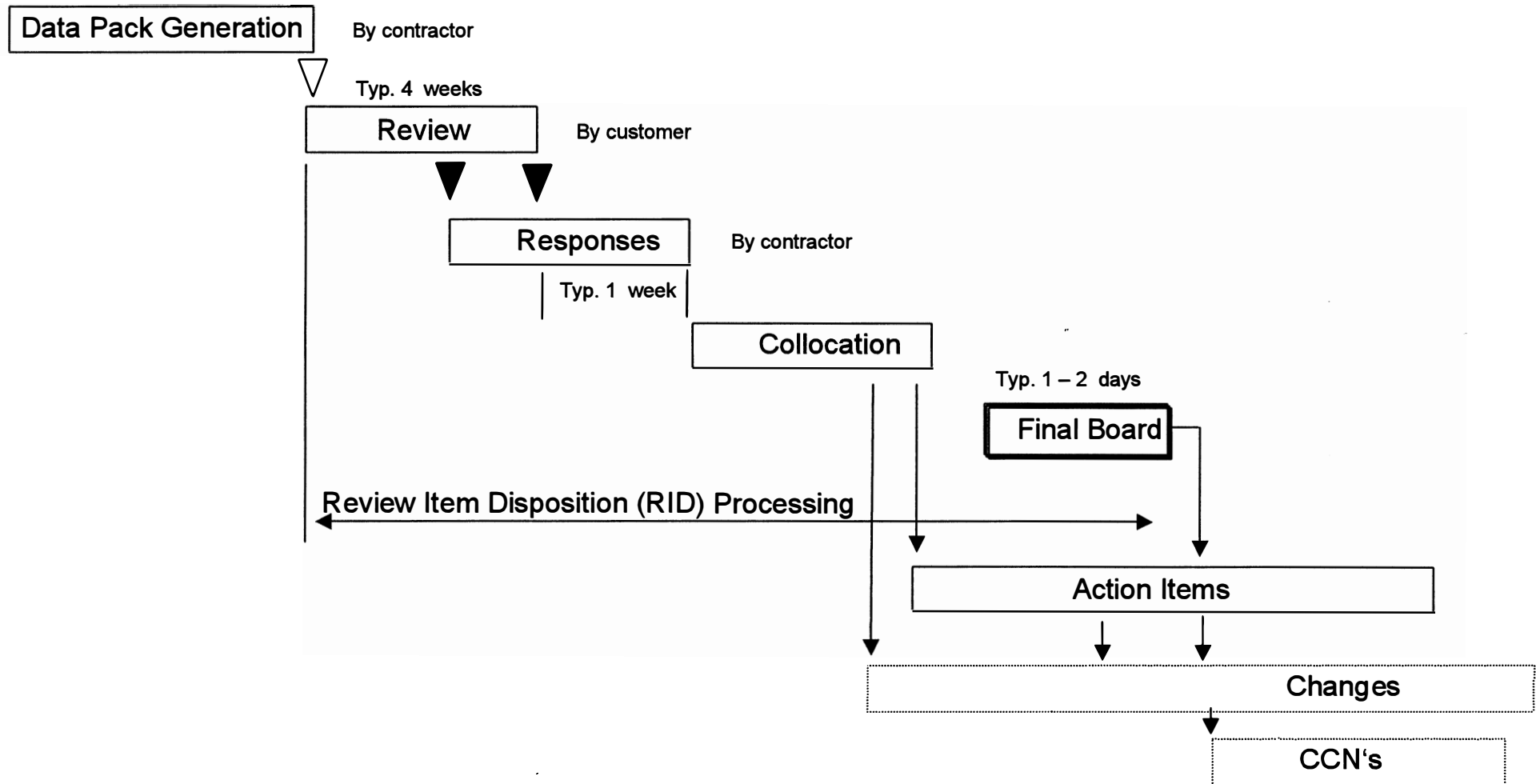
# Design Reviews



- **Tasks / Objectives**
  - **Progress check**
  - **Formal Release of activities for next phase**
- **Methodology**
  - **Generation of data package by contractor**
  - **Formulation of findings by customer**
  - **Team reviews / Boards (Decision for each open point)**
  - **Action items and Change Proposals for implementation of decisions**
- **Notice**
  - **Customer checks contractor (Chairman)**
  - **Bottom-up reviews (first unit level)**
  - **Missing Customer critique does not mean design acceptance**

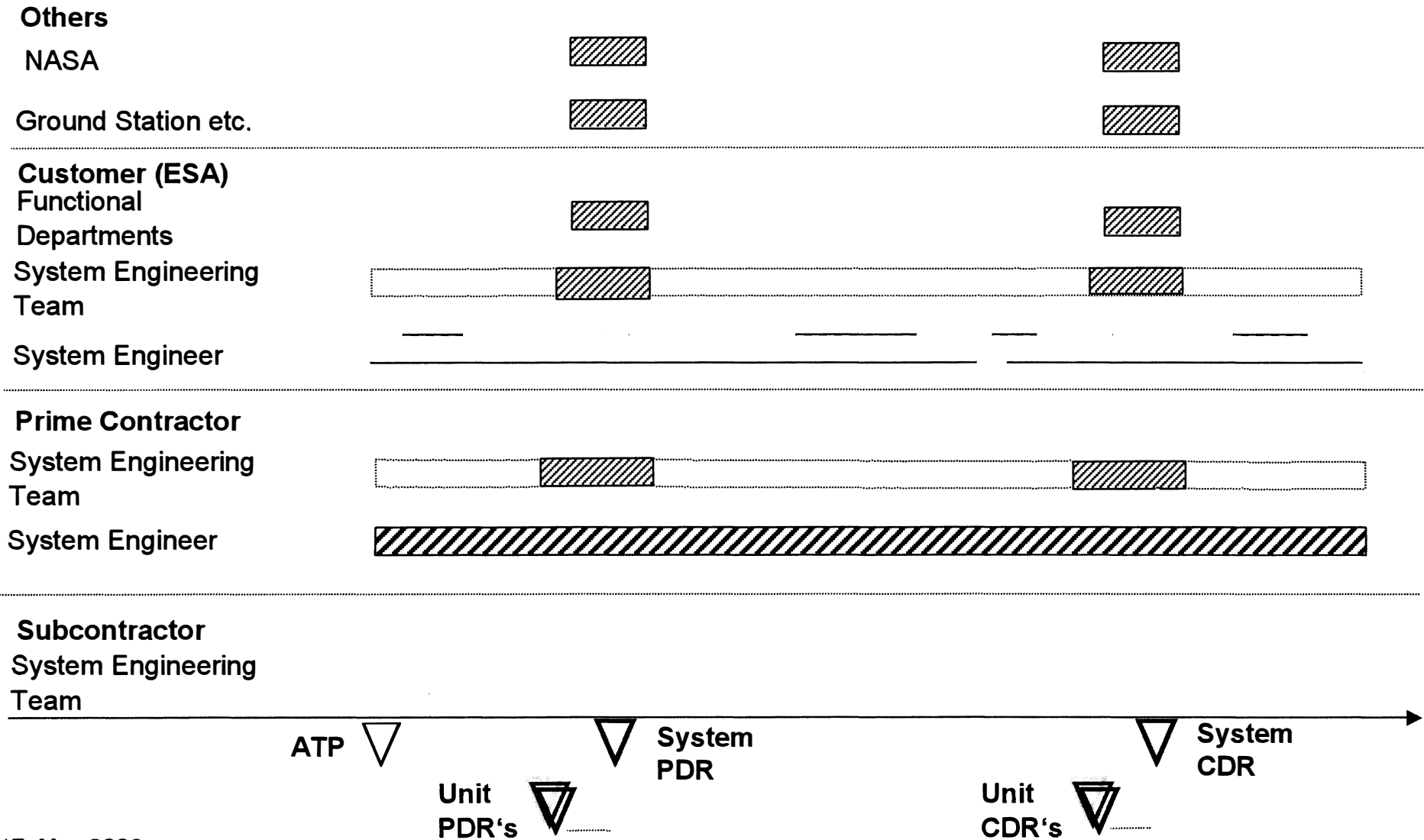


# Review / Design Change Process





# Review Levels



		<i>SHEET A</i>	
<i>ESA/ESTEC</i>	<i>REVIEW ITEM DISPOSITION</i>	<i>Columbus CDR</i>	
<b>(A) TITLE :</b>	ATCS water evaporation	<b>RID No :</b>	<b>E-TH-057</b>
<b>Originator reference:</b>	JP-25	<b>ID No :</b>	<b>18095</b>
<b>Originator :</b>	Persson, J.	<b>Assoc. RID :</b>	
<b>(B) DOCUMENT TITLE AND REF. :</b> COL-RP-AI-0100 Leakage Verification Analysis. Issue/Revision: 3 <b>Page/Section/Para :</b> 39/4.3			
<b>(C) DISCREPANCY :</b> <b>Requirement Violated : Document Title and Ref. :</b> <b>Page/Section/Para :</b> <b>Description of discrepancy :</b>  The failure investigation of the WPA gas trap revealed that vapour had the capability to diffuse through the teflon membrane acting as the hydrophobic barrier, which led to condensation inside the gas trap air reservoir. The flex hoses in the ATCS also use teflon to save mass and allow for a smaller bending radius, but there is no contribution considered in the fluid budget to account for the evaporation losses which appear inevitable, especially with the water temperature higher than the air (and dew point temperature) in much of the ATCS.			
<b>(D) INITIATOR RECOMMENDED SOLUTION :</b>  It is necessary for ALS to estimate the loss of ATCS water through the mechanism of evaporation in order to obtain a better picture of the true water loss over time in Columbus.			
<b>Signature</b>			
<b>(E) PANEL RECOMMENDATIONS :</b>  as per box D			
<b>Status : Accepted</b>		<b>Classification : Minor</b>	
		<b>Signature</b>	
<b>(F) PANEL CHAIRMEN COORDINATION</b>			
<b>Status : Accepted</b>		<b>Group : ASTRUM</b>	
		<b>Signature</b>	
		<b>ESA</b>	

		<i>SHEET B</i>	
<i>ESA/ESTEC</i>	<i>REVIEW ITEM DISPOSITION</i>	<i>Columbus CDR</i>	
<b>(A) TITLE :</b> ATCS water evaporation		<b>RID No :</b>	<b>E-TH-057</b>
		<b>ID No :</b>	<b>18095</b>
		<b>Assoc. RID :</b>	
<b>(G) CONTRACTOR POSITION :</b>			
<p>Astrium Position : Density and thickness of the teflon hoses is not comparable to the membrane used in the gas trap hence, it is expected that only permeation of gases (Oxygen, CO2, etc.) will happen but the losses of vapor will be in comparison to the other ATCS line/component leakage losses neglectable. Nevertheless, a refilling of the loop will be anyways necessary during the 10 yrs operational lifetime. Szi</p>			
<b>Status :</b>	<b>Responsible :</b>	<b>Signature</b>	<b>ASTRIUM</b>
<b>(H) PANEL DISPOSITION :</b>			
<p>Astrium will provide data showing waterloss through teflon flex hoses is negligible including evaporation.</p> <p>Due date: 31.07.02</p>			
<b>Signature</b> ESA		<b>Contractor</b> ASTRIUM	
<input checked="" type="radio"/> Accepted with action <input type="radio"/> Closed <input type="radio"/> To Pre-Board <input type="radio"/> To Board <input type="radio"/> Postponed			
<b>(I) PRE-BOARD DISPOSITION :</b>			
<b>Signature</b>		<b>Contractor</b>	
<b>(J) BOARD DISPOSITION :</b>			
<b>Signature</b>		<b>Contractor</b>	
<b>(K) CLOSE OUT REFERENCES :</b>		<b>Closed: Yes DATE :11-JAN-03</b>	
COL-RP-AI-0100, iss.4		<b>SIGNATURE : ESA</b>	





## RID Processing Rules

### •Customer:

- A) Discrepancy (in-scope issue)
  - Clear discrepancy description (design or documentation)
  - Discrepancy reference: not fulfilled requirement / ICD parameter or task
  - Options for problem resolution
- B) New reqmt. / task
  - New item description (reqmt. And/or design feature)

### •Contractor:

- A)
  - Concur to discrepancy or disagree (with justification)
  - If agreed: accept proposed option or define own one
  - Define schedule impact
- B)
  - New item understanding
  - Define cost and schedule impact



# PDR / CDR Change Implementation



- **Prior to PDR /CDR:**
  - **Coherent design and task baseline existing / control by Design Control Board (DCB)**
  - **A baseline must exist during all times to be followed by all technical disciplines**
- **During Review collocation**
  - **Change („Agreed“ RID)**
    - **Complete change defined and agreed or**
    - **Action Item to assess and/or detail change**
  - **No change: Both parties agree that baseline is adequate („Closed“ RID)**
- **After Review**
  - **In-scope-changes: approval / implementation control by DCB**
  - **Out-of-scope changes: CCN to customer for negotiation / approval**
    - **CCN technical part approved by DCB, contractual part by CCB**



# Design Review Data Package (e.g. Columbus CDR)



## •Volume 1: Baseline Status ( 4 Binders)

- 1. Implementation Status
  - Requirements
  - ICD's
  - Design
- 2. Lower Level Review Close-out
  - PICA
  - DMSS
  - Etc
- 3. Specification Tree
- 4. Product Tree
- 5. Waiver Status List (incl. Open Waivers)
- 6. ICD Contractual Index and Status Report
- 7. Abbreviation List
- 8. Configuration Item Data List (CIDL)
- 9. As-Build Configuration List (ABCL) for ETM
- 10. ETM/FM Differences
- 11. Deliverable Items List (DIL)

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## Design Review Data Package (e.g. Columbus CDR)

### •Volume 2: Verification ( 5 Binders )

- 1. Barcharts
  - Schedule Assessment
  - Master Bar Chart
  - Verification Activities
- 2. AIV Plan
- 3. Verification Control Documents (VCD's)
- 4. Verification Status Report
  - Lower Level VCD's
  - Lower Level Close-out Documents (Referenced in System VCD)



# Design Review Data Package (e.g. Columbus CDR)



## •Volume 3: Design Definition ( 23 Binders )

### •1. Reference Configuration Description

### •2. Design Definition Report

#### • 2.1 Overall Architecture

##### •On-orbit Configurations

##### •Launch Configuration

##### •Ground Configurations

#### • 2.2 Design Definitions

##### •2.2.1 Flight

###### •Configuration

###### •Mechanical / Structural Design

###### •Env. Control/Thermal Control

###### •Avionics / Information Management

###### •Software

##### •2.2.2 Ground

###### • MGSE

###### • FGSE

###### • EGSE

##### •2.2.3 Airborne Support Eqmt.

#### •2.3 On-Orbit / Ground Activities

##### •On-Orbit Operations

###### •Activation

###### •Etc.

##### •Launch-Site Processing

##### •Payload Integration

#### •2.4 Interface Design (incl. Astronaut Interfaces)



# Design Review Data Package (e.g. Columbus CDR)



- **Volume 3: Design Definition ( cont'd)**
- 4. Software (Flow Charts etc)
- 5. Drawings
  - System Lay-outs
    - Configurations
    - Fluids
    - Avionics
    - Harness Routing
- 6. Measurement and Command List
- 7. ORU List
- 8. Resources Report
  - Mass
  - Power
  - Etc.
- Supplements: Lower Level Design Definition Reports



# Design Review Data Package (e.g. Columbus CDR)



## •Volume 4: Design Support/Qualification Close-out Documents ( 33 Binders )

### •1. System / Operations

- HFE
- Activation and Operations Modes Analysis
- Etc.

### •2. Mechanical System

- Structural Mathematical Model Descriptions
- Strength / Stress Analysis
- Microgravity Analysis
- Etc.

### •3. Thermal System

- Thermal Math Model Descriptions
- Steady State Thermal Analysis
- Water Leakage Analysis
- etc.

### •4. Avionics Analyses

- EMC Analysis
- Fusing and Protection Analysis
- FDIR Analysis
- Etc.

### •5. Software

- Software Entities Concept
- Equipment Specific SW

### •6. External Interfaces Analyses / Models



# Design Review Data Package (e.g. Columbus CDR)



- **Volume 5: Operations ( 9 Binders )**

- **1. Flight Operations**

- Operations Manual
- System Operations Procedures
- Servicing and Maintenance Procedures

- **2. Ground Operations**

- Launch Site Operations Plan
- Hatch Operations
- Check-out
- Etc.

- **3. Logistics**

- Logistics Support Plan
- Supply Support Plan
- etc.





# Design Review Data Package (e.g. Columbus CDR)



- Volume 6: Payload (P/L) Accommodation ( 3 Binders )**
- 1. Pressurized Payload Interface Requirements Document
- 2. Pressurized P/L Hardware Interface Control Document Template
- 3. Pressurized P/L Generic Payload Verification Plan
- 4. DMS to P/L SW ICD
- 5. COLUMBUS to P/L SW Interface Control Document Template
- 6. External Payload Interface Requirements Document
- 7. External P/L Hardware Interface Control Document Template
- 8. External P/L Generic Payload Verification Plan
- 9. COLUMBUS Payload Accommodation Handbook



# Design Review Data Package (e.g. Columbus CDR)



## •Volume 7: Product Assurance and Safety ( 16 Binders )

- 1. Critical Functions List
- 2. Failure Mode Effects and Criticality Analysis
  - SW Error Effects Analysis
- 3. Safety Analyses
- 4. Emergency, Warning and Caution Analyses
- 5. Contingency Analysis
- 6. Availability / Maintainability Analyses
- 7. Parts Application Analysis
- 8. SW Criticality Analysis
- 9. Critical Items List
- 10. Declared Components List
- 11. EEE-Parts Evaluation Report
- 12. Declared Mechanical PMP List
- 13. MIP / KIP List
- 14. Non-Conformance Reports List
- 15. Request for Approvals
- 16. Problem Notification Status List
- 17. Accident/Incident Status List
- 18. Audits/Inspections Reports Status List



## Summary



- o Technical control has to be performed continuously – all engineers to follow the common Design Baseline as defined in the related documents***
- o At PDR and CDR additionally:***
  - All data to be synchronized and documented for formal review***
  - Additional reviewers (Ground Segment, Astronauts etc)***
- o PDR resp. CDR (payment milestones) objectives declared successful when***
  - All actions are closed / change proposals negotiated***
  - Documents are changed as agreed during review and approved by upper level***