PSLV-C20/SARAL MISSION

PSLV PROJECT

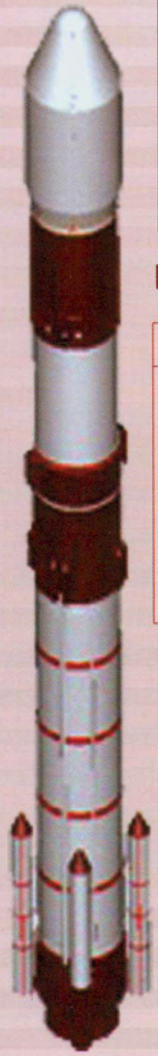
Indian Space Research Organisation

PSLV-C20/SARAL MISSION

PSLV-C20 is identified as a dawn-dusk SSPO mission carrying SARAL (Satellite with ARgos and ALtika), an ISRO-CNES (France) joint venture, as the primary satellite and six auxiliary satellites. PSLV Core Alone variant is employed for this mission. Dual Launch Adapter is used for accommodating the satellites. This is the 23rd PSLV mission of ISRO and 9th mission using PSLV Core Alone variant.

Satellites

SARAL	ISRO-CNES	409 kg
SAPPHIRE	MDA, Canada	148 kg
NEOSSat	MSCI, Canada	74 kg
NLS 8.1 (UniBRITE)	University of Vienna, Austria	14 kg
NLS 8.2 (BRITE)	Technical University, Graz, Austria	14 kg
NLS 8.3 (AAUSAT3)	Aalborg University, Denmark	3 kg
STRaND-1	SSTL, UK	6.5 kg



PSLV - C20
Vehicle Configuration

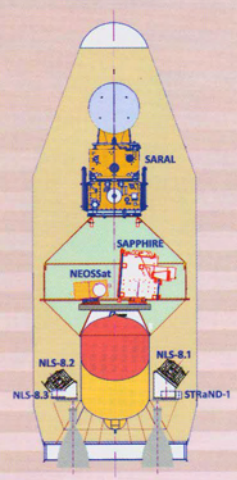
PSLV-C20 Vehicle Configuration : S139 + PL40 + HPS3 + L2.5

Vehicle Characteristics	
Vehicle Height	: 44. 4 m
Lift of Mass	: 229.7 t
Propulsion Stages	
First Stage (PS1)	: S139
Second Stage (PS2)	: PL40
Third Stage (PS3)	: HPS3
Fourth Stage (PS4)	: L2.5

PSLV-C20 Stages at a Glance				
	Stage 1 (PS1)	Stage 2 (PS2)	Stage 3 (HPS3)	Stage 4 (PS4)
Length (m)	20	12.8	3.6	2.0
Diameter (m)	2.8	2.8	2.0	2.8
Propellant	Solid (HTPB based)	Liquid ($UH25+N_2O_4$)	Solid (HTPB based)	Liquid (MON3+MMH)
Propellant mass (kg)	138190	41726	7650	2564

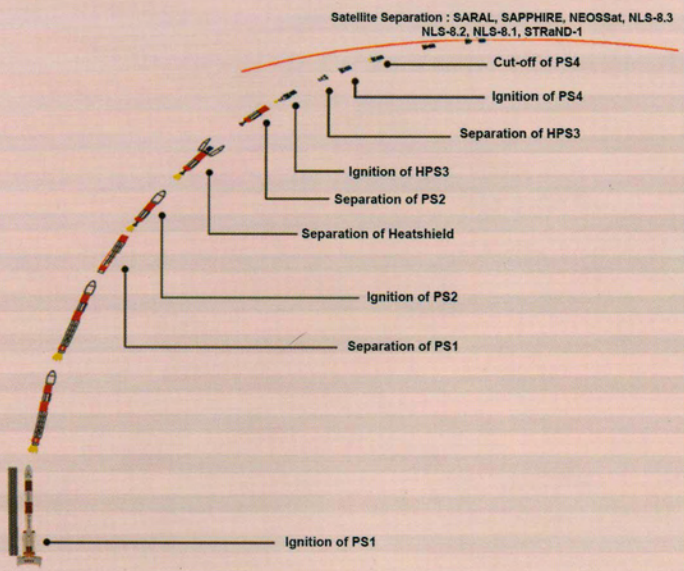
Mission Specifications	
Semi Major Axis	: 7163.393 km
(*Altitude	: 785 km)
Inclination	: 98.536 deg
Launch time	: 17:56 Hrs
Launch Window	: +20 min
LTDN	: 18:00 Hrs
Launch Pad	: First Launch Pad

*w.r.t. mean Earth radius



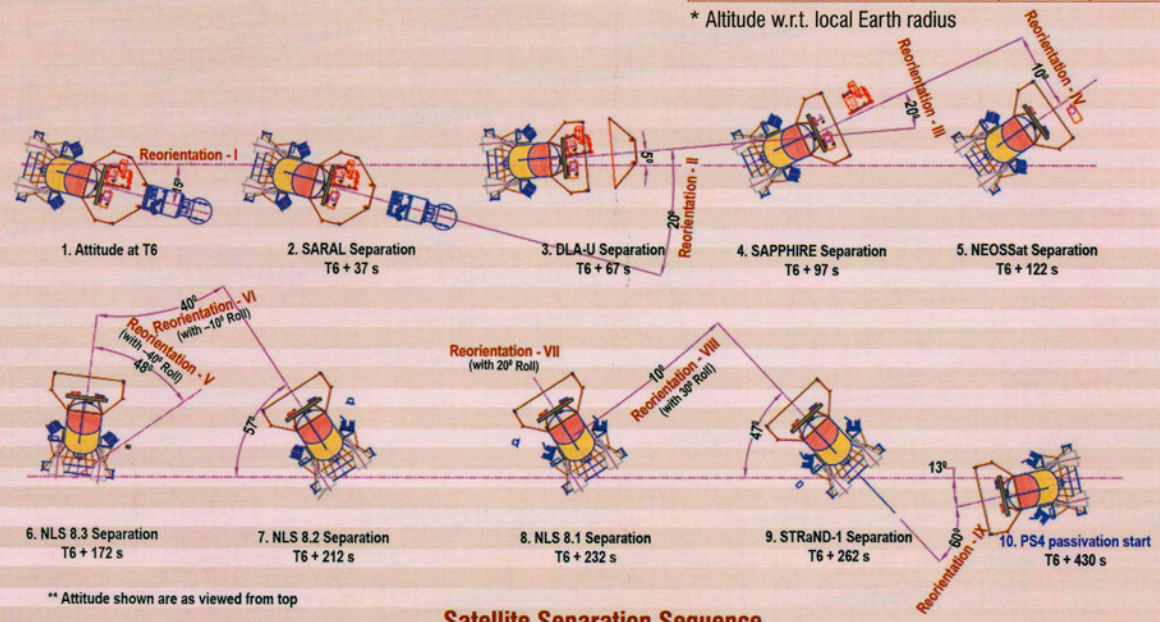
Payload Accommodation

PSLV - C20 / SARAL MISSION FLIGHT SEQUENCE



EVENTS	Time (s)	*Altitude (km)	Inertial Velocity (m/s)
RCT Ignition	-3.00	0.0262	451.89
PS1 Ignition	0.00	0.0262	451.89
PS1 Separation	113.14	52.112	1560.10
PS2 Ignition	113.34	52.306	1559.05
Heat Shield Separation	178.04	115.810	2096.37
PS2 Separation	265.04	222.051	3595.27
PS3 Ignition	266.24	223.778	3590.86
PS3 Separation	520.04	581.674	5302.02
PS4 Ignition	531.00	593.334	5283.92
PS4 Cutoff	1040.72	788.995	7453.38
SARAL Separation	1077.72	789.630	7459.46
DLA U Separation	1107.72	790.167	7459.28
SAPPHIRE Separation	1137.72	790.724	7459.10
NEOSSat Separation	1162.72	791.201	7458.93
NLS 8.3 (AAUSAT3) Separation	1212.72	792.187	7458.48
NLS 8.2 (BRITE) Separation	1252.72	793.000	7458.14
NLS 8.1 (UniBRITE) Separation	1272.72	793.413	7457.97
STRaND-1 Separation	1302.72	794.039	7457.69

* Altitude w.r.t. local Earth radius



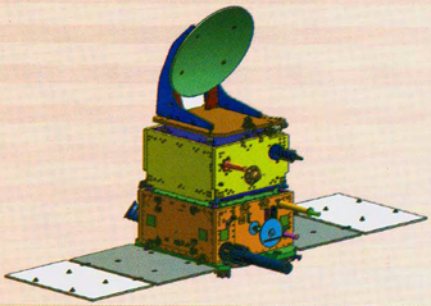
** Attitude shown are as viewed from top

Satellite Separation Sequence

SATELLITES IN PSLV-C20

SARAL

SARAL is the first mission under Indian Mini Satellite (IMS) Bus series-2, configured for 400 kg class satellite with miniaturization techniques proven in IMS-1. IMS-2 employs the modular concept for mounting the payload. It is an operational class Satellite Bus with complete redundancy in mainframe systems. The payload capability of this bus is around 200 kg. IMS-2 development is an important milestone as it is envisaged to be a workhorse for different types of operational missions in the coming years. This bus is aimed to carry medium size payloads useful for the applications in the areas of earth imaging, ocean & atmospheric studies, space science, etc., without significant changes in the bus.



SARAL deployed view

The SARAL mission results from the common interest of both ISRO and CNES in studying the ocean from space using altimetry system and in promoting maximum use of the ARgos Data Collecting System.

Payloads

- Payload Interface Module (PIM) containing ALtika & ARgos
- Solid state C Band Transponder (SCBT) from VSSC, ISRO

The PIM is provided by CNES, France.

The scientific objectives of PIM :

- Marine meteorology and sea state forecasting
- Operational oceanography
- Seasonal forecasting
- Climate and Mean sea level monitoring
- Ocean, Earth system and climate research
- Study on Animal migration

Data products from ALtika payload shall be provided to oceanographic research community to study the following:

- Ocean meso-scale variability studies with improved vertical and spatial resolution
- Data assimilation in a global ocean model
- Coastal altimetry
- Continental waters
- Inland ice sheet monitoring
- Light rainfall and clouds climatology
- Geodetic reference system determination

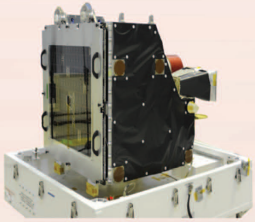
The main objective of ARgos Payload is to collect data from Data Collection Platform (DCP) and provide to the user.

Applications of the ARgos payload:

- Locating buoys and fishing vessels
- Collecting environmental data like ocean temperature profiles, currents and salinity
- Tracking animals, birds, seals etc

SAPPHIRE

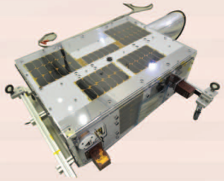
The satellite is built by MacDonald, Dettwiler and Associates (MDA), Canada. The primary objective of the SAPPHIRE mission is to deploy an operationally acceptable space based surveillance to contribute to the US Space Surveillance Network (SSN). SAPPHIRE is a space based optical sensor system to perform surveillance of orbit in deep space and to deliver Resident Space Objects (RSOs) tracking information in the orbit range of 6000 to 40000 km. ISRO's Ball Lock separation system IBL-298 is being used for separating the satellite.



SAPPHIRE

NEOSSat

The NEOSSat (Near-Earth Object Surveillance Satellite) is built by Microsat Systems Canada Inc. (MSCI). The satellite has a space telescope dedicated for detecting and tracking asteroids and satellites in Geo-stationary orbit. NEOSSat also uses IBL-298 separation system.



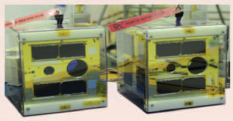
NEOSSat

NLS 8.1 (UniBRITE) and NLS 8.2 (BRITE)

UniBRITE and BRITE are the two scientific satellites launched and operated by Austria. UniBRITE is built for the University of Vienna and BRITE for Technical University, Graz by the Space Flight Laboratory, University of Toronto Institute for Aerospace Studies (UTIAS), Austria. The objective of UniBRITE mission is to photometrically measure low-level oscillations and temperature variations in stars brighter than visual magnitude (4.0), with unprecedented precision and temporal coverage not achievable through terrestrial based methods.

BRITE is similar to the UniBRITE spacecraft, with the exception of the optical filter within the payload, which is used to observe the blue region of the light spectrum.

Both the satellites use XPOD GNB separation system provided by the UTIAS, Canada



NLS 8.1 and 8.2

NLS 8.3 (AAUSAT3)

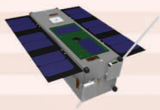
AAUSAT3 is the third student cubesat from Aalborg University in Denmark. The payloads are a dual band AIS receiver for feasibility study of receiving AIS signals from ships in arctic regions and a Phoenix GPS receiver from DLR, Germany. XPOD single separation system is being used for separation of the satellite.

NLS 8.3

STRaND-1

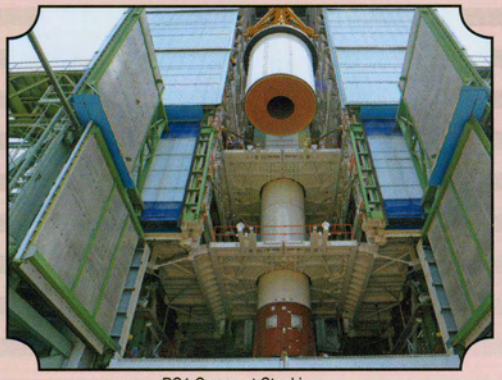
STRaND-1 is the first satellite in the series of Surrey Training, Research and Nanosatellite Development programme, built by SSTL (Surrey Satellite Technology Ltd), UK. The mission objective is to fly state-of-the art technologies and new developments in low Earth orbit.

Payloads are Smart Phone, Resistojet Propulsion System and Pulsed Plasma Electrical Propulsion System. ISIPOD separation system 3U class is being used for separation of the satellite.



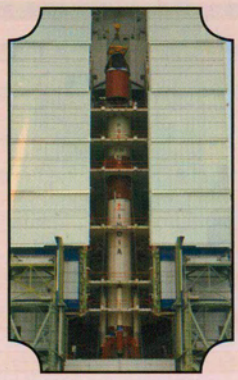
STRaND-1

CBS+NES Stacking



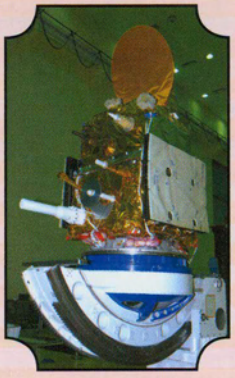
PS1 Segment Stacking

PS2 Stage Checks at SPB

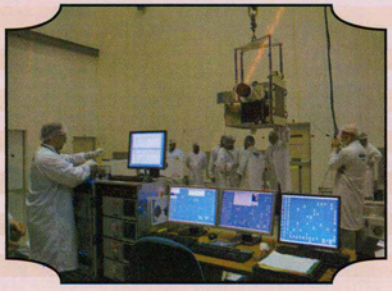


PS3-PS4 Module Stacking

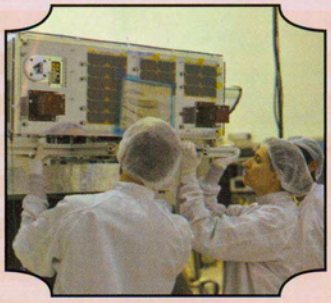
PRE LAUNCH OPERATIONS



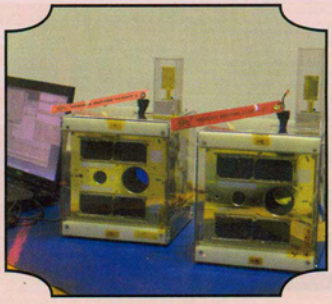
SARAL Testing



SAPPHIRE Testing



NEOSSat Testing



NLS 8.1/8.2 Testing

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