

The Return of the Queen

Getting Delfi-C3 back home

By DSE group 4

Jury Summary

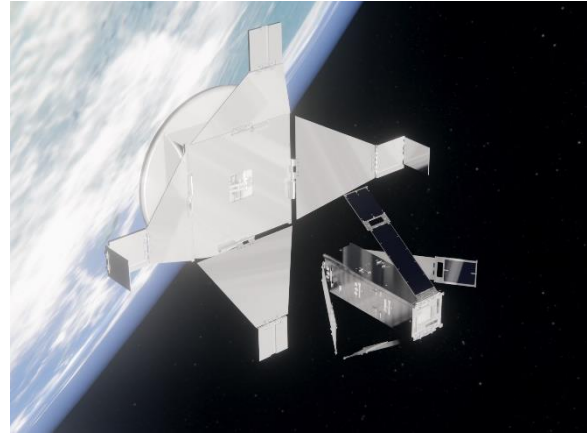
More than ten years ago, TU Delft launched Delfi-C3. It was one of the biggest accomplishments of the university at that time. To this day, Delfi-C3 is still operational, which is impressive as it was expected to be operational for only three months. Throughout the years, some systems started to show signs of degradation which were hard to explain. For this reason, the ‘The Return of the Queen’ mission was established. A spacecraft has to be designed which is able to safely return Delfi-C3 back to Earth for investigation.

To fulfil this mission, Delfi-REAL (Re-Entry And Landing) was designed. Delfi-REAL is a cubesat with a clamp on board which is able to capture Delfi-C3. The system will be launched as a secondary payload to reduce launch costs.

Re-entry and capture with a satellite as small as Delfi-REAL has never been performed before, so for these subsystems, revolutionary technology has been applied. The rest of the subsystems use proven technology to maintain high reliability. To include radio amateurs interested in space, the camera and communication signals can be decoded by them as well. This way they can assist in gathering data from the system.

The mission will consist of five mission phases. The first phase is the launch of Delfi-REAL. After that, the rendezvous phase commences. Then the observation and capture phase is initiated, followed by the altitude reduction phase. The fifth and final phase is the re-entry and landing phase. Including three months of in orbit observation, the mission duration will be seven months.

The mission cost will not exceed 2.5 million euro. At this price point it is interesting for other parties to use the services of Delfi-REAL as well. Sustainability is also taken into consideration as all propellant on board is the most sustainable propellant available. As space debris is a rapidly growing issue in space, the system will also assist in the cleaning of this debris. This way Delfi-REAL will bring Delfi-C3 back home.



Delfi-REAL Characteristics

Satellite mass: 14.5kg

Solar panel surface: 0.13m²

Mission duration: 7 months

Launcher: PSLV

Thrust force: 0.1 N

Parachute size: 4.5m²

Landing site: Kazakhstan

Mission cost: €2.5 million