

SSTL Small Satellites Enhanced Microsatellite



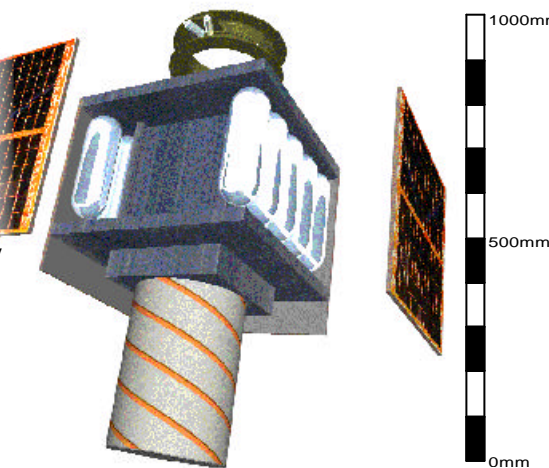
The SSTL enhanced microsatellite platform is a flexible modular design, based on the well proven SSTL modular microsatellite. It is capable of supporting a wide range of missions in LEO. Capability to support a propulsion system makes the platform ideal for constellation use. The enhanced microsatellite combines a comprehensive range of flight-proven technologies and demonstrated, tailor-made services at a low cost. The satellites can be operated in orbit from SSTL's own mission control and operations ground station at the University or from a custom station.

The Enhanced Microsatellite

The SSTL enhanced microsatellite has been designed and built to an innovative and highly modular design to meet the need for satellites that can be readily adapted to accommodate different payloads and mission objectives - rapidly and at low cost.

The enhanced microsatellite is based on the well proven UoSAT microsatellite. The modular sub-systems benefit from the extensive heritage of previous missions, whilst a larger structure allows increased power, mass and volume for payloads and sub-systems. State-of-the-art, powerful on-board computers and sophisticated data handling systems enable complex housekeeping and payload operations to be carried out in orbit, safely and with a high degree of autonomy. Coupled with extensive solid-state mass data storage, the on-board computers are able to provide an advanced processing capability for payload data not yet available on larger, more conventional satellites. The ADCS supports 3-axis stabilisation and fine pointing control of the spacecraft. The choice of either N_2 cold gas or N_2O resistojet propulsion system allows drag compensation, deployment of constellations and subsequent station keeping.

Reliability in orbit is achieved by the use of a highly integrated, layered system architecture - with operational redundancy provided, wherever possible, via alternative technologies rather than by straight duplication. This is further enhanced by the ability to reload and re-programme the spacecraft software whilst in orbit thus enabling the satellite to benefit from software upgrades throughout its operational life.



Features

- **Modular Design** - allows the use of previously qualified systems whilst maintaining flexibility
- **Rapid Development** - ready-to-launch 15 months from contract signing
- **Low Cost** - SSTL commercial approach and experience in small satellites
- **Payload Flexibility** - Modular trays, Earth Observation and External areas available
- **Launcher Compatibility** allows the bus to be accommodated on a wide variety of launchers
- **Heritage** - Baselined for the ESAT constellation and Biltensat-1 missions.
- **Ground Segment** - SSTL can offer fully compatible ground station and mission control centre as well as training

Applications

- Earth Observation - Meteorology, Environmental monitoring
- Store & Fwd Communications
- Technology Demonstration
- Constellation Use - EO, Comms
- Civil and Defence

Spacecraft

- 90 - 140 kg total
- 15 - 45 kg payload mass
- 400 - 1400 km orbit altitude
- Compatible with Ariane, Cyclone, Delta, Athena, Taurus, Zenit etc.
- Design Life of 3 years or more

Qualification / Heritage

- Baselined for ESAT constellation and Biltensat
- SSTL Satellite heritage: UoSAT-3, -4, -5, KITSAT-1, S80/T, HealthSat, POSat, FASAT-Alfa, CERISE, FASAT-Bravo, TMSAT, CLEMENTINE

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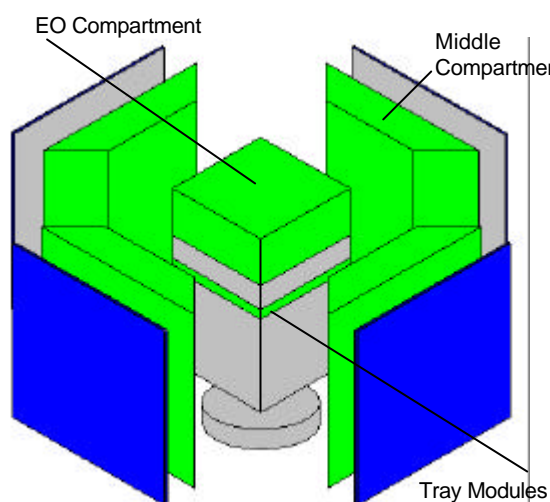
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Associated Products and Services

- **Payload Expertise** - SSTL has extensive experience in payload procurement, design and AIT. SSTL has also already flown a number of its own, commercially available, imagers and communications payloads amongst others. Customer own payloads can readily be accommodated.
- **Ground Support** - Assembly, integration and verification of the microsatellite is fully supported by SSTL-manufactured Ground Support Equipment (GSE). The GSE is also used for final checkout of the microsatellite at the launch site prior to launch.
- **Launch Support** - SSTL is expert at sourcing low-cost launch opportunities and providing launch support for secondary payloads and has acquired launch experience with Delta, Ariane 4, Dnepr, Tsyklon and Zenit.
- **In-Orbit Commissioning & Operations** - Operations, or back-up operations, may be carried out from SSTL site in the Surrey Space Centre where SSTL have commissioned 13 spacecraft and operate and monitor spacecraft. SSTL has experience in Ground Segment provision and training.

Platform and Payload Specifications

Mission Timeline	Contract to Launch Readiness	15 months
	Design Life	Typically three years or more
	Maximum lifetime	Mission dependent - UoSAT platforms have operated for over 10 years
Physical	Dimensions (stowed)	600x600mm base; variable height e.g. 500 to 700 mm
	Deployed antennas	Mission dependent
	Mass	Typically 90 to 140 kg
Power	Solar Panels	Four body mounted GaAs @80 W each for 700 mm height S/C
	Peak Power	>110 W for 700 mm height S/C
	Battery	Variable e.g. NiCd battery 200 Wh @ 14 V / 28 V
	Dual Redundancy	BCR, Power conditioning & distribution modules
ADCS	Sensors	2-axis sun sensors (x2), 3-axis magnetometers (x2), Star camera (x2), quartz gyro (x2)
	Actuators	Reaction wheels (x4), torque coils (x13)
	Attitude	3-axis stabilised - zero-momentum bias - inertial, star or nadir
	Pointing knowledge (3 σ)	$\pm 0.02^\circ$
	Pointing Capability	Control $\pm 0.1^\circ$; slew $5^\circ/\text{s}$, stability 20 arcsec/s
Guidance & Navigation	Navigation	GPS: nominally 15 m (2 σ) position accuracy (w/o SA)
	Propulsion	N ₂ cold gas propulsion OR resistojet (e.g. H ₂ O or N ₂ O) propulsion. Typically in the order of 20 ms ⁻¹
Command & Data Handling	Processor	Dual redundant: 80386EX, 25 MHz with coprocessor
	Memory	Expandable: 32 to 128 MB RAM per processor
	Operating System	Proprietary software. In-orbit reprogrammable
Communications	Uplink	Hot redundant: (9k6 CPFSK VHF Space Ops. Band) OR (S-band Rx. 16/128 kbps, BPSK no coding)
	Downlink	Cold redundant: (9k6 & 38k4 CPFSK UHF Space Ops. Band) OR (S-band 4 W Tx. 2 Mbps, QPSK, Viterbi)
	Antennas	One per downlink antennas on +Z face; On +Z & -Z faces for each uplink.
Operations Scheduling	On-board Orbit Data surveys	1s sampling programmable
	On-board clock	Updated daily via groundstation, ± 0.1 s or via GPS @ ± 1 ms
Payload Accommodation	Tray Module	Up to three tray modules: total volume of 350x350x76 mm
	Earth Observation Compartment	250x220x146 mm
	Middle Compartments	(x4) base 110x(average)450mm, height 400 to 700 mm
	External	250x220 mm
Payload Data Interface	Central	Hardwired digital and analogue command and status lines
	Network	Dual or triple redundant CAN 1 Mbps packet (ISO-11898, 11519-1); RS422 & RS485 options
Payload Power Supply	Power Supply	Numerous switched and hardwired from unregulated 28 V bus

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