Structural Engineering Overview

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ES Organization

Provide technical expertise and leadership for the development, evaluation, and operation of structural, mechanical, and thermal spaceflight systems

- Development of International Docking Standards, advanced analytical tools & methods, material, manufacturing & NDE processes
- Operation of structural, materials, dynamic, manufacturing, and thermal facilities
- SSP, ISS, CEV Program system managers, subsystem managers, NSEs
Structural and Mechanical Systems

EDL DDT&E

Advanced designs

Mechanical DDT&E

Structural DDT&E
The Thermal Design Branch provides expertise in thermal design, analysis, testing, and system management to the Space Shuttle, International Space Station, Orion Spacecraft, and other miscellaneous projects.
Materials and Manufacturing

- Failure Analysis
- NDE and Fracture Control
- Advanced Materials and Manufacturing
- Material Control
- Space Environments and Contamination
Loads and Dynamics

Analysis
- Aero-acoustics
- Transient dynamics
- Modal
- Non-linear contact dynamics

Testing
- Random Vibration testing
- Modal Testing
- Vibro acoustic Testing
- Human Rated Vibration Test Bed
Composite Structure Opportunity

New Cabin
1. Ready in 2012
2. Common goals

Opportunities
1. New Materials
2. Manufacturing
3. Design Teams
4. Testing
5. Test results
6. Analysis methods
7. Instrumentation
Inflatable Structure Opportunity

Technology Invention

- Large scale pressurized volumes utilizing advanced material and manufacturing techniques capable of withstanding 4 times operating pressure

Feasibility Demonstration

- Full scale habitation module architecture and testing of integrated systems during deployment and operations

Commercial Demonstration

- Demonstration of inflatable technology utilizing a commercial sub-scale module

Continued Advancements

- Integration of hatch/docking ports and next generation construction methods

Inflatable Habitat Development History

1996

- AO/TPS Stabilization

2000

- Bagged Foam Bumper Material Restraint Layer

2005

- Tapered Diamond Stitch (SDN44103466-001)
  - Red Lines
  - Both Stitches begin 2.0 Inches from Red Lines

2010

- Self sustaining habitation module suitable for missions beyond LEO

Technology Demonstrations

- Technology Demonstrations

- Commercial Development
Atmospheric Entry capsule Opportunity

- Remains internal (IVA) on the ISS
- Exits via the JEM airlock
- Navigates away from the ISS
- Targeted Landing
- HTV, ATV, Progress, or COTS
- Re-entry Technologies
In Conclusion...

- Structural Engineering domain is very broad in capabilities, tools, and technologies
- Here today to learn and understand common goals, challenges, and opportunities
- Everything begins with a first step - take action
  - Overcome export control challenges in a collaborative international environment
  - Advance the discipline
  - Advance international collaborations in human spaceflight