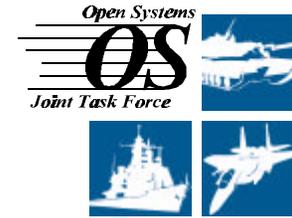


**Raytheon**



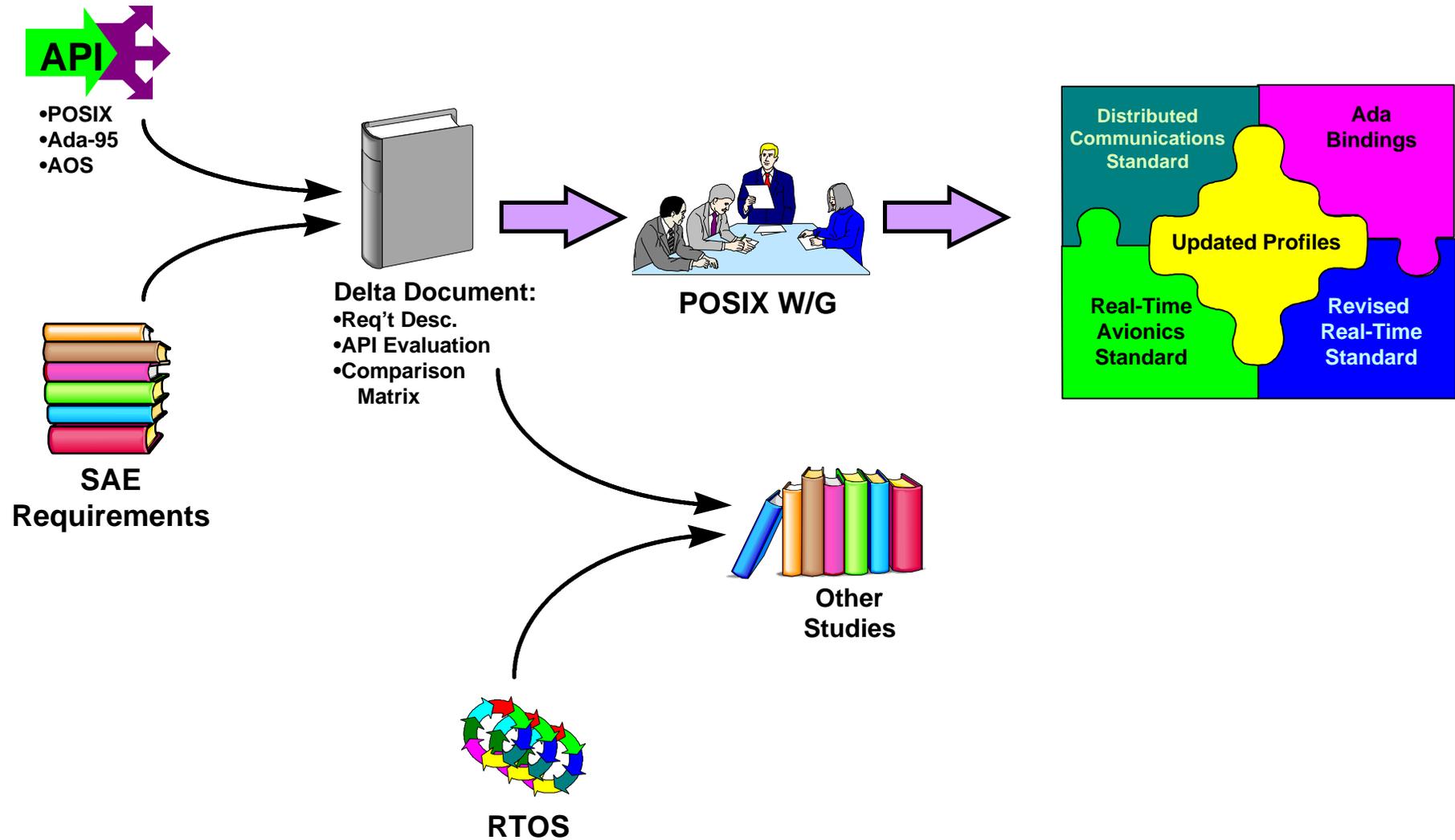
**POSIX/AOS Delta Document**  
**Open Systems Project Engineering Conference (OSPEC)**  
**FY 98 Status Review**  
**29 April - 1 May 1998**

**Curtis Royster, Jr.**  
**DISA, Center for Standards**  
**(roysterc@ncr.disa.mil)**

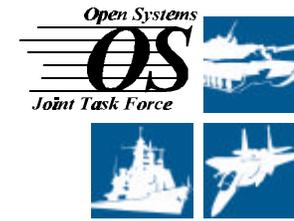
**Minerva Rodriguez**  
**Raytheon Systems Company**  
**(mrodriguez2@mail.hac.com)**



- **Background: JSF, OS-JTF, DISA (AJPO), and USAF Wright Lab funded Hughes to evaluate and determine the suitability of the POSIX and AOS APIs, and Ada 95 features for real-time embedded software**
  - **Areas of Interest: availability, performance, security, and supportability tradeoffs**
  - **Provide a Delta Document comparing POSIX, AOS and Ada 95 (1996 - 1997)**
  - **Received Funding to pursue implementation of the Delta Document Findings (1998 )**
- **The Delta Document provides information needed to decide if POSIX is feasible in real-time military avionics?**



# SAE-AS5 OS API WG Requirements



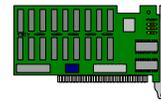
Synchronization



Data Security



Timer Services



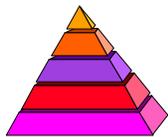
Special Devices



Fault Management



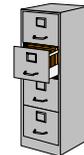
Non-Operational Support



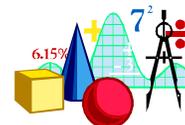
Program Support



Memory Management



File Management



Data Conversion



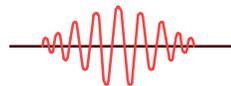
Built-In Test



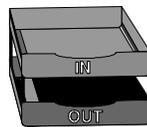
Bootup/Initialization/  
Shutdown



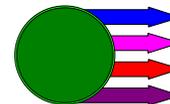
Task Control



Communication



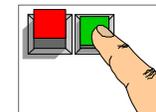
Input / Output



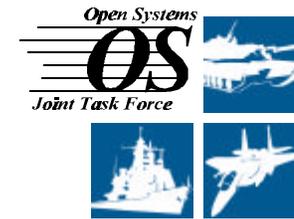
Configuration



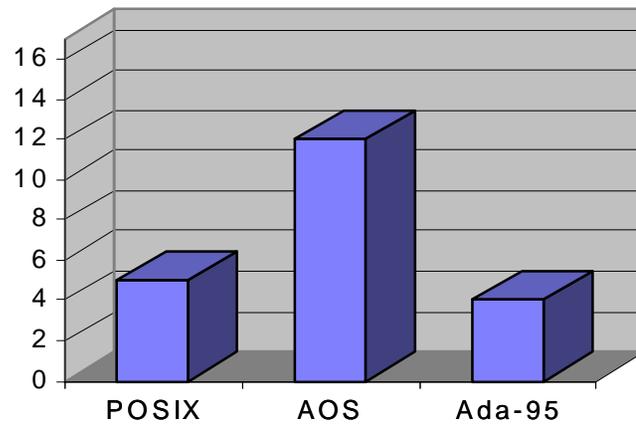
Instrumentation



Reinitialization



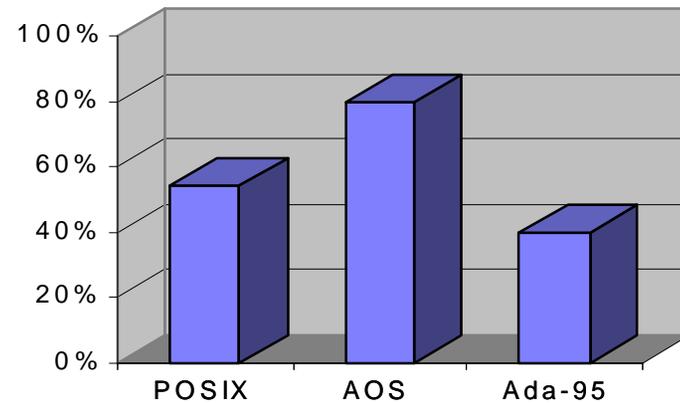
### API Functionality



### Functionality-

- 17 Functional Areas
- Based on fulfilling 75% of The Requirements in a Functional Area

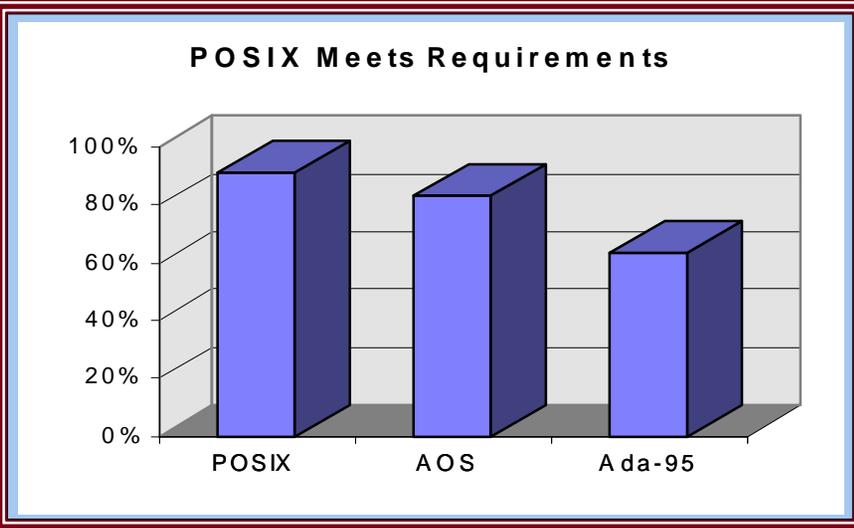
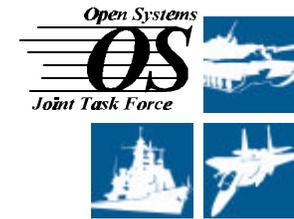
### Requirements



### Requirements-

- 277 Total Requirements
- 17 Functional Areas
- Failed, Unknown, and Not Applicable Req's not Counted As Fulfilled

# Category 1: POSIX Meets The Requirements



## Requirements:

- Synchronization
- Task Control
- Timer Services
- File Management

## Number of Requirements:

- 60 Total Requirements

## Findings:

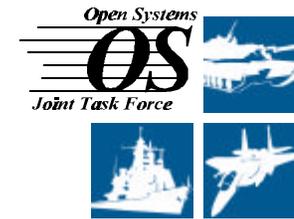
POSIX: Minor Modifications needed to:

- Synchronization
- Task control
- Timer Services
- File Management

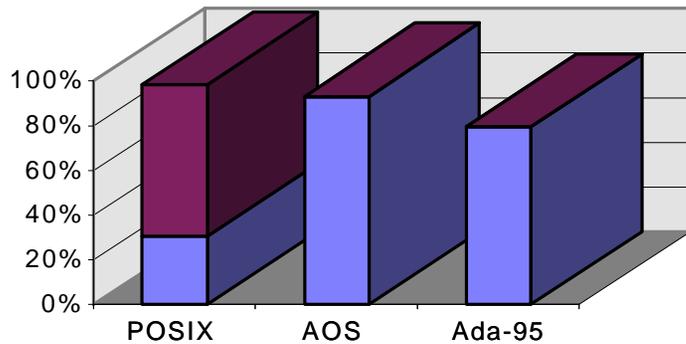
## Recommendations:

- Present List of Minor Changes to POSIX Real-Time Working Group. Example: Semaphores as Notification Mechanism.
- Write PAR. Implement Changes into Real-Time Standard.
- Evaluate the Four POSIX Military Profiles For Avionics Feasibility.

# Category 2: POSIX Nearly Meets Requirements



POSIX Nearly Meets Requirements



## Requirements:

- Communication

## Number of Requirements:

- 59 Total Requirements

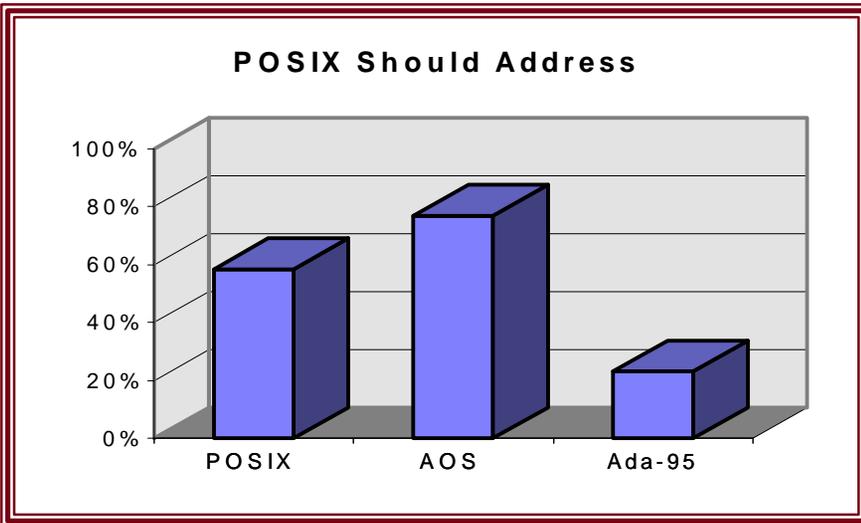
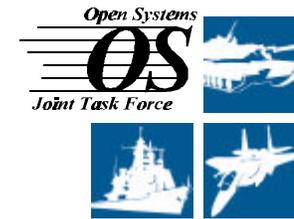
## Findings:

- The POSIX Capability for the majority of Communication was Unknown at the Time of The Evaluation.
- NOTE: Need to review the POSIX Distributed Communication Standard

## Recommendations:

- Compare Distributed Comm with Delta Document requirements
  - Recommend The Implementation of Ada Bindings of Any Relevant Requirements.

# Category 3: POSIX Should Address



## Requirements:

- > Program Support
- > Memory Mgmt
- > Data Conversion
- > Non-Operational Support
- > Data Security
- > Input Output
- > Fault Mgmt

## Number of Requirements:

- 108 Total Requirements

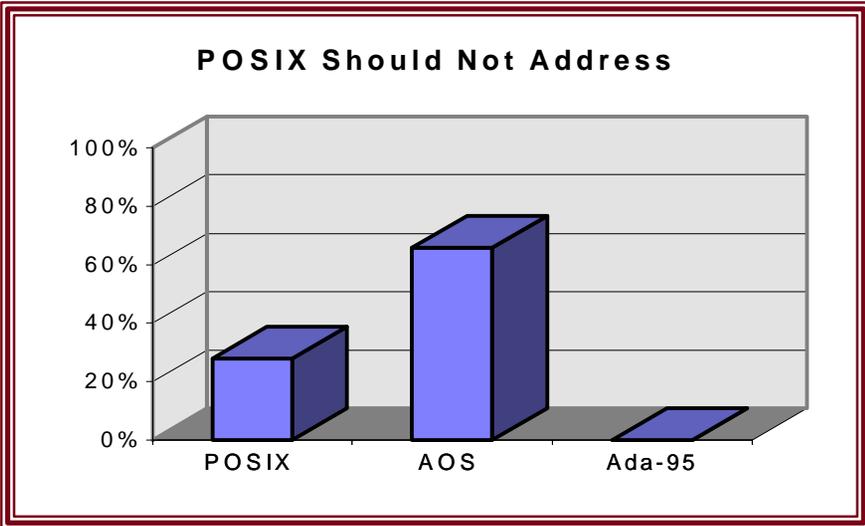
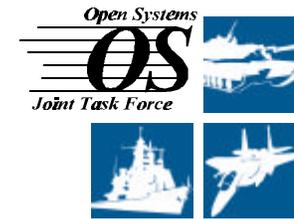
## Findings:

- Significant Deficiencies Found in:
  - Program Support
  - Data Security
  - Memory Management
  - Input Output
  - Data Conversion
  - Fault Management
  - Non-Operational Support

## Recommendation:

- Present The Missing Requirements to The Real-Time Working Group.
- Get a Consensus on The Needed Requirements & Implement
- Migrate Any Requirements That have not Been Agreed-on to Category 4.

# Category 4: POSIX Should Not Address



### Requirements:

- Special Devices > Configuration
- Built-In Test > Instrumentation
- Bootup / Initialization / Shutdown
- Reinitialization

### Number of Requirements:

- 50 Total Requirements

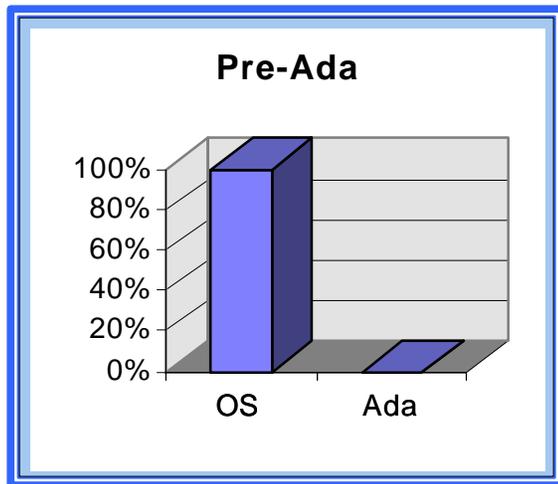
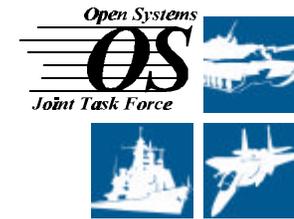
### Findings:

- Significant Deficiencies Found in:
  - Special Devices
  - Configuration
  - Built-In Test
  - Instrumentation
  - Bootup / Initialization / Shutdown
  - Reinitialization

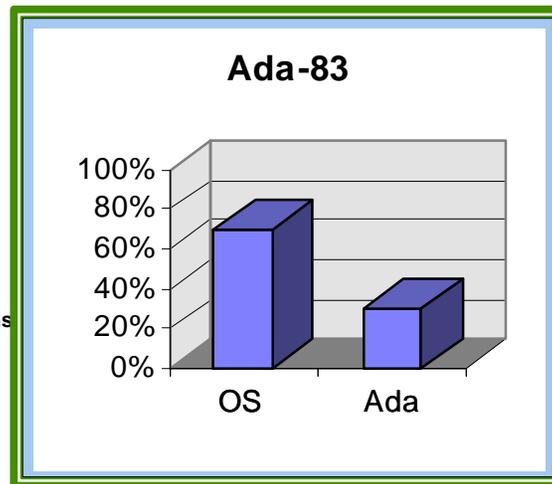
### Recommendation:

- Present The Missing Requirements to The Real-Time Working Group.
- Get a Consensus on The Requirements.
- Ask JSF OSA to Define an API for Avionics Specific Requirements.

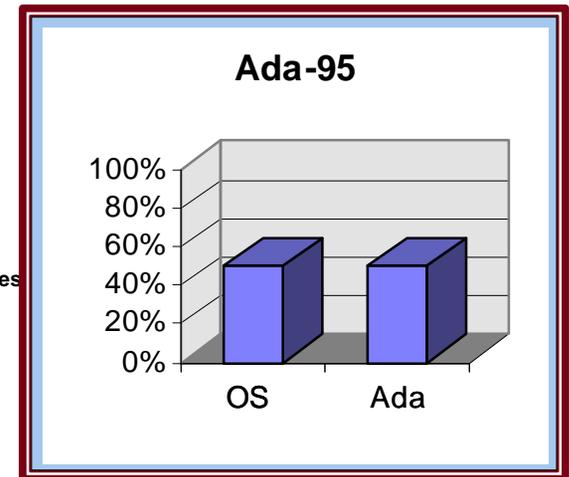
# Raytheon Ada's Real Time Capabilities



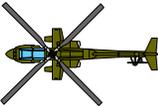
**Ada 83**  
 Tasking  
 Exceptions



**Ada 95**  
 Semaphores  
 Real-Time  
 Services

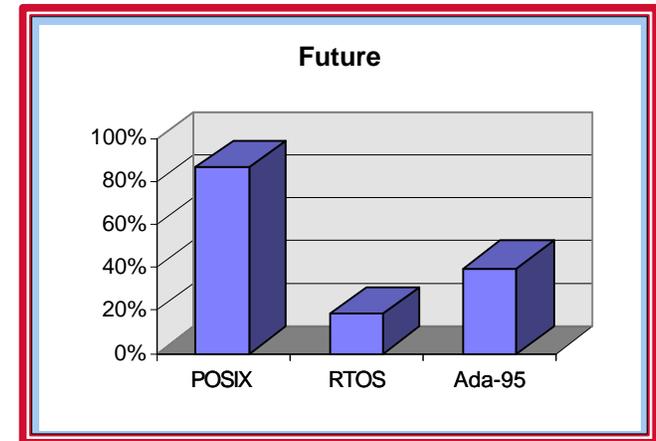
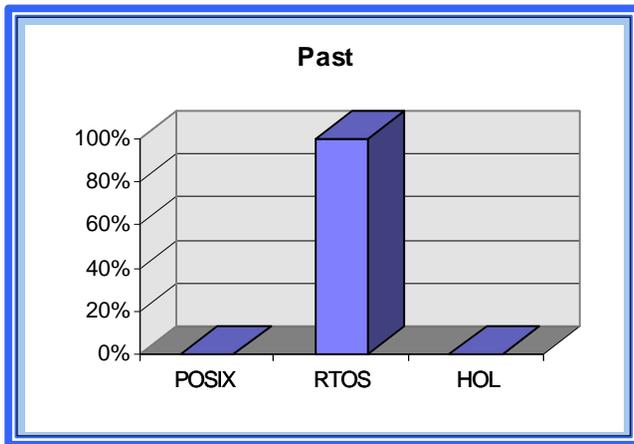
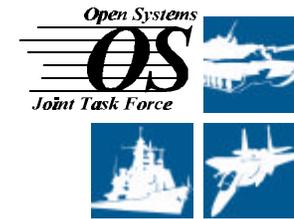


-  (F-14)
-  (F-15)
-  (F-18)
- Others** (B-2)

-  (Comanche)
-  (F-22)

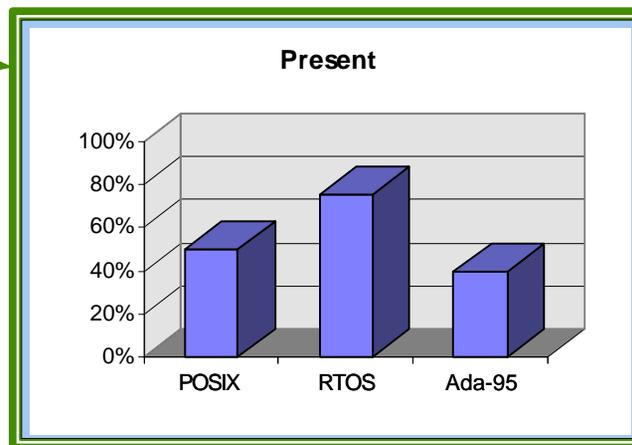
-  (JSF)

# The Trend in Application Programming I/Fs (API)



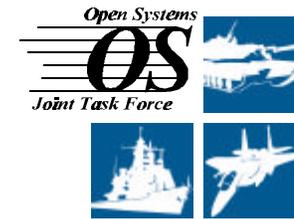
**Ada + POSIX**

- Real-Time Functionality Lacking in OS, POSIX, and Ada
- Considerable Overlap in OS, POSIX, and Ada



**Ada + POSIX**

- High Order Functionality in Ada
- General OS Functionality in POSIX
- Hardware Specific Functionality in RTOS



- **Task 1: Support The OSJTF Test Suite Industry Wide Certification Program.**
  - » Beta Test
  - » Conformance Statement Questionnaire
- **Task 2: Support POSIX Real-Time Standard.**
  - » Bring Delta Doc findings to RT System Services WG
  - » Write PARs and participate in WG
- **Task 3: Update the Delta Document and provide to JSF.**
  - » Update Delta Doc to include RT Distributed Communication
  - » Provide to JSF for DII/COE RT consideration