Project Summary
The primary goals of the Chimaera sounding rocket project are:
- Carry payloads (~10 kg) to altitudes between 100,000-250,000 ft AGL and safely recover them. This is to be accomplished through a series of lower-altitude flights, proving flight hardware and programmatic development.
- Provide senior design experience to students.

This project builds on the legacy of the Unity IV project, which previously employed teams from Utah State University, Brigham Young University, University of Utah, and Weber State University. In recent years, however, the latter two universities have withdrawn from the program, and USU and BYU have begun concurrent development of their own rockets.

Over many years, several design teams have contributed to this design. The motor uses a hydroxyl-terminated polybutadiene (HTPB) casting in an 8-inch diameter, fiber-reinforced aluminum tube for the propellant. Nitrous oxide is used as the oxidizer. The nozzle is ablative, and is fabricated using silica-phenolic. Finally, nitrogen is used to pressurize the system. The motor has produced up to 2700 pounds of thrust in static testing and is designed to operate for up to 60 seconds.

The avionics operates in two modes: safe and arm. When the rocket is in safe mode, only the vent valve and the main valve fails closed, ensuring safety during fill, operation and recovery. The avionics system is also fully capable of commanding a two-stage recovery system, but it is not implemented on this rocket.

Conclusions and Future Work
Based on the information gathered from the launch (on-board data recorder, video, photos, recovered hardware, etc.), it was determined that the on-board flight-termination systems failed to detect apogee. Although unconfirmed, we suspect that flight was terminated by our ground-based signal. Parachutes deployed almost 12 seconds after apogee was reached, resulting in opening loads (~50+ g) greater than those for which they were designed (12 g). Failure was along the sectional interfaces, previously known to be the weakest point. Secondary failure occurred along the main parachute lines.

Future work aims to keep with the original project goals, i.e. achieve successively higher altitude launches until reaching sounding-rocket range (150-250,000 ft). While research into flight termination systems will undoubtedly be undertaken, emphasis may also be placed on more efficient motors and nozzle development.