Divinycell F40 insulates high-altitude research gondola from Space Concordia

There are many things to take into consideration when sending research gondolas up to high altitudes. Among other things, the materials used must be light, be able to handle extreme cold and preferably have excellent Fire, Smoke & Toxicity (FST) properties.

Space Concordia student society
Space Concordia is an award-winning, multidisciplinary student society of over 200 members from various fields of studies at Concordia University working in different subdivisions such as Spacecraft, Ground Station, Rocketry and Robotics. Founded in 2010, the society has its headquarters in Montreal, Quebec, Canada. One team has recently constructed a gondola to be attached to a high-altitude balloon.

High-altitude payloads
High-altitude balloons are used to send payloads up to extremely high altitudes and usually function as weather balloons. However, they can also be used for experiments in very low pressure and temperature environments at stratospheric altitudes. The gondola will serve as a platform for any scientific payload and can be used by students from other universities.

Modular design for light weight and greater flexibility
The gondola is a reusable vessel made out of simple parts, some of which are 3D-printed to

drastically reduce the gondola's weight and cost without compromising durability. With its modular design its volume can be expanded and allow for more scientific payloads to be included. Some payloads, such as optical instruments or biological payloads, require directional control of the gondola, i.e. the ability to change the gondolas orientation to a specific inertial or relative reference. The high-altitude balloon gondola therefore includes a reaction wheel, allowing constant directional control of the payload up to an altitude of 100,000 feet, or 30,000 meters.

Insulation with Divinycell F40

To insulate the gondola, it was important to pick a material with very low density, as weight had to be reduced in order to use the smallest amount of helium possible. The team also wanted to achieve superior thermal insulation properties to make sure the electronics would stay within their operational temperature range.

Due to Diab's long experience in providing materials to space launch vehicles, *Divinycell F40* was chosen for this application. The recyclable, prepreg-compatible sandwich core has proven that it is able to handle the effect of 0 pressure (or, more accurately in this case, about 1 KPa, which is about 99% smaller than average air pressure) and extremely cold temperature (-60°C or -76°F). In addition, the material has excellent Fire, Smoke & Toxicity (FST) properties, preventing forest fires if the electronics would malfunction after landing. The only one small disadvantage – that the material is statically charged – was easily prevented by putting tape around the inner edge preventing the electronics to come in contact with the insulation. With a successfully launched gondola, the team from Space Concordia is happy with their first-time cooperation with Diab.

If you are interested in Space Concordia’s project, be sure to visit: *www.facebook.com/Space.Concordia* or *spaceconcordia.github.io/index.html*