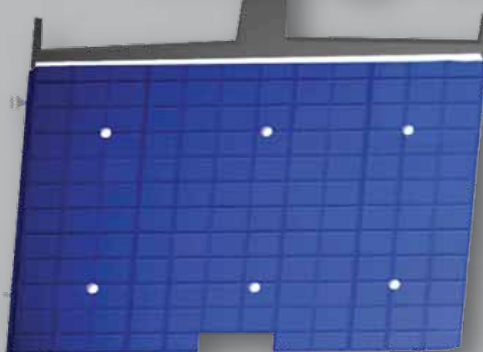
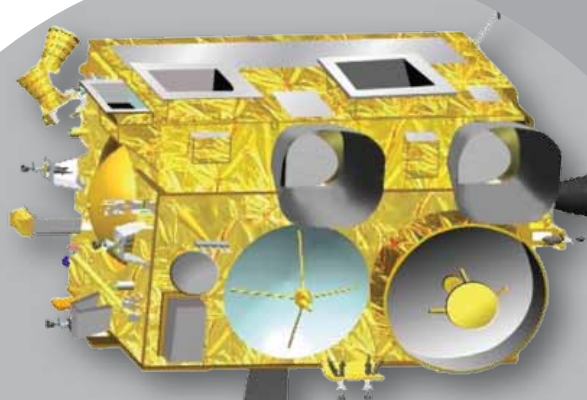




INSAT-3D

INDIA'S ADVANCED WEATHER SATELLITE



First Geostationary Sounder System Over Indian Ocean

INSAT-3D is an advanced weather satellite of India configured with improved imaging System and Atmospheric Sounder.



INSAT-3D in clean room at the launch centre in French Guiana

The KALPANA and INSAT-3A satellites of India are operational in geostationary orbit for the past one decade at 74 degree East and 93.5 degree East respectively. These Satellites have imaging systems providing images in Visible, Near-Infrared, Shortwave Infrared, Water Vapour and Thermal Infrared bands.

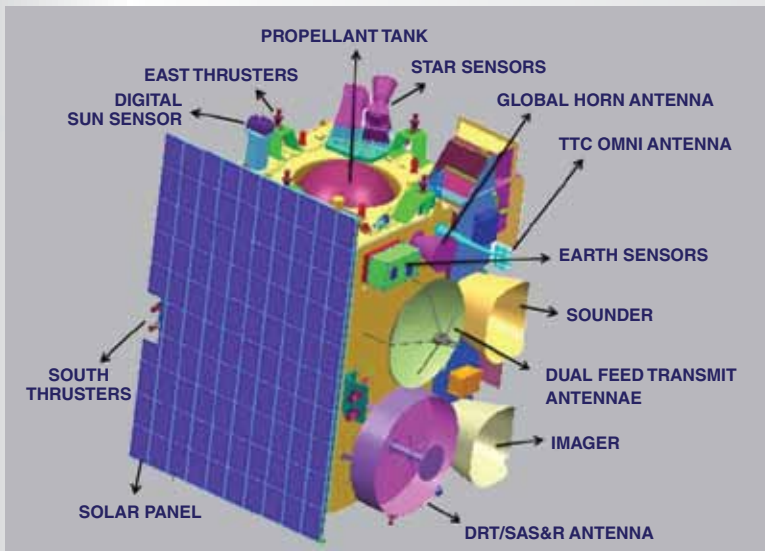
INSAT-3D adds a new dimension to weather monitoring through its Atmospheric Sounding System, which provides vertical profiles of temperature (40 levels from surface to ~ 70 km), humidity (21 levels from surface to ~ 15 km) and integrated ozone from surface to top of the atmosphere.

The Imaging System of INSAT-3D has significant improvements over that of KALPANA and INSAT-3A :

- Imaging in Middle Infrared band to provide night time pictures of low clouds and fog.
- Imaging in two Thermal Infrared bands for estimation of Sea Surface Temperature (SST) with better accuracy.
- Higher Spatial Resolution in the Visible and Thermal Infrared bands.

Also, INSAT-3D carries a Data Relay Transponder and Search and Rescue Transponder.

INSAT-3D will provide continuity to earlier missions and further augment the capability to provide various meteorological as well as search and rescue services.



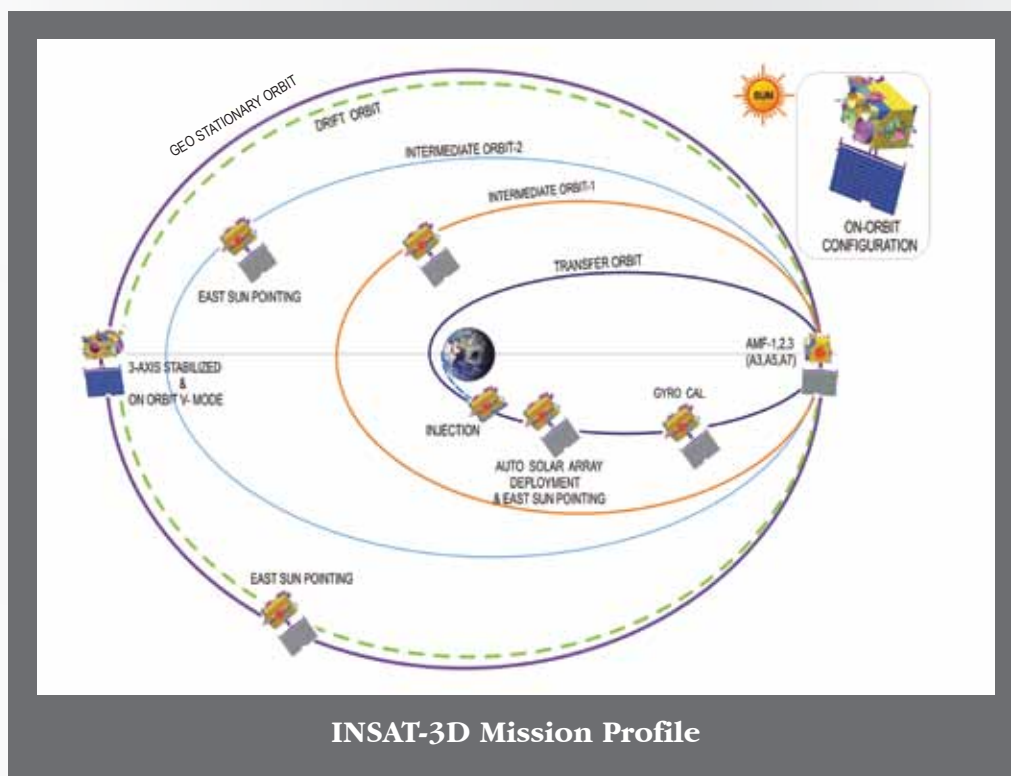
INSAT-3D configuration details

INSAT-3D has a lift-off mass of 2060 kg, which includes about 1125 kg of propellant. The propellant carried by INSAT-3D is mainly required to raise the satellite from the Geosynchronous Transfer Orbit (GTO) to its final Geostationary Orbit and to maintain the satellite attitude during its life. INSAT-3D is based on ISRO's two Tonne Class platform (I-2K bus) employing light-weight structural elements like Carbon Fibre Reinforced Plastic (CFRP). The satellite has a solar panel generating 1164 Watts of power.

INSAT-3D is launched into a Geosynchronous Transfer Orbit (GTO) by

Ariane-5 VA-214 launch vehicle from Kourou, French Guiana. The solar panel of the satellite will be deployed immediately after its injection into GTO. Following this, ISRO's Master Control Facility (MCF) at Hassan takes control of the satellite and performs the initial orbit raising maneuvers using the Liquid Apogee Motor (LAM) on-board the satellite, finally placing it in the circular Geostationary Orbit. Later, INSAT-3D will be put into its final orbital configuration and positioned at 82 deg East longitude. The designed in-orbit operational life of INSAT-3D is 7 years.

Salient Features	
MISSION	Meteorological and Search & Rescue Services
ORBIT	Geostationary
LOCATION	82 deg E Longitude
MASS AT LIFT-OFF	2060 Kg
DIMENSIONS	2.4m x 1.6m x 1.5m
POWER	Solar panel generating 1164 W Two 18 Ah Ni-Cd batteries
PROPULSION	440 Newton Liquid Apogee Motor (LAM) and twelve 22 Newton thrusters with Mono Methyl Hydrazine (MMH) as fuel and Mixed Oxides of Nitrogen (MON-3) as oxidiser
STABILISATION	3-axis body stabilised in orbit using Sun Sensors, Star Sensors, Gyroscopes, Momentum and Reaction Wheels, Magnetic Torquers and Thrusters
ANTENNAE	0.9 m and 1.0 m body mounted antennae
PAYLOADS	Imager, Sounder, Data Relay Transponder and Search & Rescue Transponder
MISSION LIFE	7 years



INSAT-3D Mission Profile

PAYLOADS:

Imager

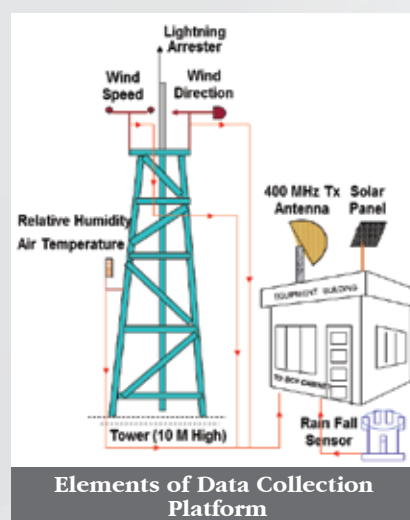
For meteorological observations, INSAT-3D carries a multi-spectral Imager (optical radiometer) capable of generating the images of the earth in six wavelength bands significant for meteorological observations, namely, *visible, shortwave infrared, middle infrared, water vapor and two bands in thermal infrared* regions. The Imager will generate images of the earth disk from geostationary altitude of 36,000 km every 26 minutes and provide information on various parameters, namely, *outgoing long-wave radiation, quantitative precipitation estimation, sea surface temperature, snow cover, cloud motion winds*, etc. Imager payload is an improved version of VHRR flown on INSAT-3A and Kalpana-1 satellites with significant improvements in spatial resolution, number of spectral channels and functionality.

Sounder

INSAT-3D also carries a newly developed 19 channel sounder, which is the first such payload to be flown on an ISRO satellite mission. The Sounder has eighteen narrow spectral channels in *shortwave infrared, middle infrared and long wave infrared regions and one channel in the visible region*. It will provide information on the vertical profiles of temperature, humidity and integrated ozone. These profiles will be available for a selected region over Indian landmass every one hour and for the entire Indian Ocean Region every six hours.

Data Relay Transponder (DRT)

Data Relay Transponder (DRT) on-board INSAT-3D will be used for receiving meteorological, hydrological and oceanographic data from remote, uninhabited locations over the coverage area from Data Collection Platforms (DCPs) like Automatic Weather Station (AWS), Automatic Rain Gauge (ARG) and Agro Met Stations (AMS). The data is relayed back for down linking in extended C-Band.



For extreme weather related disasters such as cyclone, floods and drought, real time observations of the associated parameters with appropriate network density is very important. Satellite enabled Data Collection Platforms provide a unique solution for gathering meteorological data from all over the country including remote and inaccessible places.

India Meteorological Department (IMD) and ISRO have established more than 1800 Data Collection Platforms.

INSAT-3D provides continuity of service of DRT which is currently carried by KALPANA-1 and INSAT-3A.

Satellite Aided Search and Rescue (SAS & R) Transponder

INSAT-3D is equipped with a Search and Rescue payload (operating in 406 MHz) that picks up and relays the alert signals originating from the distress beacons of maritime, aviation and land based users to the Indian Mission Control Centre (INMCC) located at ISRO Telemetry, Tracking and Command Network (ISTRAC), Bangalore.

The major users of Satellite Aided Search and Rescue service in India are the Indian Coast Guard, Airports Authority of India (AAI), Directorate General of Shipping, Defence Services and fishermen. The Indian service region includes a large part of the Indian Ocean region covering India, Bangladesh, Bhutan, Maldives, Nepal, Seychelles, Sri Lanka and Tanzania for rendering distress alert services.

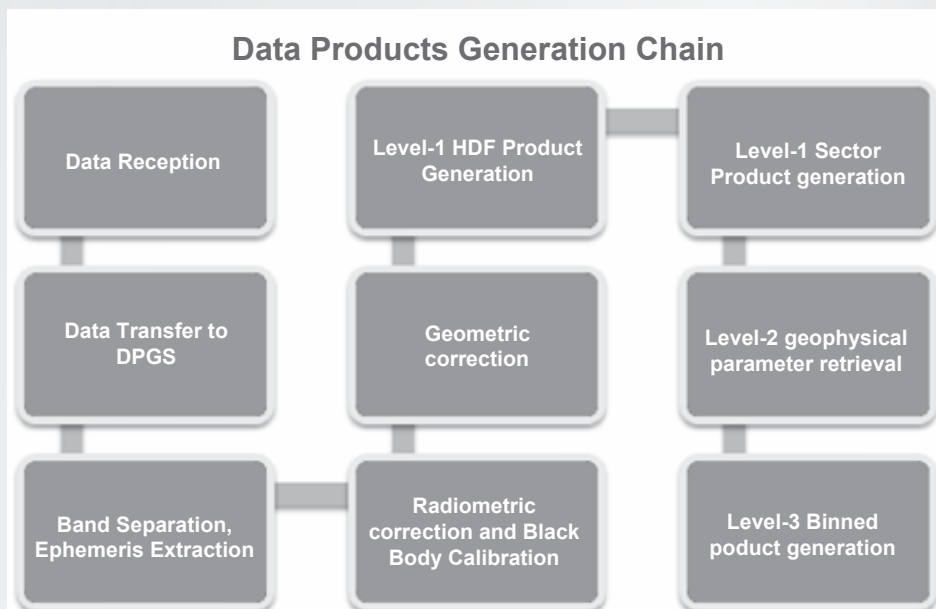


INSAT-3D joins INSAT-3A to provide operational Search and Rescue service.

INSAT-3D METEOROLOGICAL DATA PROCESSING SYSTEM (IMDPS)

Indian Space Research Organization (ISRO) has taken up the responsibility of end-to-end reception and processing of INSAT-3D data and derivation of meteorological parameters with India Meteorological Department (IMD), New Delhi. An indigenously designed and developed INSAT-3D Meteorological Data Processing System (IMDPS) is installed and commissioned at IMD, New Delhi with a Mirror Site at Space Applications Centre, Bopal, Ahmedabad.

IMDPS will cater to the processing of all data transmitted by the Imager and Sounder payloads. The data archival and dissemination is through IMD, New Delhi and Meteorological and Oceanographic Satellite Data Archival Centre (MOSDAC) websites. IMDPS comprises of three major sub-systems - (i) Data Acquisition and Quick Look Display System (ii) Data Products System and (iii) Geo-Physical Parameter Retrieval System.



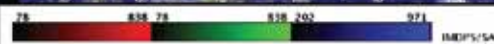
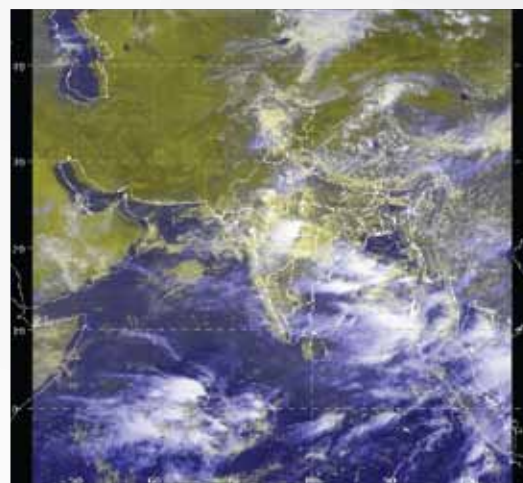
These Geophysical parameters and products will be derived and ingested into the operational weather forecasting activities at IMD. In addition, some of these parameters, particularly the AMVs from the imager, as well as the temperature and humidity profiles from the Sounder will be ingested in numerical weather forecast models in real time for accurate weather prediction.

PAYLOAD	Geo-Physical Parameters and Derived Products
IMAGER	Outgoing Long wave Radiation (OLR)
	Quantitative Precipitation Estimate (QPE)
	Atmospheric Motion Vector (AMV)
	Upper Troposphere Humidity (UTH)
	Sea Surface Temperature (SST)
	Land Surface Temperature (LST)
	Water Vapor Wind Vector
	Insolation
	Snow Cover
	Fog, Forest Fire, Smoke and Aerosol Identification
	Tropical Cyclone Position and Intensity Estimation
SOUNDER	Temperature, Humidity profiles and Integrated Ozone
	Geo-potential Height (GH)
	Layer Precipitable Water
	Total Precipitable Water
	Lifted Index (LI)
	Wind Index (WI)
	Dry Microburst Index (DMI)
	Potential Temperature Differential
	Ozone estimate

INSAT-3D SIMULATED IMAGERY



Simulated Image (Full Disk) of INSAT-3D Imager



Simulated Image (Sector) of INSAT-3D Imager