

- Turn-key solutions
- Fault-tolerant
- Flight Proven
- High-power solutions
- Radiation-tolerant designs
- High availability
- Autonomous Proximity Operations
- Well-established supply chain ensures state-of-the-art performance and quality
- FDIR – Autonomous fault detection, isolation and recovery



Fig. 1. The 1U CubeSat (TechEdSat-1) was built in short time and then launched to ISS. As one of the first CubeSats, it was deployed from ISS on Oct 4th, 2012, and deorbited on May 5th, 2013, after a successful mission.

### Stay ahead of the competition!

ÅAC leverages extensive experience in developing fault-tolerant electronic solutions for deep space and exploration missions into satellite busses giving them superior performance. ÅAC also continuously invests in new technology developments – such as the enabling technology Bluestone for the next generation Earth observation satellites. Choosing ÅAC's - Satellite platforms will ensure that your fleet of satellites will stay well ahead of the competition by offering high availability and a long operational life-time.

### Advanced missions

Our ÅAC reliable satellite platforms are rapidly tailored to customer needs and adopted to new payloads through the use of our unique Sirius avionics platform. ÅAC Microtec is dedicated to delivering customer data with high confidence and mission reliability. Our fault-tolerant systems provide affordable performance with high mission assurance for small satellites. Thanks to the use of TMR and EDAC, errors can be corrected on the fly without rebooting of the C&DH sub-system, which makes the platform perfect for doing advanced proximity operations. ÅAC's satellite solutions are the customer's choice to pair with high-end expensive payloads.



Fig 2. Integration of the C&DH sub-system with communication equipment.

### Long duration LEO missions

ÅAC Microtec is known for our durable systems based on COTS components and sub-systems. Our State-of-the-art radiation protection for small satellites ensures the success of long time mission

operations in LEO and is an enabler for future CubeSat usage in advanced proximity, deep space, and exploration missions. Choosing ÅAC as your prime satellite developer, integrator, and/or supplier will ensure successful missions for many years to come.

### Turn-key solutions

ÅAC Microtec supports your complete SmallSat journey. Choosing ÅAC's Small Satellite platforms gives you not only a State-of-the art Satellite bus, but also a near turn-key solution for reaching your mission objectives. ÅAC has through partnerships and collaborations the honor to offer a complete solution all the way from requirement phase through the AIT-phase and further into launch and mission operation support. By choosing us as the supplier you can direct all your efforts toward the valuable payload and business development while in parallel ÅAC focuses on the satellite infrastructure and related services. ÅAC also offers the service to source the right payloads to support your mission ideas, so you solely can focus on the application and business development.

### Flexibility & Partnerships

ÅAC Microtec has established collaborations with several suppliers of sub-systems and can therefore use their latest technology developments to tailor the spacecraft to meet challenging mission requirements. This also adds customer flexibility when it comes to preferred sub-suppliers and national funding arrangements where domestic suppliers are preferred. Today ÅAC Microtec has such collaborations established in many countries on four continents.

### SPARC 6U

The SPARC 6U spacecraft is a capable CubeSat platform that can host a large range of payloads through its modular design. It uses fault-tolerant avionics that meet increasingly demanding requirements on reliability, resilience and low power consumption. The SPARC-1 satellite has been developed under a bi-lateral agreement between Sweden and USA.

- Size: 6U Spacecraft Bus, whereof 2U to 3.5U are available for the Payload subsystem(s) depending on different configurations.
- Mass: <6 kg for the spacecraft bus
- Payload Power: 17W on-orbit-average with the standard configuration. The platform supports up to 45W on-orbit-average with high power extension features.
- Highly reliable system in a small package

### Payload to Spacecraft Interfaces of SPARC 6U CubeSat

The Command and Data Handling (C&DH) sub-system on SPARC utilizes SpaceWire as primary communication network. In addition to SpaceWire, several additional interface options are available for communication between the Payload and the C&DH sub-system as listed below:

Peripherals		OBC	TCM	Available for Payload(s)
SpaceWire	>10 Mbps, RMAP support	2	2	2
CAN <sup>1)</sup>	1 Mbps	2	2	2
I2C <sup>1)</sup>	3.3 V logic, master /slave config.	1	1	2
SPI <sup>1)</sup>	Master	1	1	2
Analog inputs, 24-bit	SE input channels, buffered, 1.25 to 31250 SPS	8	0	8
GPIO	3.3 V logic	16	12	28
Serial ports	16550 UART / RS422 / RS485	6	3	5
Serial port	16550 UART RS485 (safe mode bus)	1	1	0
EPS serialized control	RS485 serialized EPS control	1	1	0
PPS interface	RS485 PPS input / output	1/1	1/1	1
CCSDS TRX interface SBAND	RS422 line drivers on data stream and TRX command and housekeeping	0	1	0
CCSDS TRX interface XBAND	LVDS line drivers on data stream, RS422 on TRX command and housekeeping	0	1	0
CCSDS TRX Umbilical interface	RS422 line drivers on data stream	0	1	0

<sup>1)</sup> Future option

### Additional offering

The interest for using small satellites (including CubeSats) for advanced space applications is currently growing very rapidly as their potential as platforms for carrying advanced payloads and supporting advanced missions becomes more and more established. CubeSats in particular have gone through a remarkable change in status from being simple spacecraft platforms often overlooked by established stakeholders, to being widely accepted as capable vehicles for carrying out complex missions with advanced payloads. Besides the 6U SPARC platform, ÅAC Microtec also offers other sizes of satellites, e.g. 1U-24U CubeSats and micro-satellites (15 – 150 kg).

### InspecSat-Autonomous Proximity Operations

InspecSat is a space system concept derived from a deep space application where CubeSats are employed to inspect low mass celestial bodies. It can be done at ranges where mission safety risks or high propellant mass costs prohibits proximity operations for larger more highly valued assets. Based on the ÅAC interplanetary 3U Cubesat design, InspecSat can be supplied in larger numbers compared to monolithic high performance space systems and will operate autonomously and can inspect the object of interest at a very close range.

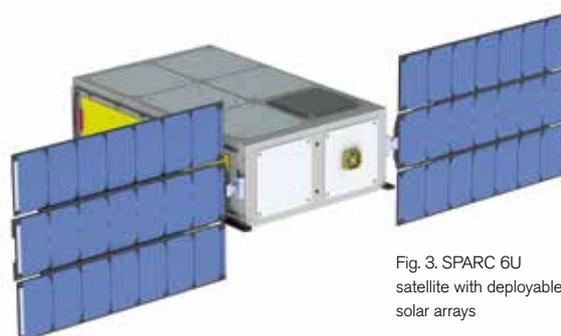


Fig. 3. SPARC 6U satellite with deployable solar arrays

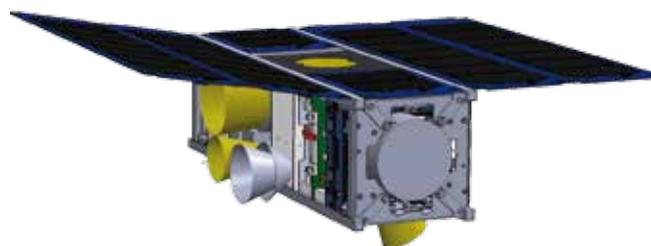


Fig. 4. InspecSat. Patch antenna on top, large yellow cone under the solar panel is the Field of View (FoV) of an imaging sensor, the grey double cone is second sensor and the two smaller yellow cones represent the star camera (bottom) and the vision based navigation camera (left).

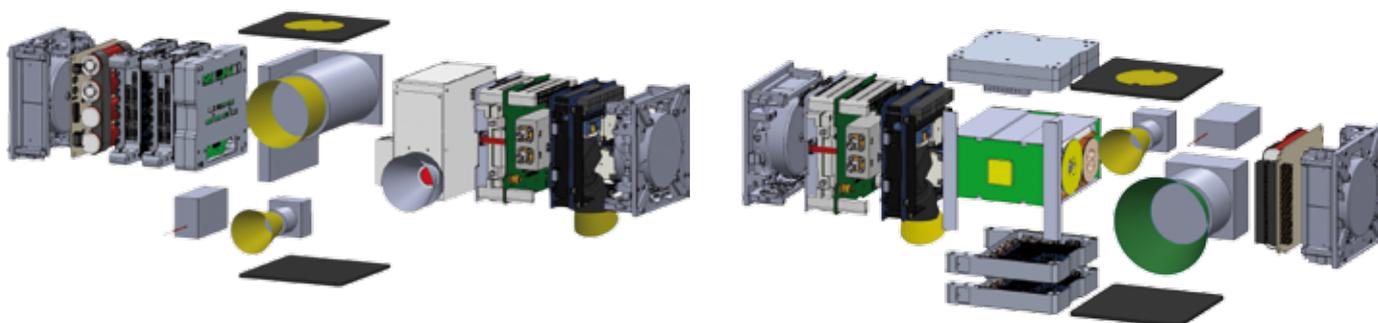


Fig. 5. The two 3U CubeSats Hugin and Munin developed for interplanetary missions.

### Deep space missions

Together with partners ÅAC has developed a concept of two three-axis stabilized 3U CubeSat platforms for deep space missions. They can carry up to 5 science sensors and simultaneously rendezvous at close range. The CubeSats can e.g. characterize magnetization and chemical composition, and do super-resolution surface imaging.

The spacecrafts are equipped with relative navigation systems capable of estimating the spacecrafts position relative to an object and propulsion system that allow them to operate close to an object. The spacecrafts can operate autonomously and individually based on schedules and navigation maps uploaded from ground.

### InnoSat

InnoSat is a satellite platform in the micro-class, which in its standard version will have a mass of about 50 kg and dimensions of 60 x 65 x 85 cm. The satellite design is flexible and can be adapted for other instruments with requirements beyond the standard specification. InnoSat is developed and offered in cooperation between ÅAC Microtec and OHB Sweden. The first mission for InnoSat is MATS. MATS is a science satellite developed for the Swedish National Space Board (SNSB).



Fig. 6. MATS satellite using the InnoSat platform.

**ÅAC Microtec** develops and supplies highly-capable components, sub-systems and nano / microsattellites as well as tailored spacecraft platforms. End-users include operators of commercial, R&D and educational space missions to whom reliability and resilience of the spacecraft are important. Thanks to our design approach and system architecture, platforms can swiftly be customized to meet specific mission and payload needs. Delivering customer data with high assurance and reliability is ÅAC Microtec's hallmark. Our fault-tolerant systems combine affordable performance with high mission confidence. For high-end payloads, our satellite solutions are the first choice of operators worldwide.

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