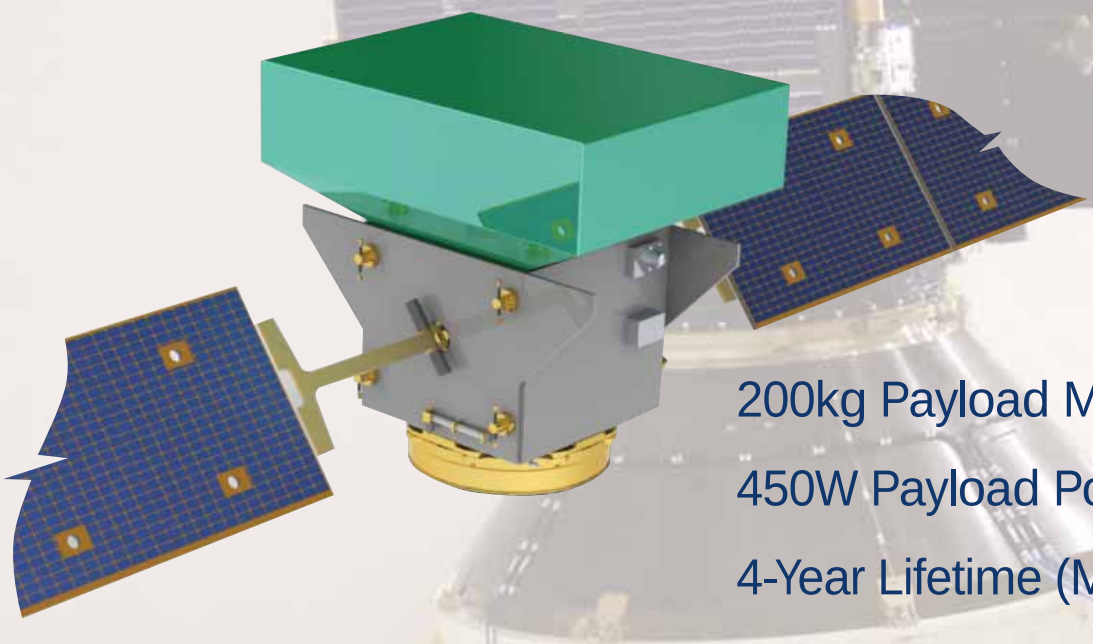
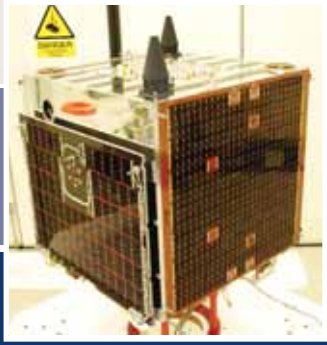
SSTL-600 Satellite Platform



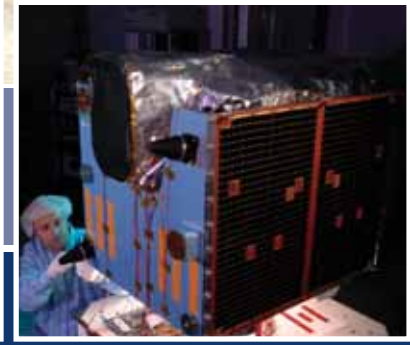
200kg Payload Mass

450W Payload Power (Peak)

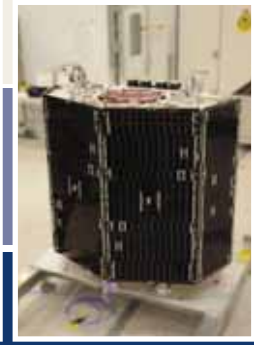
4-Year Lifetime (MEO)



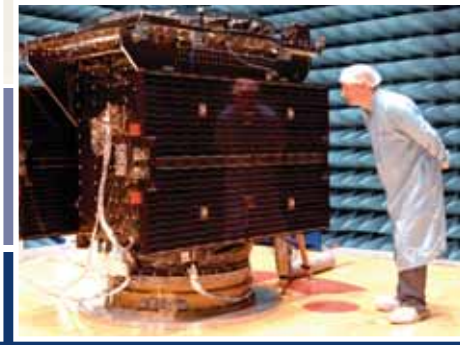
SSTL-100 :
15kg/24W



SSTL-150 :
50kg/50W



SSTL-300 :
150kg/140W



SSTL-600 :
200kg/386W

Surrey is a world leader in the provision of small satellite solutions, applications and services, with an unparalleled heritage and track record

- 34 spacecraft launched to date
- 100% mission success for 10 years
- Over 200 on-orbit years of experience
- Versatile modular platforms
- Customizable platforms to meet mission requirements
- In-house end-to-end capabilities
- Design, manufacture, integration, test, launch, operation

SURREY
SATELLITE TECHNOLOGY US LLC

The Surrey SSTL-600 Platform

Surrey has developed its portfolio of small satellite platforms to meet demanding customer applications.

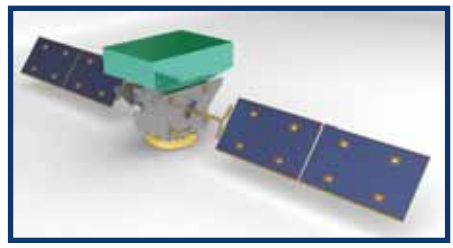
The SSTL-600 is a versatile satellite platform capable of supporting high power, high mass payloads (386W, 200kg), for low, medium and GEO Earth orbit applications.

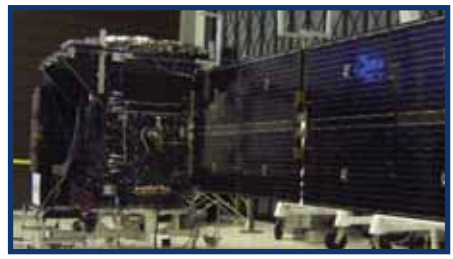
The SSTL-600 spacecraft bus is based on Surrey's heritage platform design used on the successful GIOVE-A mission, the first of the European GNSS satellites. The GIOVE-A spacecraft was launched in December 2005 into MEO, and is still currently operational as of June 2010, exceeding its MEO design lifetime by a factor of 2.

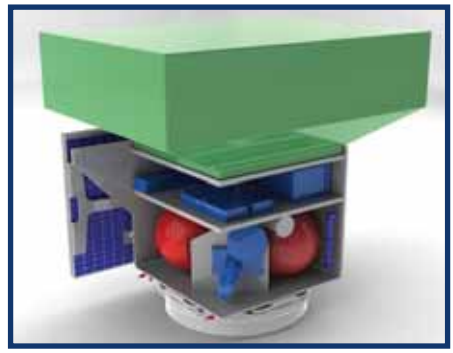
The SSTL-600 baseline platform has been designed to maximize payload capability, mission performance and orbit versatility, and provides flexible accommodation of customer-provided payloads for communications, navigation, Earth observation and science.

The SSTL-600 Fine Pointing (SSTL-600FP) option provides additional AOCS capabilities which satisfy more demanding pointing requirements.

GIOVE-A, panels in launch configuration


SSTL-300 baseline flight configuration


GIOVE-A, panels deployed in flight configuration


SSTL-300 baseline configuration


Surrey Mission Control

Baseline Performance Specification

The SSTL-600 platform provides a capable and flexible baseline solution with the potential to enhance platform performance to meet customer-specific requirements.

Mission Compatibility	
Orbit Average Payload Power	386W (450W peak) EOL
Maximum Payload Mass	200kg
Bus Dry Mass	429kg without payload
Science Data Downlink	105 Mbps, X-Band
Science Data Storage	128 Mbytes capacity, dual-redundant mass memory
Pointing Knowledge	360 arcsec (1 sigma) [SSTL-600FP = 25.2 arcsec]
Pointing Control	605 arcsec (1 sigma) [SSTL-600FP = 36 arcsec]
Pointing Stability (Jitter)	mission-specific [SSTL-600FP = 1 arcsec/second]
Slewrate	1 deg/sec
Position Knowledge	17km [SSTL-600FP = 10m]
Mission Design Life	4 years, Ps= 92%
Compatible Launch Vehicles	Falcon 1e, Atlas, Delta, Athena and other launchers
Types of Orbits Available	LEO, MEO, GEO
External Payload Volume	1900mm x 1400mm x 476mm + 938mm x 938mm x 284mm approx.
Internal Payload Volume	901mm x 908mm x 260mm
Bus Description	
Attitude Control System	3-axis control with gyros and reaction wheels
Batteries	Li-ion cells providing 60 Ah capacity
Solar Arrays	Silicon cells, total area 6.8m^2
Main Bus Voltage Range	26.5V-38V range
C&DH Bus Architecture	Dual-redundant Controller Area Network (CAN) bus
Communication Up\Downlink Band	S-Band uplink/S-Band downlink
Structure	Aluminum and aluminum-skinned honeycomb panels
Propulsion	Liquified butane gas
Delta V	91.4 m/s
Thermal Control	Primarily passive, plus limited use of heaters
Heritage & Programmatic Information	
Heritage missions	GIOVE-A
Nominal schedule from Order	31 months to payload integration, 39 months to launch

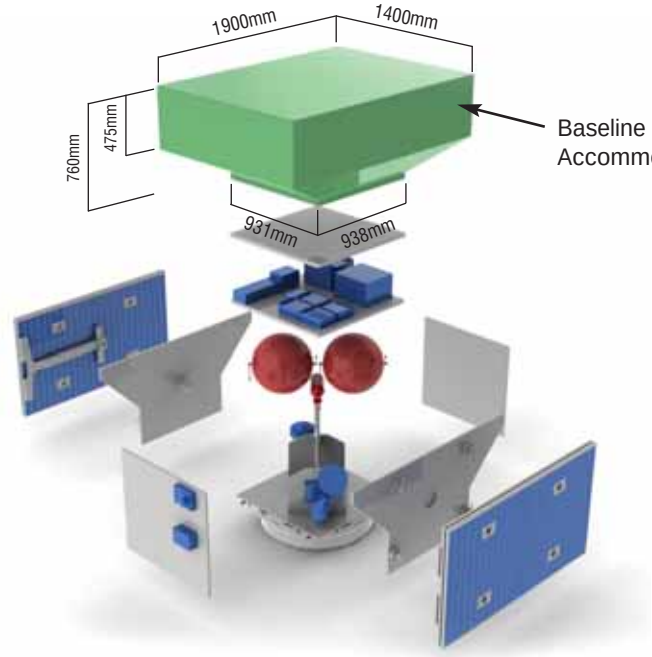
SSTL-600 Baseline Schedule

- 31 months to payload integration
- 39 months to launch
- We can deliver to more aggressive timescales to meet mission needs if required

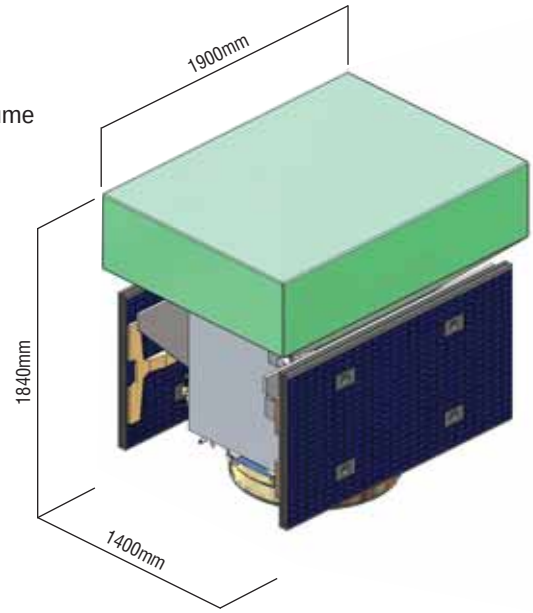
SSTL-600 Implementation Schedule		Month ARO																																						
		YEAR 1												YEAR 2												YEAR 3												Y4				
Milestone or Project Activity	Payment Event	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
SRR - Spacecraft Requirements Review	1	X																																							
Observatory Mission Design	-																																							
PDR - Preliminary Design Review	3			X																																				
Observatory Design	-																																							
CDR - Critical Design Review	3								X																															
Platform Material Procurement	-																																							
Platform Module Manufacture	-																																							
Platform Module Test	-																																							
MRR - Module Readiness Review	4																								X																
Platform Assembly Integration and Test	-																																							
TRR - Platform Test Readiness Review	-																												X											
Platform Environmental Testing	-																																							
Platform Delivery Readiness Review	-																														X									
Platform Shipment to SST-US	-																																							
IIRR - Instrument Integration Readiness Review	5																															X								
Observatory Integration	-																																							
Observatory Testing	-																																							
PER - Pre-Environmental Review	6																																		X					
Observatory Environmental Testing	-																																							
PSR - Pre-Shipment Review	7																																					X		
Shipment to Launch Site	-																																							
Launch Campaign	-																																							
Launch	-																																						X	
On-Orbit Performance Verification	-																																							
OAR - Observatory Acceptance Review	8																																							X

= Project Activity

X = Milestone



SSTL-600 Exploded CAD



SSTL-600 in launch configuration

SSTL-600 Satellite Platform

Surrey Facilities

Surrey has length and breadth of experience in integrating several instruments into a single core spacecraft and has the capabilities to successfully deliver multiple concurrent missions.

SST-US will draw on the world-leading capabilities and heritage of the whole Surrey group. SST-US will contract with SSTL for the provision of the satellite platform, under strict information controls. The tested and accepted platform will be shipped to the US for payload integration.

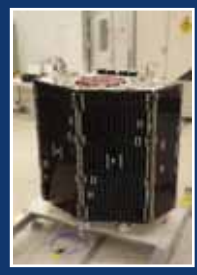
Payload Integration, Observatory-level testing, launch support and operations will be conducted by SST-US personnel, using SST-US facilties. Environmental tests will be performed at local commercially-available test facilties.

Mission-Specific Modifications

Surrey's modular, flexible and adaptable platforms are designed to accommodate a wide range of mission-specific requirements. Our collaborative style of working with customers supports the development of innovative solutions to enhance baseline bus performance, at an incremental cost, in areas such as:

- **Payload Accommodation**: Increased mass, volume or CoG
- **Attitude and Orbit Control Systems**: Enhanced agility, control and knowledge
- **Power**: Increased power generation or challenging operational power usage
- **Mission**: Orbit, launch vehicle compatibility, delivery schedule
- **Customization**: compatibility, platform customization, etc

RapidEye: Standard SSTL-150 configuration



NigeriaSAT2: SSTL-300 Customized Mechanical configuration

Costed Contractual Options

- **Fine Pointing Option**: Orbit Knowledge 10m, Pointing accuracy 0.01deg, Pointing knowledge 0.007deg
- **High Speed Data Recorder**: 16GB storage capacity
- **Enhanced X-band Transmitter:** Data rates up to 300Mbps
- **X-band Antenna Pointing Mechanism**: ±110 deg elevation, ±270 deg azimuth
- **Groundstation provision**: S/X-band mini-rack and Mission Control Suite

Platform Customization

Surrey's approach and platform architecture lends itself to adaptations and modifications to provide custom solutions, as done for many of Surrey's customers, in order to fulfill specific payload or mission requirements.

GIOVE-A: Modified subsystem configuration of SSTL-600 for MEO mission

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