Open Systems Ada Technology Demo
Open Systems-Joint Task Force
WALCOFF AUDITORIUM
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FAIRFAX VA

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AV-8B CLASS DESK
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OUTLINE

BACKGROUND

• TECHNICAL DETAILS

• FY97 RECOMMENDATIONS

• SUMMARY
BACKGROUND

GENERAL PROBLEM:
- Use of COTS is growing in military embedded applications
- Ada 95 is language of choice where COTS/GOTS can’t be applied
- Mixed language situations may arise as a result
- Risk reduction demonstrations are called for, employing Ada 95 in COTS RT environment (POSIX, C)

SOLUTION:
McDonnell Douglas Aerospace will:
- Develop an air-to-ground ballistics algorithm using Ada 95
- Link this algorithm into the AV-8B demonstration OFP (C, C++)
- Perform a flight demonstration on an AV-8B equipped with COTS MC, POSIX-compliant RTOS
- Apply/evaluate Wright Lab DFIP

BENEFICIARIES:
- AV-8B OSCAR
- F-15 MPDP Upgrade
- F/A-18 Blk 18E
- C-17 CIP
- Joint Strike Fighter

OSAT is a Building Block

MDA NAV / COMM DEMO

COMMON OFP (AV-8, F-15, F-18, JSF)

POSIX
OPEN SYSTEMS ADA TECHNOLOGY DEMONSTRATION

- **RE-ENGINEERED F-15 RUNGE-KUTTA ALGORITHM**
  - ADA 95, OBJECT-ORIENTED DESIGN
  - DFIP FAULT TOLERANT INPUT/OUTPUT PROCESSING
- **COTS RUN-TIME ENVIRONMENT**
  - POWER PC MISSION COMPUTER
  - POSIX-COMPLIANT OPERATING SYSTEM (VX WORKS)
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Software Development Tasks

• Reengineer/recode F-15 Runge-Kutta (Ada83) ballistics algorithm
  – Object-oriented design in accordance with MDA Common OFP architecture
  – Code in Ada95
  – POSIX-compliant RTOS (VX Works)
  – PowerPC host
  – Implement DFIP input and output algorithms

• Integrate with AV-8B demo (C) OFP, C++ NAV module
  – Enhance demo OFP to add A/G
    • Transform to/from platform coordinates
    • Accommodate 20 Hz algorithm (legacy code is 10 Hz)
  – Hard code Mk 76 Practice Bomb ballistics
TAV-8 CUM 6 WILL BE DEMONSTRATOR AIRCRAFT
  - BASED AT NAWC-CL

XN-6 MISSION COMPUTER WILL BE REPLACED WITH POWER PC-BASED UNIT
  - SUPPLIED BY CDI

WIND RIVER VX WORKS RTOS (POSIX-COMPLIANT)

BASELINE OFP WILL BE MDA C-OFP WITH C++ COMMON NAV/COMM MODULES (USED FOR MDA DEMO FLIGHT)

GREEN HILLS ADA 95 NATIVE AND CROSS COMPILERS

FLIGHTS WILL BE CONDUCTED AT CHINA LAKE
  - MK 76 DROPS WILL OCCUR AT CHINA LAKE’S TEST RANGE
OUTLINE

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# AV-8B Harrier Class Desk Project Schedule

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FY97 RECOMMENDATIONS

- COMPLETE ALL OSAT DEMO OBJECTIVES ($200K REQ’D)
- OSAT FOLLOW-ON CANDIDATES:
  - DISTRIBUTED PROCESSING DEMONSTRATION (MULTIPLE POWER PCs)
    - POSIX/ORB/ADA 95
  - IMPLEMENT/DEMONSTRATE F-15 ZAP MISSILE ALGORITHM
    - 5-DOF MISSILE FLY-OUT ALGORITHM
    - REDESIGN USING ADA 95, OBJECT-ORIENTED DESIGN
  - DEMONSTRATE OFF-BOARD LINK PROCESSING
    - AUTOMATIC TARGET HAND-OFF SYSTEM (ATHS)
    - ELEMENT OF MULTI-SENSOR INTEGRATION
  - IMPLEMENT/DEMONSTRATE OTHER COMMON OFP COMPONENTS USING ADA 95
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SUMMARY

- OSAT builds upon MDA’s Common OFP IRAD and offers real risk mitigation
  - Beneficiaries include all avionics programs evolving toward open systems and/or ADA 95

- DFIP analysis and test has immediate payback possibilities
  - Enhancement to common ballistics module targeted for AV-8B, F-15, F/A-18, JSF

- FY97 follow-on objectives should address other key risk areas
  - Distributed processing
  - New functionality (e.g. off-board data)