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 Demonstrations**

- **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**
  - Feasibility Demonstration

- **2000**
  - Technology Invention

- **2005**
  - Commercial Demonstration

- **2010**
  - Continued Advancements

**Flagship Demonstrations**

- Self-sustaining habitation module suitable for missions beyond LEO

**Technology Demonstrations**

- Technology development

**Commercial Development**

- Commercial demonstration

**Enabling Technology Development**

- Bagged foam bumper material

**Red Lines**

- Tapered Diamond Stitch (SDN44103466-001)
  - Both Stitches begin 2.0 inches from Red Lines
  - Smaller Diamonds are near the Red Lines.

**Shielding**

- MMOD
  - Bagged Foam Bumper Material
  - Restraint Layer

**AO/TPS**

- Technology demonstrations

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION**

**JSC ENGINEERING DIRECTORATE**
Atmospheric Entry capsule Opportunity

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