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DEVELOPMENT AND FUTURE OUTLOOK OF AN IN-HOUSE DEVELOPED HEMISFLO RIBBON DROGUE PARACHUTE.

Abstract

The Stratos III and IV missions of Delft Aerospace Rocket Engineering (DARE) are sounding rockets that aimed to reach altitudes between 60-100 km altitude. In order to recover the payload sections of the Stratos III and IV rockets, a two-stage recovery system was designed, containing a drogue parachute to stabilize and decelerate the vehicle. The deployment of this drogue parachute is expected to be quite violent and can face supersonic conditions, high inflation loads, or instability of the vehicle. To this end, the team initiated research into and development of a strong, supersonic capable drogue parachute. After a number of design iterations, a final version was reached: a 0.2 m^2 Hemisflo ribbon parachute manufactured from aramids. This paper will describe the design, production and testing process of the Hemisflo ribbon parachute, as well as a short description of the SPEAR mission that performed an in-flight test of the parachute at Mach 3 in November 2022. Lastly, the authors will reflect upon the development process by including a redesign of the drogue parachute, which will incorporate all the lessons learnt on manufacturing and performance of the parachute. With the recent flight test of the parachute the paper also looks into future applications of this small supersonic capable parachute. Although the current parachute size is only suited as drogue parachute for lighter vehicles, it may also be implemented as pilot chute to deploy a larger drogue parachute and/or extract it from its parachute bag.