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Endless vastness – with ARIS and Böllhoff into space

aris
space to grow

In August 2017, the Akademische Raumfahrt Initiative Schweiz ARIS was founded by a group of students in a classroom at the university ETH Zurich.

It is a non-profit association with the purpose to form students in hands-on project work and to sustainably shape the perception of space. Made by students for students, ARIS stands for ambition and Swiss pioneering spirit.

The student teams are given high flexibility and responsibility in order to work efficiently and independently wherever possible. The ultimate goal: to fly a demonstrator in Low Earth Orbit by 2029.

The project ASTREA 2022 – a safe and reliable rocket engine

Since September 2021, a team of 8 mechanical engineering students has started to design and build a hybrid engine, which will be implemented into the sounding rocket HELVETIA, another project of the ETH Zurich.

The primary objective is to improve the engine efficiency over the previous design in order to carry the HELVETIA rocket to its desired apogee. Through weight saving and changing the combustion reaction, a higher specific impulse is achieved. The ASTREA hybrid engine is designed to generate 6,000 N of thrust using a combination of nitrous oxide and acrylonitrile butadiene styrene. After a burn time of just 7 seconds, the engine has generated a total impulse of 40,960 N – enough to deliver a payload of 4 kg to 30,000 feet.

The student team ASTREA

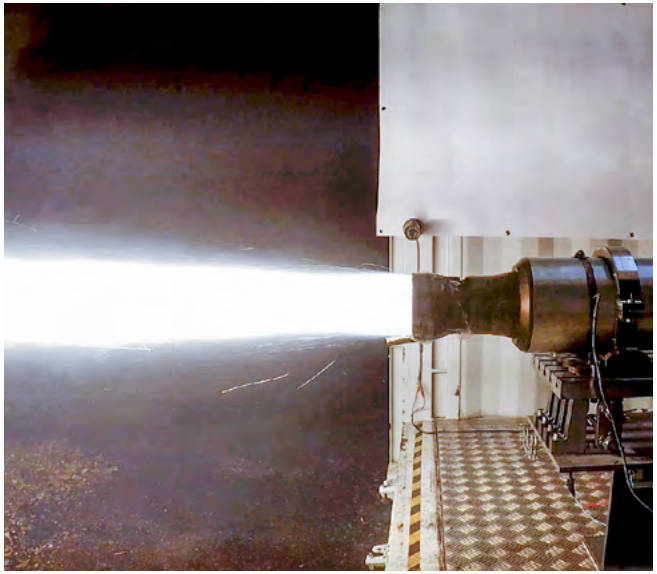

The developed rocket HELVETIA

Initial situation

The hybrid engine consists of several subsystems such as a tank, a data acquisition and control system, a combustion chamber and an injector. This injector atomises the oxidising agent nitrous oxide from a liquid into a fine mist, which is then injected into the combustion chamber. This allows the nitrous oxide to react more easily with the fuel. In order to withstand the developed pressure, steel screws must be inserted into the aluminium injector component. However, the combination of steel and aluminium often causes galvanic corrosion. This leads to broken threads and damages resultant the entire component. To prevent this situation, a heavy-duty and wear-resistant thread reinforcement is required. Consequently, the ASTREA team contacted our local technical experts: Böllhoff Verbindungstechnik AG in Wetzikon, canton of Zurich.

The solution: HELICOIL® thread inserts

Thread reinforcement has been inseparably linked to HELICOIL® for over 65 years. Wherever materials with low shear strength (e.g. aluminium, aluminium-magnesium alloys and fibre-reinforced plastics) are used, HELICOIL® thread inserts come into operation. They meet the requirements of national standards, aviation and military standards.



Firing test of the ASTREA hybrid engine

Successful start of the HELVETIA rocket at the Spaceport America Cup 2022

The HELICOIL® Screwlock thread insert is a wire with rhombic profile formed into an elastic spiral. It produces high-strength threads and has also a clamping area for captive screw locking. The steel screws can simply be screwed in. Even with frequent use, the wear of the nut thread is excluded and the longevity of the component is guaranteed.
Currently, 12 HELICOIL® Screwlock with the dimension M 8 are installed in the drive of the hybrid rocket.

Spaceport Cup America 2022

The Spaceport America Cup, held in New Mexico (USA) is the world's largest university rocket engineering competition. Each year more than 1,700 students gather in over 150 teams from around the world and compete to target altitudes of 10,000 and 30,000 feet with their own developed rockets.

This year the Cup took place from June, 21 – 25 and the ARIS team started in the highest category "Hybrid SRAD 30,000 feet" – and they did it. The rocket even reached an altitude of 33,800 feet. Congratulations to the team!

Please find more information regarding our HELICOIL® here: https://www.boellhoff.com/de-en/helicoil

Customer benefits

- Strong
- High thread loading
- Wear-resistant; low and constant thread friction
- Corrosion and temperature resistant
- Screw locking
- Cost-effective
- Tight fit
- Increased quality and value

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