



GSLV-F12/NVS-01 MISSION

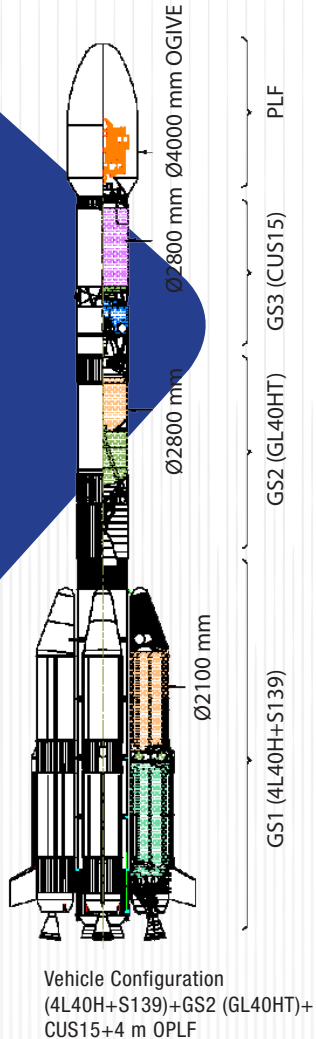


SDSC SHAR
SRIHARIKOTA

Indian Space Research Organisation



GSLV-F12/NVS-01 MISSION



GSLV-F12 is the 15th flight of India's Geosynchronous Satellite Launch Vehicle (GSLV) and the 9th flight with Indigenous Cryo stage. This is the 6th operational flight of GSLV with indigenous Cryogenic stage. The configuration of GSLV-F12 Payload Fairing is 4 m dia Ogive version.

The GSLV-F12 will place NVS-01 satellite into a Geosynchronous Transfer Orbit. Launch is planned from the Second Launch Pad (SLP) at Satish Dhawan Space Centre, SHAR on May 29, 2023.

GSLV-F12 Vehicle Characteristics

Vehicle Height	51.7 m
Lift off Mass	420 t
Stages	3
First Stage (GS1)	S139+4L40H
Second Stage (GS2)	GL40HT
Third Stage (GS3)	CUS 15 (Indigenous)

GSLV-F12 Stage Characteristics

Stages	First Stage (GS1)		Second Stage (GS2)	Third Stage (GS3)
Parameter	4 L40H	S139		
Length (m)	19.682	20.176	11.958	9.894
Diameter (m)	2.1	2.8	2.8	2.8
Propellant	UH25 & N ₂ O ₄	HTPB	UH25 & N ₂ O ₄	LH ₂ & LOX
Propellant Mass (t)	170.688	138.102	42.098	14.420
Stage Mass at Lift-Off	190.688	160.807	47.246	17.051



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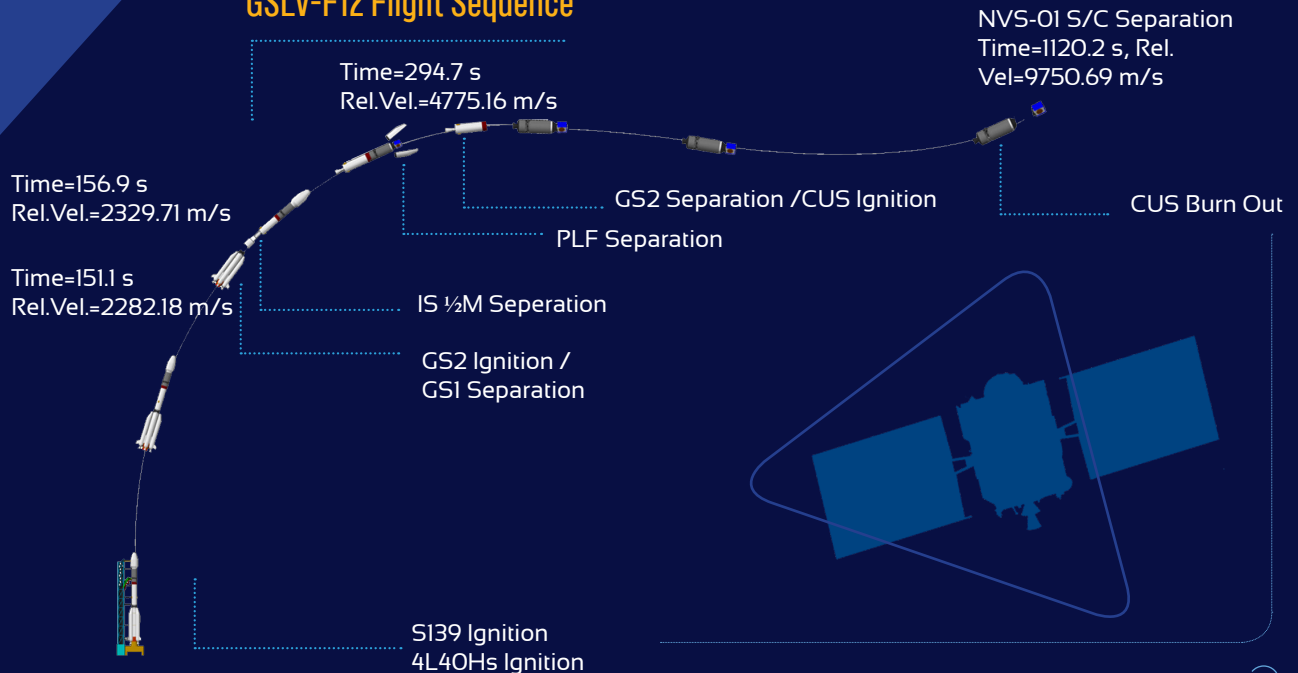
GSLV-F12 Mission Specifications

Orbit	GTO
Perigee	170 ± 3 km
Apogee	36568 km
Argument of Perigee	178 ± 0.5 degree
Inclination	19.36 ± 0.1 degree
Launch Azimuth	104 degree
Payload Mass	2232 kg

Highlights of GSLV-F12

- Sixth Operational Flight with Indigenous Cryostage
- Second Mission with 4 m dia Ogive PLF
- Active Pressurization for Cryogenic Upper Stage (CUS)
- Induction of CUSCE V2

GSLV-F12 Flight Sequence

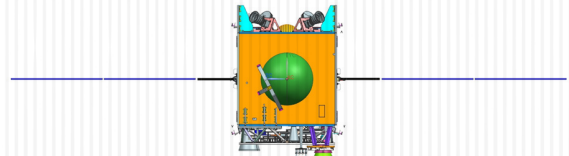
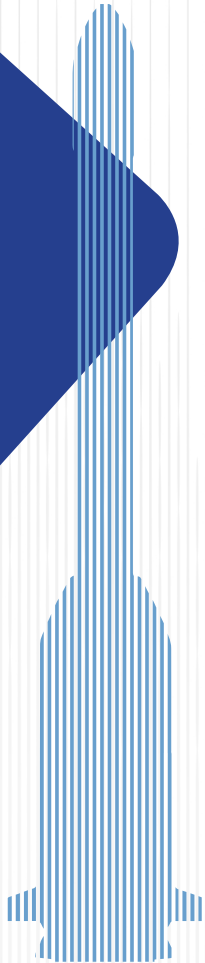




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GSLV-F12 Flight Events

Event	Time (s)	Altitude (km)	Relative Velocity (m/s)	Inertial Velocity (m/s)
4L40Hs ignition	-4.8	0.03	0	451.92
S139 ignition	0	0.03	0	451.92
4L40H shut off	148.9	69.53	2283.02	2706.35
GS2 ignition	149.5	69.97	2283.93	2707.45
GS1 /GS2 separation	151.1	71.14	2282.18	2706.43
IS ½M separation	156.9	75.25	2329.71	2756.48
PLF separation	237.4	114.76	3437.58	3882.17
GS2 shut off	291.3	130.38	4761.32	5207.93
GS2 separation	294.7	131.32	4775.16	5221.59
CUS ignition	295.7	131.59	4774.64	5221.11
CUS shut off	1105.2	236.67	9760.63	10212.43
CUS burn out	1110.2	241.45	9759.92	10211.88
NVS-01 S/C separation	1120.2	251.52	9750.69	10203.03



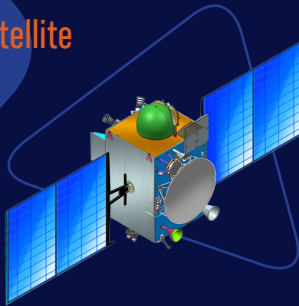


GSLV-F12/NVS-01 MISSION

Navigation with Indian Constellation (NavIC)

The Indian Regional Navigation Satellite System (IRNSS) with an operational name of NavIC that stands for Navigation with Indian Constellation. It is providing accurate real-time positioning and timing services over India and a region extending approximately 1500 km around the Indian Mainland. The fully deployed NavIC constellation consists of seven satellites in GeoSynchronous / Inclined GeoSynchronous Orbits.

NVS-01 satellite



NVS-01 is the first in the second-generation navigation satellite series which will ensure continuity of legacy NavIC services and also provide new service in L1 band. NVS-01 satellite is built around the standard I-2K Bus and is compatible with GSLV. It has a lift-off mass of approximately 2232 kg. It carries navigation payloads operating in L1, L5 and S bands. The satellite is powered by two solar arrays, capable of generating power up to 2.4 kW and a Lithium-ion battery supporting payload and bus load during eclipse. The satellite employs



both passive and active thermal management, unified bi-propellant propulsion system and three-axis body stabilised zero momentum system with reaction wheels. The mission life of NVS-01 is 12 years.

As compared to the first generation satellite series, the second-generation satellite series includes L1 Navigation band and encompasses indigenously developed Rubidium atomic clock. The L1 navigation band is popular for providing PNT (Position, Navigation and Timing) services for civilian users and for interoperability with other GNSS signals. The space-qualified Rubidium atomic clock, indigenously developed by Space Applications Centre, Ahmedabad is an important technology which only a handful of countries possess.



PAYLOADS

Navigation Payloads

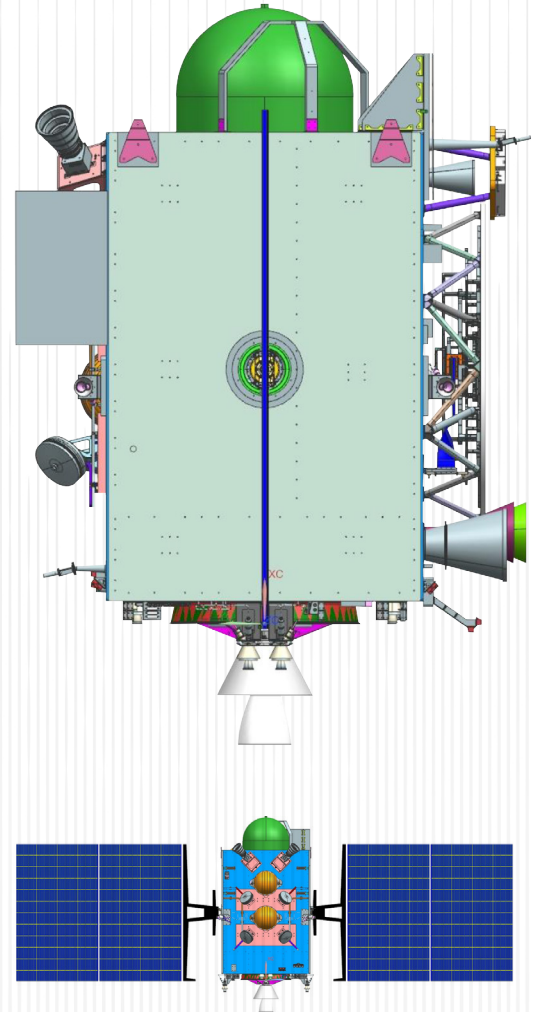
The navigation payload operates in L1, L5, and S bands and employs Tri-band antenna. The heart of the navigation payload is the Rubidium Atomic Frequency Standard (RAFS), the atomic clock which acts as a stable frequency reference for the navigation payload.

Ranging Payload

The ranging payload consists of CxC transponder used for two-way CDMA ranging to facilitate precise orbit determination.

The Key Applications of NavIC

- Terrestrial, aerial, and maritime navigation
- Precision agriculture
- Geodetic surveying
- Emergency services
- Fleet management
- Location-based services in mobile devices
- Orbit determination for satellites
- Marine fisheries
- Timing services for financial institutions, power grids, and other government agencies
- Internet-of-Things (IoT) based applications
- Strategic applications





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GLIMPSES





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