

National Aeronautics and  
Space Administration



**MARSHALL**  
SPACE FLIGHT CENTER



# Space Systems Department

Leadership at All Levels

# Acronym Dictionary

ECLSS: Environmental Control and Life Support Systems  
EEE: Electrical, Electronic, and Electromechanical  
EMI: Electromagnetic Interference  
ESD: Electrostatic Discharge  
EUSO: Extreme Universe Space Observatory  
EXPRESS: EXpedite Processing for Experiments to Space Station  
E3: Electromagnetic Environmental Effect  
FA: Electrical Failure Analysis  
FPGA: Field Programmable Gate Array  
GDT: Geometric Dimensioning & Tolerancing  
GN&C: Guidance Navigation and Control  
ISS: International Space Station  
LSE: Lead Systems Engineer  
MSG: Microgravity Science Glovebox  
NMLS: Neutron on Measurements at the Lunar Surface  
ORU: Orbital Replacement Unit  
RF: Radio Frequency  
SE&I: System Engineering & Integration  
SLS: Space Launch System  
SW Integration: Software Integration



Leadership at All Levels

# NASA Marshall Space Flight Center

## Systems Engineering & Integration

- Lead Systems Engineers
- Systems Integration
- Systems Engineering Implementation
- Leads Avionics & SW Integration
- Imagery

## Mechanical & Optical Design, Analysis and Fabrication

- Mechanical Design
- Stress, Thermal, and Loads Analysis
- Optical Systems Design, Fabrication, & Test
- Hardware Fabrication: Large Structures, Assembly, Cleaning, & Outsourcing

## Avionics

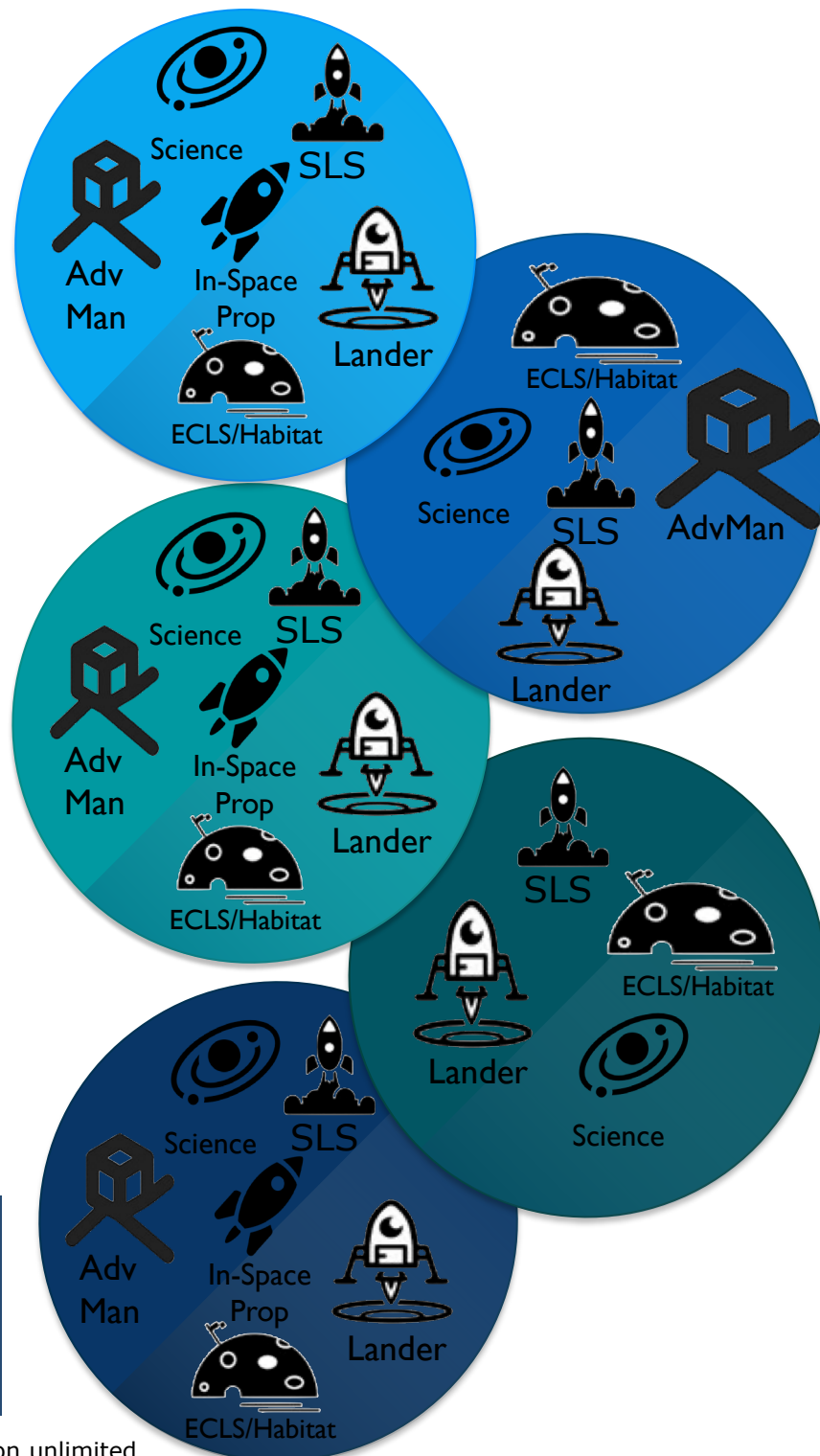
- Avionics Design & Electrical Integration
- Power Electronics Development
- Electronics Fabrication & Failure Analysis
- RF, E3, & GNC Analysis and Testing
- Spaceflight Imaging Systems & Sensors

## Flight & Ground Software & Simulation

- Software Systems Engineering
- Software Development
- Hardware-in-the-loop and Simulation Development

## Systems Development, Integration, & Test

- Testing of instruments, racks, payloads & subsystems
- Design & development of specialized sensors & science instruments
- Integrated ECLSS systems design, analysis and technology development for human space exploration missions.

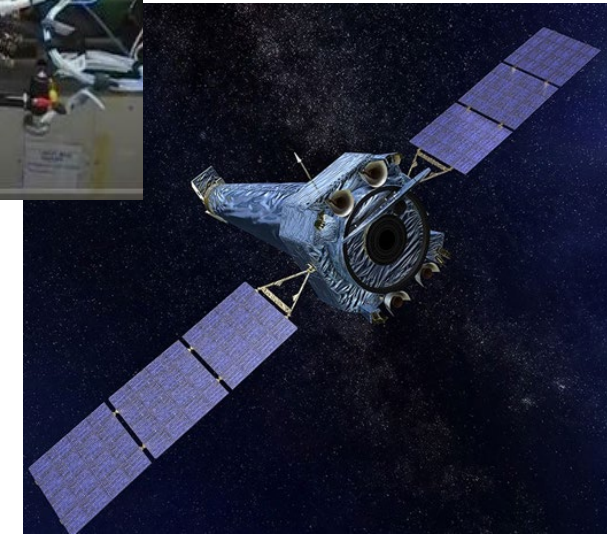
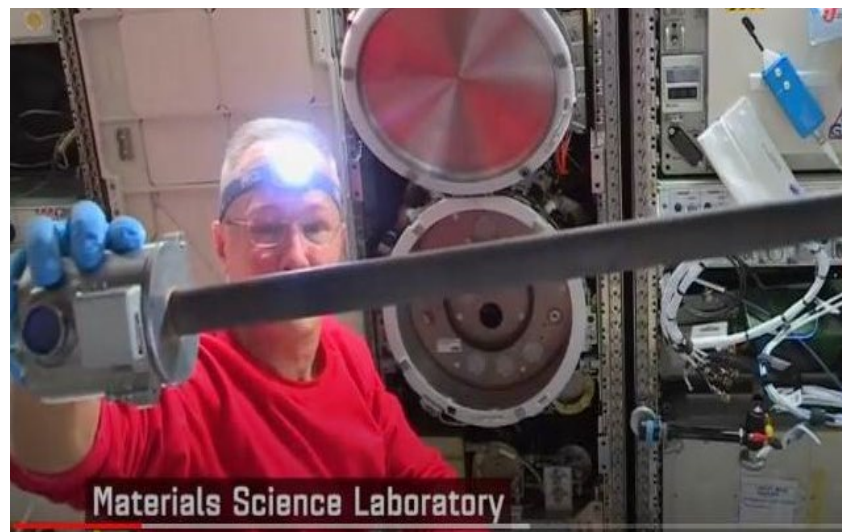


## Key Capabilities

- Plan for the application and management of Systems Engineering
  - Identify, define, and plan the technical effort applicable to the product-line lifecycle
- Provide technical management and coordinate across engineering
  - Integrate engineering resource requirements
    - Provide Department Lead Engineers
- Coordinate the development of integrated avionics and software products
  - Provide technical integration expertise for the avionics architecture
- Provide the Systems Engineering discipline expertise and the development of Systems Engineering work products
  - Apply Systems Engineering practices and principles to help solve the complex science and engineering challenges

### ES10 Division Contacts

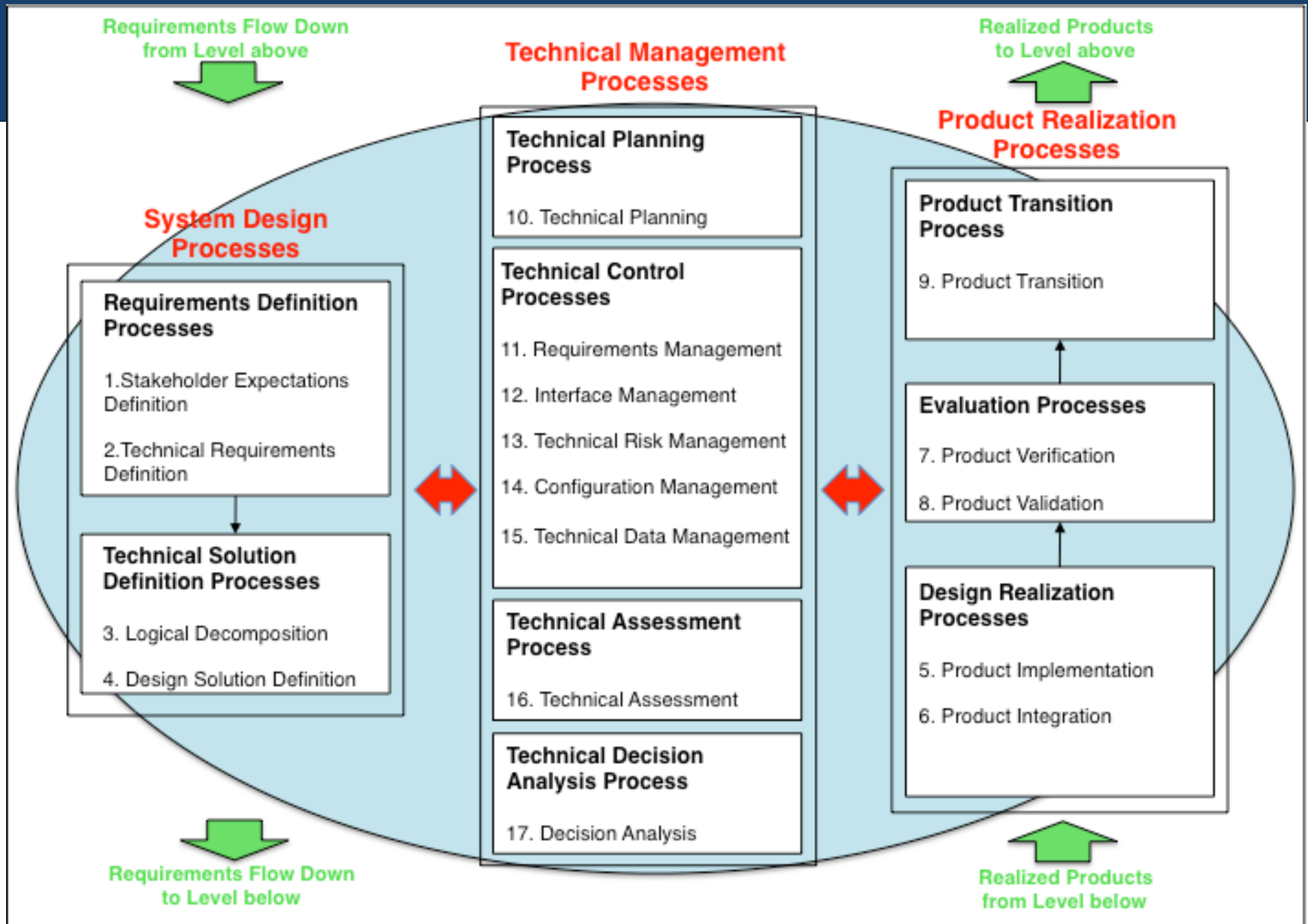
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|-------------------------------|--------------------------------|----------|
| <b>ES10 Division Chief</b>    | <a href="#">Rex Graves</a>     | 544-2224 |
| <b>ES10 Assistant Manager</b> | <a href="#">Neil Rainwater</a> | 544-8918 |



## Systems Engineering & Integration Division

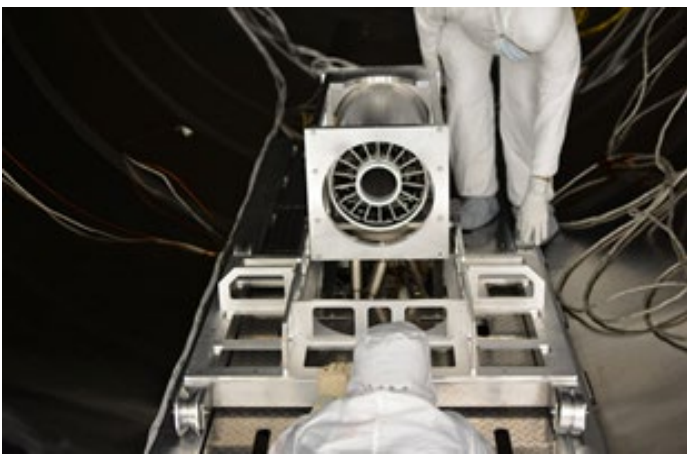
[The Systems Engineering and Integration](#) division provides projects value-added solutions to a broad spectrum of SE&I challenges from initial Formulation through Sustaining Engineering. The Systems Engineering and Integration division is comprised of a Projects Engineering Branch (i.e. Lead Systems Engineers), an Avionics Systems Integration Branch (i.e. Avionics & Software Discipline Leads), and a Systems Engineering Branch. Together the branches integrate multi-disciplines to deliver products that meets the customer's particular use, needs, and capabilities.

# Systems Engineering & Integration Division



- Design, Analysis, Fabrication, Assembly, Integration, Calibration & Testing of:**
- Mechanical & structural space flight and development hardware including ground support equipment
  - Thermal control, ECLSS hardware
  - Optical mirrors for grazing & normal incidence & light lightweight replicated optics
- Fundamental discipline expertise:**
- Structural & mechanical, GDT-based design
  - Strength, fatigue, fracture, loads, dynamics, vibroacoustics, microgravity, shock, & advanced payload isolation modeling & analyses
  - In-space thermal & pipe flow analysis
    - Development & verification test criteria/requirements, extensive test operations support, data processing/correlation for thermal, strength, dynamics, acoustics and vibration
  - Opto-mechanical thermal design & analysis

- Recent applications & specific expertise:**
- Grazing optics for X-ray Telescope
    - New air revitalization systems, sustaining engineering of flight ECLSS systems for ISS
    - Microgravity materials science experiments & on-board test facilities for ISS
  - Specialized ground support and transportation equipment for SLS
  - Deployment & control mechanisms & system integration for Solar Sail based CubeSat
  - Agency/commercial robotic & crewed Lunar Lander structural & thermal subsystems
  - Many recent and ongoing spaceflight hardware development activities



# Mechanical & Optical Design, Analysis & Fabrication Division

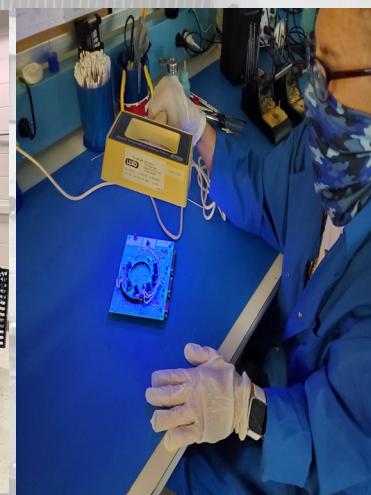
The [Mechanical & Optical Design, Analysis & Fabrication Division](#) provides comprehensive mechanical and aerospace engineering expertise in design, analysis, fabrication, assembly and integration.

We deliver structural, mechanistic, optical, thermal and fluid system hardware for advanced technology implementation, small spacecraft, critical ground hardware for human space flight programs, science investigations, and exploration initiatives.

| ES20 Division Contacts |                              |          |
|------------------------|------------------------------|----------|
| ES20 Division Chief    | <a href="#">Dave Whitten</a> | 544-7027 |
| ES20 Assistant Manager | <a href="#">Jeff Farmer</a>  | 544-3179 |

## Key Capabilities

- Flight data systems design & analysis
  - Signal conditioning, instrumentation, and controller design and analysis
- Design, implementation, and test of imaging and video systems
  - FPGA logic design
- EMI, ESD, lightning indirect effects, & power quality testing
- Design, development, test, and analysis of RF communication systems and components
  - Power electronics design, development, test, & analysis
- Power electronics controller design and analysis
  - Power quality assessments
- Motor and/or motor controller design and analysis
- Electrical and physical power interface compatibility assessments
- Electrical integration design & analysis
  - Electrical power system and component design, development, test, and evaluation
- EEE parts screening and physical analysis
  - Research in printed electronics
- Electrical fabrication, assembly, and testing
- Evaluation, selection, & test of GNC spaceflight hardware
  - Flat Floor Robotics Laboratory



## Avionics Division

The [Avionics Division](#) provides electrical design, development, fabrication, testing, and evaluation of avionics systems such as electronic control systems, data systems, power electronic systems, RF and Communication systems, flight instrumentation systems, inertial components for GN&C systems, flight instruments and sensors, and imaging systems. In addition, the division also provides for analysis and testing of Electromagnetic Environmental Effect, Electrical Failure Analysis, and EEE parts screening and analysis.

The Avionics Division has capabilities ranging from the design, development, fabrication, testing, and control of the avionics architecture to the independent verification and validation of integrated systems after fabrication. The avionics design capabilities range from direct development and/or testing of hardware to performing insight and analytical integration of work. The division performs research, design, development, fabrication and testing of electronic circuits and systems, instrumentation and signal conditioning, imaging, flight computers, sensors, power supplies, custom magnetics, data busses, digital systems, FPGA, and drive electronics for motors, valves, and other electrical actuators.

### ES30 Division Contacts

|                                       |                             |          |
|---------------------------------------|-----------------------------|----------|
| <b>ES30<br/>Division Chief</b>        | <a href="#">John West</a>   | 544-6858 |
| <b>ES30<br/>Assistant<br/>Manager</b> | <a href="#">Jeff Wesley</a> | 544-3393 |

## Key Capabilities

- Perform flight software requirements, design, development, integration, test and verification.
- Performs software configuration management for control and release of software deliverables operations.
- Provides flight software development and test facilities.
- Provides fully-qualified Human-Rated Class A Software utilizing voting architecture, autonomous and commanded operations, sensor data qualification
- Provides ECLSS software
- Provides simulations and models for avionics development and testing.
- Provides real-time simulation, lab control, and facility data acquisition software requirements, design, development, integration, test, and configuration management.
- Develops avionics and software ground systems test.
- Develops, operates, and maintains multiple system integration and test facilities.



## Flight & Ground Software & Simulation Division

[Flight & Ground Software & Simulation Division](#) provides comprehensive engineering expertise for the development of flight and ground software, including software development facilities, avionics and software ground systems test facilities, and operation facilities. ES50 is a Maturity level 3 flight software rated organization.

### ES50 Division Contacts

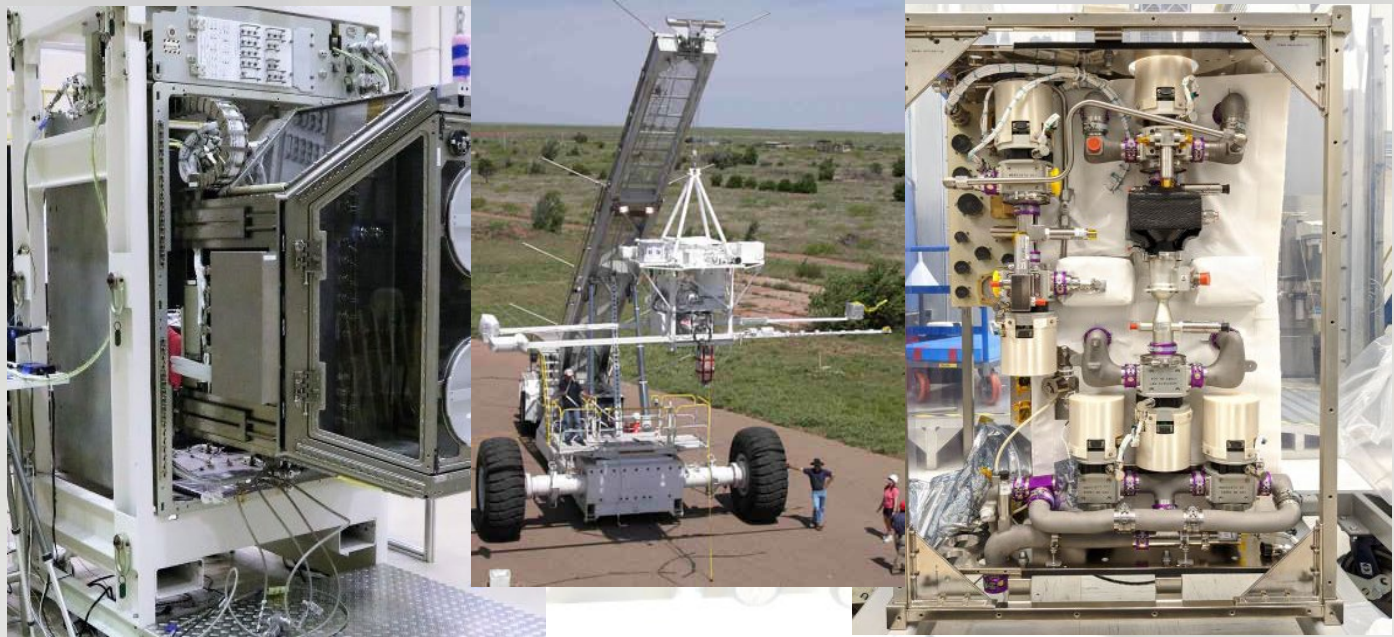
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| <b>ES50 Division Chief</b>      | <a href="#">Deanna Whitehead</a> | 544-8787 |
| <b>ES50 Technical Assistant</b> | <a href="#">Terry Brown</a>      | 544-1626 |
| <b>ES50 Technical Assistant</b> | <a href="#">Darrell Bailey</a>   | 544-2072 |

## Key Capabilities

- Design, development, testing, and evaluation of Environmental Control and Life Support Systems.
  - Design and development of specialized science instruments and payloads.
- Planning and implementation of ground test programs for qualification and certification of flight instruments.
- Design and development of special test equipment and related software to test functionality of flight hardware.
- Development of hardware test beds to support proof of concept, breadboard, and subsystems/systems validation.
- Development of procedures, test conduction, data collection, data archival for analysis, and verification closeout as well as anomaly investigation/resolution.
  - On-orbit control support.
  - Ground station monitoring.
  - Post-flight de-integration.

### ES60 Division Contacts

|                         |                             |
|-------------------------|-----------------------------|
| <b>ES60</b>             |                             |
| <b>Assistant Manger</b> | <a href="#">Linda Jeter</a> |
|                         | 544-7392                    |



## Systems Development, Integration, & Test Division

The [Systems Development, Integration, & Test Division](#) provides testing of instruments, racks, payloads & subsystems, as well as design & development of specialized sensors & science instruments. The division also contains subject matter experts in test methods, planning, procedure development, test data and test reporting with emphasis on ECLSS, SLS and NMLS. Development activities include the definition, design, assembly, integration and operation of flight hardware utilizing a wide variety of disciplines located within the division focused specifically on orbital and suborbital payload, systems, and instrument development. Examples of the activities include the ECLSS ORU Processing, MSG operation, EXPRESS Functional Checkout Unit Rack and the EUSO. The breadth and depth of hardware related experience is a valuable asset to its current and prospective customers. Systems Development, Integration and Test Division consists of two groups: Instrument Development, Integration & Test Branch and Environmental Control and Life Support Systems Development Branch.