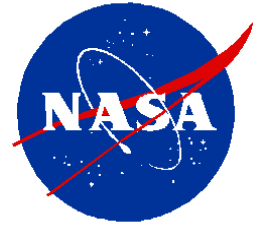


SSTL Small Satellites MINISAT 400 Platform



The SSTL minisatellite is based on the flight heritage of the UoSAT-12 mission, which in turn draws heavily on the flight heritage of SSTL's numerous smaller microsatellite missions. The SSTL-designed modular, multi-mission minisatellite platform has been designed to meet a wide range of mission objectives in LEO. The platform has been designed according to similar cost-effective principles that have proved so successful on previous SSTL satellites and is compatible with a range of affordable launch options.

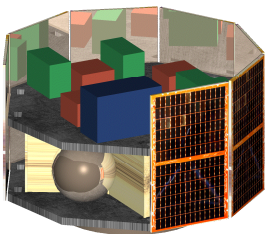
The SSTL Minisatellite

The SSTL minisatellite 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 structure is a 9-sided prism measuring 940mm in height, and up to 1100mm in diameter. The platform is designed to support 200kg of payload distributed in the various accommodation volumes to form a 400kg class satellite. The external frame offers outside access to space for telescopes, antennas, sensors, radiators and other payloads. The payload bay offers payload volume underneath the external frame, and above the main spacecraft avionics bay.



The on-board computer offers advanced command, status and data retrieval services to the payloads and sub-systems via a triple redundant CAN local area network and hardwired analogue and digital lines. The SSTL developed operating system S/W is in-orbit reprogrammable and allows a high level of autonomous operation and flexibility. Expandable solid state memory is available for payload use. The platform offers switched and unswitched power supplies via an unregulated +28V power bus. The on-board ADCS can support high pointing knowledge and capability requirements for imaging missions. The system may be augmented with GPS receivers for orbit determination and N₂ cold gas or N₂O resistojet propulsion system for drag compensation & station keeping purposes. S-band uplinks and downlinks provide high data rates to support large data transfer requirements.



Features

- **Modular Design** allows the use of previously qualified systems whilst maintaining flexibility
- **Rapid Development** - ready-to-launch 18 months from contract signing
- **Low Cost** - SSTL commercial approach and experience in small satellites
- **Payload Flexibility** - Various external and internal compartments available
- **Launcher Compatibility** allows the bus to be accommodated on a variety of launchers
- **Heritage** - UoSAT-12 was launched early 1999 and has been operating successfully since. SSTL has launched 15 small satellites
- **Ground Segment** - SSTL can offer fully compatible ground station and mission control centre as well as training

Applications

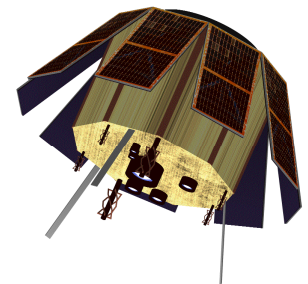
- Earth Observation - Meteorology, Environmental monitoring
- Store & Forward Communications
- Science & Technology Demonstration
- Constellations
- Civil and Defence

Platform & Options

- Any low Earth orbit (LEO)
- Wide range of launchers
- <400kg total
- <200kg payload mass
- Internal and external P/L accommodation
- Cold gas or Resistojet propulsion
- 3-axis high performance ADCS
- UHF / VHF or S-band Comms
- Autonomous S/C Control
- Reprogrammable on-board S/W
- 60W per panel (x9) with
- Canted/deployable panels optional

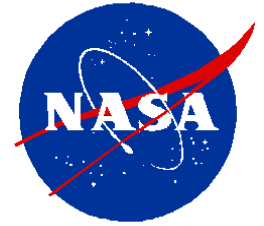
Qualification

- UoSAT-12 April 1999



affordable access to space

SSTL Small Satellites MINISAT 400 Platform



Platform and Payload Specifications

Mission Timeline	Contract to Launch Readiness	18 months
	Design Life	Typically 1 year
	Maximum lifetime	Mission dependent - UoSAT buses have operated for over 10yrs
Physical	Dimensions (stowed)	1100x1100x885mm excluding external equipment
	Deployed antennas	Dependent on configuration
Power	Mass	<~400kg
	Solar Panels	Nine body mounted GaAs cell panels @~60W each (72W option)
	Peak Power	250W arrays & battery; 175W arrays only
	Battery	22 cell 7Ah NiCd battery (x3): 21Ah total capacity@28V
	Redundancy	Failure tolerant via 3 separate power systems. Internal redundancy
ADCS	Sensors	2-axis Sun sensors (x4), Earth sensors (x1), magnetometers (x2), Star Camera (x2), Quartz gyro (x4)
	Actuators	Reaction Wheels (x4), Torque coils (x13)
	Attitude	3-axis stabilised momentum bias - inertial, star or nadir pointing
	Pointing knowledge (3 σ)	$\pm 0.02^\circ$ (72arcsec)
	Pointing capability	control $\pm 0.1^\circ$ (360arcsec); slew $5^\circ/s$, stability $20''/s$
Navigation	Navigation	GPS Rx: 100m(3 σ) position accuracy
Command & Data Handling	Propulsion	Cold Gas System 5.3kg propellant, $15ms^{-1}$. Resistojet Option.
	Processor	Triple redundant (one cold): 80386EX, 25MHz with co-processor
	Memory	Expandable: 32 to 128MB RAM per processor
	Operating System	In-house design OS. In-orbit reprogrammable
Communications	Uplink	Hot redundant S-band Rx. 16/128kbps, BPSK no coding.
	Downlink	Cold redundant S-band 4WTx. 2Mbps, QPSK, Viterbi.
	Antennas	1 per downlink antennas on +Z face; On +Z & -Z faces for uplink.
	Standard	CCSDS
Operations Scheduling	On board orbit data surveys	1s sampling programmable
	On board clock	Updated daily via groundstation, $\pm 0.1s$; or GPS option
Payload Accommodation	Mass	<~200kg
	Internal Volume	8 bays: 0.18m ² ; 0.03m ³ ; (6x) 0.01m ²
	External Volume	250mm height x 1000mm diameter
Payload Data Interface	Central	Hardwired digital and analogue command and status lines
	Network	Triple redundant CAN 1Mbps packet (ISO-11898); RS422/485
Payload Data Transfer	Storage	3072Mbit
	Transfer Rate	2048kbps
Payload Power Supply	Power Supply	Numerous switched and hardwired from unregulated 28V bus

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.
- Ground Support** - Assembly, integration and test of the microsatellite is fully supported by SSTL-manufactured Electrical Ground Support Equipment. The EGSE 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 aquired 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 already operate 13 other spacecraft. SSTL also has experience in Ground Segment provision and training.

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