







General

- COLUMBUS approach is a compromise between
- Classical approach: Full system qualification on EM
- Protoflight: Complete qualification on FM (i.e. no system EM)
- ETM Definition: see excerpts of Columbus D & D and AlV Plan
- Ground rules and principles (see following flow):
- Design is approved at PDR's down to unit level
- After PDR the design is changed only in controlled way
- FM Design is approved at CDR's



COLUMBUS D&D Plan

Baumfahrt-Infrastruktur



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2.4.2 Model Philosophy

2.4.2.1 System Level

As first step on Flight Configuration level an Electrical Test Model (ETM) configuration will be assembled consisting of functional EM units and the complete harness arranged in support structures. It will be used for functional qualification testing to the maximum content possible with this configuration.

Because the structure is not there, radiated emission testing cannot be made but e.g. conducted susceptibility qualification testing is foreseen.

Also the onboard SW and the APM/EGSE interfaces can be fully exercised as missing onboard functional units will be simulated by the EGSE.

The EM units and software will be identical to the Flight Model in physical and functional design as necessasry for qualification objectives. Differences in detailed manufacturing processes and parts quality not influencing the objectives of the EM usage are considered acceptable. Redundancies will be included to such an extent as necessary for qualification testing.



COLUMBUS AIV Plan

Daimler-Benz Aerospace

Raumfahrt - Infrastruktur

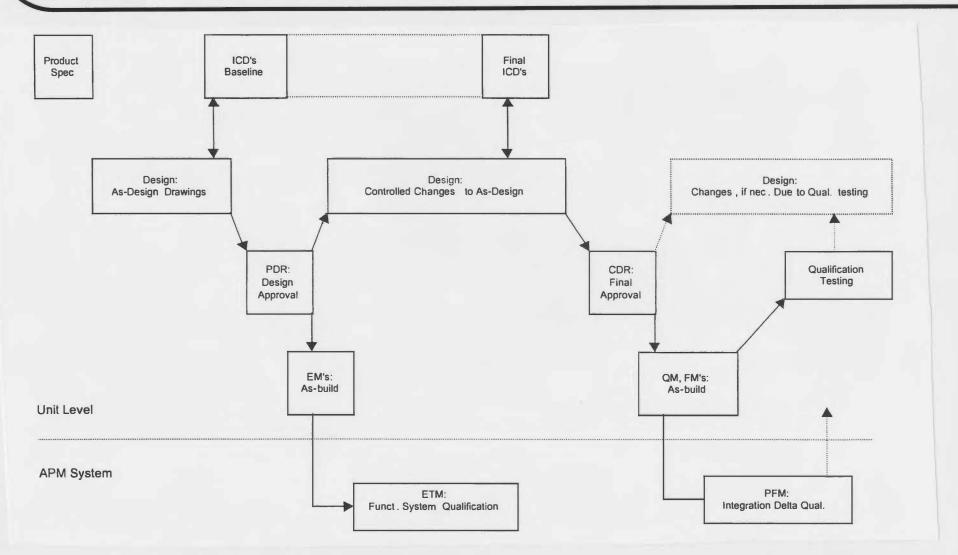


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Model	Definition	Purpose	
BB/DM	o on unit-S/S level for electronic units and critical fluidic/ mechanical -thermal parts	o to develop the design concept on S/S or unit level	
	o non-flight HW	o to check eventual equipment modifications	
EM Engineering Model	 o full flight design, but limited flight standard (no high reliability components necessary). Identical to FM in form, fit and function o MIL grade EEE parts (extended temperature range) procured as a goal from the same production lot of QM/FM Hi-Rel parts as defined in RD(5), PAS spec. 	o to qualify function/performance & internal/external interfaces as far as possible	
QM Qualification Model	o all units - assy, SS (structure) o full flight design and flight standard	o environmental qualification on unit, assy, ORU, (S/S structure)	
EQM Eng. Qualif. Model	o full flight design and EM standard o EEE parts stem from the same product line as FM Hi Rel parts	o environmental/functional quali- fication	



Design and Qualification Logic



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CIDL-ABCL-EM/FM Differences List Relations

As - Design Doo	ETM As - Build Doc.		
CIR: CSRD/RFW's SSMB/APM ICD CCN's etc.			
CID: • FM System Drawings (released at CDR) • FM Sytem Parts List • FM Sytem Test Procedures • etc.	 ETM System Drawings (released at PDR) ETM Sytem Parts List ETM Sytem Test Procedures 	 Number of installed units, e.g 2 EM CMU's 2 FM CMU's 4 CMU's 	
CIR: FM Unit Drawings (released at CDR) FM Unit Parts List etc	 EM Unit Drawings (released at (PDR) 	 Identification of serial items: EM CMU #1. EM CMU #2 etc. 1 	
APM: FM	APM: ETM		As design vs.
	EM/FM Difference List for EM CMU #2		As build verification at Acceptance Reviews