



# IMA & Software Activities



**July 16, 2002**

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***Presentation the GAMA Avionics Group***

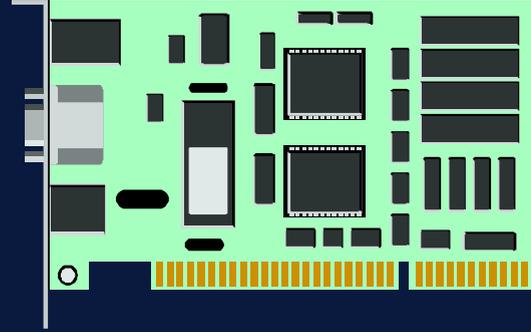
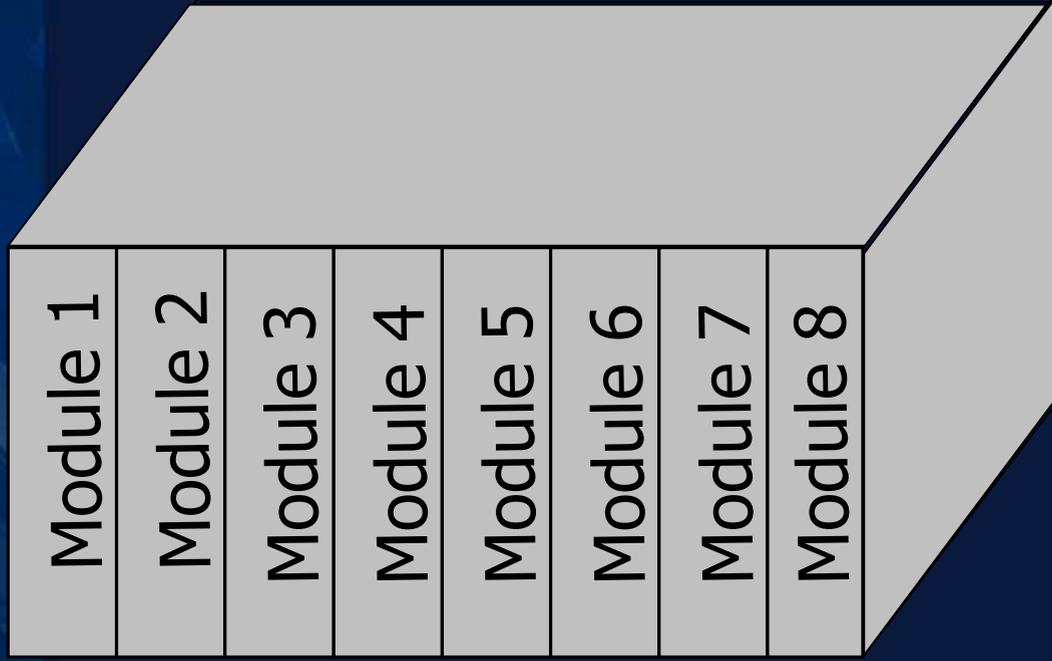


# Presentation Topics

- ✦ **Integrated Modular Avionics (IMA) Status**
- ✦ **Software Program Activities**
- ✦ **Software-Related Research**



# IMA Status





# FAA'S IMA Team (TSO and AC for Hardware Elements)



# TSO Status

- ◆ **Title: “TSO-C153, INTEGRATED MODULAR AVIONICS HARDWARE ELEMENTS”**
- ◆ **Published in Federal Register – 12/01**
- ◆ **Addressed all public and FAA comments – 3/02**
- ◆ **Signed May 6, 2002**



# TSO Overview

- ◆ **Section 1 – Purpose**
- ◆ **Section 2 – Applicability**
- ◆ **Section 3 – Requirements**
- ◆ **Section 4 – Marking**
- ◆ **Section 5 – Application data requirements**
- ◆ **Section 6 – Manufacturer data requirements**
- ◆ **Section 7 – Furnished data**
- ◆ **Section 8 – Manufacturer data sheet**
- ◆ **Section 9 – Availability of references**
- ◆ **Appendix 1 – MPS criteria**
- ◆ **Appendix 2 – Example format for data sheet**
- ◆ **Appendix 3 - Definitions**



# Some Unique Things About This TSO

- ✦ **TSO is for “Brain Dead Hardware”**
- ✦ **Manufacturer Develops and Submits MPS to FAA**
- ✦ **TSO Provides Criteria to Be Addressed in the MPS**
- ✦ **Software Functionality is Limited**
- ✦ **TSO’d Hardware Elements May Support Functional TSOs**
- ✦ **Manufacturer Creates a Data Sheet to Aid Users**



# AC Status

- ◆ Title: “GUIDANCE FOR INTEGRATED MODULAR AVIONICS (IMA) THAT IMPLEMENT TSO-C153 AUTHORIZED HARDWARE ELEMENTS”
- ◆ Sent to FAA field offices – 12/01
- ◆ Addressed FAA comments 3/02
- ◆ Draft 10 (dated 5/10/02) – Nearly ready for Federal Register (FR)
- ◆ Publish in FR - 7/02
- ◆ IMA Team Meeting - 9/02
- ◆ Complete AC - 10/02



# AC Overview

- ◆ 1 – Purpose
- ◆ 2 – Related Docs
- ◆ 3 – Definitions
- ◆ 4 – Acronyms
- ◆ 5 – Scope
- ◆ 6 – Background
- ◆ 7 – Document Overview
- ◆ 8 – IMA System Cert Overview
- ◆ 9 – Safety Assessment
- ◆ 10 – Configuration Mgt
- ◆ 11 – Electronic ID
- ◆ 12 – Software
- ◆ 13 – Complex Hardware
- ◆ 14 – Design Guidance
- ◆ 15 – Environmental Qual
- ◆ 16 – Human Factors
- ◆ 17 – Testing (multiple levels)
- ◆ 18 – Roles & Responsibilities
- ◆ 19 – Third Party Guidance
- ◆ 20 – Airworthiness
- ◆ 21 – Maintenance & Continued Airworthiness



# RTCA Special Committee #200 (SC-200)



# SC-200 Background

- ✦ **RTCA Ad Hoc Meeting on Modular Avionics – 1/02**
  - **Determined Need for SC-200**
  - **Draft Terms of Reference**
- ✦ **SC-200 Approved by RTCA – 3/02**
- ✦ **First SC-200 Meeting – 5/02**
- ✦ **Plan to join with EUROCAE WG-60**



# Major Goals of SC-200

- ◆ **Propose and document a method for transferability of certification credit between stakeholders (e.g., aircraft manufacturer, system integrator, multiple application providers, platform provider, operators, regulators).**
- ◆ **Create guidance to address the following safety and performance issues (at a minimum):**
  - **Partitioning & Resource Management**
  - **Fault Management & Health Monitoring**
  - **Safety & Security**
  - **Flight Operations & Maintenance**
  - **Environmental Qualification**
  - **Configuration Management**
  - **Assurance**



# FAA's Thoughts on SC-200

- ✦ **Will Build Upon Hardware Element TSO and AC**
- ✦ **Will Be Targeted For Large Transport Aircraft, with Applicability for Business Jets and Smaller Aircraft**
- ✦ **Will Likely Result in An Additional AC**



# Software Activities





# FY 02 - 03 Software Activities

- ✦ **Object-Oriented Technology (OOT)**
- ✦ **Software Policy / Guidance**
- ✦ **Software Training**
- ✦ **Certification Authorities Software Team (CAST)**
- ✦ **Complex Electronic Hardware**
- ✦ **Manufacturing Software Vision**
- ✦ **Other Software Activities**



# Object Oriented Technology (OOT)

## Phase 1

- ◆ **Workshop #1 held April 9-11, 2002**
- ◆ **Workshop Purpose**
  - **Identify safety and certification issues related to using OOT**
  - **Work with industry, government, and academia to establish positions on key issues**
- ◆ **Workshop Outcome**
  - **Draft position papers on eight issues and glossary**



# Object Oriented Technology (OOT) (cont)

## Phase 2

- ◆ **Draft *Handbook for Object Oriented Technology in Aviation: OOTiA Workshop Proceedings* (Jan 03)**
- ◆ **Workshop #2 tentatively scheduled for Mar 25 - 27, 2003**
- ◆ **Workshop Purpose**
  - Use Draft *Handbook* as input
  - Work with industry, government, and academia to mature positions on issues
- ◆ **Workshop Outcome**
  - Revised *Handbook* (Sep 03)
  - Develop training based on *Handbook* (Oct 03)



# Object Oriented Technology (OOT) (cont)

## Phase 3

- ✦ **Publish *Handbook for Object Oriented Technology in Aviation: OOTiA Workshop Proceedings* (Jun 04)**
- ✦ **Create Advisory Circular (AC) or implement into DO-178C (TBD)**



# Software Policy / Guidance

- ✦ **Notice 8110.97 - Reuse of Software Life Cycle Data (Dec 01)**
- ✦ **Reuse of Software Components Order or AC (Dec 02)**
- ✦ **Mega Software Order (combines notices)**
  - **Routed for comments - (Dec 01)**
  - **Send to Federal Register – (Oct 02)**
  - **Complete Order – (Jan 03)**
- ✦ **Advisory Circular for DO-200A**
  - **Standards for Processing Aeronautical Data**
  - **Draft in Work**



# Software Training

- ✦ **Software Job Functions Course: DO-178B (ongoing)**
- ✦ **Software for Managers IVT (Nov 01)**
- ✦ **Annual Software Conference (May 02; spring 03)**
- ✦ **Real-time Software Design (FAA only) (Aug 02; May 03)**
- ✦ **Software Reuse IVT (Oct 02)**
- ✦ **Update Software Job Aid (Dec 02)**
- ✦ **IMA IVT (Feb 03)**
- ✦ **OO Basics IVT (Oct 03)**



# Certification Authorities Software Team (CAST)

- ◆ **International Team of Software / Certification Specialists who meet semi-annually**
- ◆ **Purpose is to Harmonize Software Issues among Certification Authorities**
- ◆ **Position Papers**
  - **Potential basis for policy, guidance, or training material**
  - **Subset posted on FAA Software Website**



# CAST (cont)

- ✦ **Recent Papers / Topics of Discussion:**
  - **Safety Engineering Techniques**
  - **Avionics Database Approval/Validation**
  - **Merging High- and Low-Level Requirements**
  - **COTS Operating Systems**
  - **Continuity of Integral Processes**
  - **Databus Evaluation Criteria**
  - **Autocode Generators**
  - **Reverse Engineering Techniques**
  - **Data/Control Coupling**
  - **Cache**



# Complex Electronic Hardware

- ✦ **John Dimtroff is point of contact**
- ✦ **Advisory Circular in work**
  - **References RTCA/DO-254**
  - **Send to Federal Register (Jun 03)**
  - **Publish (Oct 03)**



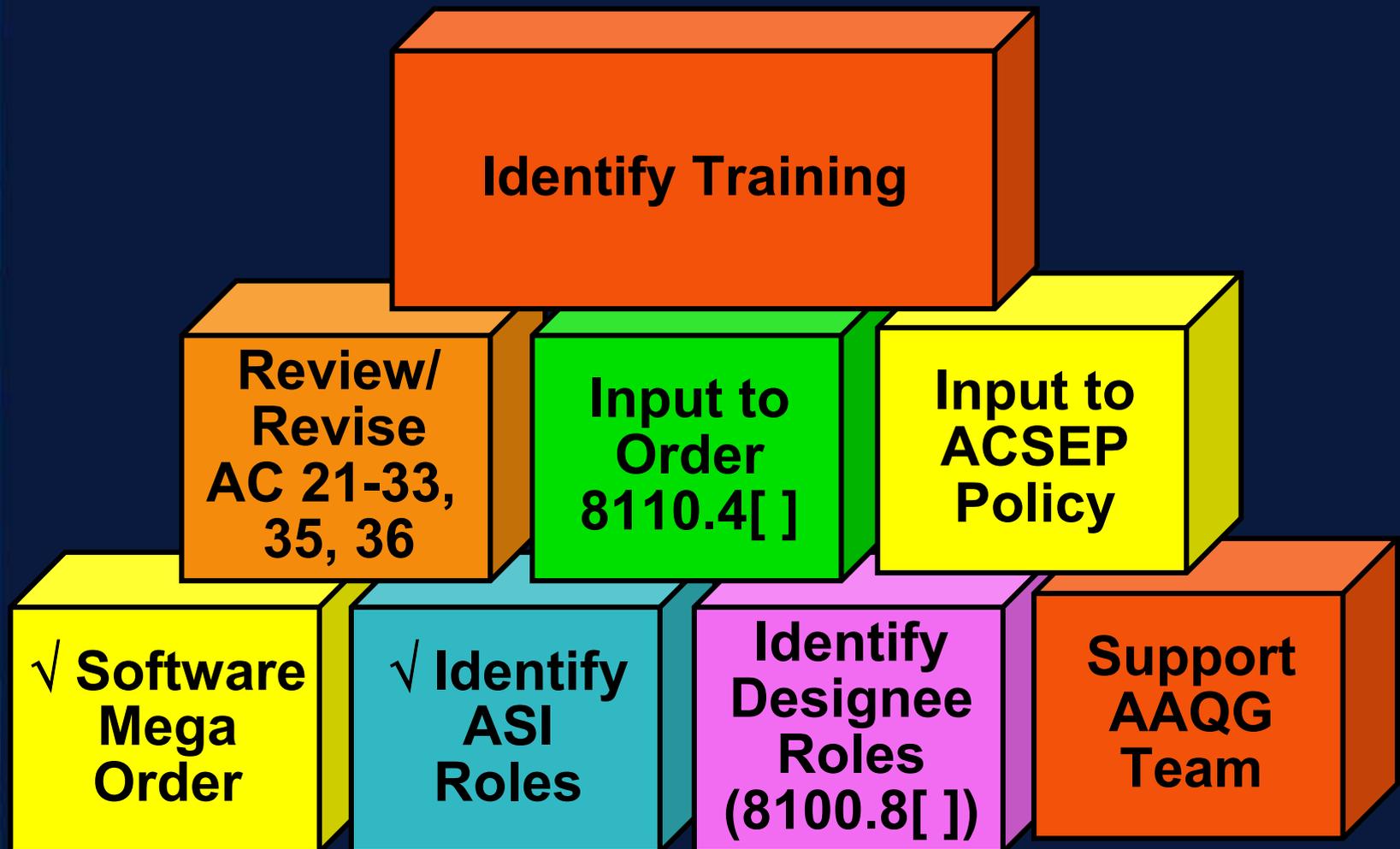
# Overarching Aviation Safety Inspector Software (OASIS) Team

## OASIS Virtual Team Charter:

- **Develop vision for aviation safety inspectors (ASIs) in manufacturing / production software**
- **Identify policy, guidance, and training needs related to manufacturing / production software**



# OASIS Team Activities



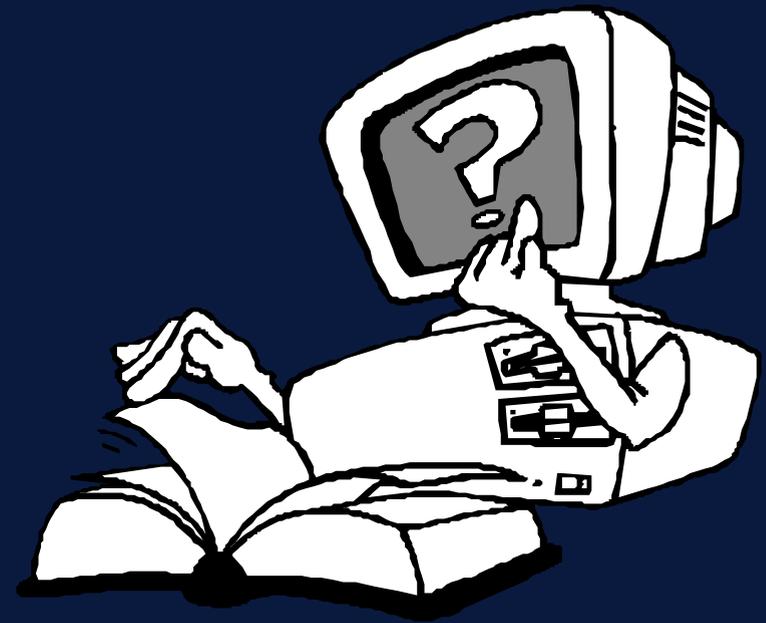


# Additional FY 03 Software Activities

- ◆ **Create CNS/ATM Software Vision**
- ◆ **Create Vision to Work with Military on DO-178B-related issues**
- ◆ **Begin working with Flight Standards regarding software needs**



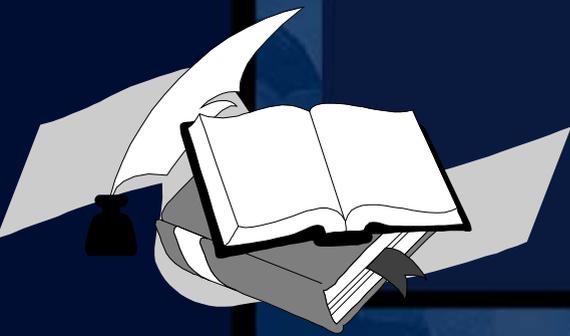
# Software-Related Research





# Software and Digital Systems (SDSS) Research Program Purpose

- ✦ To address safety, performance, and technology issues in the areas of:
  - Software
  - Complex electronic hardware
  - Digital systems
- ✦ SDSS research supports the policy and guidance initiatives of the FAA





# SDSS Technical Community

- ◆ **Leader: Leanna Rierson**
- ◆ **Sponsor: Barbara Lingberg**
- ◆ **Tech Ctr Mgr: Chuck Kilgore**
- ◆ **Members:**
  - Will Struck
  - Jorge Castillo
  - Robin Sova
  - Gary Horan
  - Brenda Ocker
  - Dennis Wallace
  - John Lewis
  - Jim Treacy
  - Tony Lambreghts
  - Tom Kraft
  - Larry Bessette



# SDSS Research History

- ◆ **Past Research in the Areas of:**
  - **Modified Condition/Decision Coverage (MC/DC)**
  - **Service History**
  - **COTS Software**
  - **COTS Hardware**
- ◆ **See FAA Software Web-site for Reports:**
  - **<http://av-info.faa.gov/software>**



# SDSS Research Priorities

✓ Underway

☺ Anticipate starting

- ✓ 1- COTS software and components
- ✓ 2- Object oriented technology
- ✓ 3- Complex electronic hardware case study
- ✓ 4- Software development tools assessment
- ✓ 5- Software verification tools assessment
- ✓ 6- New paradigm for aircraft fly-by-wire control
- 7- Databus evaluation criteria
- ☺ 8- Semiconductor wearout effects
- 9- Tool qualification of complex electronic hardware



# SDSS Research Priorities (cont)

✓ Underway

☺ Anticipate starting

✓ 10- Real-time scheduling analysis

✓ 11- Ethernet as an aviation databus

12- Avionics computer resource issues

✓ Underway  
☺ Anticipate starting

☺ 13- Microprocessor evaluations

14- Safety engineering in software

15- Software service history and reliability models

16- Transfer of aviation data on the internet

✓ 17- COTS ground systems verification

✓ 18- Software service history case study



# Related Research

- ✦ **NASA's Aviation Safety Program**
- ✦ **Aerospace Vehicle Systems Institute (AVSI)**
- ✦ **Individual Companies**
- ✦ **Universities**



# Summary

- ◆ **IMA, Software Program, and Research are Progressing Well**
- ◆ **For more information**
  - **E-Mails:**
    - **[Leanna.Rierson@faa.gov](mailto:Leanna.Rierson@faa.gov)**
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  - **Software Web-Site:**
    - **<http://av-info.faa.gov/software>**