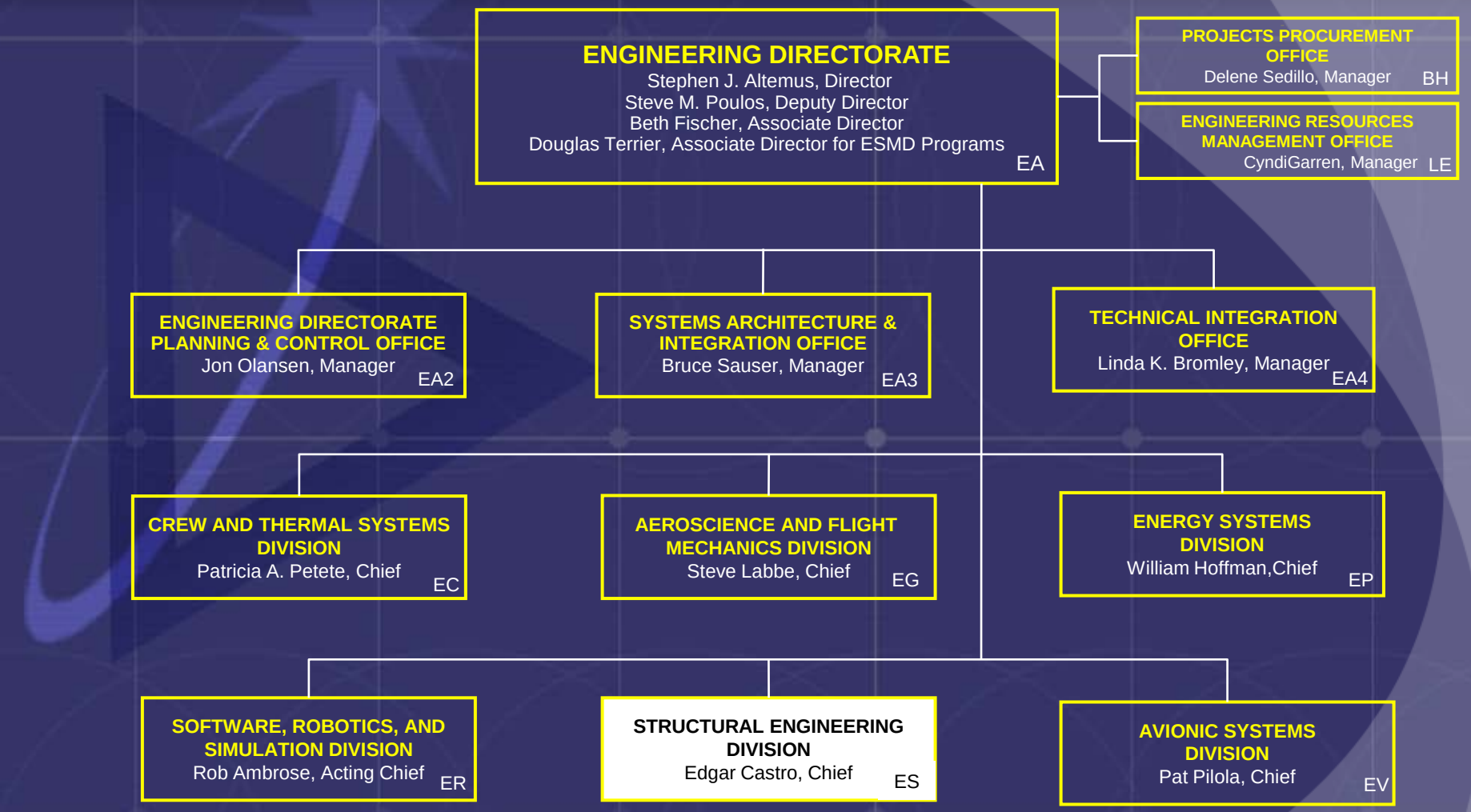
Structural Engineering Overview

Edgar Castro

2011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EV

ES Organization

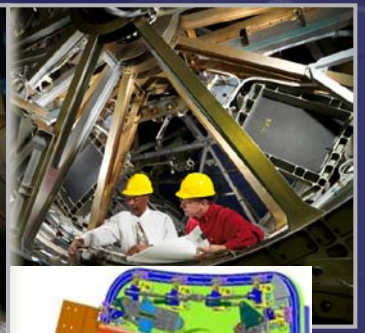
Provide technical expertise and leadership for the development, evaluation, and operation of structural, mechanical, and thermal spaceflight systems

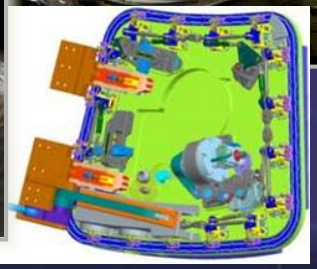
- Development of International Docking Standards, advanced analytical tools & methods, material, manufacturing & NDE processes
- Operation of structural, materials, dynamic, manufacturing, and thermal facilities
- SSP, ISS, CEV Program system managers, subsystem managers, NSEs

Structural and Mechanical Systems

EDL DDT&E

Advanced designs



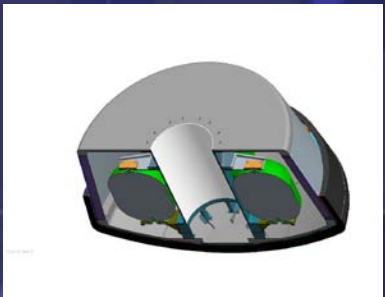


Mechanical DDT&E

Structural DDT&E

Passive Thermal Systems

Thermal Analysis
- AESOP/STAB
- Thermal Desktop
- SINDA/FLUINT



Thermal Design
- Thermal Protection System
- Passive Thermal Control
- Pro-E Capability

System/Subsystem Expertise
- Orbiter Thermal Protection
- Orbiter Leading Edge
- Orbiter Thermal Control
- ISS Passive Thermal Control
- Orion Passive Thermal Control
- Orion Thermal Protection

Thermal Testing
- Atmospheric Reentry Materials and Structures Evaluation Facility (ARMSEF) a.k.a. "Arc Jet" – Bldg. 222
- Radiant Heat Test Facility (RHTF) – Bldg. 260

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.

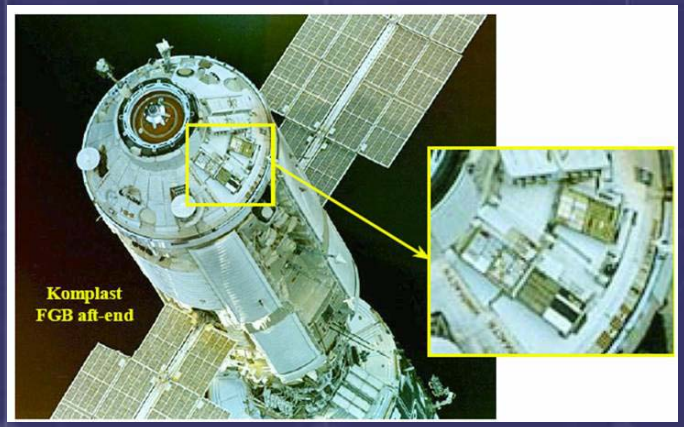
Materials and Manufacturing

Failure Analysis

Material Control

NDE and Fracture Control

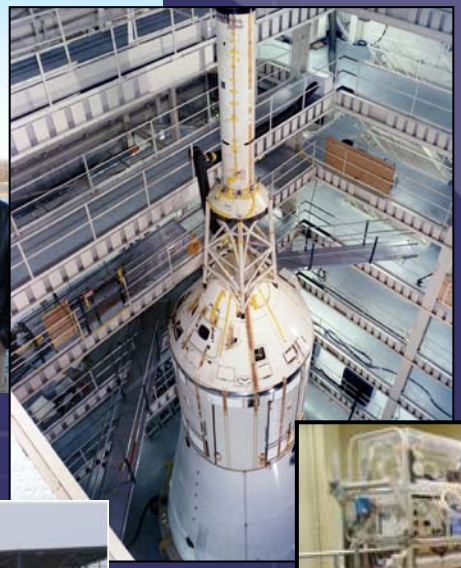
Advanced Materials and Manufacturing



Space Environments and Contamination

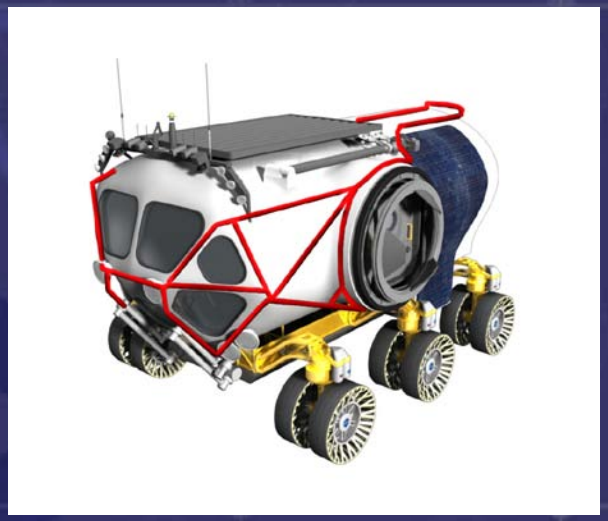
Loads and Dynamics

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

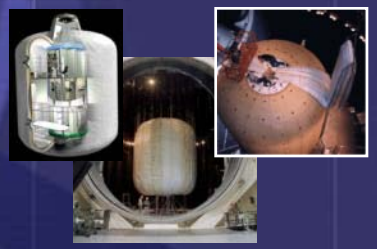
Technology Demonstrations

Technology Invention

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

1996

Feasibility Demonstration



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

2000

Commercial Demonstration

Demonstration of inflatable technology utilizing a commercial sub-scale module

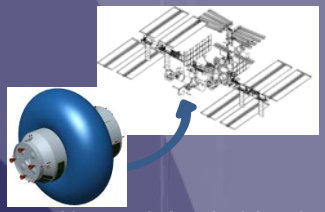
2005

Continued Advancements

Integration of hatch/docking ports and next generation construction methods

2010

Flagship Demonstrations

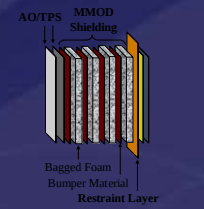


Self sustaining habitation module suitable for missions beyond LEO

Inflatable Habitat Development History

Technology Demonstration

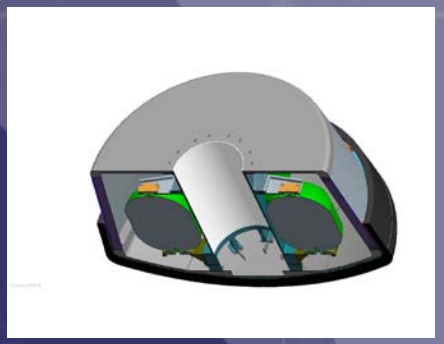
Enabling Technology Development



Commercial Development

Atmospheric Entry capsule Opportunity

Remains internal (IVA) on the ISS



Exits via the JEM airlock

Navigates away from the ISS

Re-entry Technologies

HTV, ATV, Progress, or COTS

Targeted Landing

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