

Stowing and Random Analysis of a Deployable Antenna



Image courtesy Composite Technology Development, Inc.

Case Study

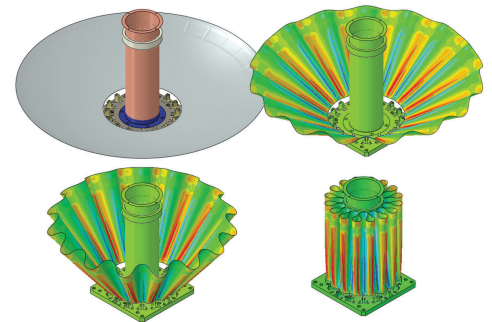
OVERVIEW

Composite Technology Development, Inc., (CTD) has developed the TEMBO reflector antenna, a lightweight deployable antenna for space applications. The qualification process required CTD to show that the antenna can survive harsh dynamic launch environments in the stowed configuration. CTD asked ATA to provide analysis support to simulate the stowing process to represent the preloaded stress state and perform a random vibration analysis to examine the stress due to the dynamic launch environment.

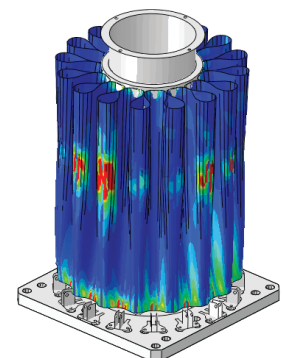
ATA's unique experience in simulating the behavior of deployable structures made it possible to simulate the stowing process and assess the total stress and survivability of the antenna in the launch environment, enabling CTD to accelerate the design process by analytically verifying their design before any fabrication began.

TASKS PERFORMED & KEY INNOVATIONS

- Created a finite element model of the reflector in the deployed state and developed a multistep simulation "recipe" to simulate the stowing process, including effects of various stowing fixtures.
- Performed trade studies to examine effects of various thickness of several components, and recovered component stress due to the stowing process to ensure hardware safety.
- Computed modes and frequencies in stowed configuration accounting for deflected shape, launch restraint preloads, and stress stiffening and contact from the stowing process.
- Performed random analysis of launch configuration to analytically qualify the design.



Select frames from the stowing simulation



RMS stress from random analysis

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