

# Payload Design for the Stratos II Sounding Rocket

## Introduction

Delft Aerospace Rocket Engineering (DARE), the student society for experimental rocketry of the TU Delft, is currently developing the Stratos II rocket. The primary goal of Stratos II is to bring multiple scientific experiments to an altitude of 50 km. These experiments are to be designed to conduct research during the flight of the rocket and contribute to the funding of the Stratos project. With the launch of Stratos II, students from universities and other higher education colleges across Europe are given the opportunity to carry out scientific and technological experiments. By participating with an experiment in the Stratos II rocket, students will experience the full project life cycle of their experiment, from design and development, to building and testing, to operation and data analysis.

The payloads will be housed in the payload module of the capsule of the Stratos II rocket. The electronic flight computer onboard of the rocket will provide the payload with a power supply and telemetry capabilities. This rocket is developed completely by students themselves. Within DARE there are students of all phases of their studies cooperating to make this mission a success.

## The assignment objective

The objective of the assignment provided to the students is stated as follows:

*“Develop a scientific or technological payload to conduct an experiment onboard the Stratos II sounding rocket.”*

## Criteria

A number of criteria are posed to the payloads by the Stratos II mission objective and physical design. These are, in general, the following: The payload...

- has to perform a scientific or technology experiment during the flight of Stratos II.
- has to be compatible within the payload module of Stratos II (i.e. it must fit within the budgets of mass, volume, power and data).
- has to be safe to store, transport and handle.
- is not allowed to interfere with the other payloads or electronic systems of Stratos II.
- has to be delivered to the Stratos II operations team at least two months before the launch of Stratos II (currently planned end of summer 2013).

## Ideas for experiments

There are multiple types of experiments which can be performed by a payload. The following are a number of suggestions for scientific research and technology experiments which can be executed during the flight.

- Upper atmosphere radiation measurements
- Magnetic field measurements
- Testing of navigation, positioning and attitude determination systems
- Testing of electrical systems and sensors designed for space and astronomical operations

Unfortunately microgravity experiments cannot be performed on the Stratos II sounding rocket as the rocket design does not include roll control.

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## Payload integration and operation

The payload slots in the rocket are all stacked into the payload module of the capsule, which sits directly under the nosecone of the rocket. The electronics for the experiment do not require their own power source or transmitter. The flight computer of Stratos II provides power for the payload experiments, telemetry to transfer the measurement data to the ground segment and onboard data storage.

The Stratos crew will arrange the complete launch and operations of the rocket. After integration and testing the crew will make sure the payload is transported to the launch site and mounted into the rocket. The ground station for the Stratos II rocket is also operated by the crew.

## Background Information

With more than 100 Bachelor and Master Students, DARE is one of the largest student societies on experimental rocketry of Europe. Since its founding in 2001 it has launched almost a 100 rockets in the Netherlands and on various locations abroad, such as Germany, Spain, Sweden and South-Africa. The goal of the society is to design, manufacture and launch rockets by developing and testing all required subsystems themselves.

On the 17<sup>th</sup> of March 2009, the students of DARE launched the Stratos I rocket from Esrange Space Center in the north of Sweden. The rocket reached its apogee at 12.2km, breaking the European altitude record for amateur rocketry. This launch was a culmination of more than 2 years of hard work by a dedicated team of students. The project enabled the team members to gain valuable experience, not only in building reliable highly technological rocket systems, but also in project planning and logistics.

After the successful launch of Stratos I, DARE aims for even higher goals: the goal of Stratos II is to leave the stratosphere and fly half way to space, reaching an altitude of 50 km. Stratos II will not just aim to achieve a certain altitude record but will carry aboard a number of scientific payloads.

The educational goal of Stratos II is to introduce students to all the technical and operational aspects of a sounding rocket development and launch. The international cooperation between all different parties involved gives a unique experience to all parties involved.

A part of the financing of the project will be done through the distribution of the payload slots that are available on the rocket. These payload slots are available to education instances and companies who want to participate in the project. There is also a possibility to reserve multiple payload slots and link these together.

## Contact information

If you are interested or wish more information concerning the rocket, the payload or the project stratos contact us at:

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