



**Research, Development & Engineering Command**  
**Aviation and Missile Research, Development and Engineering Center (AMRDEC)**



# **Joint Architecture for Unmanned Systems**

**Robert L. Wade**  
**Software Engineering Directorate**

**Technology to the Warfighter Quicker**



# Joint Architecture for Unmanned Systems

## Goal and Approaches



- The Purpose Of JAUS Is Interoperability With An Emphasis On The Logical Communications Between Heterogeneous Computing Systems Used For Unmanned Systems Command And Control.
- JAUS Is A Common Language Enabling Internal And External Communication Between Unmanned Systems. It Incorporates A Component Based, Message-Passing Architecture Specifying Data Formats That Promote The Stability Of Capabilities By Projecting Anticipated Requirements As Well As Those Currently Needed.
- JAUS Is Open, Scalable, And Responsive To The Unmanned Systems Communities' Needs.

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# ***Joint Architecture for Unmanned Systems***

## **Program Overview**



**Purpose:** The primary purpose of JAUS is interoperability -- the ability to operate unlike systems with unlike controllers.

**Product:** A standard messaging set to support the rapid and cost-effective development of unmanned systems.

**Payoff:**

- More efficient development,
- Reduced ownership cost, and
- An expanded range of vendors.

**Sponsored By:**

**OSD Joint Ground Robotics Enterprise**



# Joint Architecture for Unmanned Systems Challenge



## Objectives:

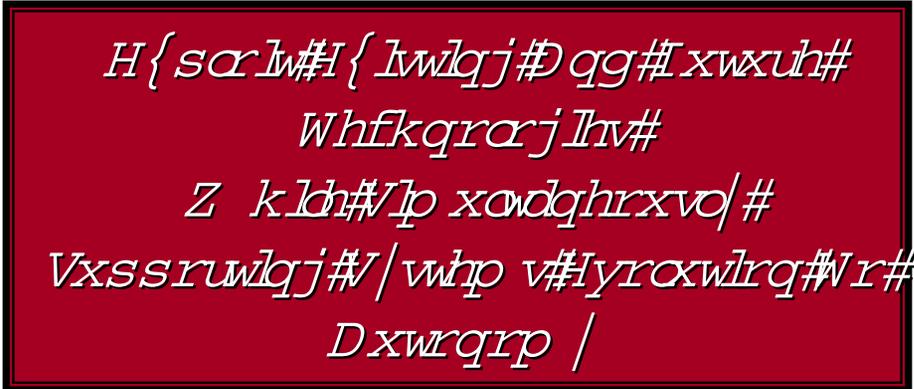
- Vehicle Platform Independence  
Supports Interoperability on any platform
- Mission Isolation  
Supports configurable payloads
- Computer Hardware Independence  
Not based on dated technology
- Technology Independence  
Supports technology insertion
- Operation Independence  
Allows the user to determine the operation
- Communications Independence  
No requirement for specific data link

## Problem:

- Subsystems common to unmanned systems (UMS) have been unique for each system.
- Performance gains made by one system cannot be easily leveraged for a different system with a similar requirement.

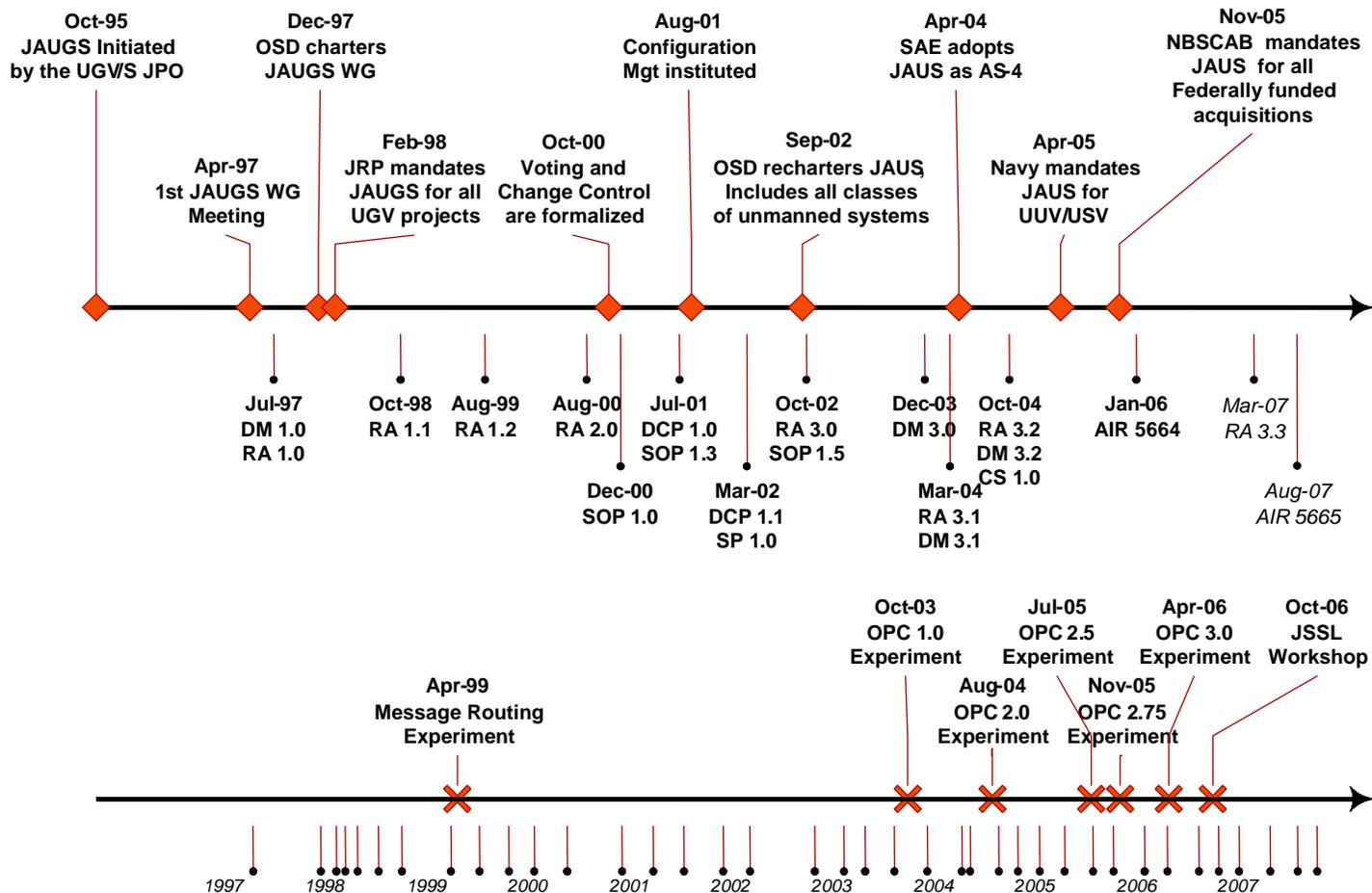
## Challenges:

- Avoid being “locked into” a vendor’s solution.
- Avoid being “locked out” of technology advancements.
- Support all classifications of control (teleop, semi-autonomous) and all classifications of systems (combat, combat support, combat service support).
- Support the evolution of a system from one classification to another.
- Usable under current acquisition guidelines.





# Joint Architecture for Unmanned Systems Timeline

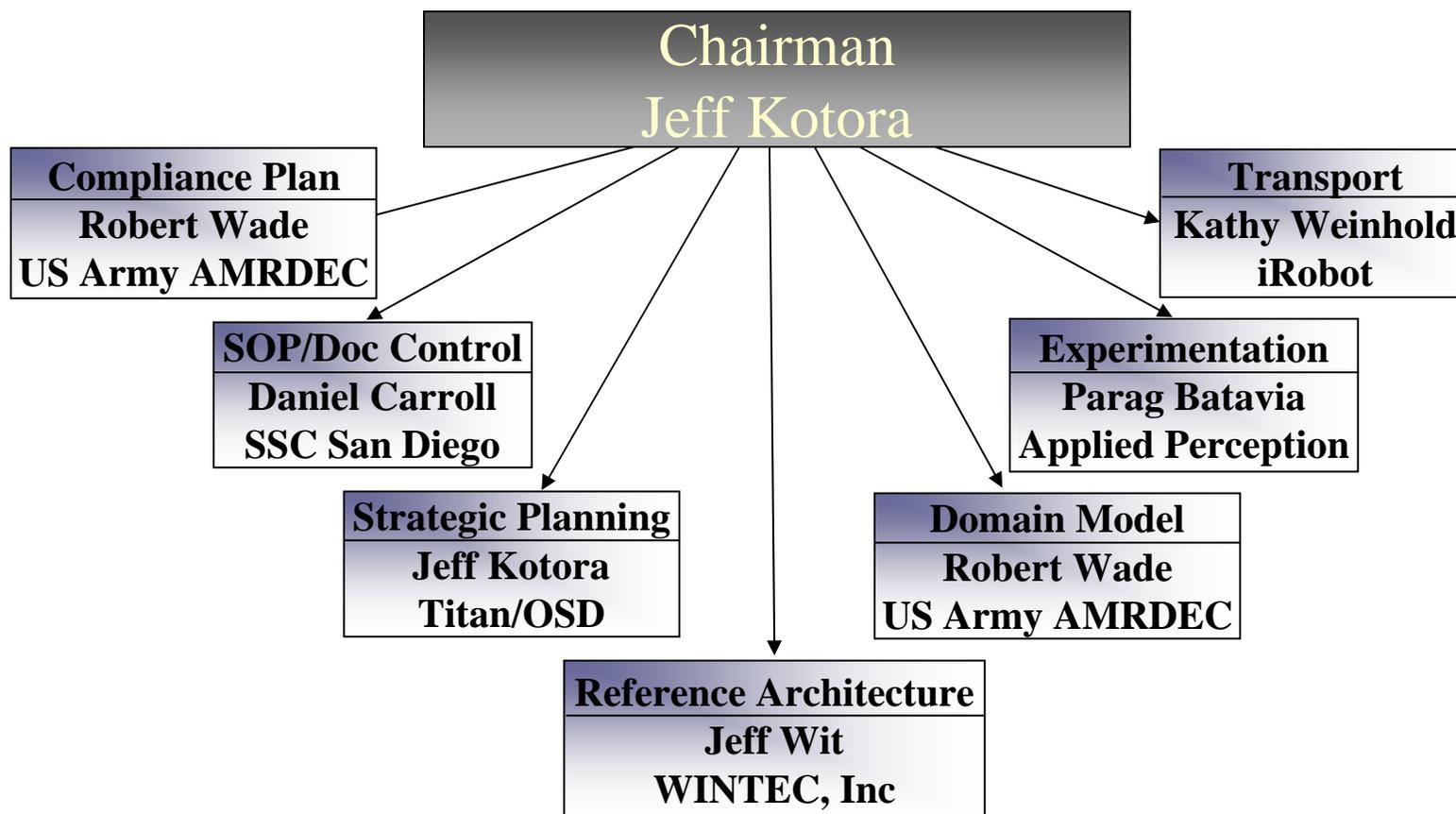


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# Joint Architecture for Unmanned Systems

## JAUS Working Group



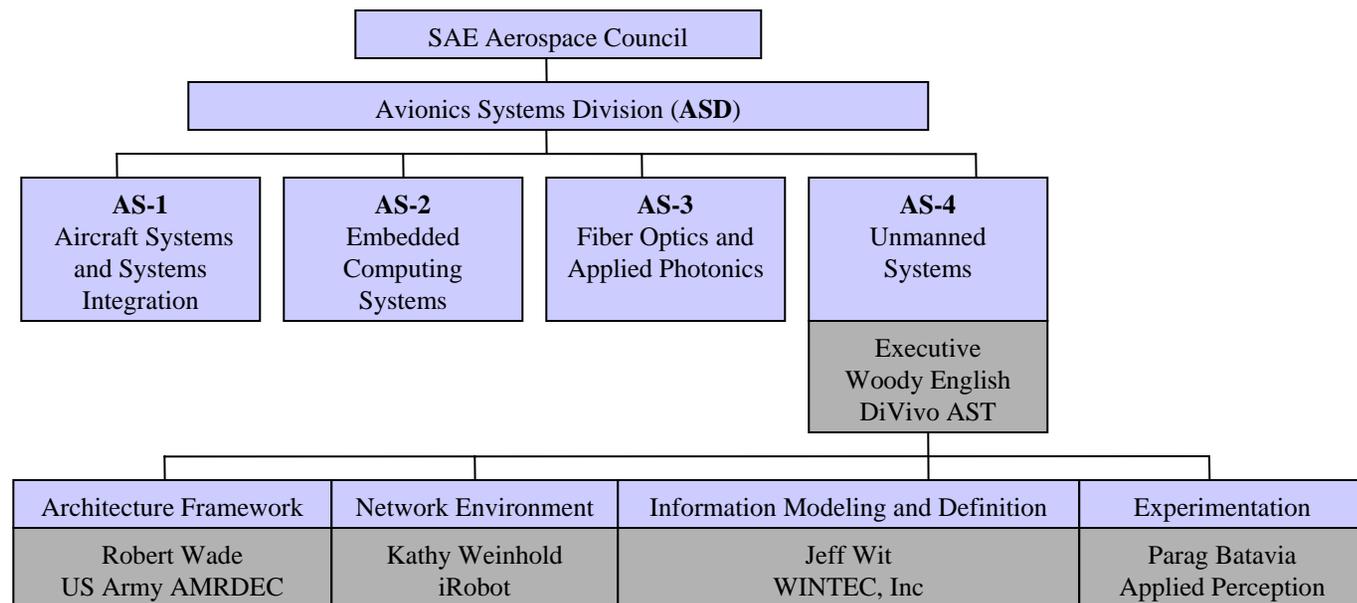
- Web Page: [www.jauswg.org](http://www.jauswg.org)
- FTP Site: [ftp.jauswg.org](ftp://ftp.jauswg.org)
  - Username: jauswgftp
  - Password: jauswgftp



# Joint Architecture for Unmanned Systems Transition To An Industry Standard



- Society of Automotive Engineers (SAE) October 2004
  - Aerospace Council
    - » Avionics Systems Division (ASD)
      - Unmanned Systems Committee (AS-4)



***JAUS And AS-4 Will Execute In Parallel Until Further Notice***



# ***Joint Architecture for Unmanned Systems*** **Systems Incorporating JAUS**



## ***Current Systems & Developments:***

- Air Force ARTS
- Air Force REDCAR
- Army CRS
- Army FCS (UGV, UAV, US, UM, MGV)
- Army MDARS-E
- Army RCSS
- Marine Corps Gladiator
- Navy JUSC2 ACTD
- Navy MTRS
- Navy Spartan ACTD
- Navy USSV
- State Department NGEODRCV



# **Joint Architecture for Unmanned Systems**

## **SAE Participant Organizations**



# **Service, Industry & Academic**

## **Participants:**

- Applied Perception
- Autonomous Solutions
- BAE
- Boeing
- Carnegie Mellon
- General Dynamics
- Harris
- iRobot
- L-3
- Lockheed Martin
- Northrop Grumman
- SAIC
- Univ of Florida
- DoC NIST
- OSD JGRE
- Air Force AAC
- Air Force Research Laboratory
- Army AMDEC
- Army ARDEC
- Army CERDEC
- Army MANSCEN
- Army STRI
- Army TARDEC
- Army UAMBL
- Marine/Army RS JPO
- Navy EODTECHDIV
- Navy NSWC
- Navy NUWC
- Navy SPAWAR SC
- PM Soldier

*The JAUS Working Group Has Over 29  
Organizational Members*



# Joint Architecture for Unmanned Systems

## Recent Accomplishments



- *OSD Joint Ground Robotics Enterprise* – Mandated for use by all JGRE programs.



- *Army Future Combat Systems* – Operational Requirements Document required capability.



- *Navy Littoral & Mine Warfare* – Directed for incorporation in Unmanned Ground Systems, Unmanned Surface Vehicles and Unmanned Underwater Vehicles.



- *National Bomb Squad Commanders Advisory Board* – Requires JAUS compliance for use by all federally funded robotic programs FY'08 and beyond.

***JAUS Is Evolving Into The Unmanned Systems Messaging Standard***



# *Joint Architecture for Unmanned Systems*

## Upcoming Milestones



- **Complete transition to SAE**
- **Dynamic registration/configuration**
- **Mission planning and execution**
- **Transport specification**
- **Weapons/fire control**
- **Component definition changes**
- **Products**
  - **Compliance Tool Suite**

***JAUS/SAE AS-4***  
***Unmanned Systems Interoperability***



# Joint Architecture for Unmanned Systems



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