

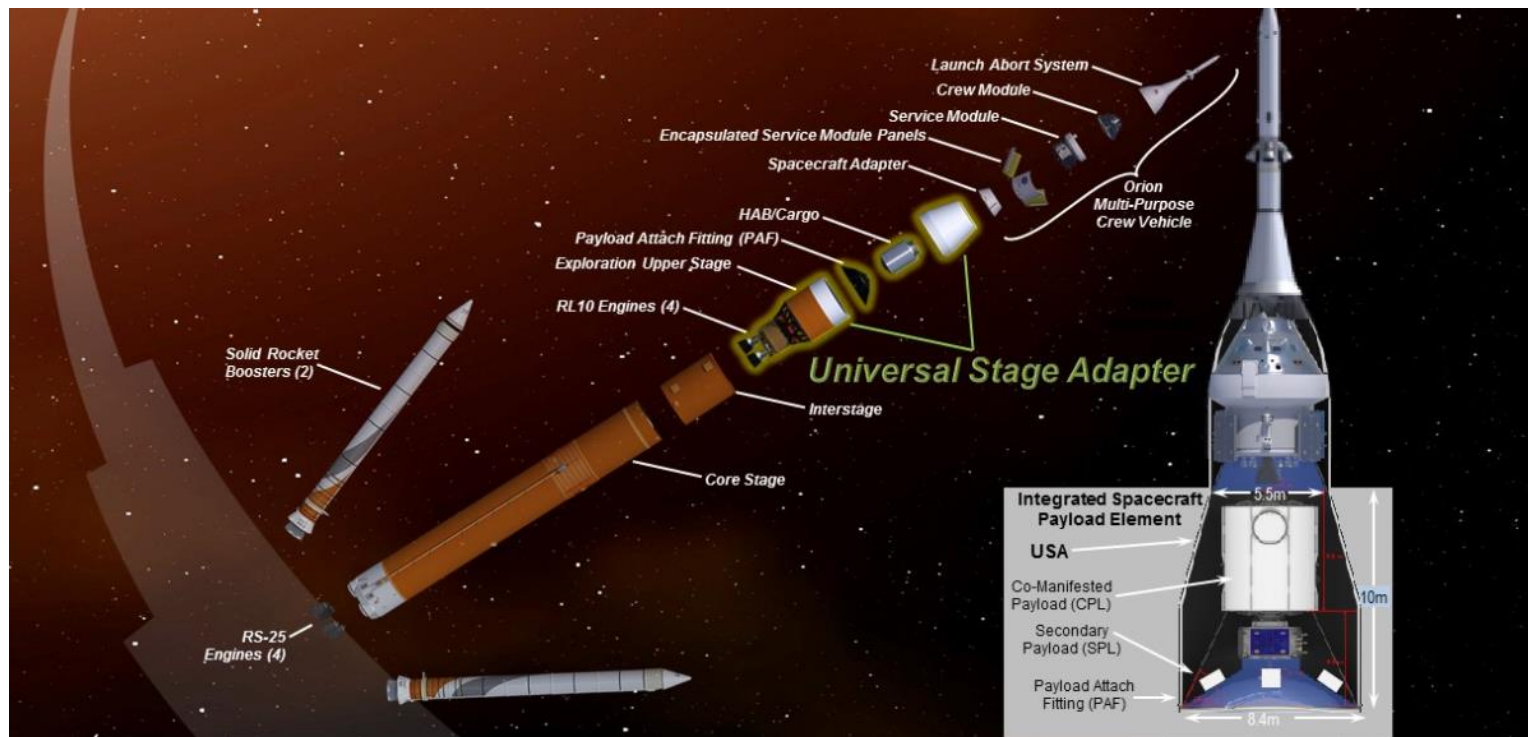
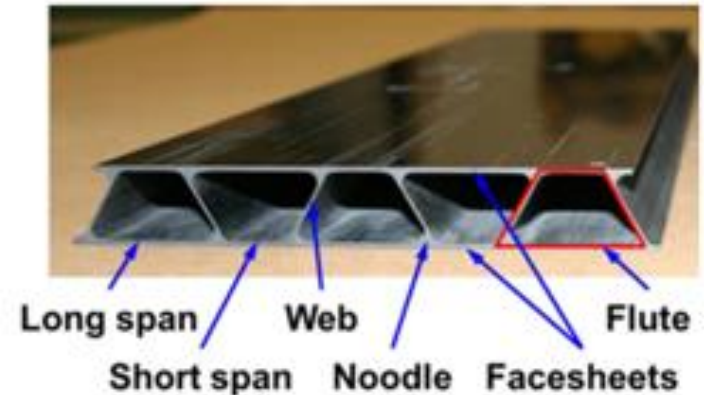


# Modal Test of the Fluted Cylinder

Kenneth Pederson  
NASA Glenn Research Center  
Cleveland, Ohio

# Summary

- The fluted cylinder test article was available from a past test, and was a representative shape and size for the USA program to test its acoustic foam treatment
- Modal testing's purpose was to define the damping of the structure to be fed into the acoustic models



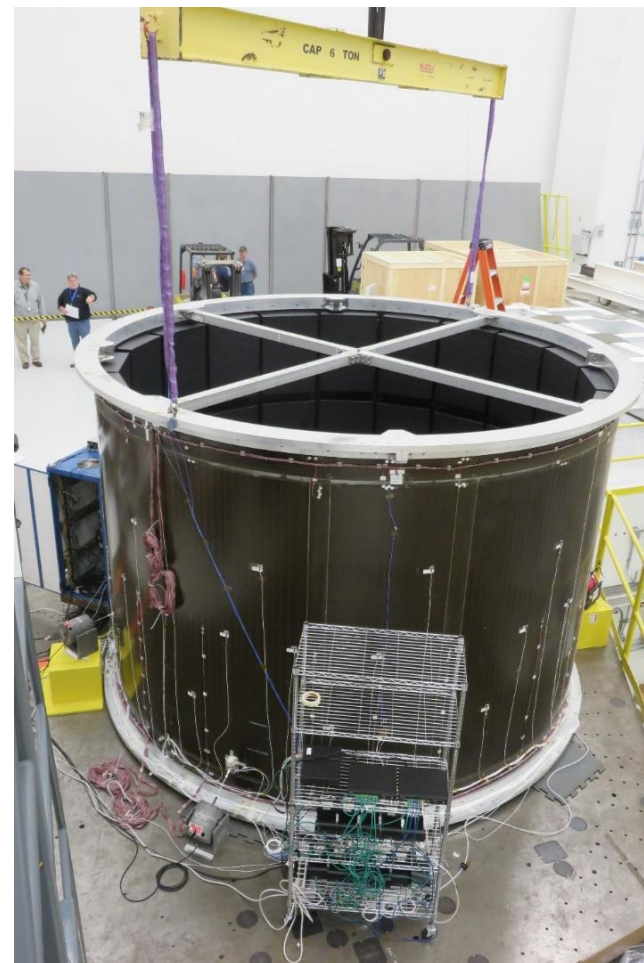
# Test Configurations

- 4 total configurations

- On Stand with blankets
- On stand without blankets
- Hanging with blankets
- Hanging without blankets



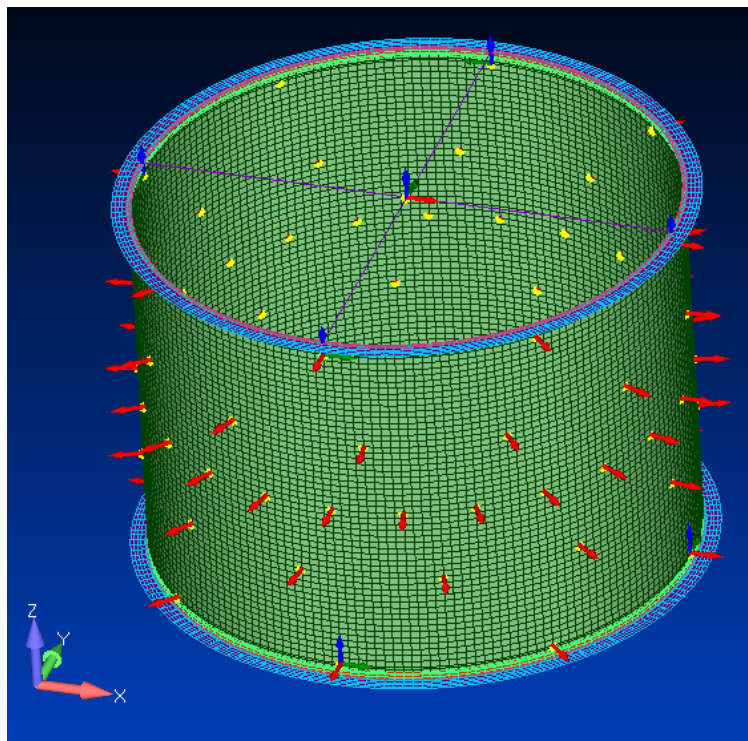
On acoustic test stand (Fixed-Free)



Hanging (Free-Free) Boundary Condition

# Pre-Test

- A FEM of the fluted cylinder was developed to use in a pre-test analysis
- A pre-test analysis was completed to determine ideal sensor locations for efficiently extracting modal parameters

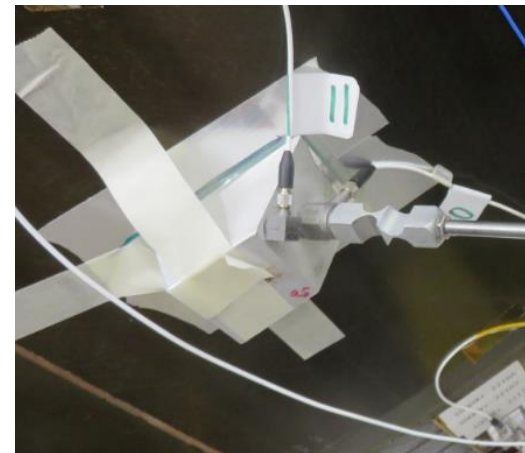


- Commercial codes from ATA Engineering used to select ideal instrumentation layout
- Free-Free
  - 98 response accelerometers were chosen
  - Crane and lifting spreader bar instrumented
- Fixed-Free
  - 106 response accelerometers
  - 4 modal shaker excitation
    - 3x 50 lbf
    - 1x 110 lbf



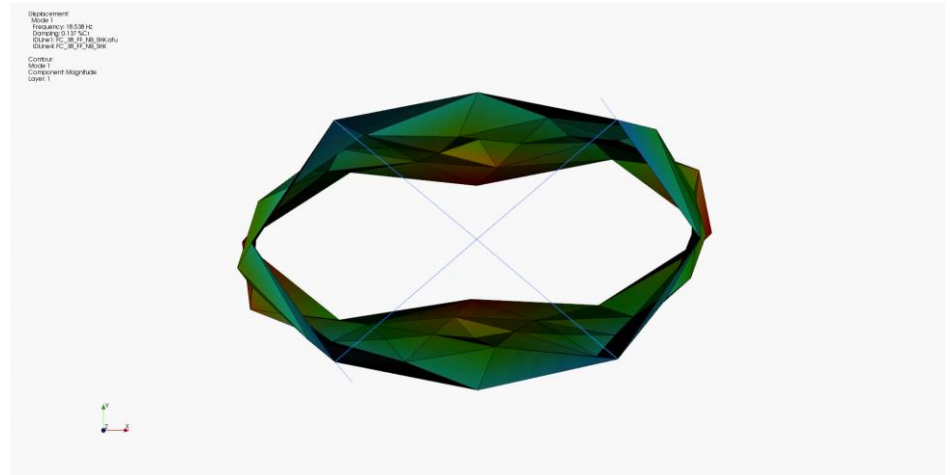
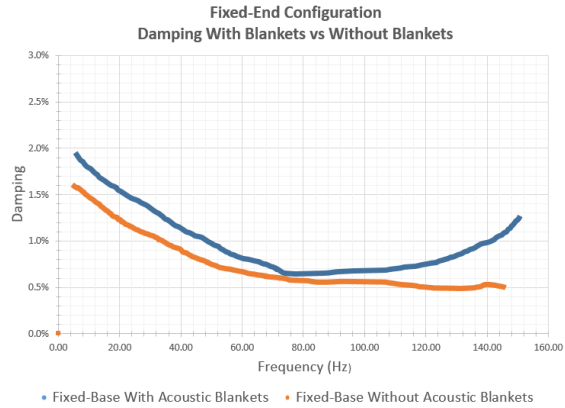
# Test

- **Fixed-Free:**
  - No Blankets
    - 8 Single impact tests
    - 2 MIMO impact tests
- **Fixed-Free:**
  - With Blankets
    - 13 Single impact tests
    - 1 MIMO impact tests
- **Free-Free:**
  - With Blankets
    - 2 continuous random runs
    - 1 burst random run
- **Free-Free:**
  - No Blankets
    - 2 continuous random runs
    - 2 burst random run
    - 6 impact tests
  - 4 modal shaker excitation
    - 3x 50 lbf
    - 1x 110 lbf



# Results

- Fixed-Free:
  - 37 modes under 150 Hz



- Free-Free:
  - 30 modes under 150 Hz

