Open Systems Core Avionics Requirement

Nick Carter
OSCAR Applications Manager

AV-8B Fleet Configurations

- **Harrier II Plus**
  - APG-65 Multimode Radar
  - Night Attack
  - Provisions for Beyond Visual Range Weapons
-

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

- **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

AV-8B OPEN SYSTEMS CORE AVIONICS REQUIREMENT
OSCAR

BOEING

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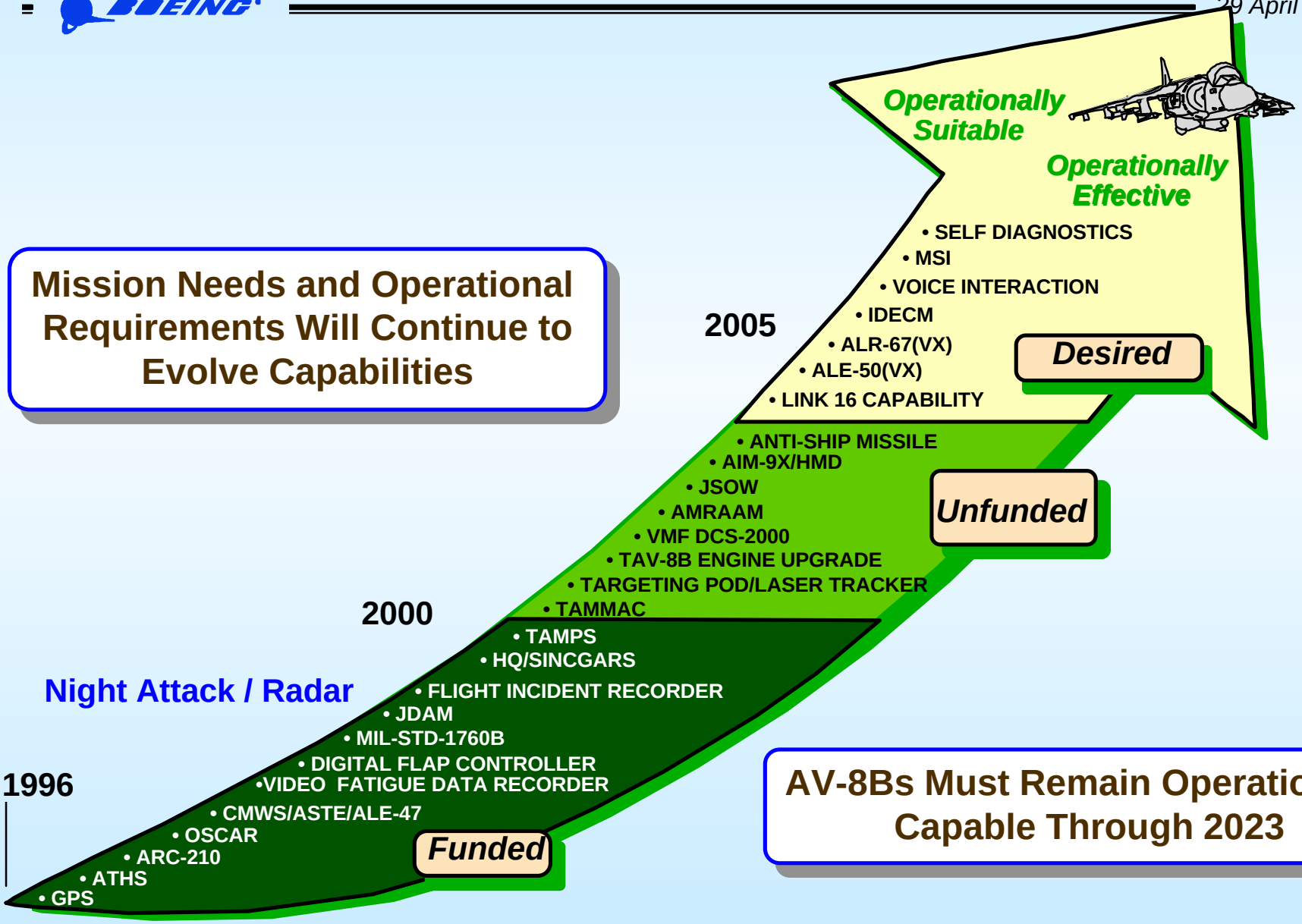
Mission Needs and Operational Requirements Will Continue to Evolve Capabilities



AV-8Bs Must Remain Operationally Capable Through 2023

OSCAR Focus

Software Maintenance Cost Drivers

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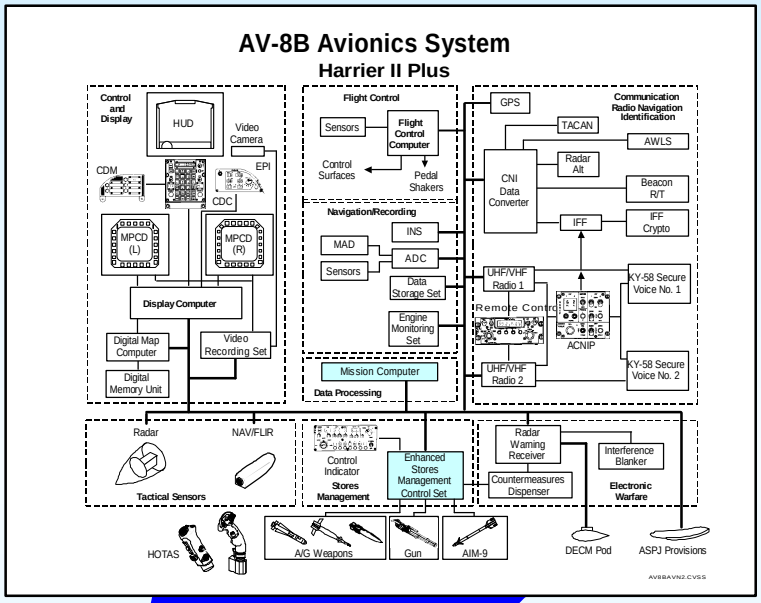
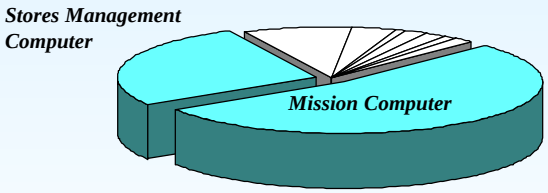
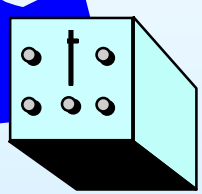
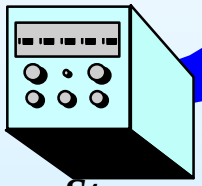


Two Components Impact ~ 75%
of Routine Update Maintenance Cost





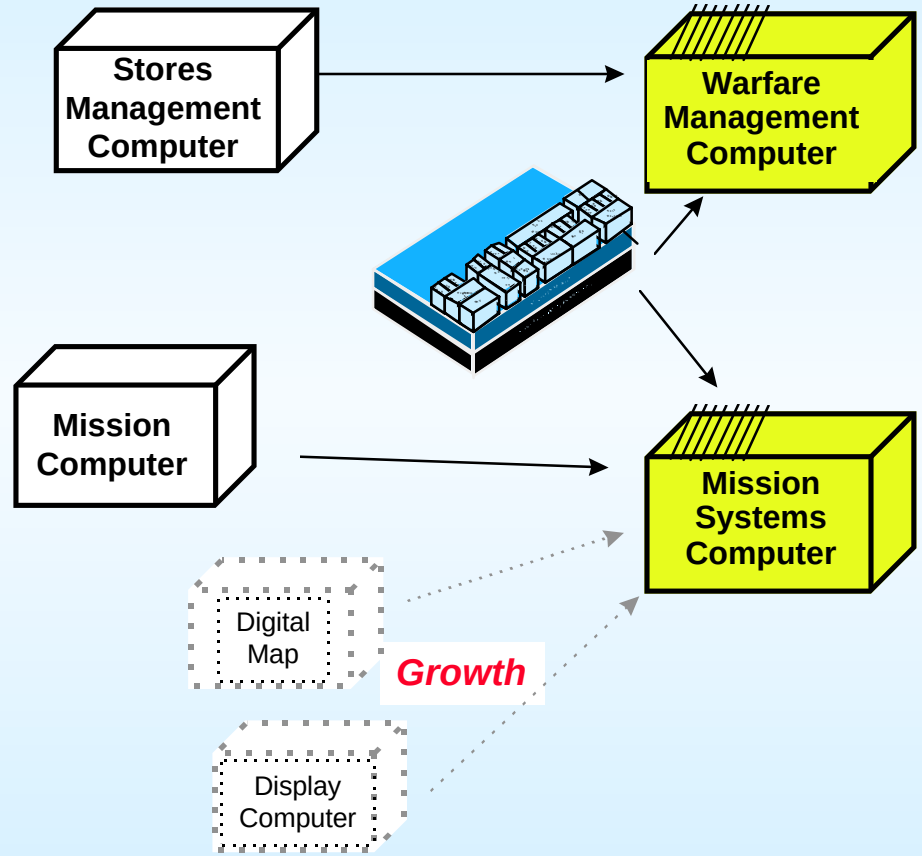
Mission Computer



Stores Management Computer

Addresses The High Payoff Areas

The OSCAR Solution



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

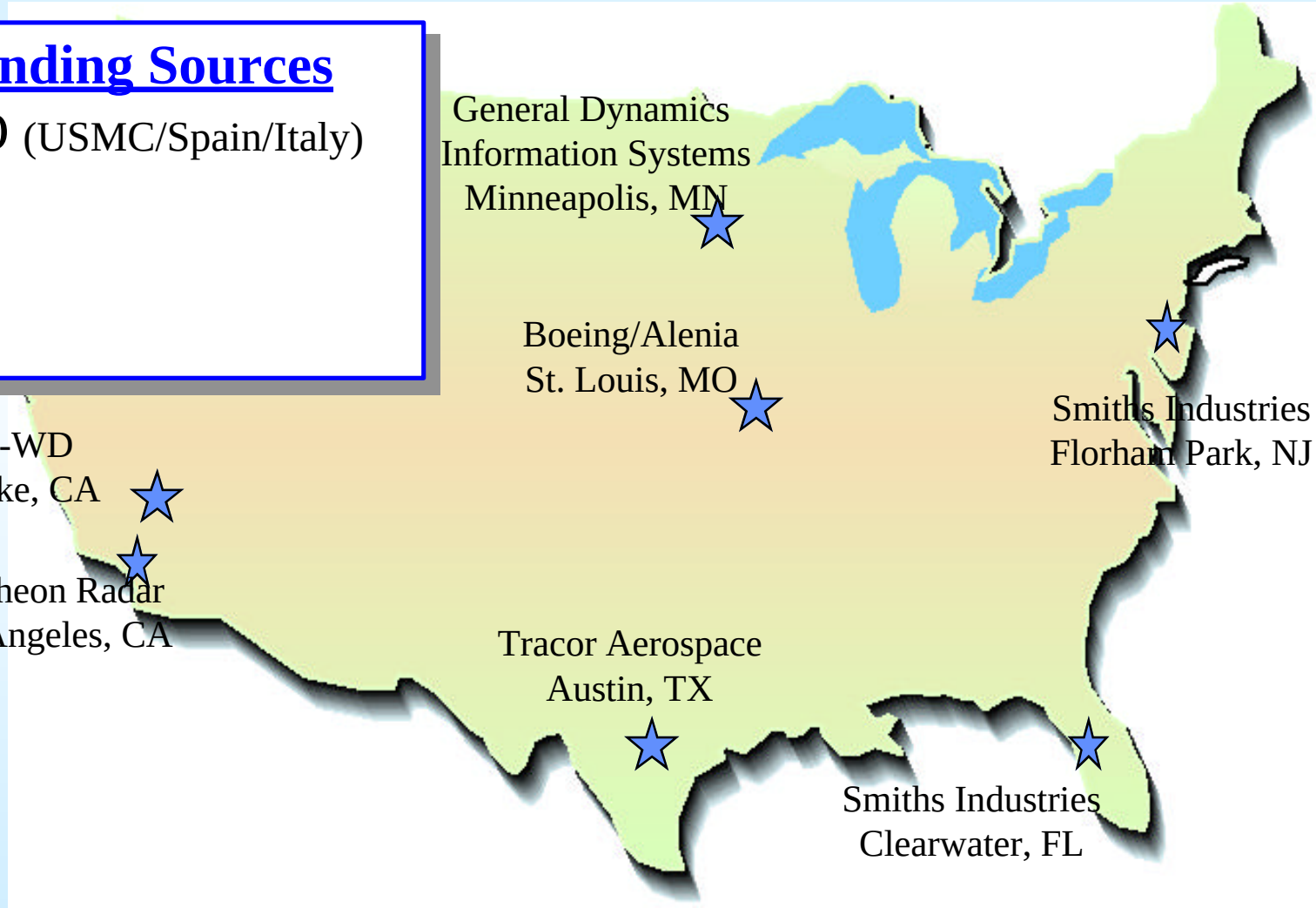
Streamlined Acquisition

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

OSCAR Program Structure

Program Funding Sources

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



OSCAR Schedule Summary

AV-8B OPEN SYSTEMS CORE AVIONICS REQUIREMENT

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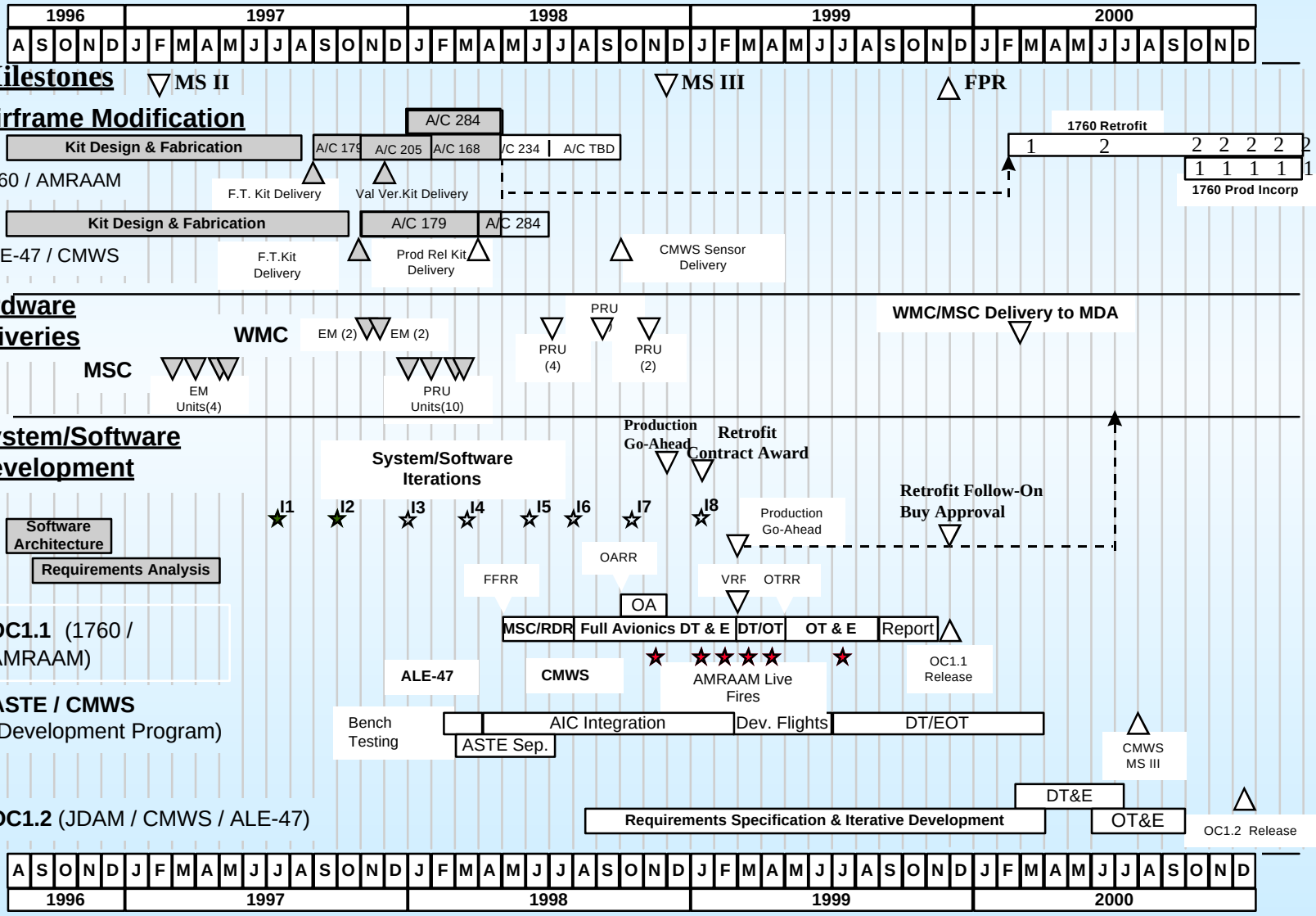
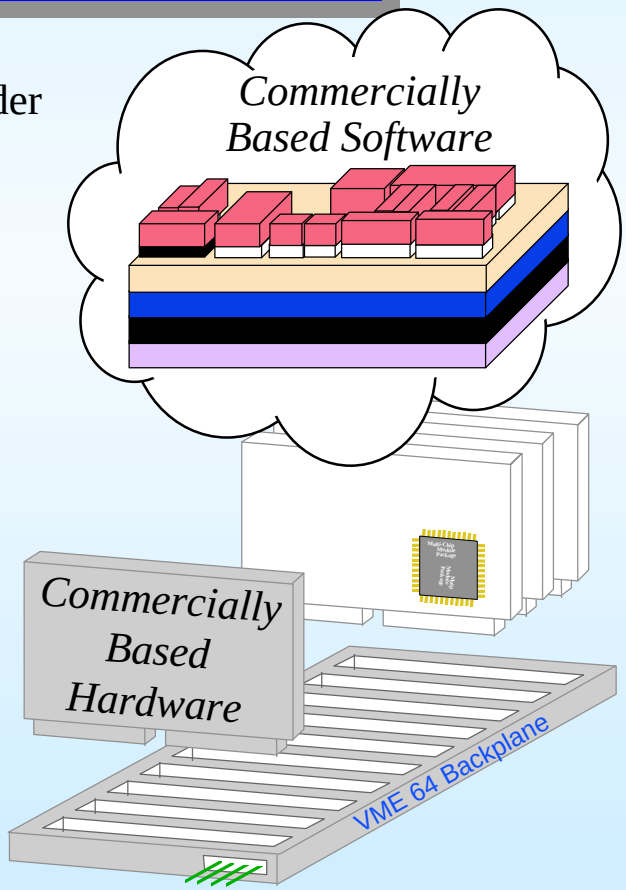


5 May 97

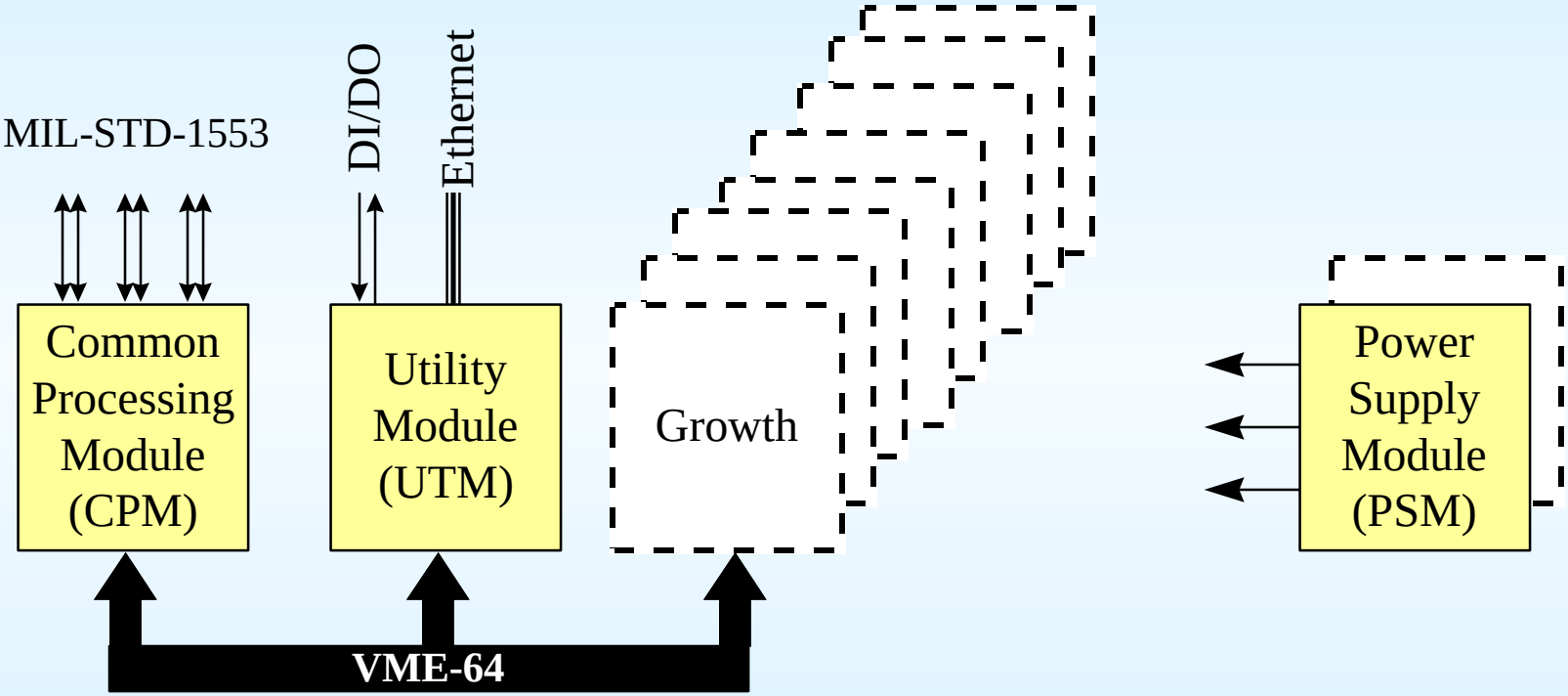
OSCAR Uses Standard Interfaces

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

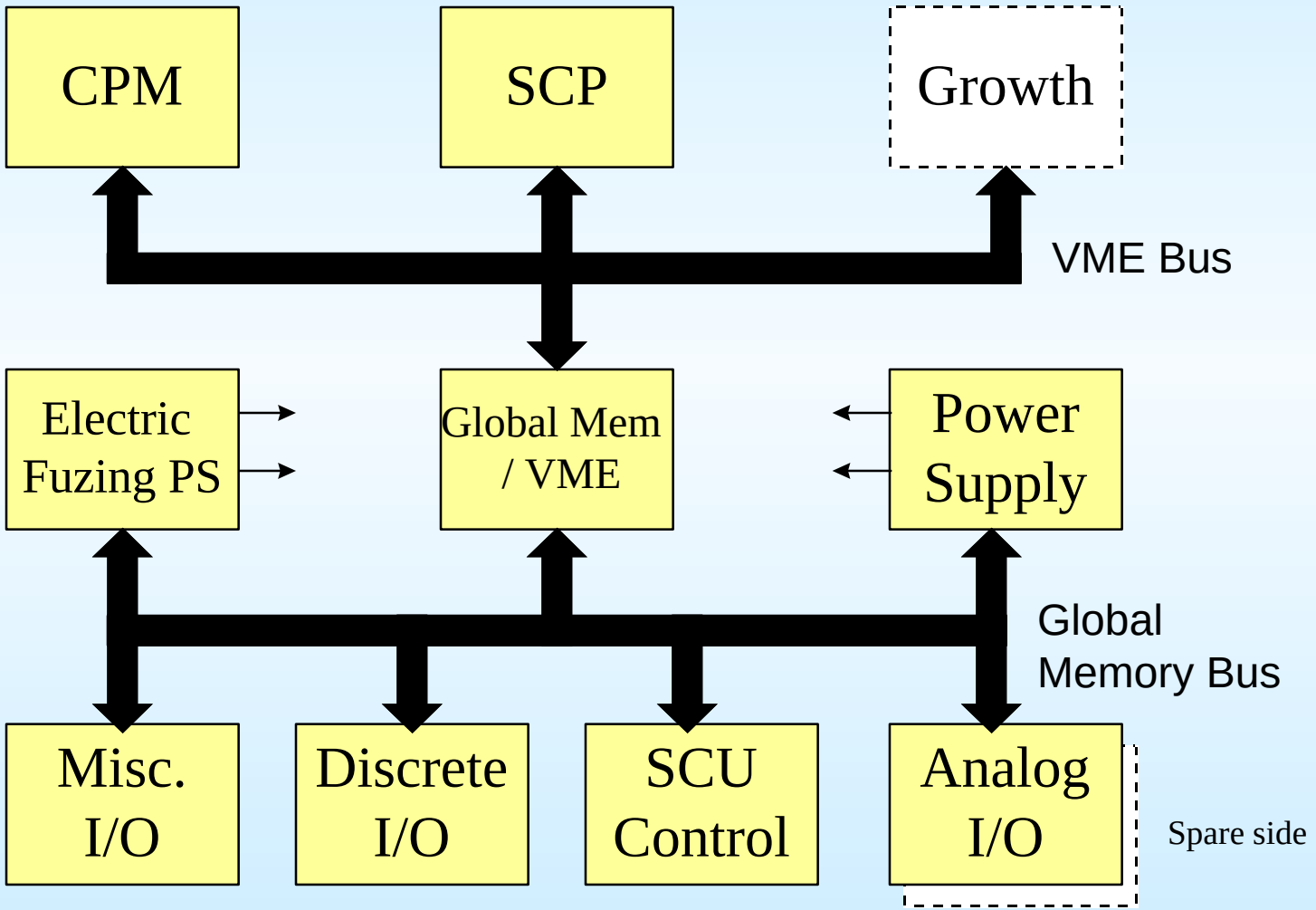
- **Software**
  - Commercially Supported, Objected Oriented, High Order Language (e.g. C++)
  - COTS Development Tools and Processes
  - IEEE/ANSI STD P1003 POSIX Compliant Real-Time Operating System (e.g. VxWorks)
  - COTS Software Components (e.g. VME Drivers and Interrupt Handlers)
  - Industry STD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

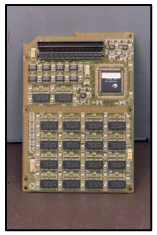


WMC Architecture

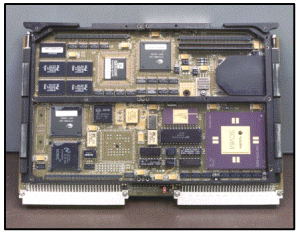


CPM Commonality

Memory
Mezzanine
16, 32 or 64MB



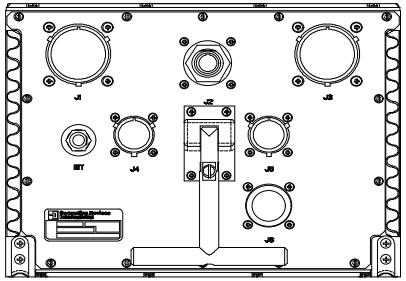
MIL-STD-1553
Mezzanine
1, 2, or 3 channels



CPM

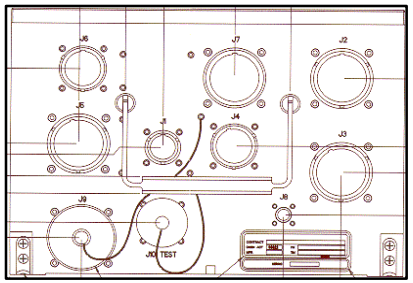
Dy-4

GDIS



MSC

Smiths



WMC

Avionics HW Status

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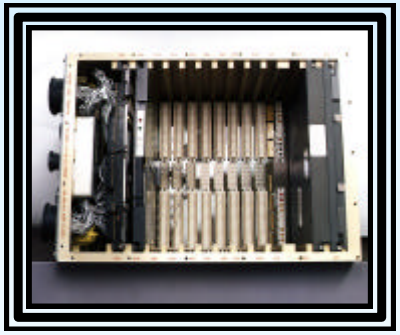
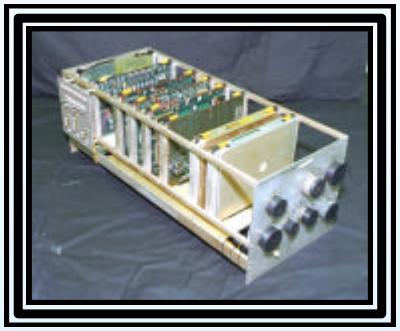
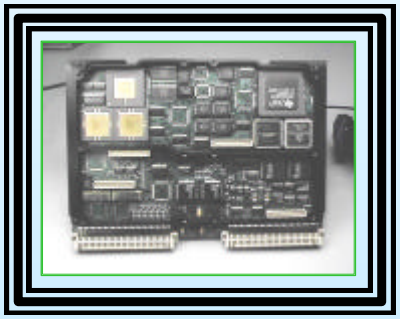
- Mission Systems Computer (GDIS)
  - **All Subsystem CDR Actions Closed**
  - **All EMD Units Delivered to Boeing (4)**
  - **Production Relevant Units Delivered (6)**



- 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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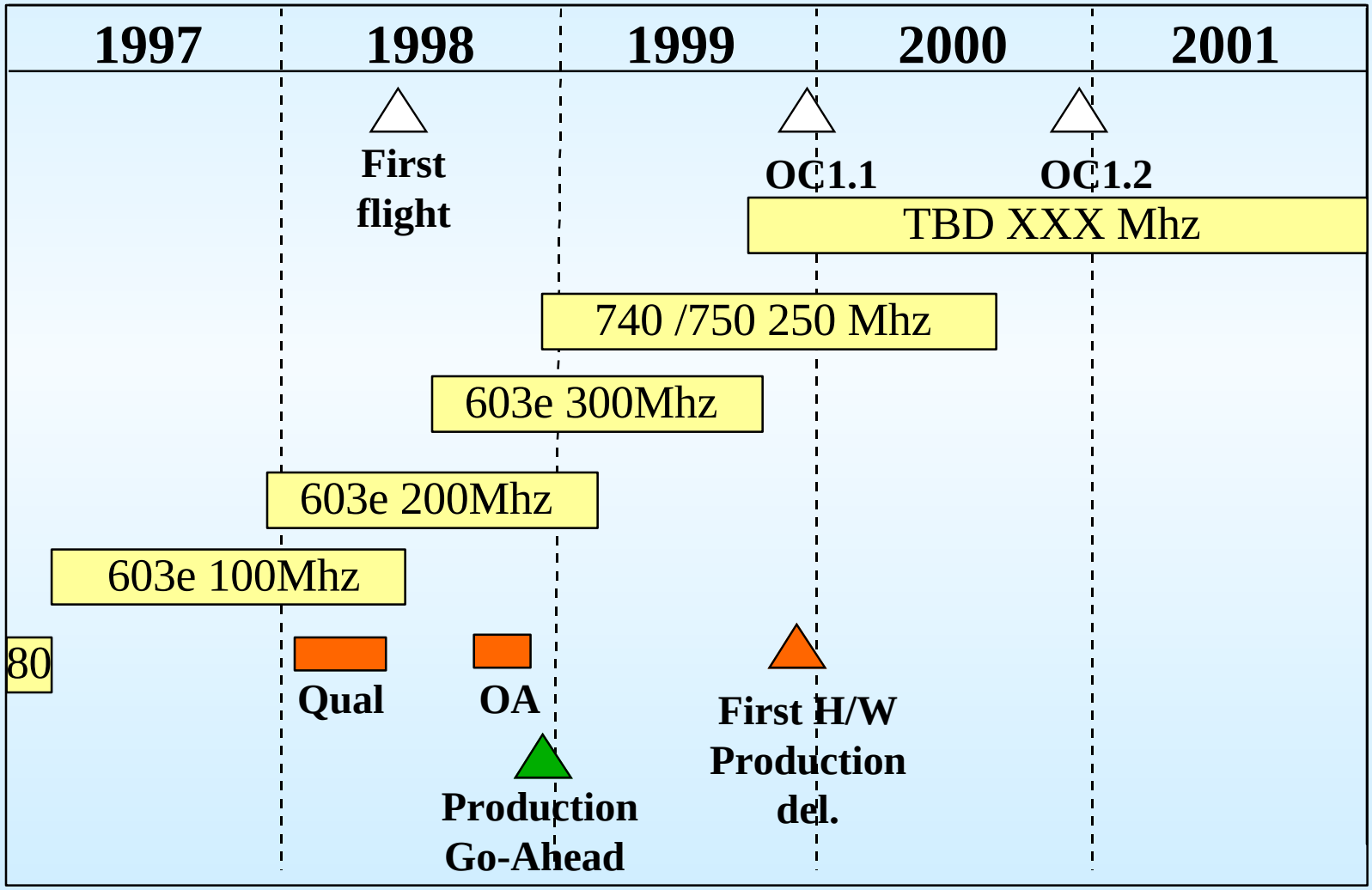
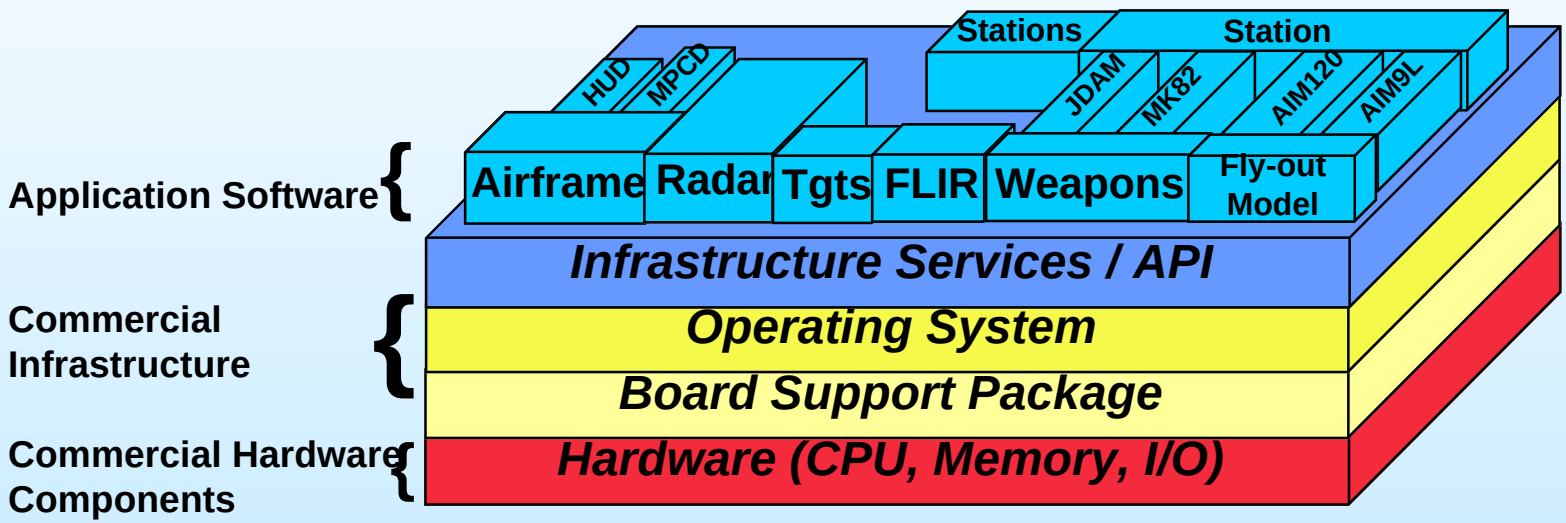


OSCAR Software Architecture

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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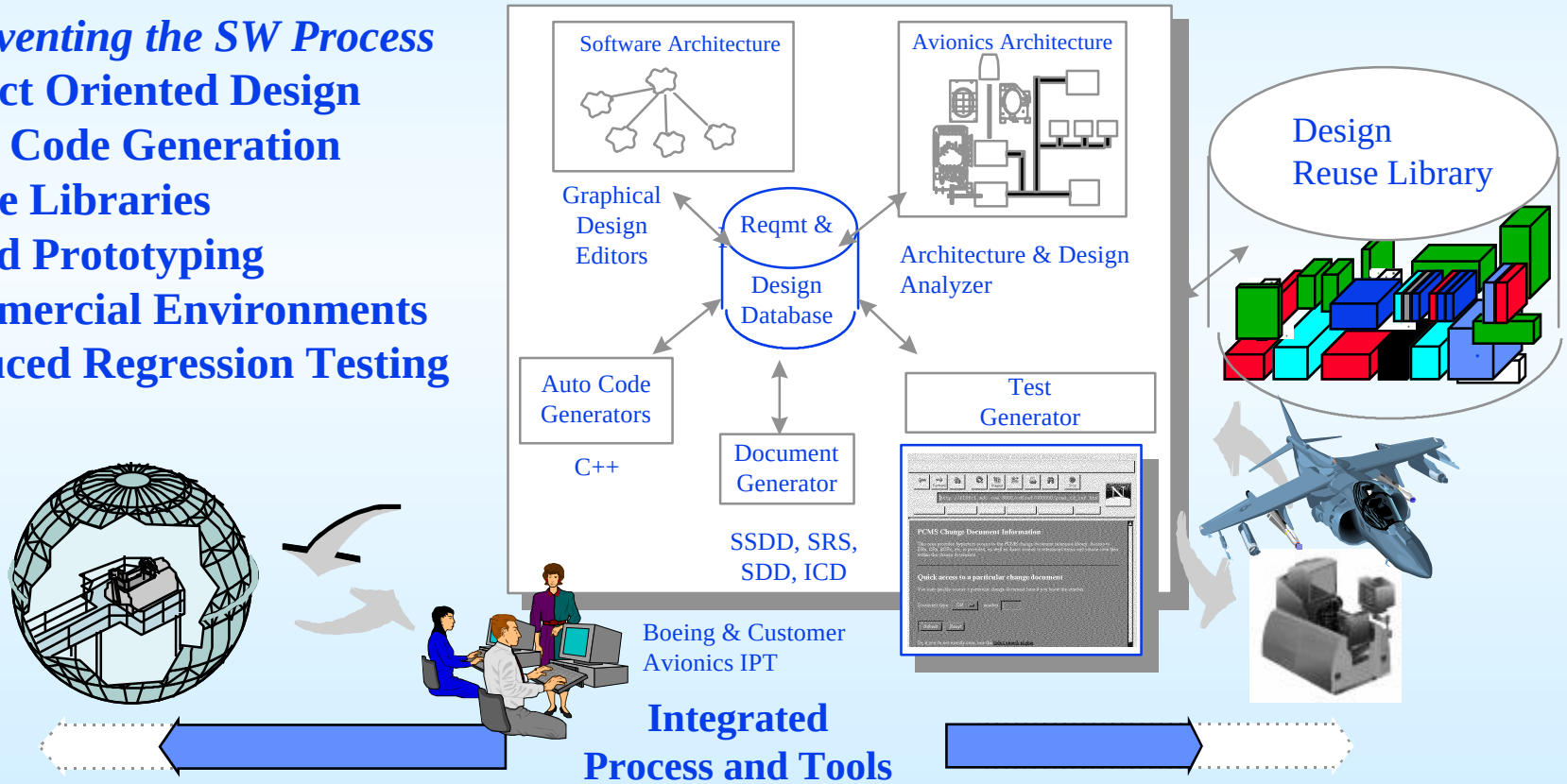
Re-Inventing the SW Process

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



Open System Benefits

- **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

- **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