Electronic Systems Branch (ESB) Overview

Mar. 8, 2010

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Head, Electronic Systems Branch (ESB)
Systems Engineering Directorate (SED)
LaRC, Hampton, VA

ESB

- Electronic Systems Branch (ESB):
  - Strategic Plan
  - Vision/Focus Areas
  - Staff
  - Areas of Expertise
  - Contractor Support
  - Labs
  - Projects
  - New Business
  - Contact info
  - Summary

Branch Strategic Plan

Vision Statement

- *Be the **Center's** primary resource for space and flight electronics & avionic systems*

Mission Statement

- *Provide leadership in the development of space and flight electronics. Our mission is accomplished using engineering and management skills for the design, development, and application of state-of-the-art electronic and avionic systems for exploring space, characterizing the Earth's climate, and conducting flight experiments.*

Stretch Goal:

- *Be the **Agency's** primary resource for space and flight electronics & avionic systems*

ESB Overview (cont.)

- **ESB Staff:**
- ESB Office
  - Branch Head, Will Scott
  - Asst. Branch Head, Marvin Beatty
  - Branch Chief Engineer, Dr. Bob Hodson
  - ASA, Debbie Monroe
  - Secretary, Alyssa Schanz
- 34.25 Civil Servants (28.25 Elec. Engineers, 6 Elec. Techs.)
- 15 On-site contractors (9 EE/CS's, 3 Elec. Techs)
- Several students (co-ops & summer)

ESB Overview (cont.)

- **ESB Org:**
- ESB Office – Head, Asst. Head, Branch Chief Engineer, Sec.
- Aero Programs - Lead – Marvin Beatty
  - UAVs
- Branch Chief Engineer – Dr. Bob Hodson
  - Leads Monthly Management Reviews, sets technical direction, plans technical training, reviews technical papers, NESC avionics rep.
- New Business Manager – Will Scott
  - Focus group meetings, monthly branch meeting summaries, coordinate and review all proposal submittals in the branch, works with other new business managers
- B1202 Lead Technician – Jeff Massie
  - B1202 Lab Manager – Jeff Massie
  - Staff – Larry Cowen, Mike Flood, Fred Fitzpatrick, Jimmy Adams
- ESB Safety and Environmental Manager – Larry Cowen (Also the B1202 Safety and Environmental Manager)

ESB Overview (cont.)

- **Areas of Expertise:**
- Modeling:
  - System data flow, algorithm development
  - (Dr. Jeffrey Beyon)
- Systems Design:
  - Architecture
  - (Dr. Bob Hodson)
- Digital/programmable logic design:
  - I/O systems, memory, computer bus interfaces, data acquisition, micro-controller
  - (Dr. Tak Ng, Kevin Somervill, Mark Jones, Denise Scearce)
- Analog design:
  - Detector signal conditioning, filtering, data acquisition
  - (Dr. Arthur Bradley, John Diamond, Will Scott)

ESB Overview (cont.)

- **Areas of Expertise: (cont.)**
- Robotics
  - (Dr. Arthur Bradley, Sam Miller)
- Controls:
  - Flight controls, Motion/motor control
  - (Dr. Mark Motter, Dr. Joel Campbell)
- Power Systems:
  - Grounding, DC/DC converters, batteries
  - (Will Scott, Guillo Gonzalez, Dr. Arthur Bradley)
- Ground Support Equipment
  - (Marvin Beatty, Gene Monroe)
- EEE Parts, packaging, manufacturing
  - (John Pandolf, Dr. Yuan Chen)

ESB Overview (cont.)

- **Areas of Expertise: (cont.)**
- Testing, fabrication, lab instrumentation
  - (Larry Cowen, Mike Flood, Fred Fitzpatrick)
- RF testing
  - (vacant)
- Aero flight instrumentation
  - (Jeff Massie, John Chapman, Nick Trombetta)
- Technical Management/Monitoring
  - COTR
  - (Marvin Beatty, Guillo Gonzalez)
- Project Management
  - (Will Scott, Carl Mills)
- Other:
  - NESC member - avionics
    - (Dr. Bob Hodson)
  - Fabrication – PCB layout
    - (Jimmy Adams)

ESB Overview (cont.)

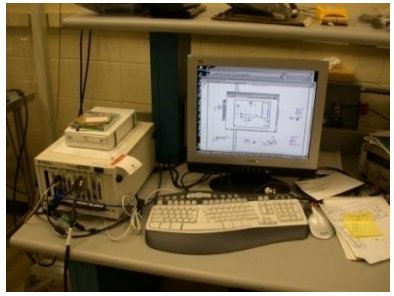
- Contractor Support (on site)
  - Avionics
    - (Tom Johnson, Dr. William Edmonson)
  - Signal Processing
    - (Dr. Tom Shull)
  - Project Management
    - (John Cox)
  - Aero Flight Instrumentation
    - (vacant)
  - EEE Parts
    - (Willie Munden)
  - Digital Design
    - (Dr. Jerry Tucker, Robert Akamine)
  - Analog Design
    - (Doug Taylor)
  - CAEDE Sys. Admin.
    - (Carl Thomas)
  - Fabrication
    - Raytheon contractors

ESB Overview (cont.)

- **Labs**
  - TTSS-FPI development
  - Advanced Avionics
  - UAV Flight Controls
  - Robotics / Reconfigurable Computing
  - EEE Parts and Packaging
  - GPS / UAV Instrumentation
  - CAEDE
  - Environmental Testing
  - Aero Flight Instrumentation
  - RF Testing / Mobile Telemetry Trailers

Objectives:

- Develop and validate an airborne instrument prototype that will measure ozone, a key oxidant, in the troposphere
- Investigate new technologies that could enhance instrument performance
- Develop and evaluate various subsystems needed for the instrument
- Integrate subsystems and provide overall performance evaluation in a lab environment prior to flight



Flight Computer

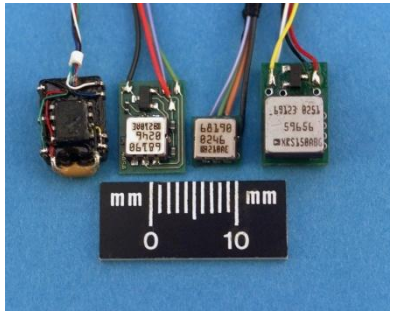
Clean Tent for Instrument Assembly

Isolated Table for Optics Evaluation

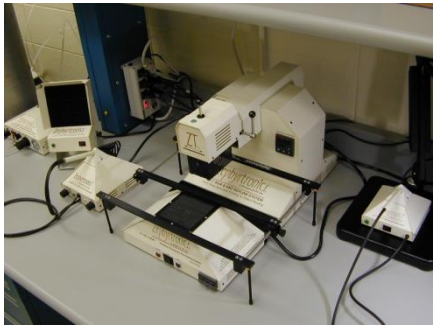
EEE Parts and Packaging Lab

Objectives:

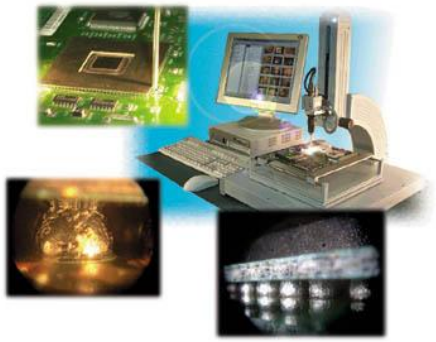
- Expand knowledge regarding suitability of electronic parts/packaging for space flight use
- Provide assistance in selection of parts
- Investigate promising new technologies
- Devise innovative means for ensuring worthiness of parts/packaging



Miniaturized Circuit Boards



Work-station for Flight Board Rework



Quality Control Station

ESB Overview

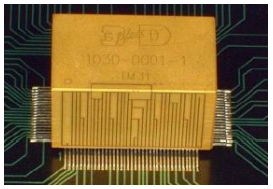
- Some past projects:
- Atmospheric sensing satellites:
  - HALOE, CERES, SAGE (II, III), CALIPSO, ERBE, SABER
- Shuttle & ISSE payloads:
  - PASDE, FOSS, LITE, FILE, LDEF, SILTS, MODE, MAPS, MACE, MIDAS, IR Camera, MISSE
- Other space based instruments:
  - SEDS, OMDC, MDIM
- Aero based atmospheric sensing instruments
  - LASE, GPS
- Balloon based
  - FIRST, GPS

ESB Overview (cont.)

- Current and recent projects:
- Space Instrument Projects
  - CALIPSO, CERES
- Space Technology Development
  - SIRF, TTSS-FPI, IRVE, robotics
- EEE Parts Assessment
  - Advanced manufacturing
- Airplane and Ground Based Instruments
  - VALIDAR, C&I
- Aero Flight Technology Development
  - UAV

Recent Projects

- Projects:
  - Aero
    - GA data acquisition
    - B757 RTF Pallet Lead
    - UAV controls
  - CALISPO
    - In-house Electronics Lead
    - Anomaly leads
  - X43A electronics anomaly lead
  - GIFTS Control Module Lead
  - FIRST Project Manager
  - TTSS-FPI Project Manager
  - PDA demo
  - RTIMS
  - RSC
  - JTARS
  - SEE Immune FPGA

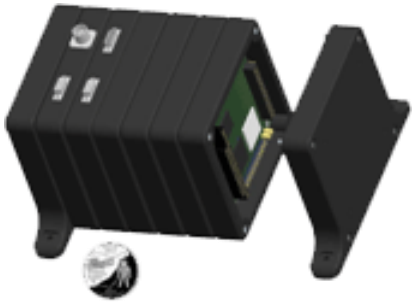


Advanced Avionics Roadmap

GIFTS
6U cPCI
33 MHz Clock
32 Bit Data Bus

Advanced Avionics

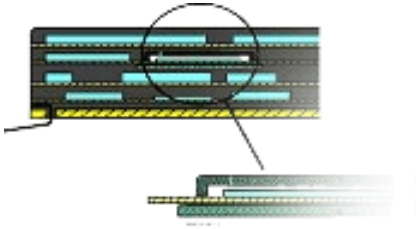
3U cPCI
33 MHz Clock
32 Bit Bus



Reconfigurable Scalable Computing (RSC)

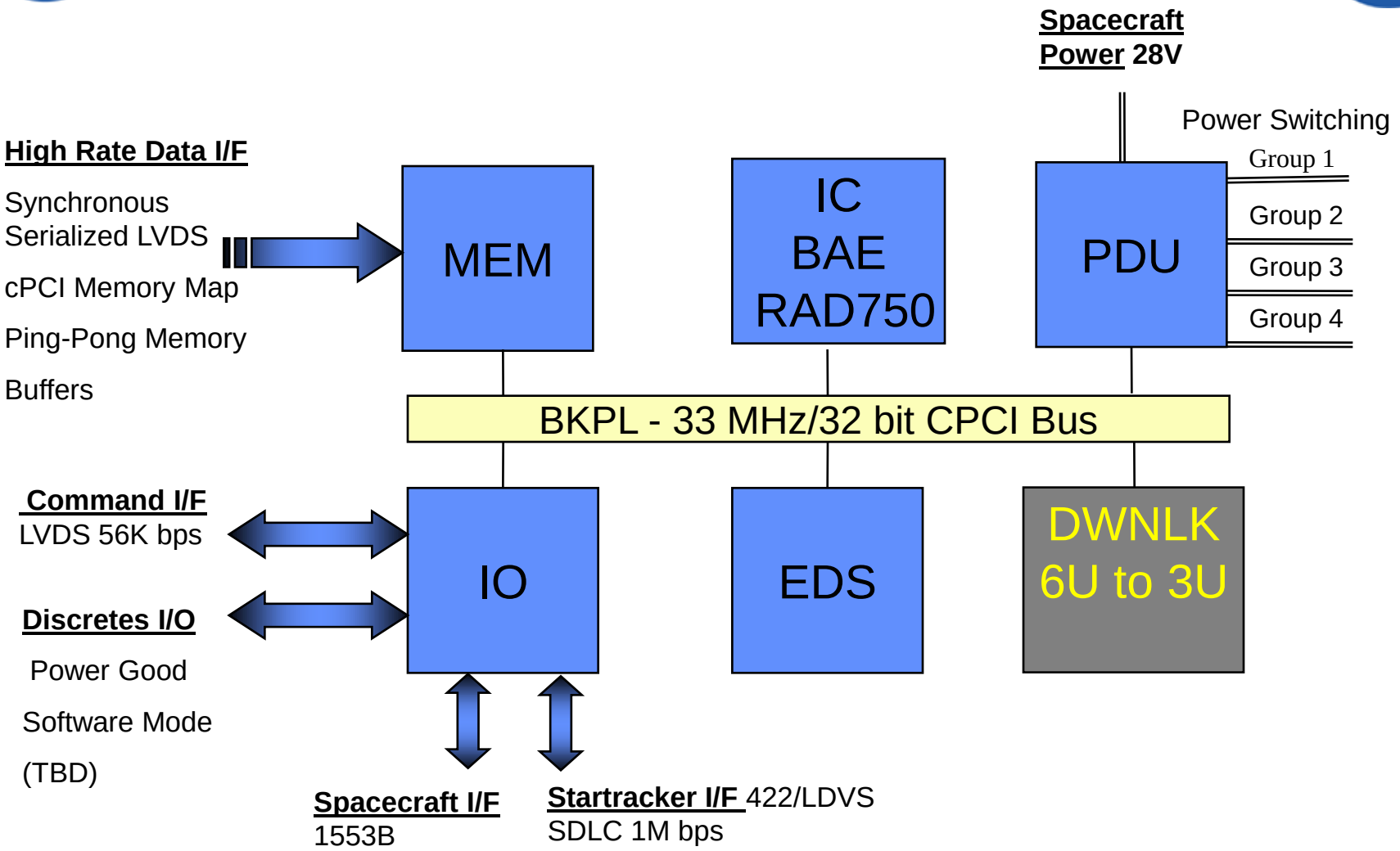
PCI 33 MHz 64 bits
IP-Based Approach

Integrated Stack
64 MHz Clock
64 Bit Data Bus

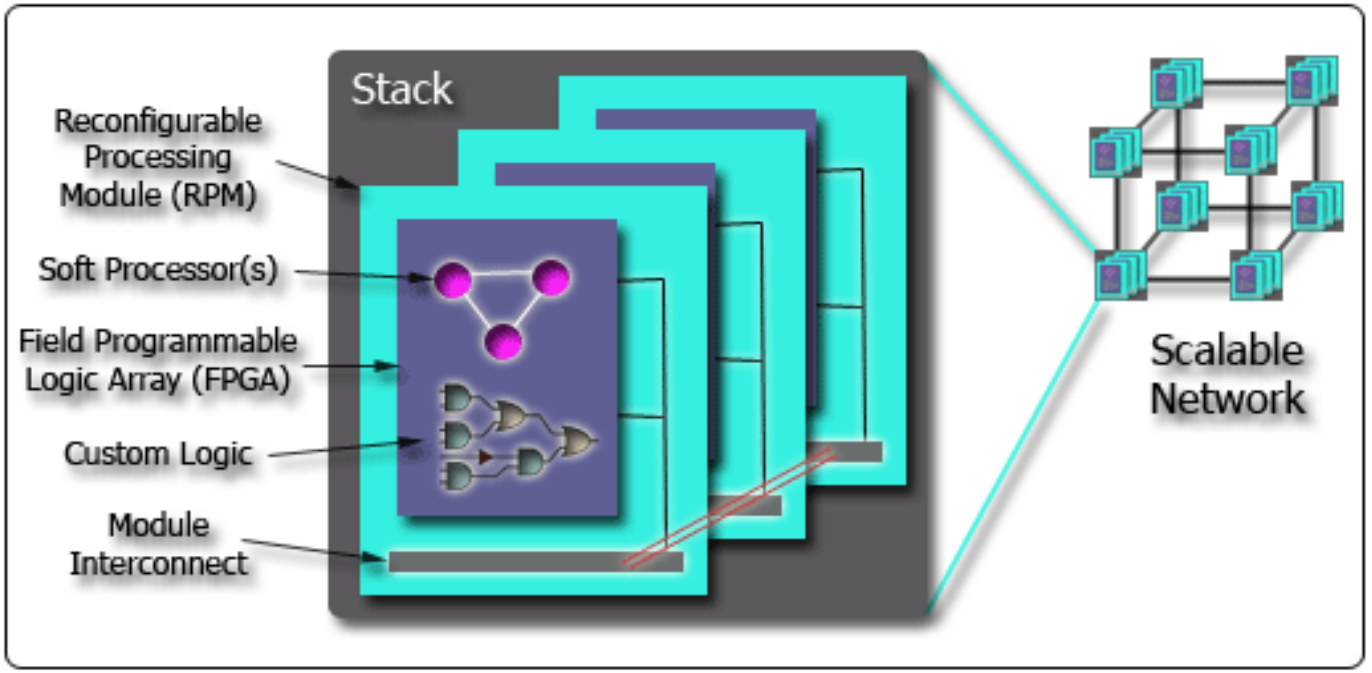


2004 2006 2008 2010+

Advanced Avionics (EM) System Architecture

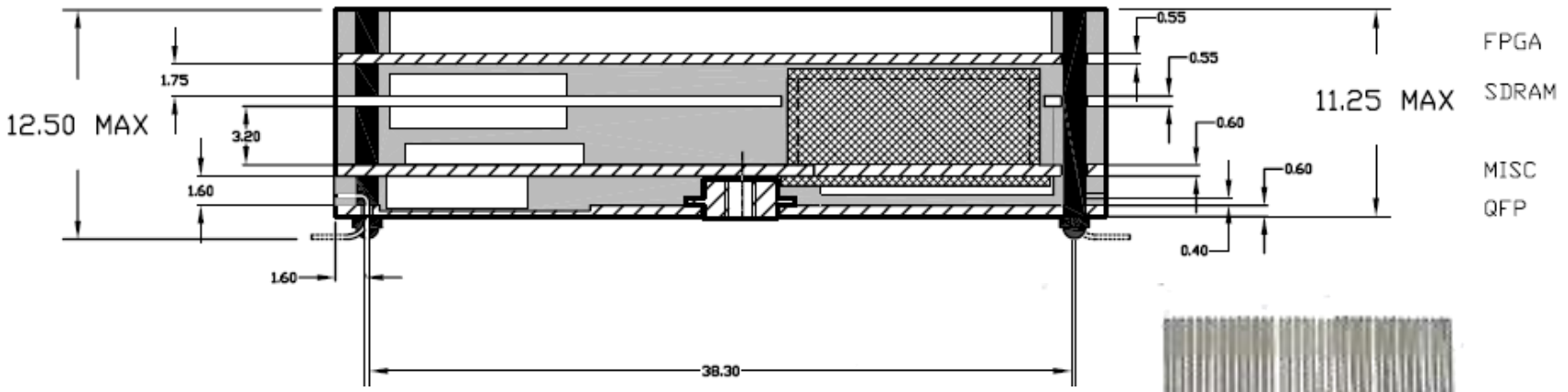


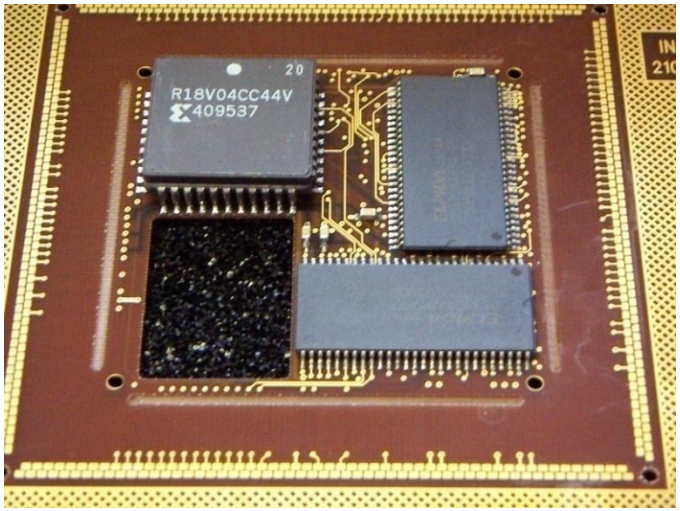
Reconfigurable Scalable Computing

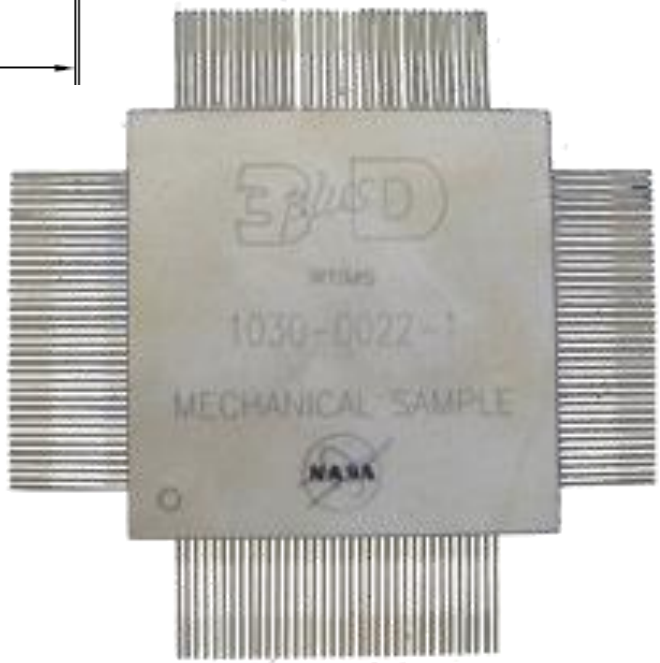


- **Radiation Hardened Reconfigurable Avionics for Space Applications**
- **Built on high-speed Field Programmable Gate Array (FPGA) technology**
- **Utilizes soft-core processors**
- **Complete hardware/software computing solution with broad application**
- **Leverages COTS software and standards**
- **Modular/stackable approach to reduce mass and volume**

RTIMS: Stack, Layers & Module







ESB

- Contact Info:
- Branch Head;
  - Will Scott, (757) 864-1075, Willis.J.Scott@nasa.gov
- Act. Asst. Branch Head
  - Marvin Beatty, (757) 864-1689, Marvin.E.Beatty@nasa.gov
- Branch Chief Engineer
  - Dr. Bob Hodson, (757) 864-2326, Robert.F.Hodson@nasa.gov
- Secretary
  - Alyssa Schanz, (757) 864-1839, Alyssa.M.Schanz@nasa.gov

ESB Overview (cont.)

- **Summary:**
- Interests in – Reconfigurable computing, robotics, avionics, highly integrated electronics, flight instrumentation, controls, & modeling
- Full suite of labs. Full support of fabrication and quality assurance
  - PCB layout design and assembly in-house
- Highly integrated with the other discipline branches