Paper ID: 41544
oral
student

45th STUDENT CONFERENCE (E2)
Student Team Competition (3-GTS.4)

Author: Mr. Patrick Spieler
Switzerland, patrick.spieler@alumni.epfl.ch

Ms. Elena Sorina Lupu
Swiss Federal Institute of Technology Lausanne, Romania, lupusorina@yahoo.com
Mr. Dalmir Hasic
University of Salzburg, Switzerland, dhasic@cs.uni-salzburg.at
Dr. Anton Ivanov
Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, anton.ivanov@epfl.ch
Mr. Christian Cardinaux
Western Switzerland University of Applied Sciences - HEIG-VD, Switzerland, christian.cardinaux@heig-vd.ch
Mr. Michael Spieler
Swiss Federal Institute of Technology Lausanne, Switzerland, michael.spieler@epfl.ch
Mr. Michael Pellet
Swiss Federal Institute of Technology Lausanne, Switzerland, michael.pellet@epfl.ch
Mr. Emilio Lozano
ICEYE, Finland, emilio.lozano@iceye.fi
Prof. Dario Floreano
Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, dario.floreano@epfl.ch
Dr. Stefano Mintchev
Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, stefano.mintchev@epfl.ch

TECHNOLOGY DEMONSTRATOR OF A ROCKET CARRYING A DEPLOYABLE FLEET OF AUTONOMOUS GLIDERS

Abstract

The Intercollegiate Rocket Competition (IREC) aims at gathering students across the world to design and build a rocket that goes up to 3km or 10km, carrying 4kg of payload. As part of this competition, the Team Duster, formed by students from swiss universities develops the rocket with a payload targeting an apogee of 3km.

Firstly, the rocket flying to 3km is presented, along with its design and manufacturing process. The rocket follows a dual-event recovery process. Firstly, the drogue (small) parachute is deployed, reducing the speed of the rocket to about 30 m/s. At the same time the separation of the nosecone occurs thereby releasing the payload. After the rocket reaches the 457m altitude, the second (main) parachute is deployed, reducing the speed to 6m/s. Throughout the launch, the subsequent separation and landing procedures we constantly receive the telemetry information provided by the custom-designed avionics components placed in the nosecone of the rocket. To ensure that the deployment occurs at predefined altitudes, the decision is made to use 2 redundant systems for altitude measurement independent of the avionics placed in the recovery bay. The trajectory of the rocket was simulated in 3 different environments, including our own developed simulator. The rocket is making the first flight in end-of-March 2017 in Switzerland where its flight data is to be compared with the simulation data. Based on this data, the necessary corrections of the trajectory will be performed in order to improve the competition Flight - in mid-June.

Secondly, an innovative payload flying in the rocket is presented. A fleet of 6 gliders is deployed from the rocket at apogee using a system based on a spring mechanism. Equipped with an autopilot, differential GPS and control surfaces using servomotors, the gliders will be autonomous and will fly in formation. Eventually, they will land at a fixed point on the ground. The gliders have a wing span of approximately 200mm and a body length of 100mm. During the flight, the gliders are transmitting information back to the ground and will be tracked using a custom-made Ground Station. A potential video-recording of the flight is to be investigated in the future.

The results of the intermediary flight (end-of-March) as well as the competition flight - both in terms of rocket trajectory and flight of the gliders is included in the paper, along with further recommendation for a similar technology demonstrator in the future.