Designing and testing a payload that can withstand 50 times the force of gravity, vibrations on all axes, maintains weight restrictions, and has a center of gravity within a 1 x 1 envelope for flight on a Terrier-Orion sounding rocket is a very complex task. The rotation test at Wallops Island is discussed in great detail in the sounding rocket user guide. The rocket will reach an altitude of 68-72 miles and rotate at 5 revolutions per second with a tentative launch date of June 25, 2015.The testing procedures for vibrations, stress analysis, and payload center of gravity restriction is unknown. The methods for vibration testing at the Wallops Island facility remain unknown. The section of the payload and its canister mounting location bottom or top is unknown. Natural frequencies can be tested locally to determine the frequency of the payload and any coupling effects. Testing procedures and practical experiments conducted in other articles has been of great use. These lessons learned give an insight on problems faced by other professionals in regards to payload testing.

The research question has helped to answer some of the questions or problems that can arise in the design of a payload. According to Arinkin L. Panasenko, Vibration test stands can be manufactured locally to test payloads, reduce costs, and expedite the design process pages 803-809. In their 2012 study, J. K. Comrie found that when the payload is placed inside the rocket cavity the air inside was compressed and this compressed air had an adverse effect on the natural frequency page 16. E. De Barros found that it is more effective to separate vibrations into component frequencies to analyze the data with the highest frequency above 600 Hz observed in the Z direction. R. Thomas explores the idea of manned mission to take enthusiast to the outer limits of the atmosphere where they will experience zero gravity to promote further space exploration pages 8-10.

Works Cited

[1] S. Arinkin, L. Panasenko, and E. Papok, "Self-aligning stands on hydraulic supports for testing products and systems of aeronautical and space-rocket engineering," *Journal of Engineering Physics & Thermophysics,* vol. 82, pp. 803-809, 2009.

[2] J. K. Comrie, Umesh., "Vibroacoustic studies on sounding rocket bulkheads.," *Active and passive smart structures and integrated systems,* p. 16, 2012.

[3] E. S. De Barros, Domingos. Campos, Ailson., "Vibration Testing of the First Stage Booster Adapter for the First VSB-30 Sounding Rocket Vehicle Test Flight," *Enviromental Noise Control,* pp. 2067-end of article, 2005.

[4] S. F.-F. Heine, E. Rutherford, J. Wikus, P. Oakley, P. Porter, F. McCammon, D., "Vibration Isolation Design for the Micro-X Rocket Payload - Springer," *Journal of Low Temperature Physics,* vol. 176, pp. 1082-1088, 2014.

[5] R. Margasahayam, "Structural Impact of Rocket Motor Sound and Vibration," *EE, evaluation engineering.,* vol. 40, pp. 52-end of article, 2001.

[6] R. Thomas, "SpaceShipOne Undergoes Ground Vibration Tests," *Sound & vibration,* vol. 37, pp. 8-end of the article, 2003.