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WEDGETAIL: A SOUNDING ROCKET TO LIFT OFF ROCKETRY EDUCATION IN AUSTRALIA

Abstract

Although Australia has numerous benefits for sounding rocket activities, there has been a limited extent of professional interest in the field of sounding rocketry from the universities, especially at the undergraduate level. To overcome this shortcoming, USyd Rocketry Team, a student-led sounding rocketry organization, has been established at the School of Aerospace, Mechanical and Mechatronic Engineering (AMME) at the University of Sydney. As the first external initiative, USyd Rocketry Team has begun the Wedgetail project, which comprises a 2.2m-long, class M rocket that will be launched at the Intercollegiate Rocket Engineering Competition (IREC). The aim is for the rocket to reach 10,000 ft (3km) altitude as accurately as possible. The high-level design of Wedgetail has been completed using OpenRocket, and the rocket was found to be aerodynamically stable with 1.56 calibre stability margin. A dual-deployment recovery system has been designed in-house to meet the recommended ground impact speed of less than $9ms^{-1}$. To verify the aerostructural design, we performed computational fluid dynamics (CFD) and finite element analysis (FEA), and the results indicate that the design complies with the launch requirements. We will also present the manufacturing process, including the fabrication of a carbon fibre tube for the fuselage and the reinforcement of a set of 3D-printed fins with carbon fibre. Moreover, Wedgetail will carry a CubeSat payload housing a spectrometer, all designed and built by students as part of coursework. Furthermore, the development of a custom avionics unit is presented, of which the data is compared to a commercial off-the-shelf (COTS) unit for verification. It is expected that Wedgetail will serve as a valuable platform to facilitate future research and education, for instance in carrying scientific experiments to the atmosphere and allowing field verification of various student-led extensions.