



Open Systems Core Avionics Requirement

Nick Carter
OSCAR Applications Manager



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AV-8B Fleet Configurations



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- **Night Attack**

- ☐ NAVFLIR/Night Vision Goggles
- ☐ Digital Moving Map
- ☐ Triples the Number of Expendables



- **Harrier II Plus**

- ☐ APG-65 Multimode Radar
- ☐ Night Attack
- ☐ Provisions for Beyond Visual Range Weapons

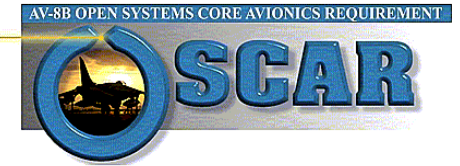


- **Day Attack / Trainer**

- ☐ Twice Payload/Radius AV-8A
- ☐ Digital Avionics/Integrated Cockpit



OSCAR Vision



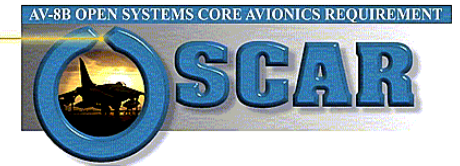
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“To Significantly Reduce the Life Cycle Support Costs of the AV-8B Avionic System Through the Application of Open System Principles, Commercial Technologies and Acquisition Reform Initiatives”

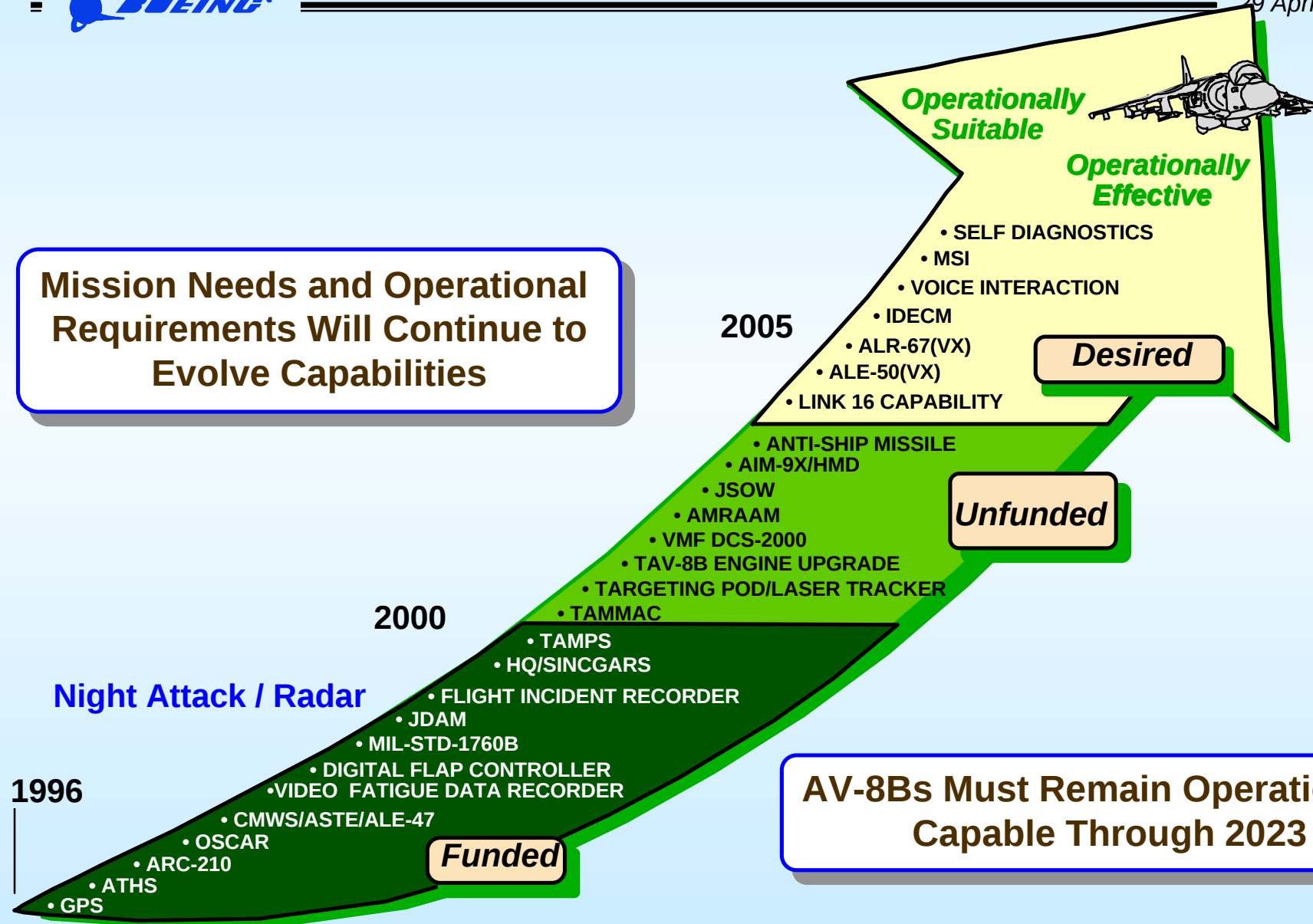


AV-8B Operational Requirements



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Mission Needs and Operational Requirements Will Continue to Evolve Capabilities

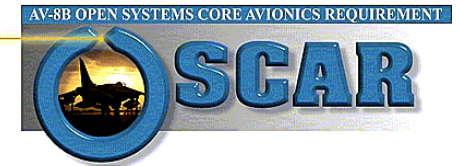


AV-8Bs Must Remain Operationally Capable Through 2023

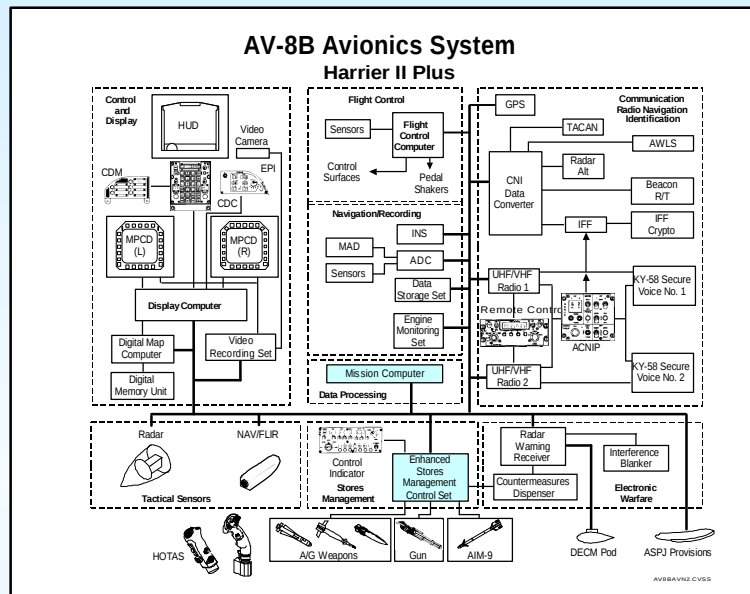


OSCAR Focus

Software Maintenance Cost Drivers

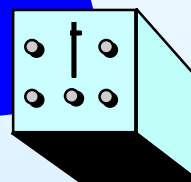
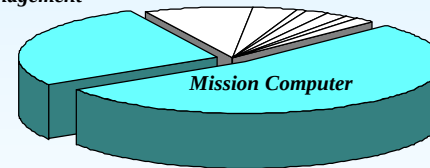


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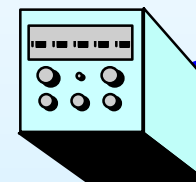


**Two Components Impact ~ 75%
of Routine Update Maintenance Cost**

Stores Management
Computer



**Mission
Computer**

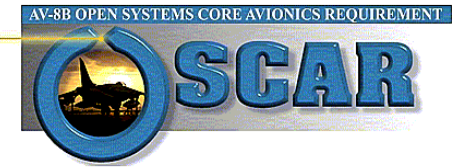


**Stores
Management
Computer**

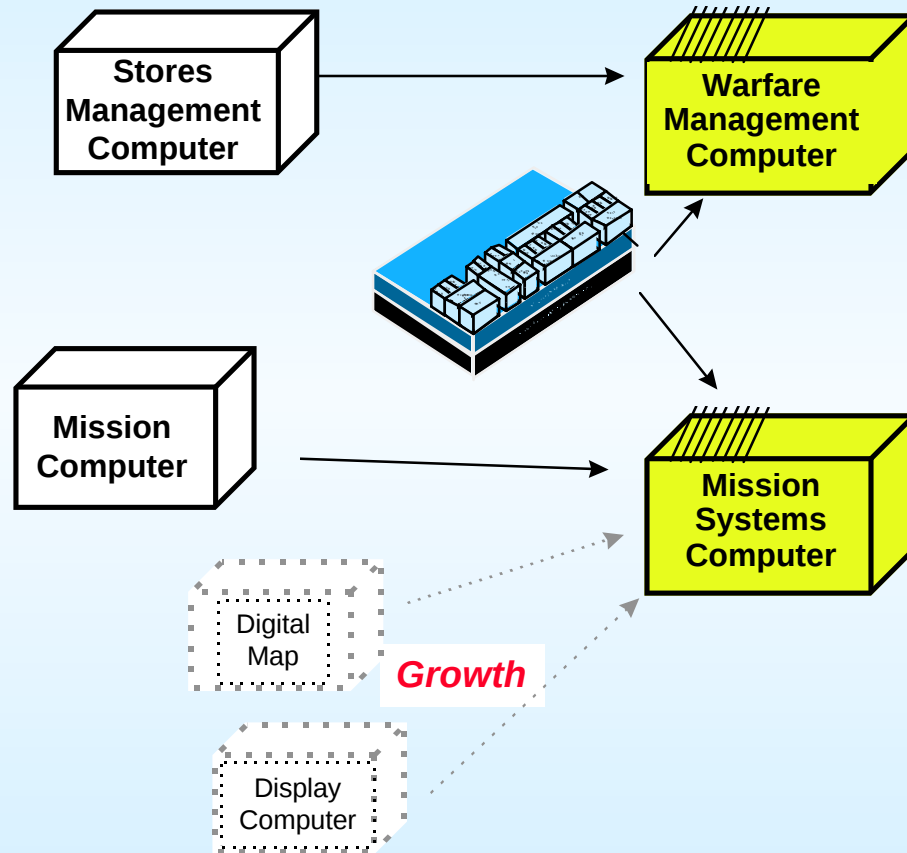
Addresses The High Payoff Areas



The OSCAR Solution



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**Meets Today's Requirements While
Positioning for Future Growth**

Modular Avionics

- Retains Form, Fit, Function
- VME 64 Backplane
- VME 6U Form Factor

Modular Software

- Reusable Across Platforms
- Hardware Independent
- OO Design, C++
- Well Defined Interfaces

Reduced Support Cost

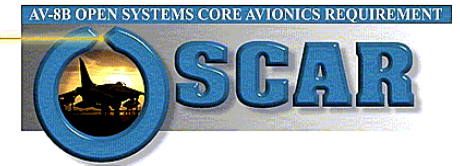
- O to OEM 2-Level Maintenance
- Extended Warranty
- Guaranteed Turn-Around Time

Streamlined Acquisition

- Performance Specs
- Leverage Off Commercial Mkt
- CM Controlled by Prime



OSCAR Program Structure



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Program Funding Sources

- AV-8B JPO (USMC/Spain/Italy)
- DBOF
- CTIP
- COSSI

NAWC-WD
China Lake, CA

Raytheon Radar
Los Angeles, CA

General Dynamics
Information Systems
Minneapolis, MN

Boeing/Alenia
St. Louis, MO

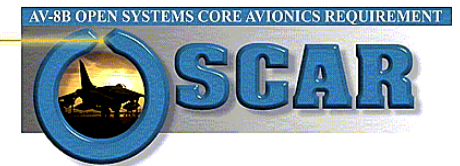
Tracor Aerospace
Austin, TX

Smiths Industries
Clearwater, FL

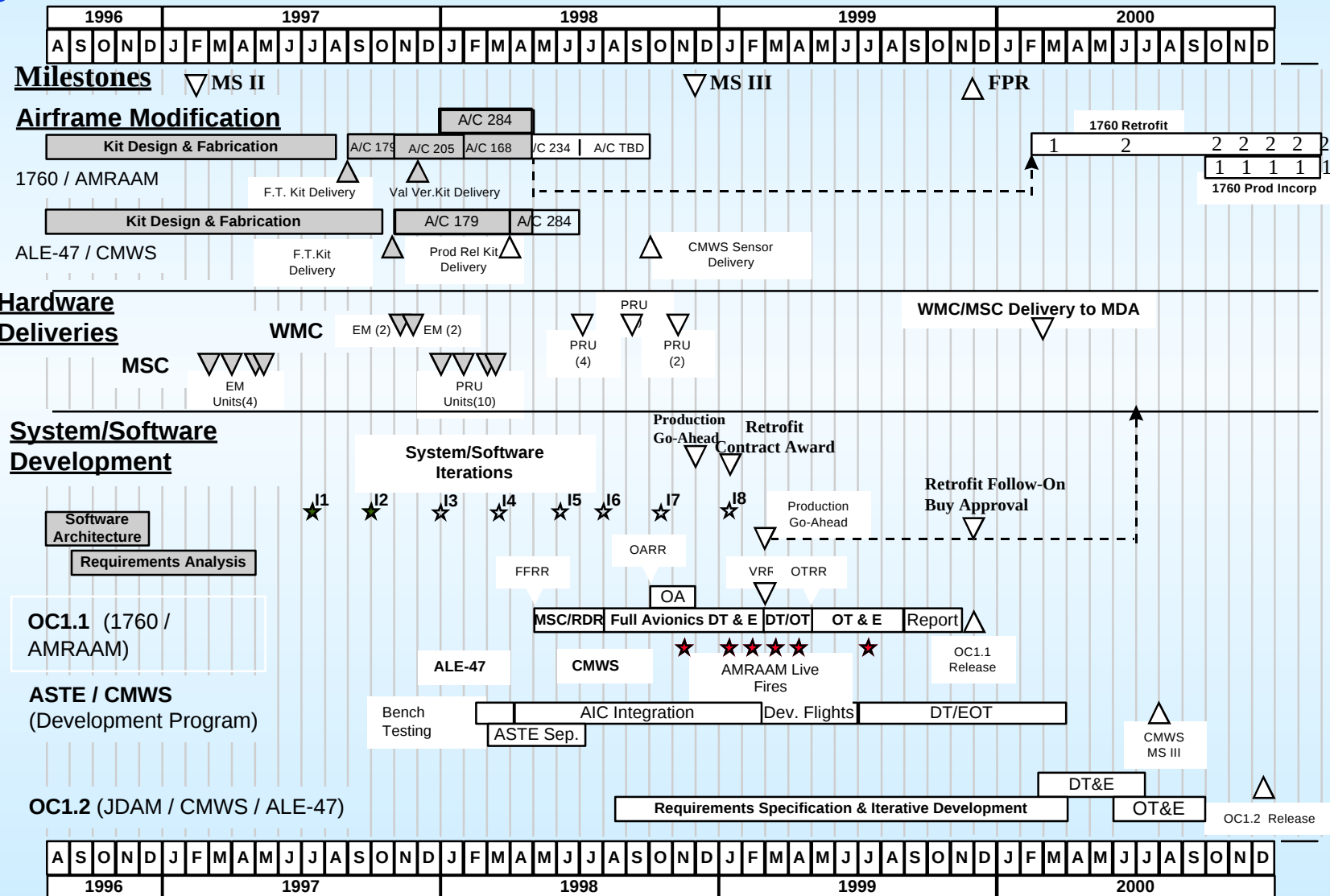
Smiths Industries
Florham Park, NJ



OSCAR Schedule Summary



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5 May 97



OSCAR Uses Standard Interfaces



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OSCAR is an Open System Architecture Which Standardizes Physical, Electrical, and Software Interfaces at Line Replaceable Module Level...

• Software

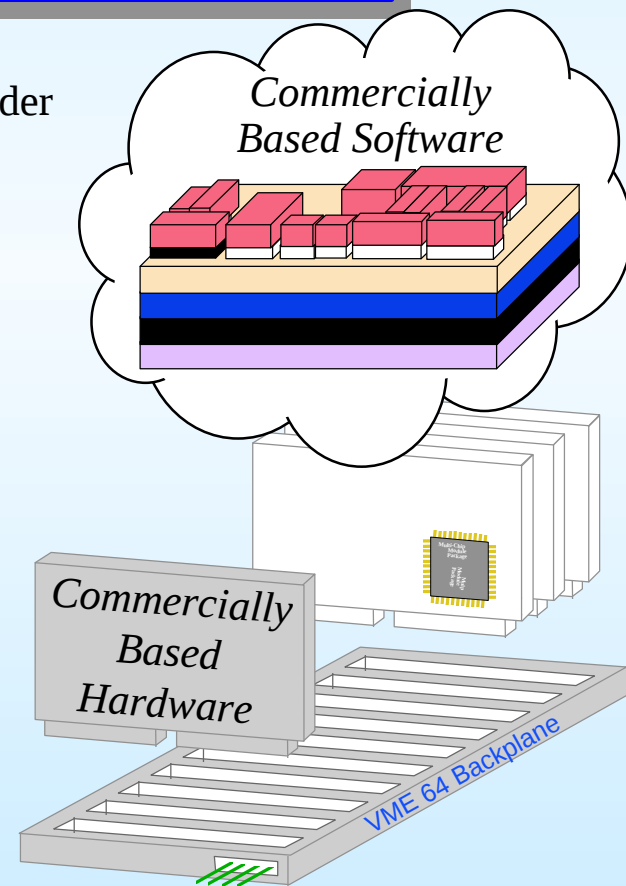
- Commercially Supported, Objected Oriented, High Order Language (e.g. C++)
- COTS Development Tools and Processes
- IEEE/ANSI STD P1003 POSIX Compliant Real-Time Operating System (e.g. VxWorks)
- COTS Software Components (e.g. VME Drivers and Interrupt Handlers)
- Industry STD CORBA Compliant Application Program Interface (API)

• Mechanical

- IEEE 1101.2 Conduction Cooled VME 6U Module

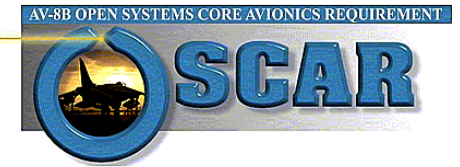
• Electrical

- ANSI/VITA STD 1-1994 VME-64 Backplane Bus
- ANSI STD X3.230-1994 Fibre Channel Bus (Growth)
- IEEE STD 802 Ethernet Development Interface

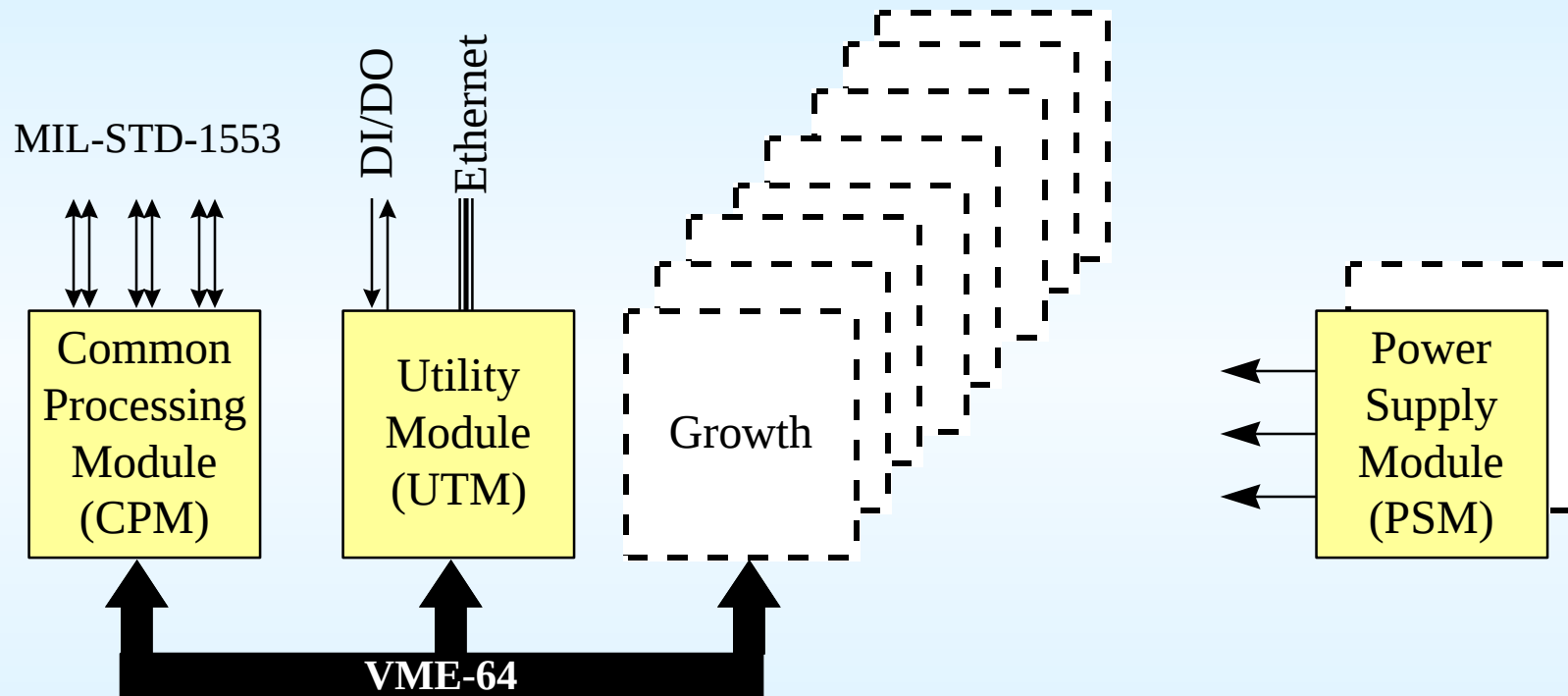




MSC Architecture

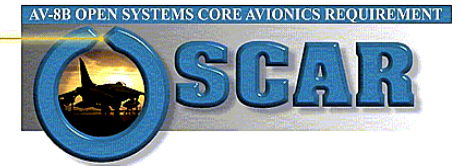


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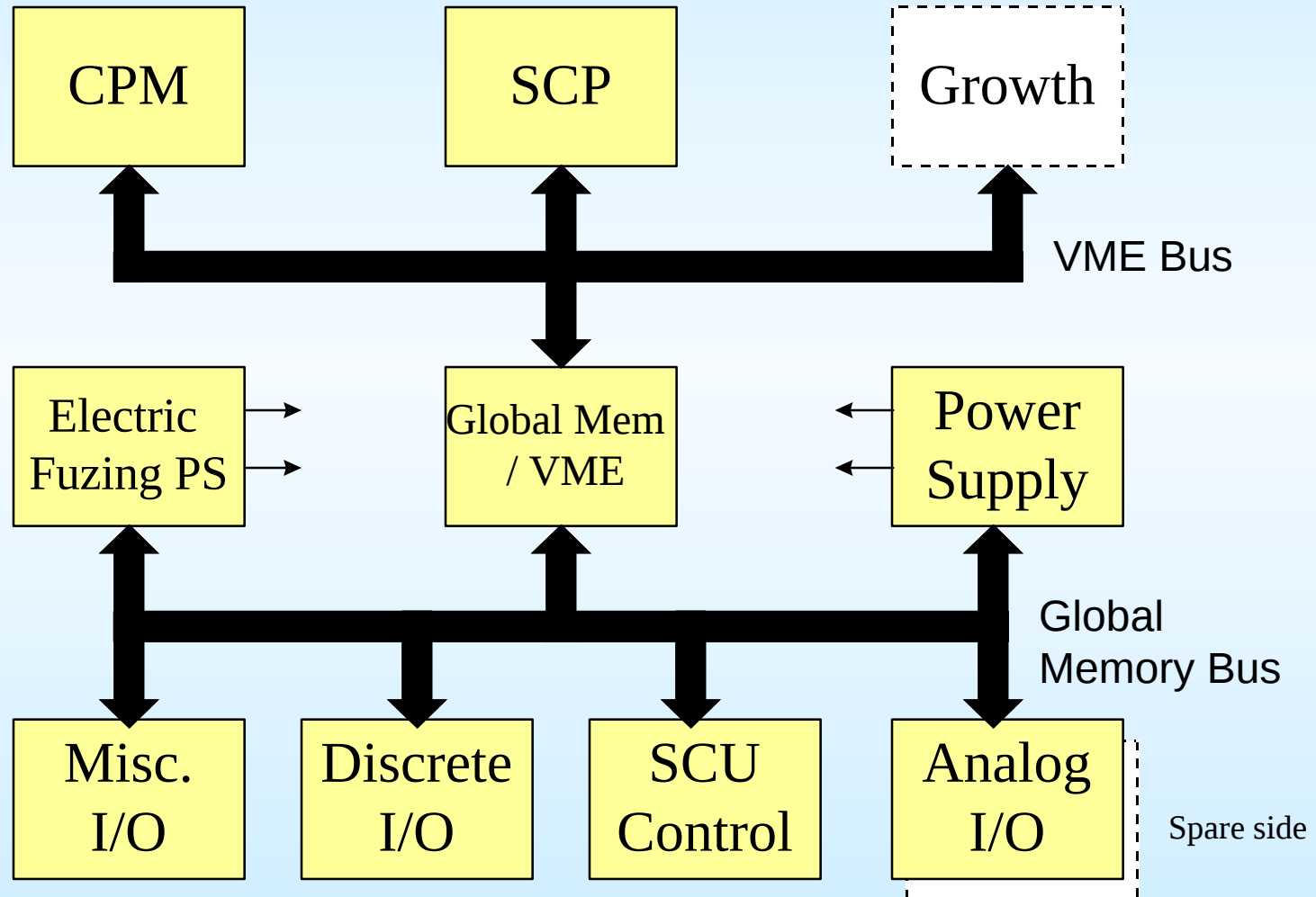




WMC Architecture

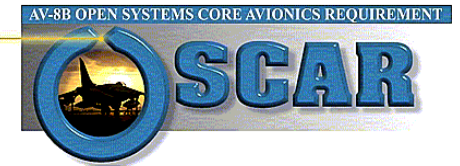


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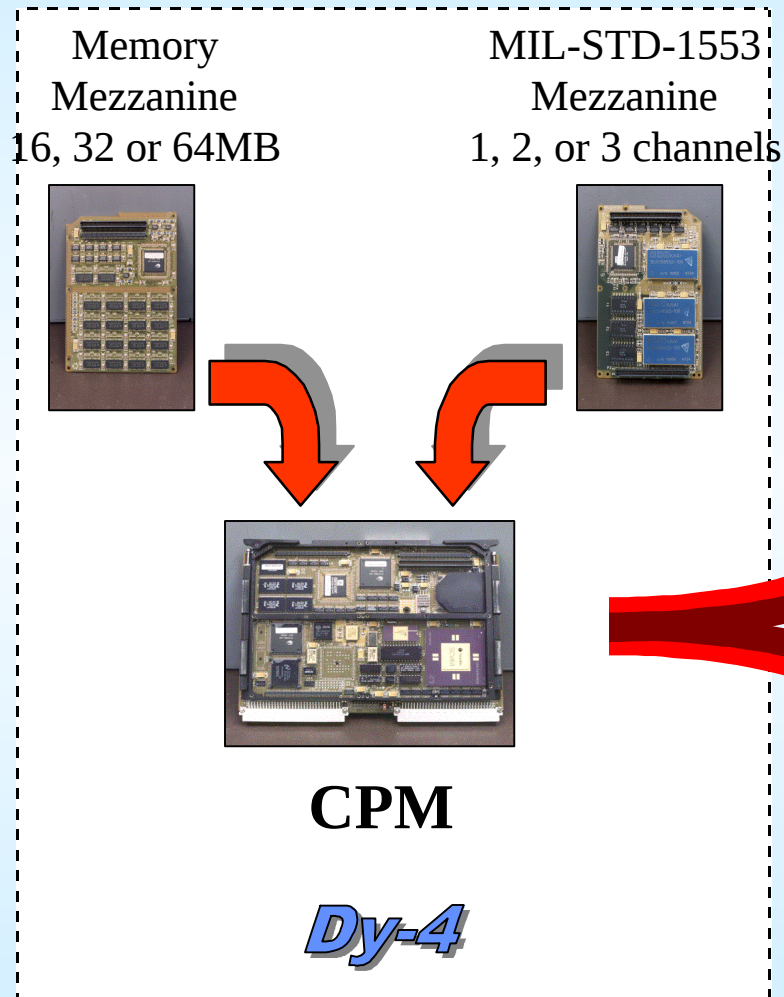




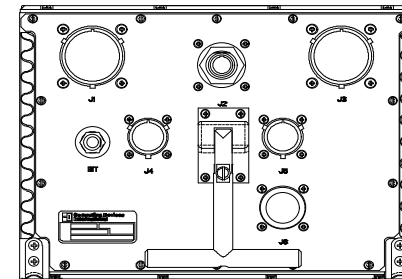
CPM Commonality



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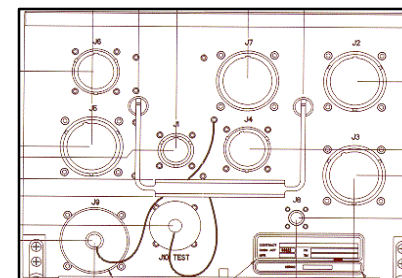


GDIS



MSC

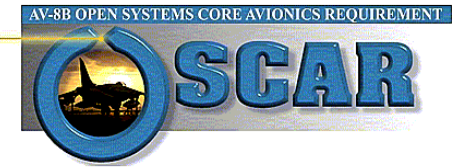
Smiths



WMC

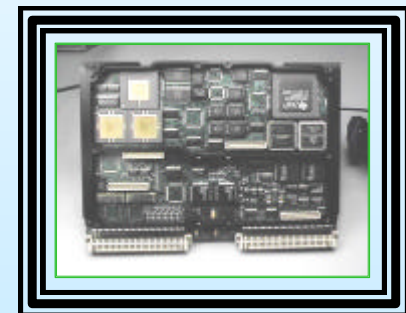
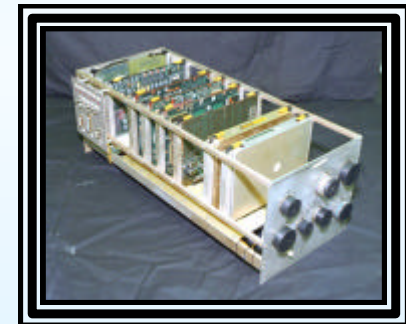
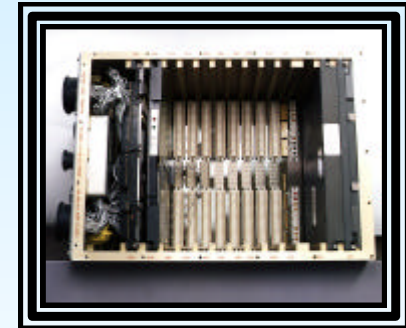


Avionics HW Status



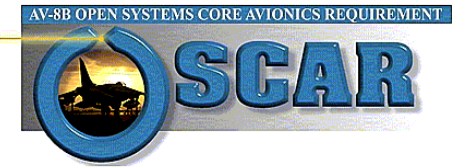
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- Mission Systems Computer (GDIS)
 - ❑ All Subsystem CDR Actions Closed
 - ❑ All EMD Units Delivered to Boeing (4)
 - ❑ Production Relevant Units Delivered (6)
- Warfare Management Computer (Smiths Industries)
 - ❑ All Subsystem CDR Actions Closed
 - ❑ All EMD Units Delivered to Boeing (4)
 - ❑ Production Relevant Unit Delivery - Jul 98
- ALE-47/39 Module (Tracor Aerospace)
 - ❑ All Subsystem CDR Actions Closed
 - ❑ EMD Units Delivered to Boeing (4)
 - ❑ Production Relevant Unit Delivery - Jun 98

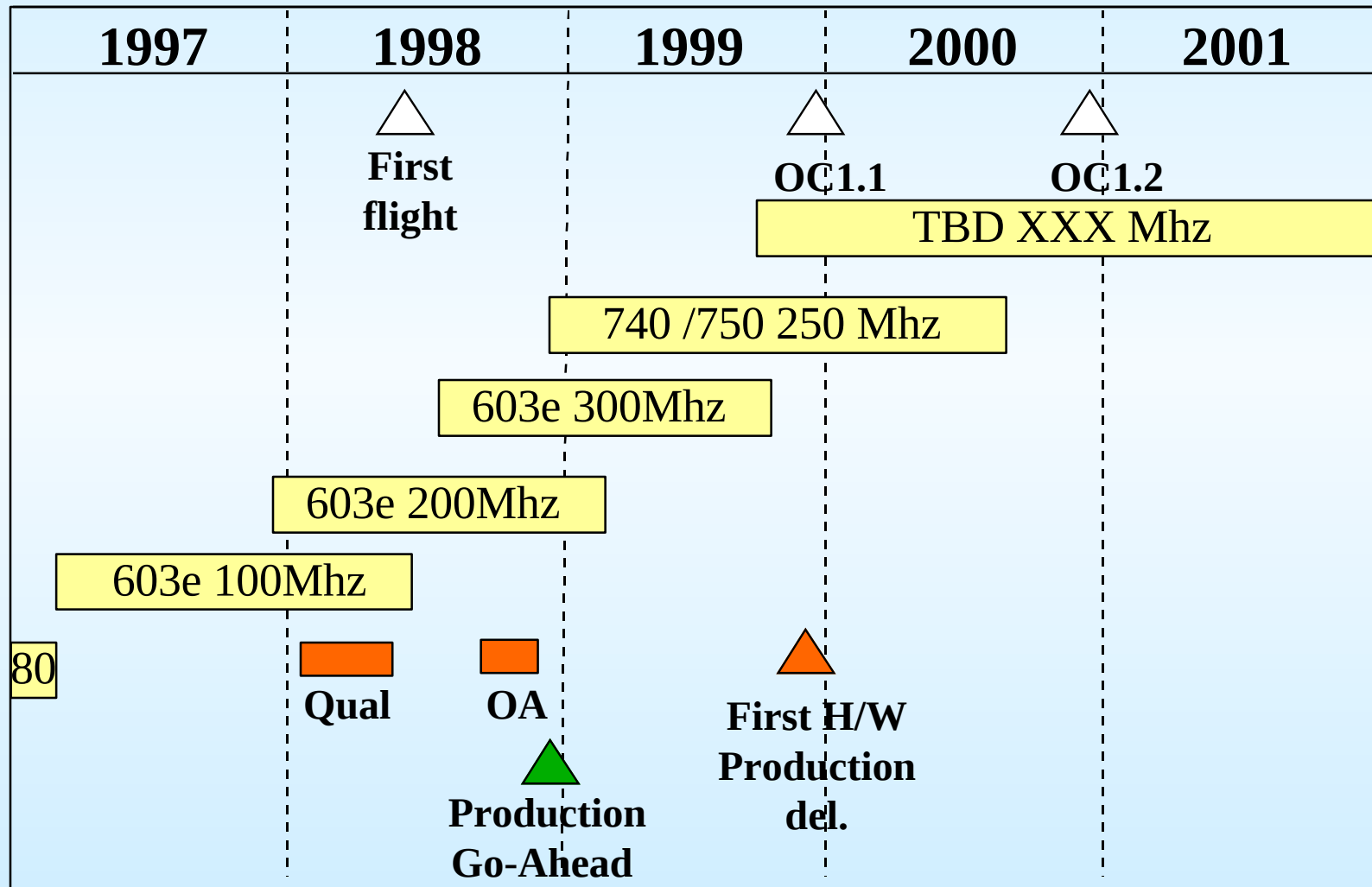




Technology Roll Plan

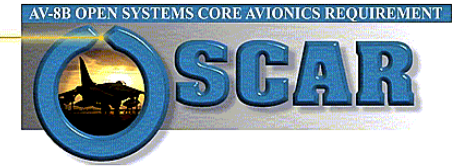


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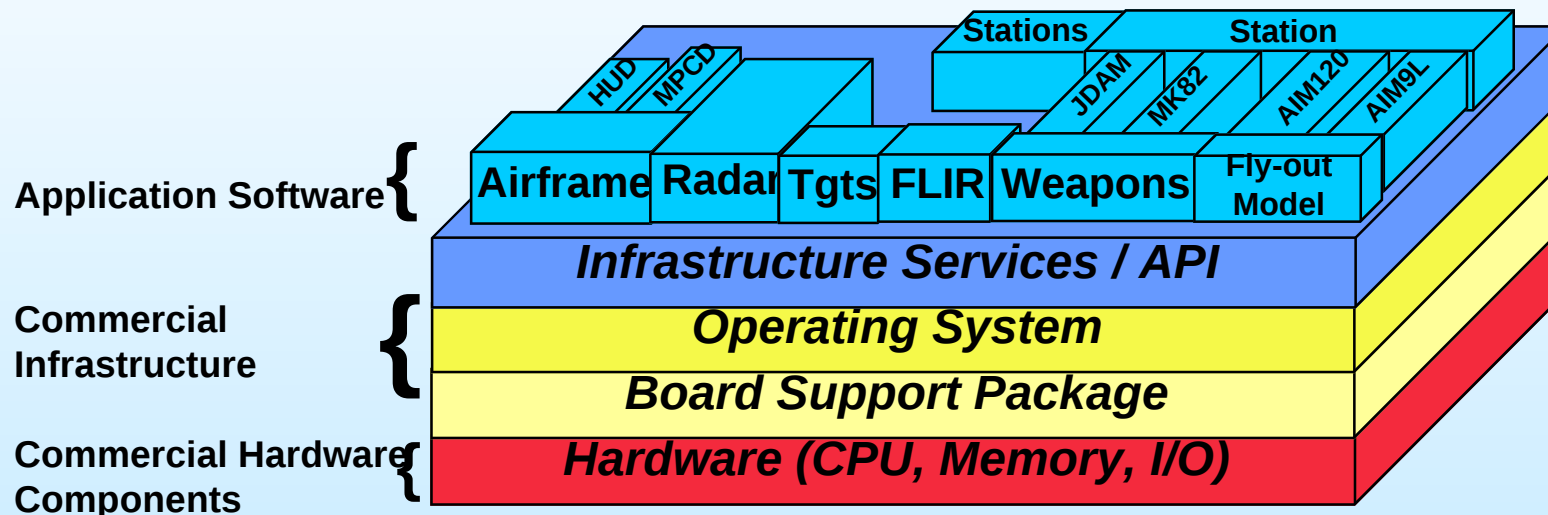
OSCAR Software Architecture



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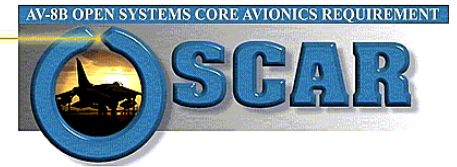
OSCAR Code & Design Reuse

- Hardware Independence
- Tools/Process Reuse
- Reuse In Non-Flight Domains -
Simulators, Trainers, Maintenance
- Reduced Regression Testing





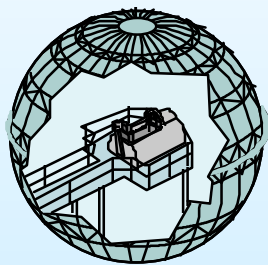
OSCAR Software Engineering Environment



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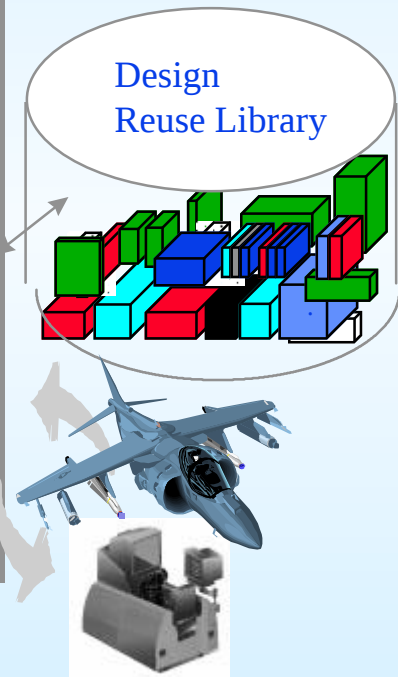
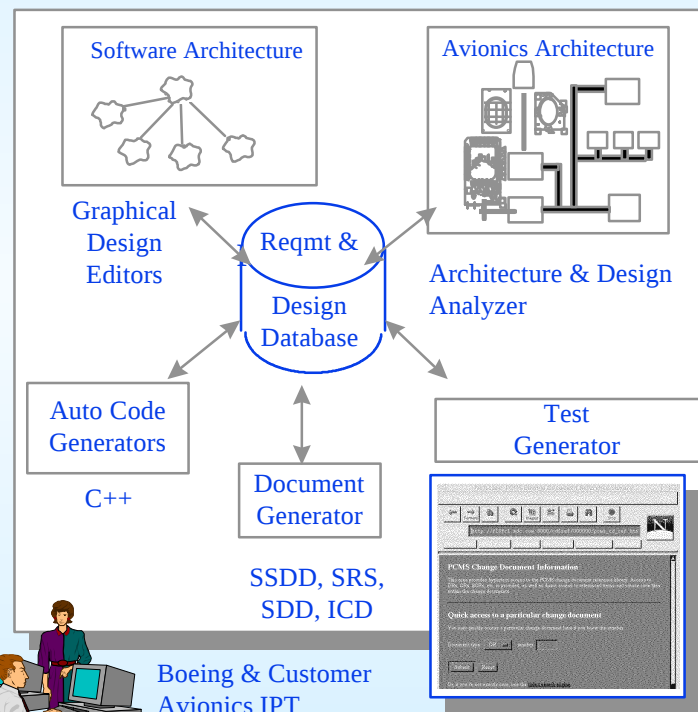
Re-Inventing the SW Process

- Object Oriented Design
- Auto Code Generation
- Reuse Libraries
- Rapid Prototyping
- Commercial Environments
- Reduced Regression Testing



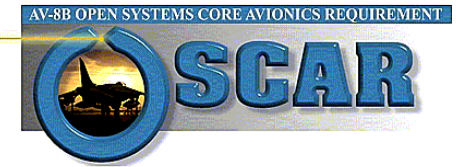
Boeing & Customer
Avionics IPT

**Integrated
Process and Tools**





Open System Benefits



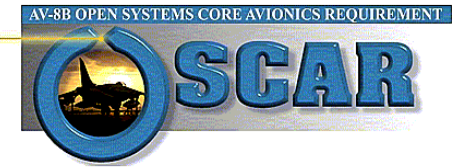
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- **Commercial Processor Marketplace Leverage**
 - ❑ Started with 80MHz, 100MHz Upgrade, 200MHz Today
 - ❑ Reduced Upgrade Cost/Schedule/Risk
- **Commercial Hardware Improves “Time to Market”**
 - ❑ Solutions Readily Available
 - ❑ Used Commercial Convection Cooled Hardware for Prototype
- **Commercial Software Marketplace Leverage**
 - ❑ Tools Available Now
 - ❑ No NRE Required for Development
- **Interfaces Already Defined**
 - ❑ Less Upfront Technology Investment Required
 - ❑
 - ❑
 - ❑

“Better/Faster/Cheaper”



Open System Challenges



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- **High Performance 1553 Not Commercially Available**
 - ❑ Some Development Required
- **Adequate Memory/Throughput**
 - ❑ Difficult to Achieve with Current Technology(1553 Overhead)
 - ❑ Commercial O/S Adds Processing Overhead
- **Test Philosophy Does Not Support Rapidly Changing Technology**
 - ❑ Typical Flight Test Program is 12-18 Months
 - ❑ Processor Technology Roll is Less than 12 Months
- **Avionic Environment Difficult to Achieve at “71°C”**
 - ❑ Some Trade-offs Required
 - ❑
 - ❑

**Benefits of Open Systems Far
Outweigh Challenges**