# Joint Architecture for Unmanned Systems

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# Introduction

The Joint Architecture for Unmanned Systems addresses interoperability with an emphasis on the logical communications between heterogeneous computing systems used for Unmanned Systems command and control.

JAUS = { Messages }

Message = Control + Addressing + Data

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*JAUS is an Open Systems Specification*

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# Objectives of JAUS

- 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

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*JAUS is designed to exploit existing and future technologies while simultaneously supporting systems evolution to autonomy*

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# Activities

- OCU/Payload Experiment
- Expand JAUS Message Set
- Develop JAUS Compliance Tool Suite (JCTS)
- Transition to an Industry Standard
- Provide information to organizations asking "What is JAUS?"

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*JAUS Activities are designed to promote and evolve the standard to include existing and future capabilities*

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# OCU/Payload Experiment

- Completed 2 of 3 experiments and incorporated recommendations from test groups into JAUS RA

*JAUS has been expanded through experimentation*

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# OCU/Payload Experiment

- Planning virtual and live experiments to evaluate and finalize World Modeling and Mission Planning messages
- Planning virtual and live experiments to evaluate and finalize Transport level specification to ensure interoperability at the transport layer

| Organization | MP & WM | Transport |
|---|---|---|
| NSWC | Yes | Yes |
| Harris | Yes | Yes |
| ASI | Yes | Yes |
| SPAWAR | Maybe | Yes |
| AFRL | Maybe | Yes |
| iRobot | Maybe | Yes |
| AMRDEC | Provide JCTS | Provide JCTS |
| API | Yes | Yes |
| UF | Yes | No |

*JAUS will be expanded through experimentation*

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# Expand JAUS Message Set

- Working with Collaborative Engagement experiment to determine new message requirements
- Using outcome of OPC experiments to expand the current message set
- Working with NASA to determine new message requirements
- In preliminary discussions with UUV community to determine new message requirements

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*JAUS will be expanded through working with DoD , other Gov't organizations, industry, and academia*

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# Develop JAUS Compliance Tool Suite

- Prototype system completed – results used to determine system requirements
- Software Requirements Specification completed
- System Design and Implementation Started
- Beta-Testing to begin 1st Quarter FY06
- First Release 2nd Quarter FY06
- Sustainment plan being developed

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*Procurement entities will be able to better test and validate JAUS compliance by using the JAUS Compliance Tool Suite*

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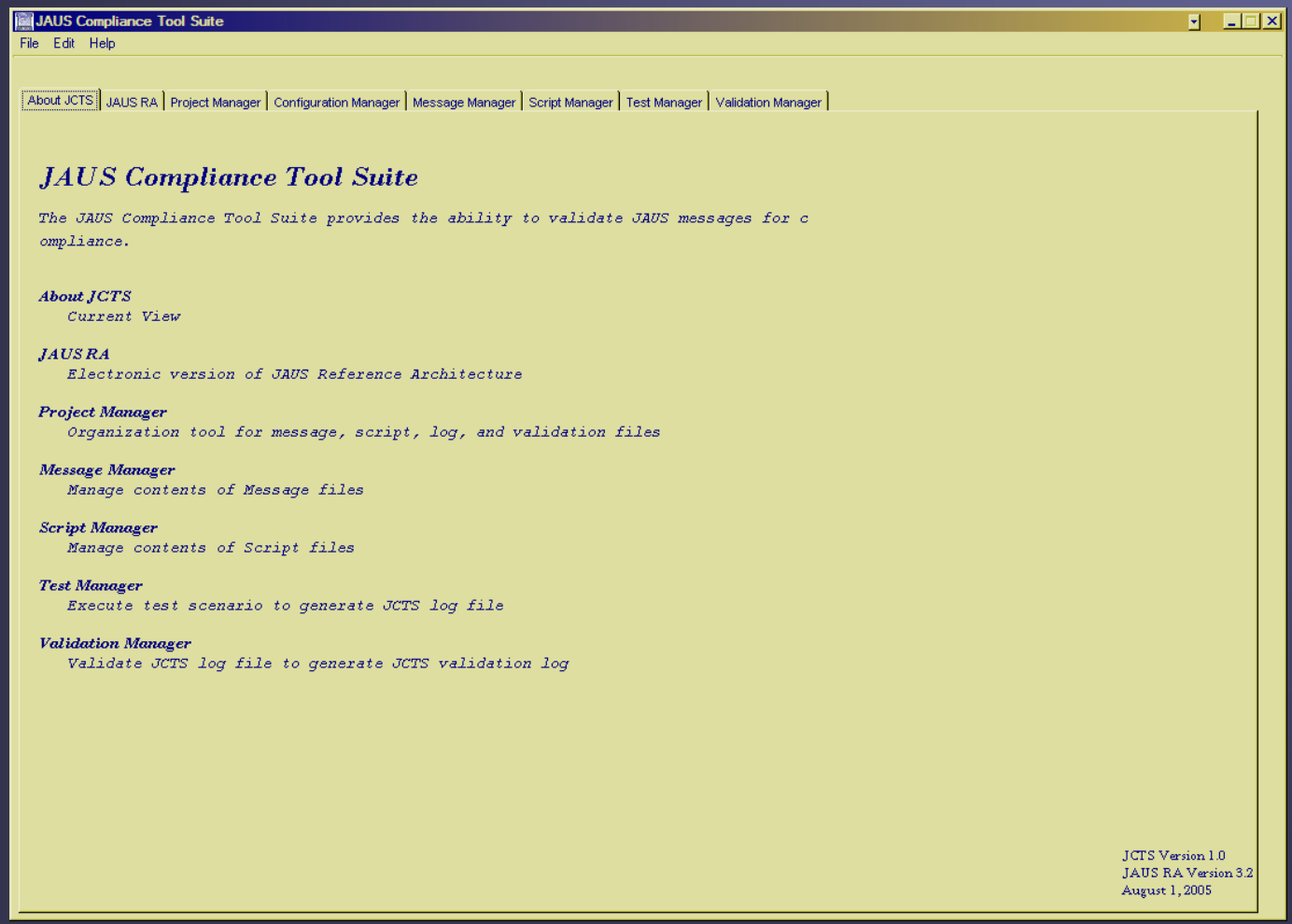
# Develop JAUS Compliance Tool Suite

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*The JAUS Compliance Tool Suite is an easy to use, flexible, and scalable tool.*

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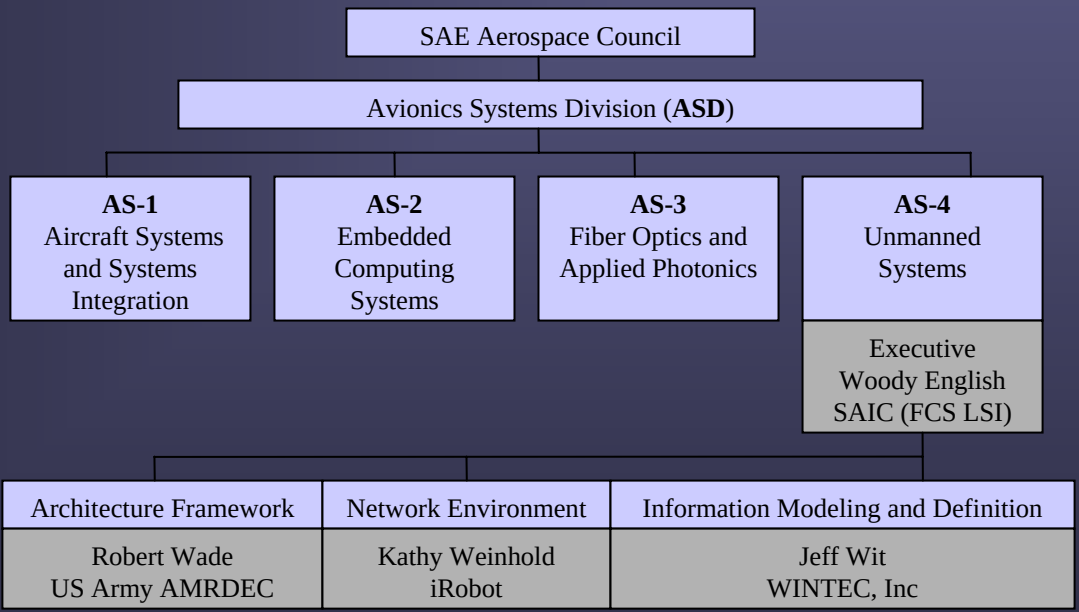
# Transition to an Industry Standard

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




*JAUS WG and AS-4 will operate in parallel*

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# JAUS—SAE Migration

| JAUS Documents | Technical Content | SAE Documents |
|---|---|---|
| Domain Model | Requirements Baseline/Background | |
| Reference Architecture | System Composition/Nomenclature<br>Component Level Architecture | Architecture Framework |
| | Message Headers<br>UMS Specific Protocol<br>(Dynamic Registration)<br>(Service Connections)<br>(Ack/Nak)<br>(Large Data Sets) | Network-Session |
| | Message Definitions (sans header) | Unmanned Systems Message Set |
| Transport Specification | TCP/IP Assignments<br>Point to Point Protocols | Network-Transport |

*Current JAUS Document Set will be compatible with the first set of SAE Documents*

# Provide Information

- JAUS is being considered by NASA Joint Technical Architecture for Robotics Systems (JTARS) WG to be included as a NASA standard
- A working relationship has been established between the JAUS WG and JTARS WG
- UUV community looking to adopt JAUS
- JAUS being presented at UUV workshop at AUVSI later this month

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*Organizations are coming to the JAUS WG to learn more about JAUS*

# Schedule

| Milestones | FY05 | | FY06 | | | |
|---|---|---|---|---|---|---|
| | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| Expand Messages | | | | | | |
| Develop JCTS | | | | | | |
| Transition to SAE | | | | | | |
| Conduct OPC Experiments | | | | | | |
| Sustain JCTS | | | | | | |
| JTARS Participation | | | | | | |

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# Summary

- JAUS is maturing and expanding through experimentation and government/industry/academia participation
- JAUS compliance tool is being developed
- JAUS is transitioning to a industry standard for unmanned systems
- JAUS is being considered by NASA and other Government organizations
- JAUS WG is supported by numerous Government, Industry, and Academic organizations

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*JAUS is growing and being used by a expanding number of organizations and users*

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