

cooling in space.

AEROSPACE

CORE COMPETENCIES

1. (Thermal) design analyses and optimization
2. Design for production
3. Space qualification with (industrial) partners

Satellites often contain onboard computers, generating heat that must then be dissipated. Dumping heat into space might seem an easy task since space is extremely cold, right? In reality, this isn't (always) the case. Besides being very cold, space can also be very hot. Moving heat away from dissipative devices inside space satellites toward space radiators is a challenging but really interesting task. Together with NLR and ISIS Space, we are working on the realization of a Mini mechanical pumped loop (miniMPL) for moving heat inside small satellites in an efficient and reliable manner.

Dumping heat in space

The only way for space satellites to reject heat into the environment in space is through radiation. For low power (<20 Watt) satellites a 'simple' passive radiator can be sufficient, but higher powers require a more advanced thermal control.



KRYOZ

The satellite's onboard computer allows for sophisticated processing. But the electronics produce heat that needs to be dumped into space. The increase in power dissipated in CubeSats demands a more advanced thermal control system (TCS). To integrate a TCS into a CubeSat, it needs to be low-cost, physically small, low in power consumption, and both modular and flexible.

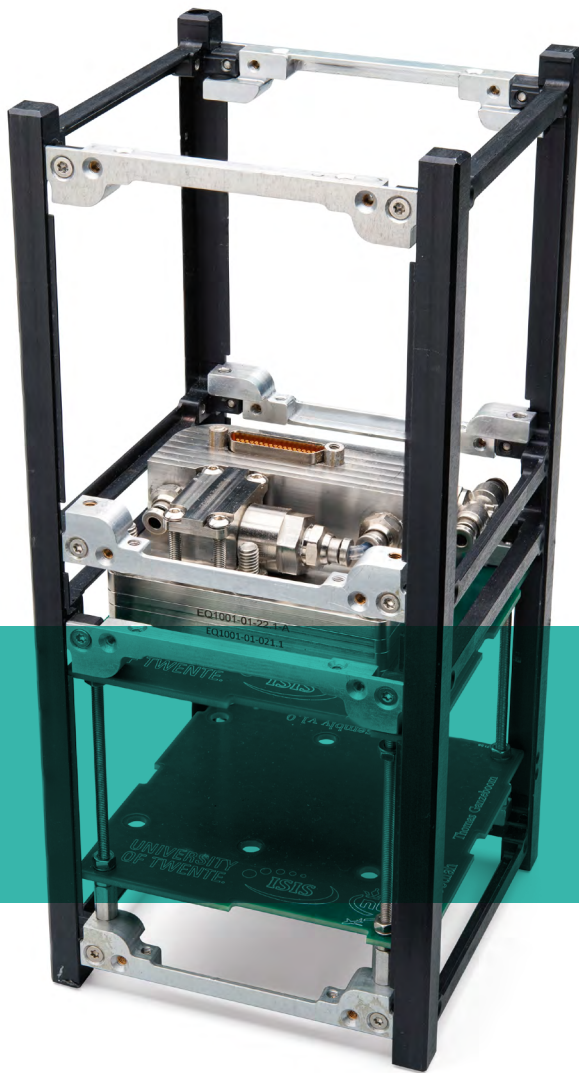
Royal NLR developed a new thermal concept as a robust solution for this: the mini mechanically-pumped loop (MPL). Alongside NLR, we are now bringing this technology to the next Technology Readiness Level (TRL) and is preparing it for industrial production. Further optimizing the efficiency of the

pump and making it ready for reliable production is part of our challenge.

CubeSats

The sizes of small satellites (also known as nanosatellites) follow the CubeSat standard, which defines the outer dimensions of the satellite within multiple cubical units (U).

1U is equivalent to dimensions of 10x10x10cm. A typical size that can accommodate small technology payloads is a 3-unit CubeSat with dimensions of 10x10x30cm. A thermal control system becomes relevant for 3U CubeSats with large deployable solar panels, or 8U without deployable solar panels.



“space, the final frontier?”