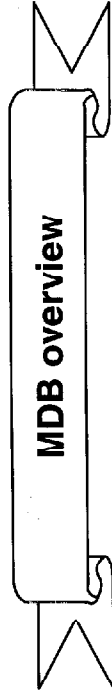




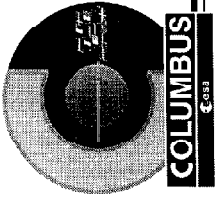
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MDB Overview



Overview of :
Columbus Ground Software (CGS)
product
Mission Data Base



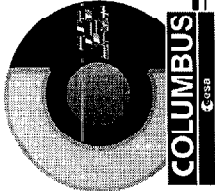


CGS Common Ground Software Overview

1. Introduction and programmatic aspects

2. Mission Data Base architecture





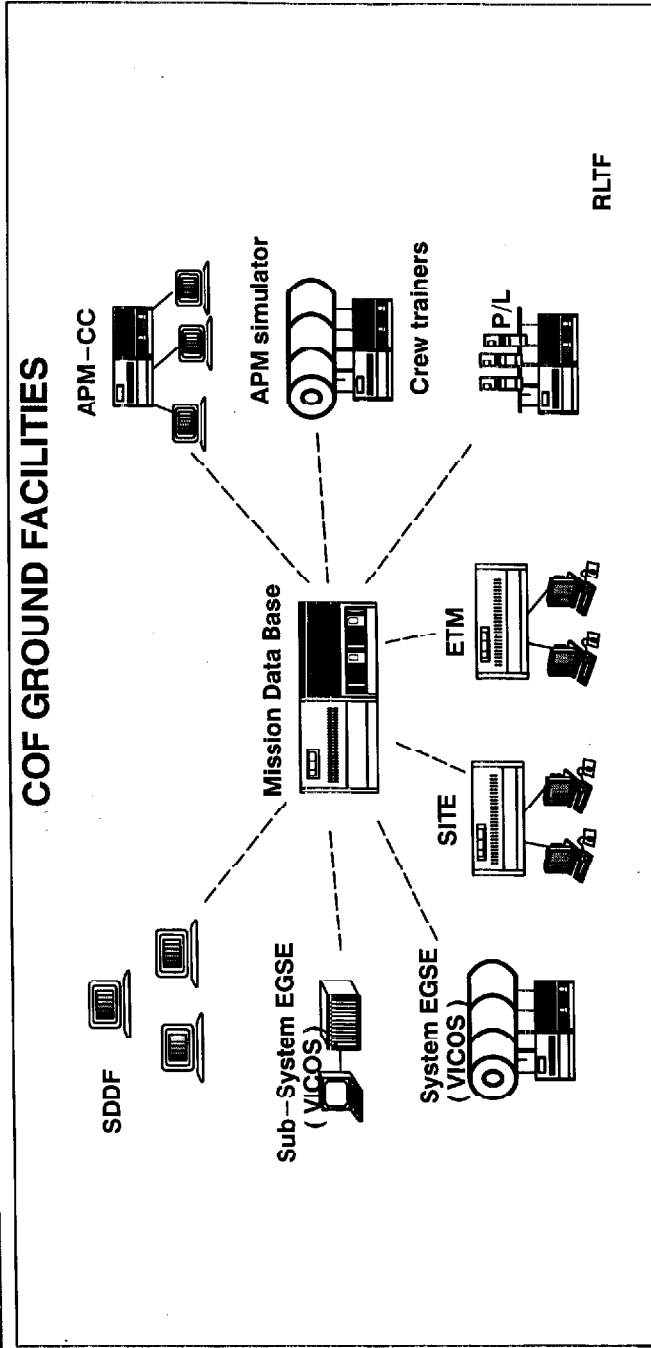
What has ESA developed for the Space Station Program ?

- Initially ESA (with DASA-RI as prime contractor) developed a generic software package to provide the ground software infrastructure for the total life-cycle of the APM/COF project. This includes software in support of flight software development and integration, EGSE, simulators and mission control. This package (software tool-set) is known under the name Columbus Ground Support (CGS) software.
- Currently this CGS software is qualified and taken in use on different places in the ISSA project
(e.g. NASA SVF, MBF,PSIC/F, UDC, ERA-EGSE, Russian SM SITE and TF/EGSE)
- Central in this CGS package is the Mission Data Base
Which can be used separately (as in the NASA ISSA Database MBF) or together with other CGS tools to build up ground support facilities.





MDB Overview – Introduction and programmatic aspects

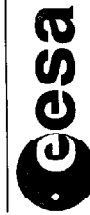




MDB Overview – Introduction and programmatic aspects

CGS Budget Status – Overview

Company	Product	lines of "Ada" code		up to Jun 94	Budget (MAU)		V 3 total
		V 2	V 3		GSRF	CCN	
DASA	CSS	330,000	500,000	4.3	2.2	6.5	
DASA	CGS-System			8.2	8.7	16.9	
IK/CC	VICOS						
	TES	200,000			1.6	11.1	
	TSCV	70,000	316,000	9.5			
	TEV	115,000					
SBI	DBS	90,000	237,000	5.8	0.9	6.7	
ABT	NWSW	30,000					
	TSS	50,000	83,000	3.0	0.1	3.1	
DASA	HCI	140,000	280,000	1.0	1.0	2.0	
DASA	MDA/MDB	250,000	426,000	4.4	3.1	7.5	
DASA	CLS	100,000	126,000	2.7	0.7	3.4	
GMV/Rovsing	FWDU/GWDU	220,000	232,000	4.9	0.3	5.2	
DASA	CGSI	15,000	17,000	2.8	0.3	3.1	
CRI	SDE	300,000	300,000	18.1	0	18.1	
	TOTAL	1,910,000	2,517,000	64.7	18.9	83.6	



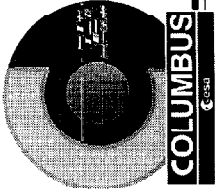


MDB Overview – Introduction and programmatic aspects

SGS products in use at the different spacestation facilities

CGS	COF	COF	COF	NASA	NASA	NASA	NASA	NASA	NASA	NASA	ERA	AT/	CTV	GSRF
	COF	COF	COF	MBF	SVF	FSIC/F	POIC	MCC	UTP	UTP	ERA	AT/	CTV	GSRF
	COF	RLTF	DMS-R	MBF	SVF	FSIC/F	POIC	MCC	UTP	UTP	ERA	AT/	CTV	GSRF
CGSI	X	X	X	X	X	X	X	X	X	X	X	?	?	X
SDE	X	X	X									?	?	X
MDA	X	X	X	X	X	X	X	X	X	X	X	?	?	X
CLS	X	X	X	X	X	X	X	X	X	X	X	?	?	X
GWDU	X	X	X	X	X	X	X	X	X	X	X	?	?	X
FWDU & CPLE	X	X	X									?	?	X
HCI	X	X	X								X	?	?	X
TES & TSCV	X	X	X	X	X	X	X	X	X	X	X	?	?	X
DBS	X	X	X	X	X	X	X	X	X	X	X	?	?	X
TEV	X	X	X	X	X	X	X	X	X	X	X	?	?	X
NWSW	X	X	X	X	X	X	X	X	X	X	X	?	?	X
TSS	X	X	X	X	X	X	X	X	X	X	X	?	?	X
CSS	X	X	X								X	?	?	X
MARTIX & Int.	X			X								?	?	

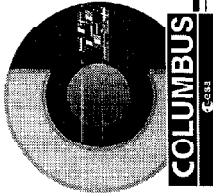




MDB installations operational in the US

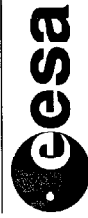
- **NASA / Boeing Mission Build Facility (MBF) in Houston**
 - MBF being the central database for ISSA development.
- **McDonnell–Douglas (Product Group 1 Lead Company)**
 - Slave Database to MBF for McDac. PG1 activities.
- **McDonnell–Douglas / BOEING System Verification Facility (SVF)**
 - Slave Database to MBF for all ISSA Integration and Check–out activities.
- **Boeing Huntsville (Payload Operation Integration Centre – ISSA)**
 - PSIVF, Payload Software Integration and Verification Facility.
 - UDC, User Development Complex.
- **NASA Mission Control Centre ISSA**
 - Prototype Facility Database (later to be used in combination with the MBF).





MDB installations in operations in Europe

- **RSC-Energia Moscow (For Service Module par of ISSA)**
 - MDB installations as part of the SM ground support Systems (delivered as part of the DMS-R project).
 - MDB installations as part of Master Test Facility, for compatibility test between FGB, SM and NASA elements in Moscow
- **European Robotic Arm (ERA)**
 - MDBs as part of the EGSE (Checkout Facility and the MPTE (training facility).
- **COF/APM consortium users**
 - ABT, Belgium EGSE developer.
 - Røvsing, Copenhagen Flight & Ground Display Tool.
 - RST, Rostock Ground SW development.
 - MATRA Toulouse DMS development.
 - DASA-RI, Bremen COF, DMS-R.

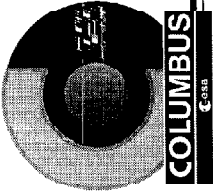


After 90 copies of MDS in use

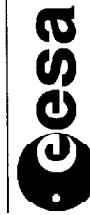
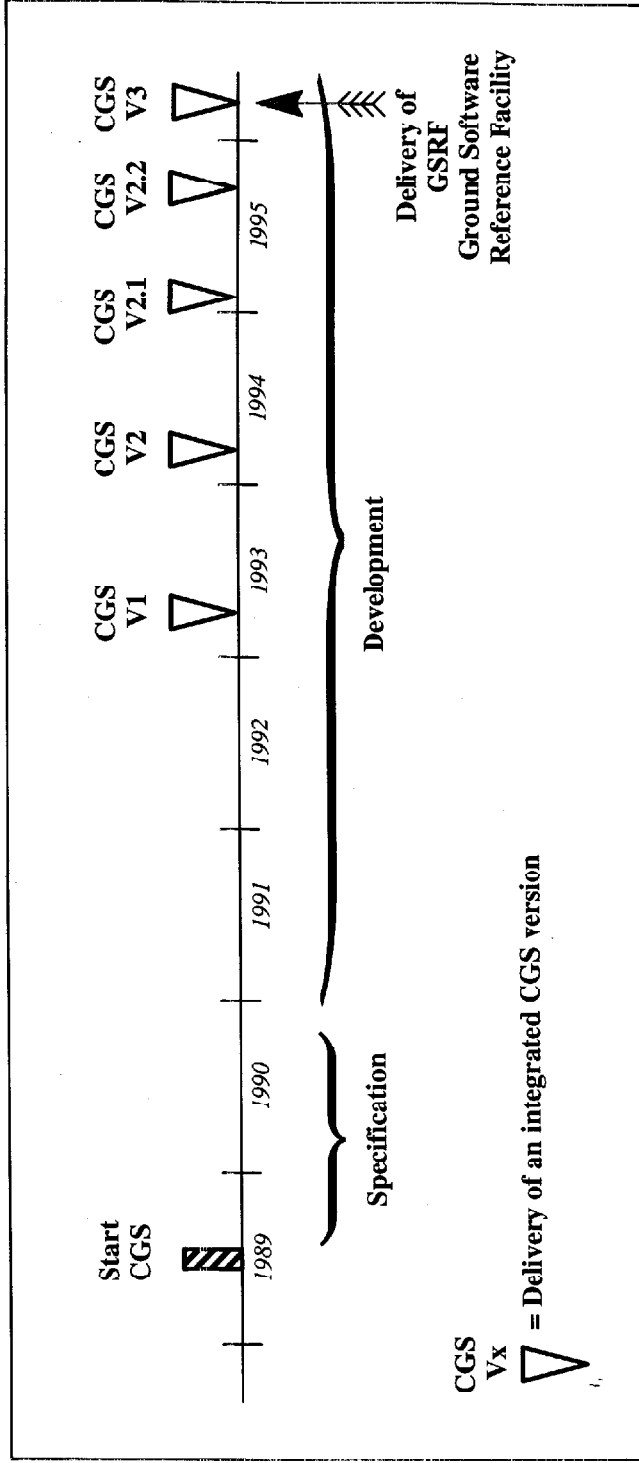


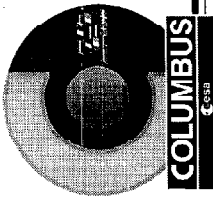
Support environment for the Mission Data Base

- The MDB software is provided and supported as COTS (commercial Off The Shelf).
- Maintenance is performed under an ESA contract (10 MAU workpackage added to the COF contract).
- Updates, modifications, new versions planning etc. is subject to results of the CGS User Control board (ESA, DASA and users)
- Help–desk facilities available
- Training courses and support can be provided
- SPR (Software Problem Report) system in place
- Reference system available for training and demonstrations.

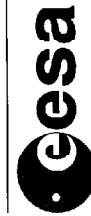
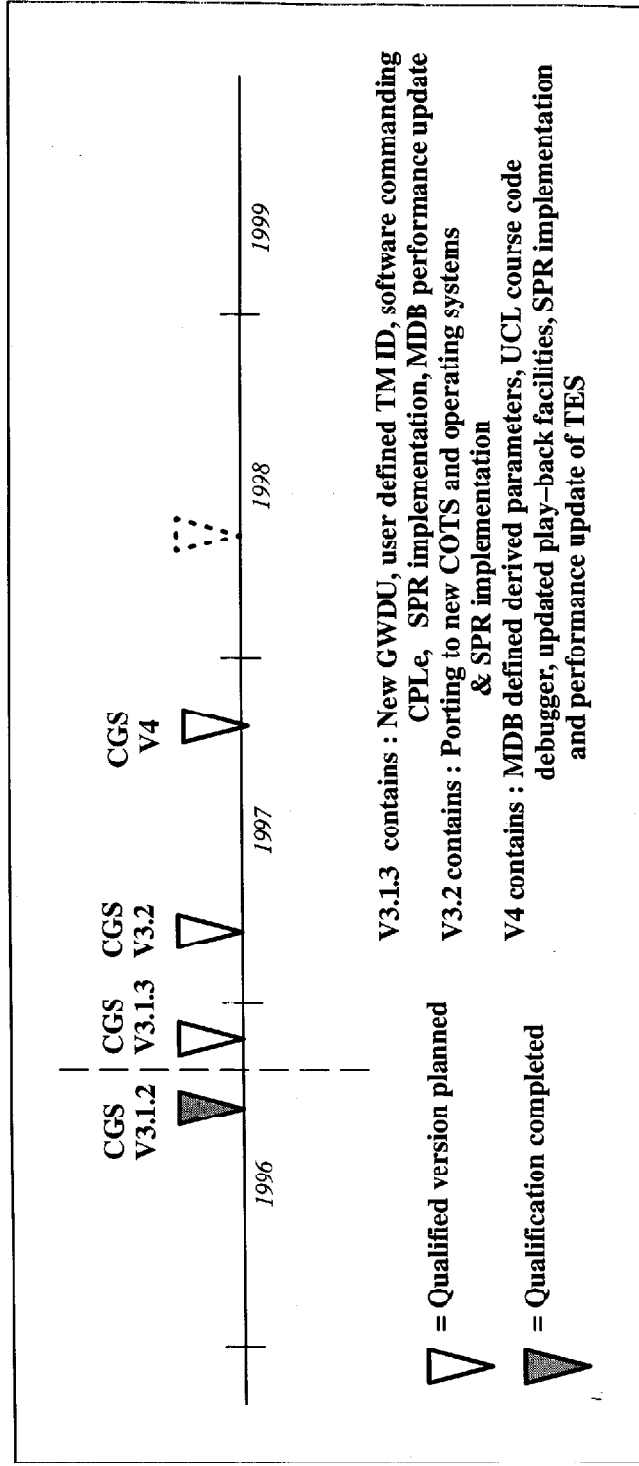


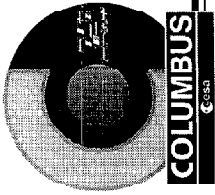
CGS development schedule





CGS maintenance and update schedule



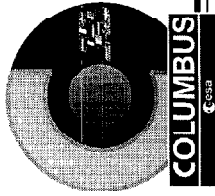


CGS Common Ground Software Overview

1. Introduction and programmatic aspects

2. Mission Data Base architecture





MDB Overview – MDB architecture and functionality

(Basically def. of systems - from database - another db)

What contains the MDB

The MDB (Mission Data Base) provides the single distributed Data-Base for all project software and data products for flight, EGSE, simulation and operation.

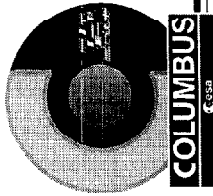
It contains :

- Flight configuration definition
Including items as:

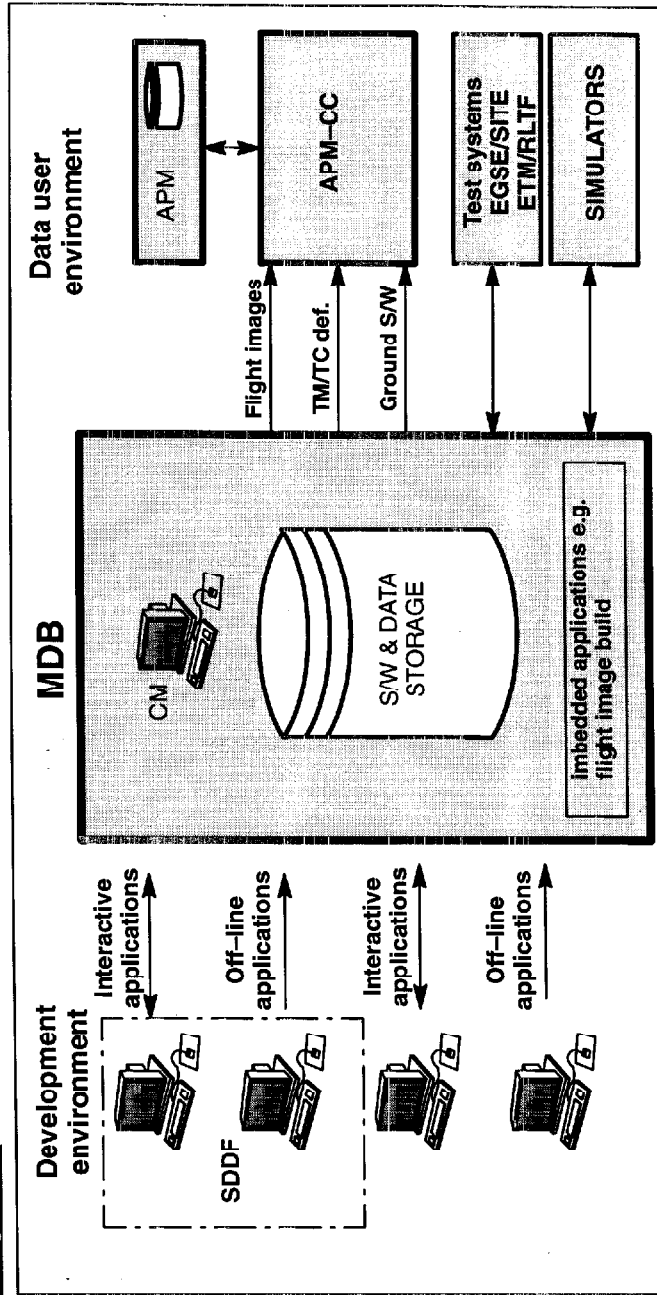
Telemetry definitions, Telecommands, Channelization, CCSDS definitions, Bus protocols, sensors/actuators, Calibration curves, Analog parameters, derived parameters etc.

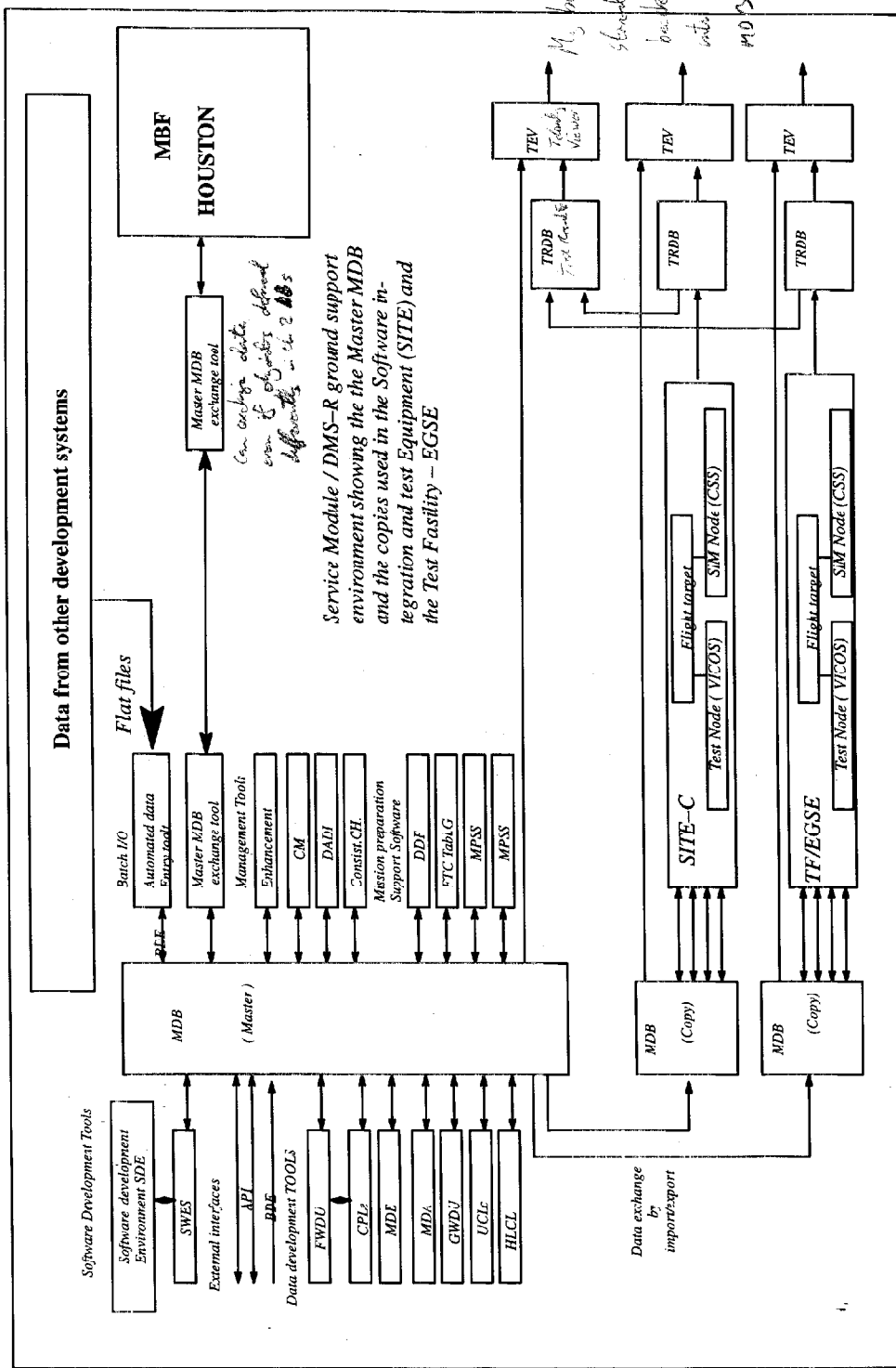
- Flight software and data products (including SWRU, Displays , procedures)
- EGSE configuration control, including:
 - Configuration definition, procedures, displays, test sequences
 - EGSE software, and complete test definitions
- Simulation configuration control, including configuration definition, procedures, models, displays and CSS software CM
- Flight images (ready for up-loading)

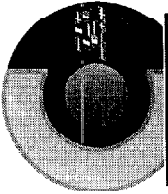




MDB Overview – MDB architecture and functionality







MDB architecture and functionality

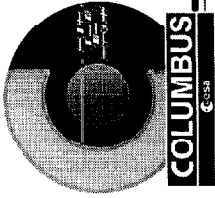
The MDB (Mission Data Base) architecture contains the following functions :

- Hierarchical Decomposition and Name tree concept
Including short identifiers and foreign keys

*} implemented on Oracle 6.3
we look like a 0003*

- System Tree and User Tree concept
- Configuration management (on more then one baseline at the time)
with CCUs and CDUs
- Support for distributed use by different contractors in the consortium
- Ownership control
- Multi layer consistency checking capability
*- can check what objects referenced by one object
are consistent with the way they are used.*
- Mapping Tool
- maps data between objects
- External interfaces
- Tool interfaces





MDB integrated tools as available

- **Prime contractor MDB definition and management tool (DADI)**

Data dictionary Definition, End-Item type definition, Mapping tool control, Consistency checker control, System Tree build, Report generator, SID allocation, selective archive and removal, Configuration management.

- **Integrated data development tools (ready for use)**

User MDB I/O screens and report generator, Script language compiler(UCL), Display builder, Software Development environment, Model definition tools, MATRIXx, etc.

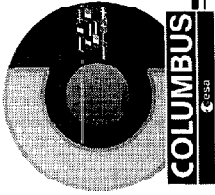
- **Integrated mission preparation tools**

Flight image builder, Data formatting tools, table builder

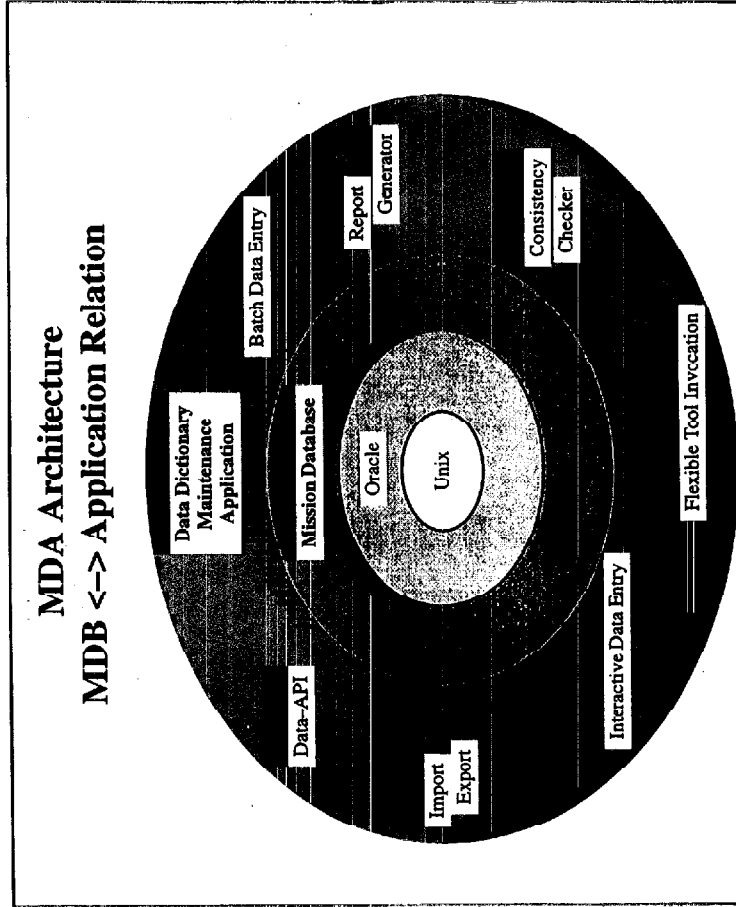
- **Batch Data entry**

Flat-file data entry





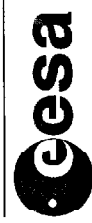
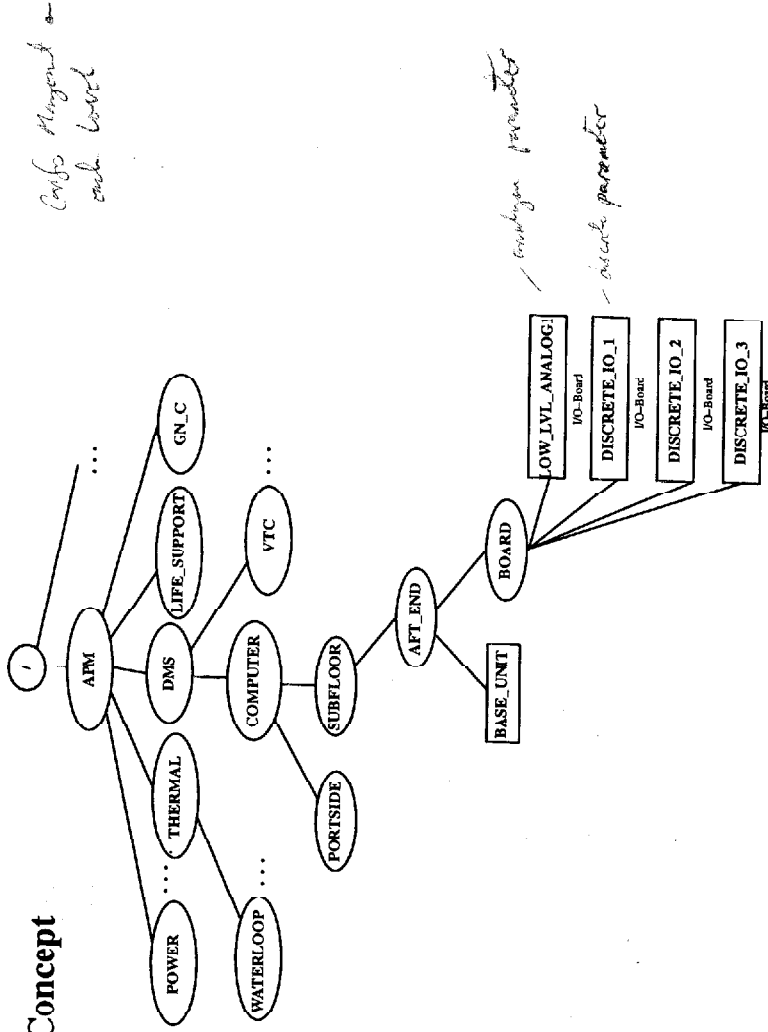
MDB Overview – MDB architecture and functionality



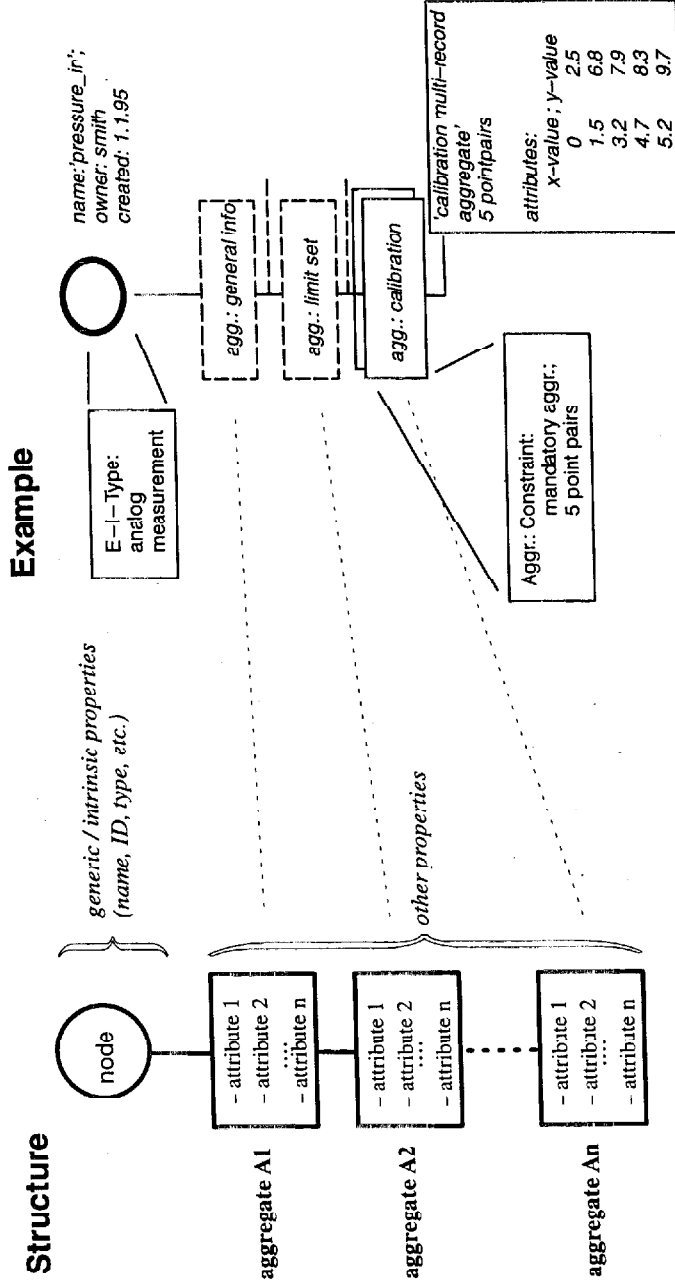


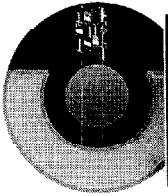
MDB Overview – MDB architecture and functionality

Name Tree Concept



MDB Overview – MDB architecture and functionality

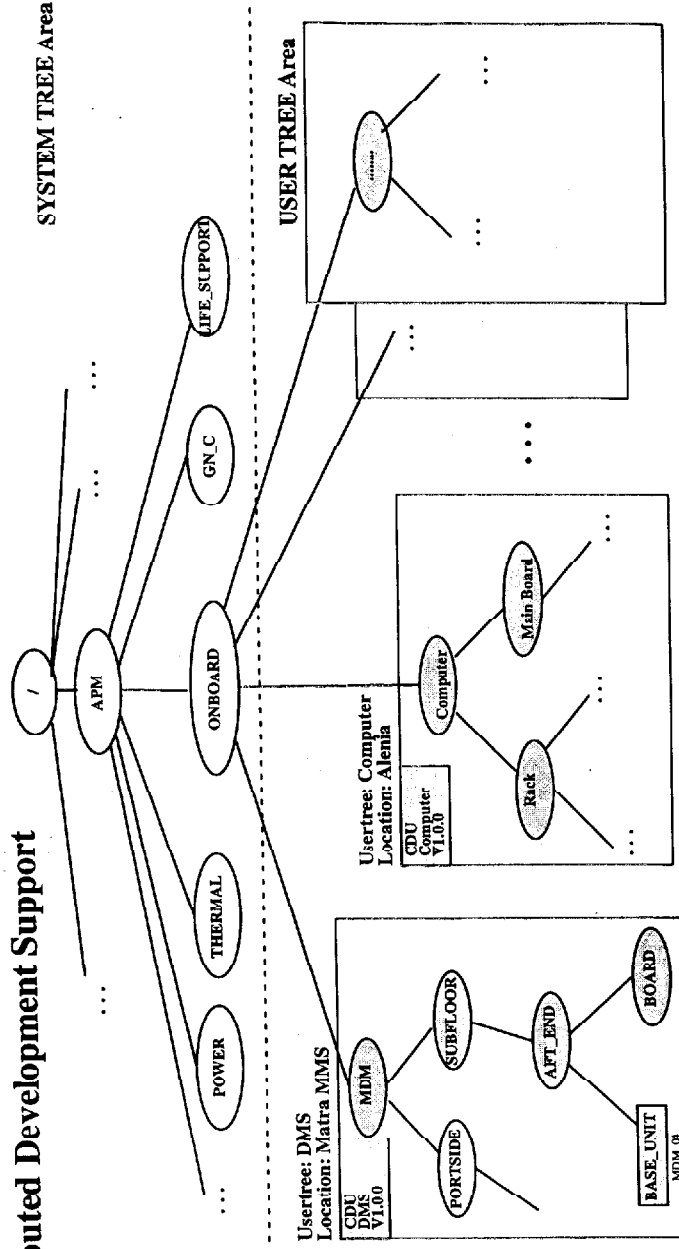




COLUMBUS

MDB Overview – MDB architecture and functionality

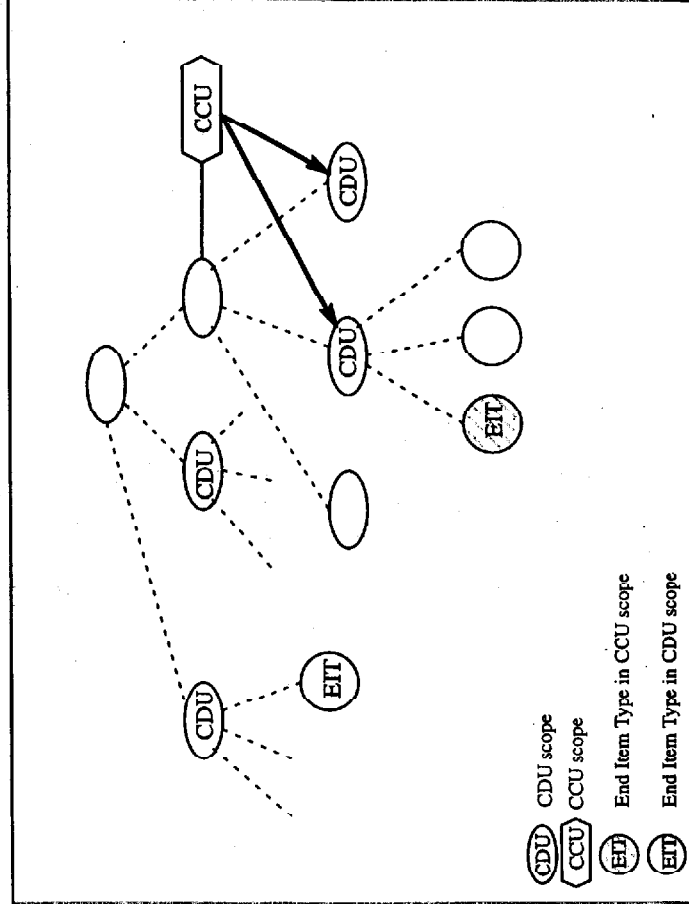
Distributed Development Support

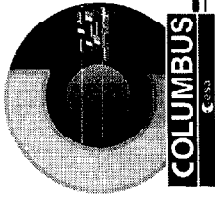




MDB Overview – MDB architecture and functionality

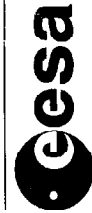
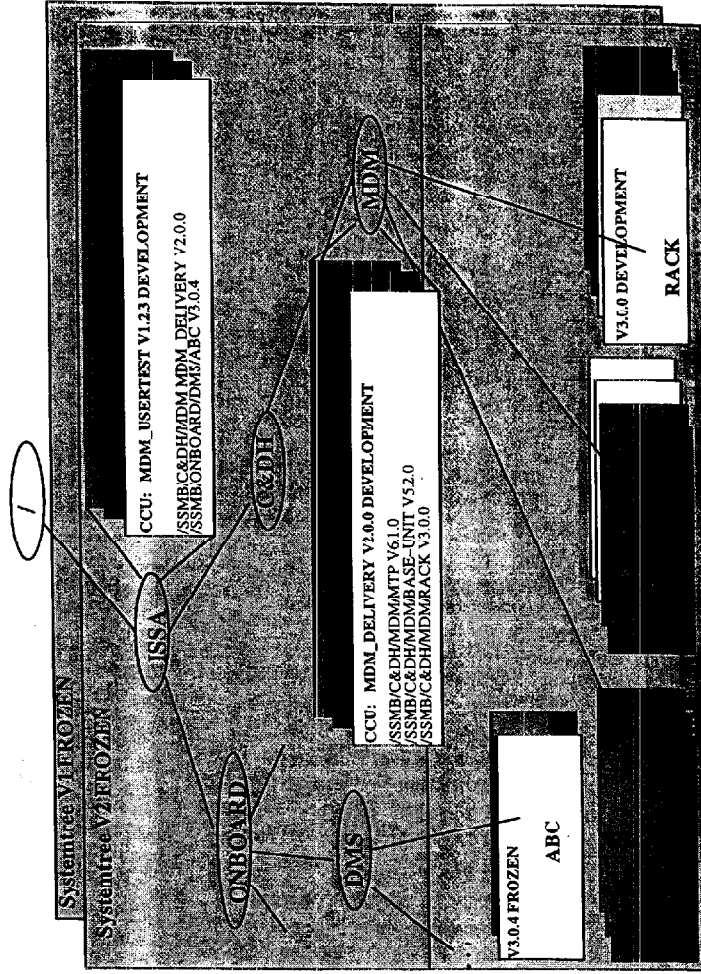
CCU - Config Control Units
CDU - Config Data Units
- defines the set of data used for a given test etc

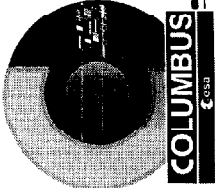




MDB Overview – MDB architecture and functionality

MDA Configuration Management (rough overview)





MDB Overview – MDB architecture and functionality

MDA does provide four level of Version Handling and Configuration Control .

- **Mission Version handling**

The Mission version handling provides the capability to manage complete Name-Trees with all its items like System Trees, User Trees etc. in parallel in the Database.

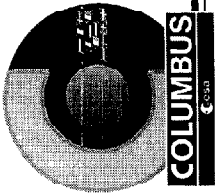
- **System Tree Version handling**

The System Tree that can exists in versions is the higher part of the name tree that represents the breakdown to a level of contractual boundaries or technical boundaries e.g. the split up into different Products.

- **User Tree Version handling**

The User Trees are carrying the actual data e.g. the decomposition of an electronic box into its sub-parts with all its data, software, displays, simulation models etc. . The User Tree is the lowest level of version handling within MDA.





MDB Overview – MDB architecture and functionality

■ User Tree Configuration handling

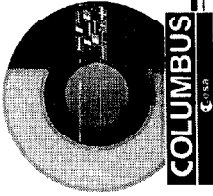
User Tree Configuration handling does provide the ability to group selected versions of User Trees into a configuration for a given purpose.

Example: User Tree MTP V6.1.0 carrying the Master Test Processor
User Tree Base-Unit V5.2.0 carrying the Base Unit description
User Tree I/O-Rack V3.0.0 carrying the I/O Board description

are collected into a User Tree Configuration for Test & Check-out purposes.

User Tree Configurations can reference other User Tree Configuration and by that a hierarchy of configurations can be build.





Consistency Checks & Rules

■ Generic Consistency Rules:

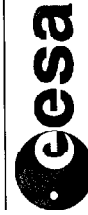
- Mandatory Field Checks
- Referential Integrity
- Referential Type Compatibility
- Cross Reference List Checking

■ Consistency Status

- NONE No consistency checking performed since last modification
- GLOBAL_VALID Version fulfils all consistency rules and does not contain external end item references
- LOCAL_VALID Version fulfils all consistency rules but does contain external end item references
- LOCAL_INVALID Version does not fulfil all consistency rules

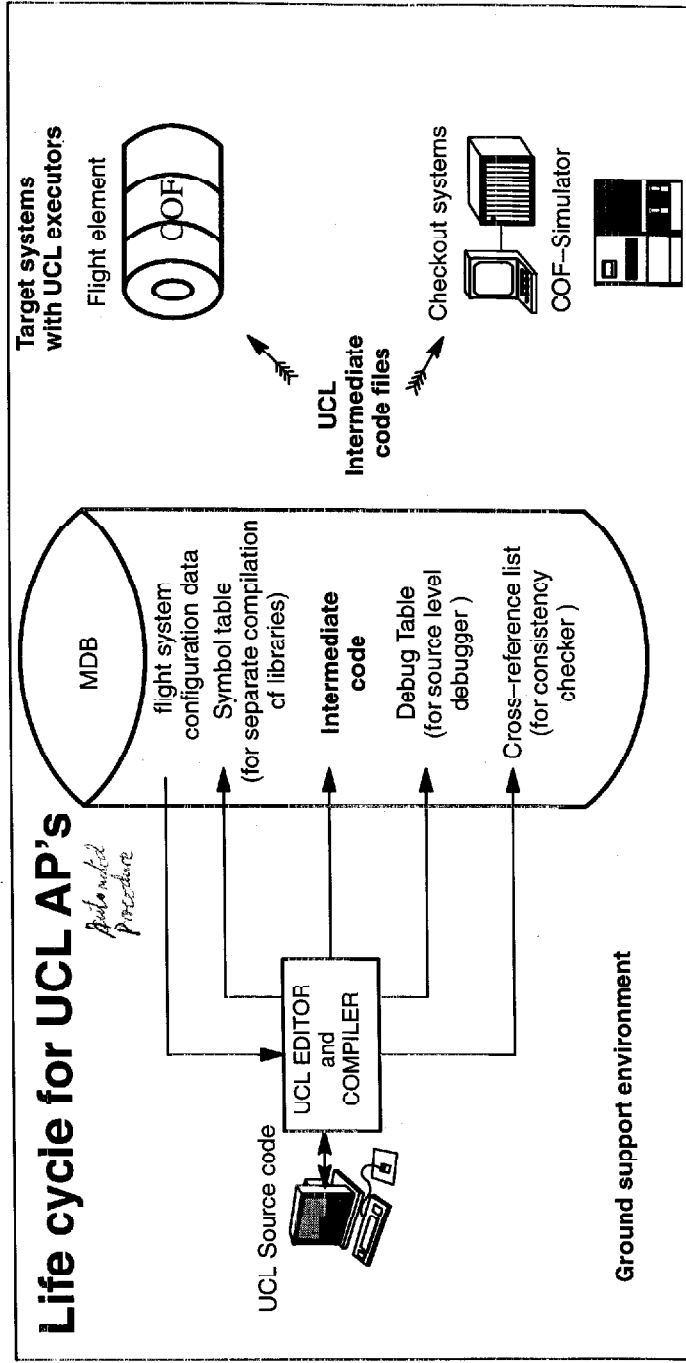
Consistency Checker extensibility

MDA does provide the possibility to integrate "User Written Consistency Checks". This feature is based on Oracle stored procedures standard mechanism.





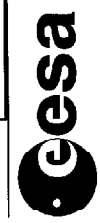
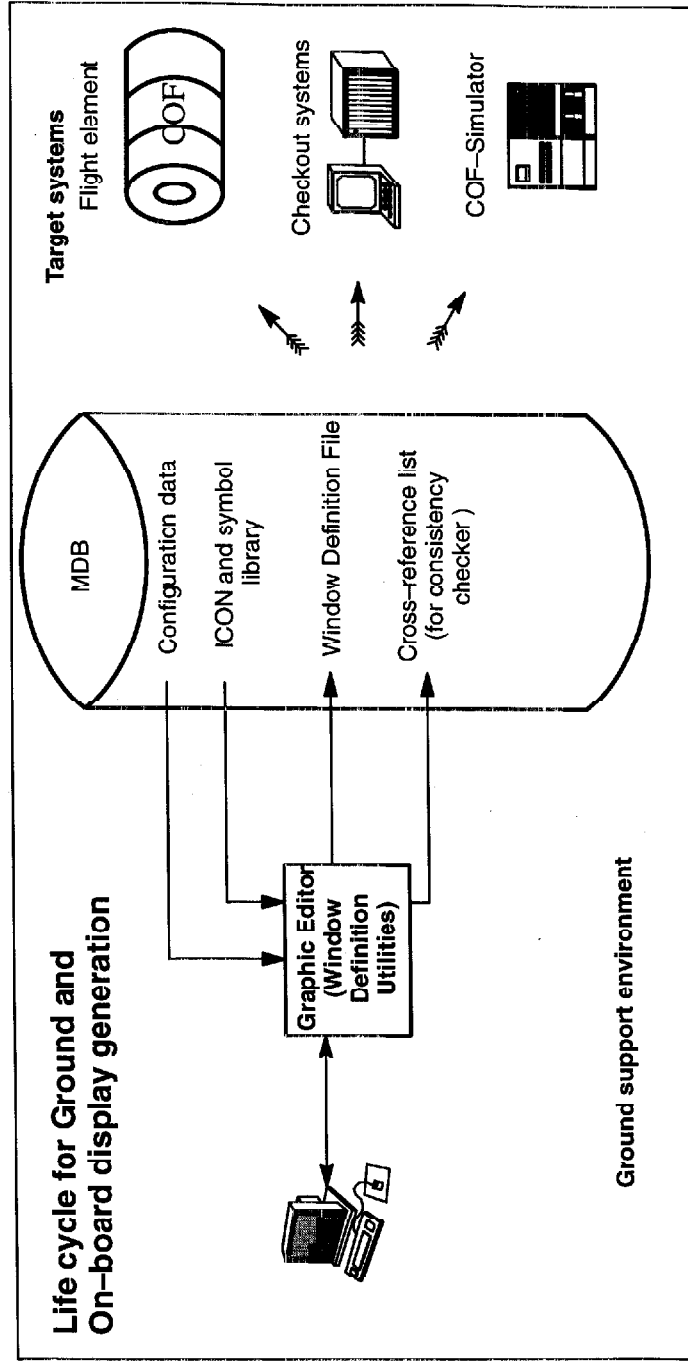
Procedure flow (for on-board and ground use)

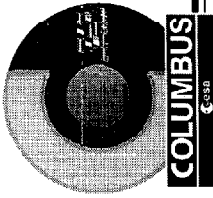




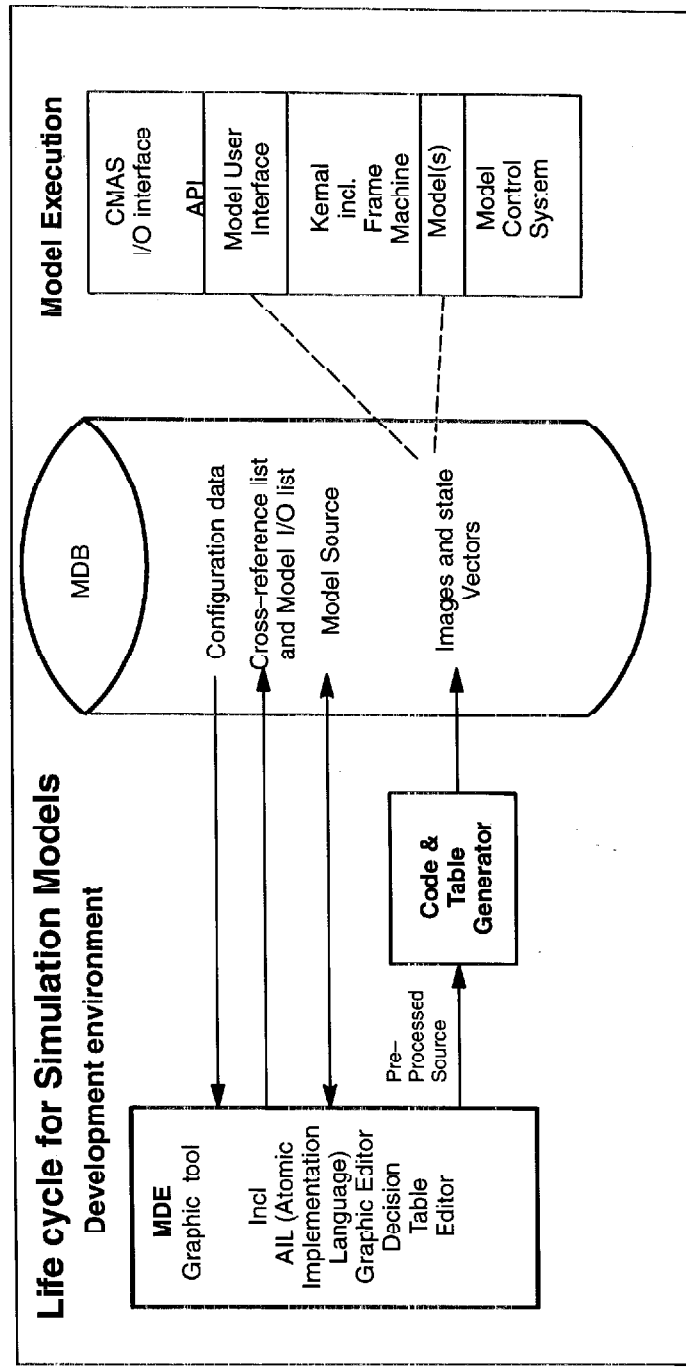
MDB Overview – MDB architecture and functionality

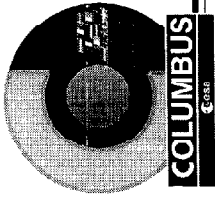
HCI (Ground & Flight Window Definitions using GWDU & FWDU)



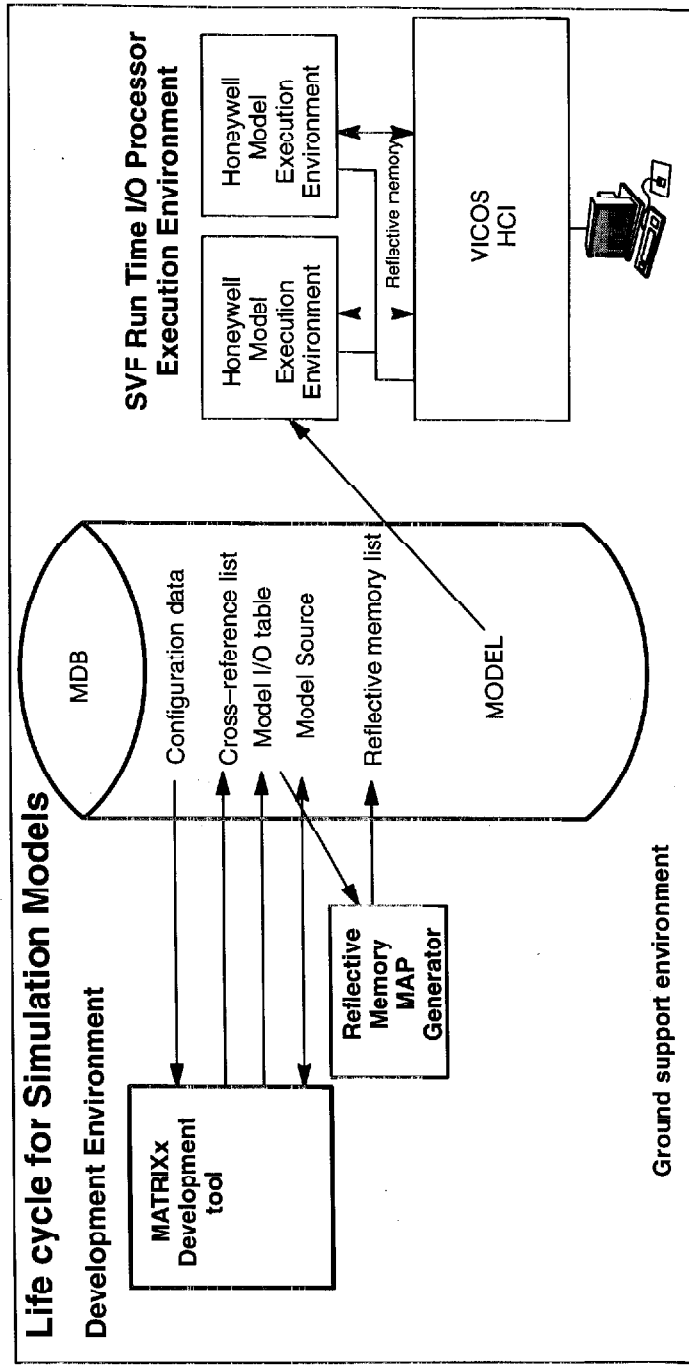


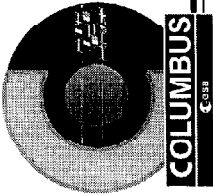
Simulation Model Generation



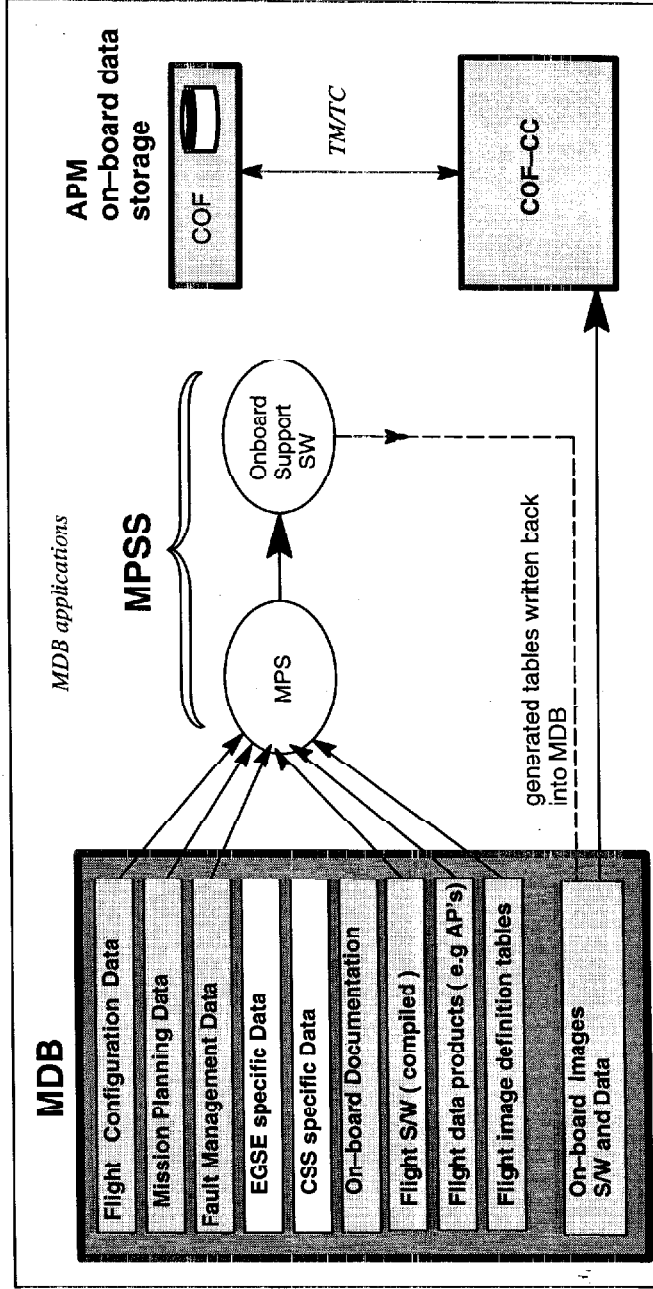


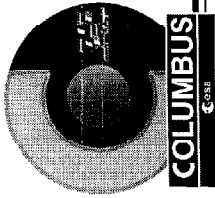
MATRIXx integration with MDB (for SVF RTIOP)



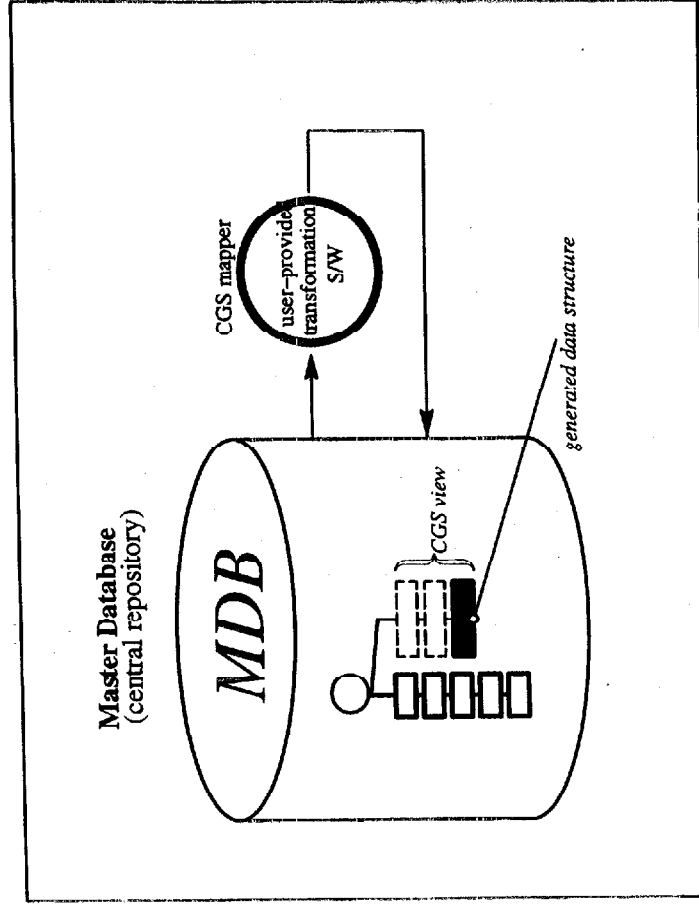


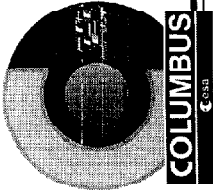
Mission build as integrated MDB service





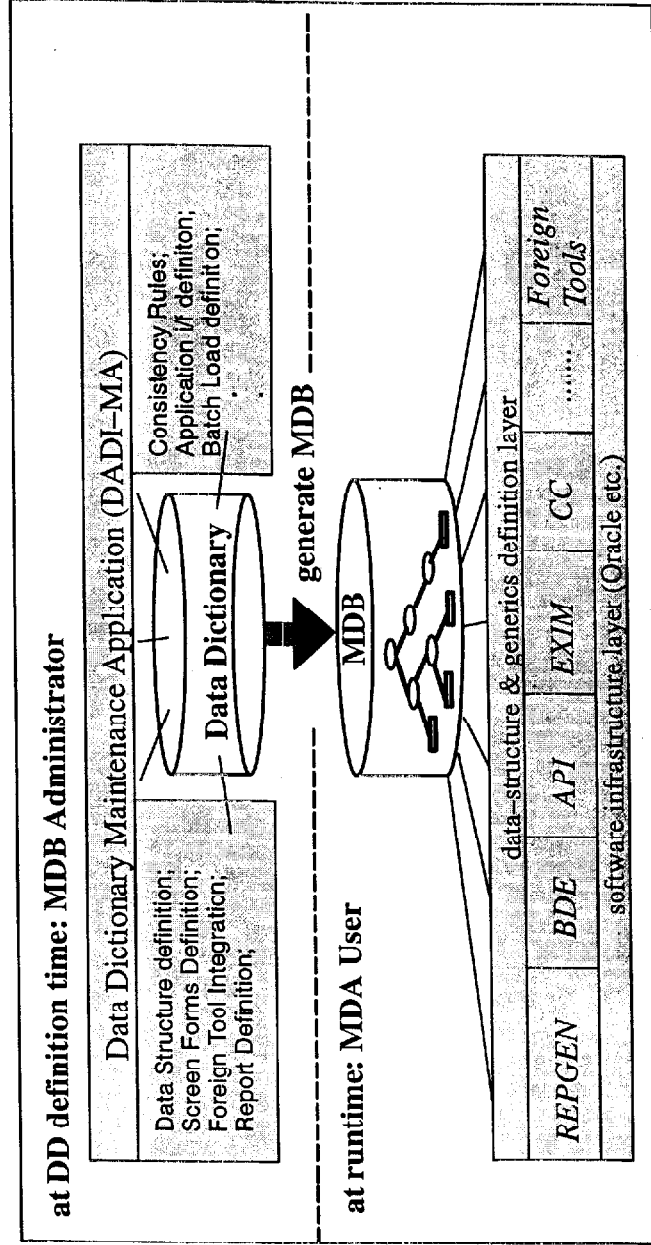
MDB Overview – MDB architecture and functionality

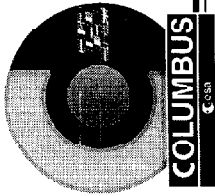




MDB Overview – MDB architecture and functionality

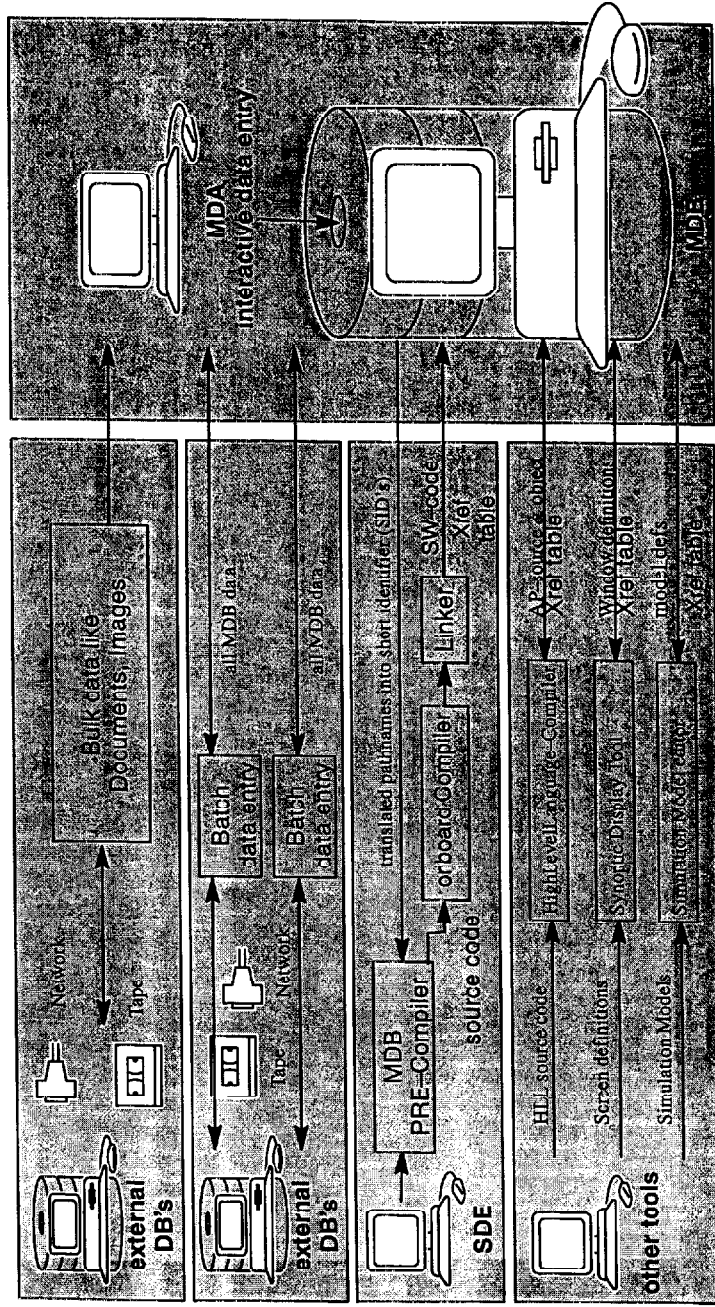
MDA Open Architecture general concept

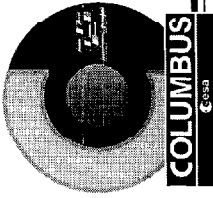




MDB Overview – MDB architecture and functionality

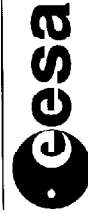
A Toolset Scenario with all kind of Data-structures involved





MDB input/output interfaces

- **Import/Export (for Data and CM information exchange between MDB in the same project)**
- **Flexible tool invocation (for additional user tools integration)**
- **Batch Data Entry (for Data to and from other data-bases or data sources)**
- **End-Item creation via Batch Data Entry**
- **Batch data(including CM data) exchange between foreign MDBs (MDB data bases with different system trees and end-item definitions.**





MDB Overview – MDB architecture and functionality

