

# Flight and Landing Analysis of the Pad Abort Demonstrator



Image Credit: Lockheed Martin

## Case Study

### OVERVIEW

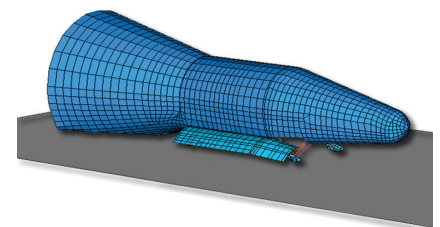
The Lockheed Martin launch Pad Abort Demonstrator (PAD) was used as a test bed to demonstrate crew escape technologies and validate analytical models for future crew escape systems. The PAD test bed was designed to use fully instrumented mannequins to provide data on crew environments during test and checkout of crew escape propulsion systems, parachute deployment, vehicle orientation, landing techniques, and external aeroshell configurations. Lockheed Martin asked ATA to develop loads for flight and ground handling, including structural, thermal, and vibroacoustic environments. Over a period of five months, ATA used a variety of advanced analysis tools, including Abaqus, I-deas, NX Nastran, and MATLAB, to demonstrate feasibility of the concept.



System-level finite element model

### TASKS PERFORMED & KEY OUTCOMES

- Developed and maintained a system-level finite element model through several design iterations.
- Determined accelerations and forces due to liftoff, ascent, recovery, and landing, as well as thermal and vibroacoustic environments.
- Performed transient analyses for a variety of flight conditions.
- Performed trade studies and investigative analyses on liftoff and landing events.
- Utilized Abaqus to perform nonlinear landing analyses, including studies to properly size the landing struts and verify that vehicle rollover would not occur.
- Supported preliminary design review, critical design review, and intermediate reviews.



Detailed impact landing simulation carried out using Abaqus/Explicit

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