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Nano satellites demand rugged interconnects

Case Study

By Ben Green, Harwin plc

For the past decade, satellite design has been an important discipline at the faculty of Aerospace Engineering at the Delft University of Technology in the Netherlands, and a team of students and graduates is currently only months away from witnessing the launch of the first satellite to be designed and manufactured at the university. Size and weight are critical, but just as important is the requirement for ultra-reliable signal transfer. So when searching for connectors that would withstand the rigours of a space mission, the team turned to high-rel interconnect maker, Harwin.

Delfi-C3 is the first nano satellite student project from the faculty of Aerospace Engineering faculty in Delft. It is based on the CubeSat concept and a number of experiments will be carried on board the satellite. Dutch Space approached the University to discuss the possibility of testing a new type of thin film solar cell in the space environment. The Dutch research institute TNO Science and Industry also is experimenting with an autonomous Sun Sensor using a wireless link for data transfer, and a third new technology to be tested during the Delfi-C3 mission is an advanced, high-efficiency transceiver designed for application in pico and nano satellites.

A team of MSc students started the design of the Delfi-C3 mission in December 2004. Currently, the student team consists of aerospace engineering students, electrical engineering students and computer engineering students. Two team members that have already graduated on the project are continuing their activities for the mission at the faculty. Several BSc students from the TH Rijswijk and the Hogeschool Rotterdam education establishments complement the Delfi-C3 design team.

In order to shorten development time and test and verification procedures, the structural design of Delfi-C3 is based on the increasingly popular CubeSat standard, developed by California Polytechnic State University (CalPoly) and Stanford University. A standard (1U) CubeSat is a cube with 10cm sides and mass of up to 1kg: Delfi-C3 is the size of three standard CubeSats.

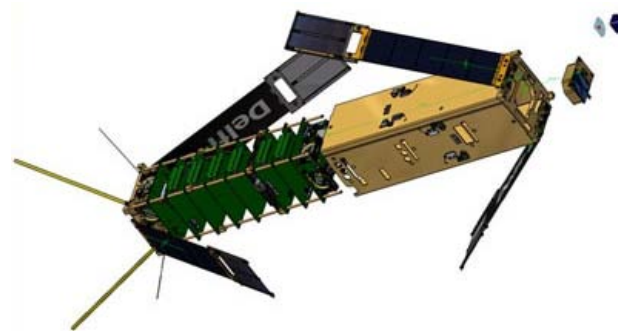
Comments project manager, Wouter Jan Ubbels: "Delfi-C3 measures 10x10x30cm, about the size of a milk carton. It is due for launch on the 30th of June in India and it will orbit about 630km above the earth."

Because of the payload the tiny satellite is carrying, size and weight of all components are a vital concern.

Explains Ubbels: "Normally in space exploration D subminiature connector types might be used. But in a small satellite such as ours D type connectors would be way too big, and also the cable harnessing would account for a disproportionately large amount of the weight of the craft."

So the team at Delft spent hours poring over catalogues eventually identifying Harwin's [Datamate range of connectors](#) as suitable for their purpose.

2mm pitch Datamate (M80) connectors conform with British Standard 9525-F0033 and can withstand high levels of shock, acceleration and vibration in addition to a large number of mating cycles, all without loss of performance. They also operate perfectly under extremes of



temperature - a necessary consideration in space, as satellites are alternately facing directly into, or away from the sun. The contact features a four-finger beryllium copper clip to ensure integrity of connection even under the most severe conditions. Datamate connectors come with crimp or PC tails (vertical and horizontal), in surface mount and through hole versions, and with extra-secure jackscrew and latching options. Datamate connectors can feature mixed contact technologies including signal, power, and coax.

Details Ubbels: "We chose to use Datamate signal and power connectors for the solar cells and other functions. [J-Tek](#) (Jackscrew) versions were preferred to cope with the excessive shock and vibration experienced especially during launch."

He continues: "As a sponsor of the Delfi-C3 mission, Harwin have been very helpful and responsive throughout this project. The company was able to provide all the detail we needed about issues such as out-gassing and we are very grateful for their support."

Useful links:

- ❖ [Datamate](#)
- ❖ [Delfi-C3](#)
- ❖ [Delfi-C3 YouTube channel](#)



Space constraints meant that fine pitch connectors were required for the Delfi C3 project.

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