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Author: Mr. Felix Lindemann
University of Stuttgart, Germany, st120690@stud.uni-stuttgart.de

Mr. Aaron de Windt
Delft University of Technology (TU Delft), The Netherlands, aaron.dewindt@gmail.com

Mr. Nikita Sirons
The Netherlands, nikita.sirons@gmail.com

EXPERIMENTAL FLIGHT DATA ANALYSIS OF THE STRATOS II+ SOUNDING ROCKET

Abstract

This paper presents and discusses the post processed flight data of the Stratos II+ sounding rocket launched to an altitude of 21.5 km in October 2015 from the Spanish Centro de experimentación de El Arenosillo (CEDEA). The Stratos II+ rocket is the most powerful rocket developed and launched by Delft Aerospace Rocket Engineering (DARE) so far. DARE is a student group working on rocketry at Delft University of Technology, with the ambition to launch a rocket across the Kármán line.

The flight of October 2015 served as in-flight verification of the launcher and its subsystems. Stratos II+ is a slender sounding rocket, with a total length of 6.9 m and a diameter of 0.20 m, powered by the 180 kNs DHX-200 Aurora hybrid rocket engine. The nose cone of the rocket was safely recovered from the Atlantic Ocean, housing three scientific payloads, cameras, and storage devices with the recorded flight data sets. During the entire flight, multiple pressure sensors monitored the engine performance, while accelerometers, gyroscopes and magnetometers recorded the in-flight behaviour of the rocket. Next to the video footage from the two onboard cameras, data from an optronic ground tracking system was gathered, which resulted in a complete dataset to characterise the overall performance of the vehicle. Post processing of the data allowed a comparison between a) the engine performance in flight and on ground, and b) the flight path in the simulation and in reality. It was found that the rocket flew lower than predicted by the simulation. This under performance was caused by multiple factors, one of which was the occurrence of a roll-pitch coupling during a brief part of the ascent. Deduced from this analysis, improvements are suggested for the development and design of the upcoming Stratos III sounding rocket.