

## IRS 1C

IRS-1C is India's second generation operational Remote Sensing Satellite. The satellite carries Payloads with enhanced capabilities like better Spatial resolution additional spectral band, improved repetivity and augment the Remote Sensing capability of the existing IRS-1A and IRS-1B. The satellite payload consists of three sensors, namely Panchromatic camera (PAN), Linear Imaging and Self-Scanning Sensor (LISS - III) and Wide Field Sensor (WiFS). The PAN camera provides data with a spatial resolution of 5.8m and a ground swath of 70 km at nadir view. This camera can be steered up to + 26 degrees, which can be used to acquire stereo pairs and this also improves the revisit capability to 5 days. LISS - III camera provides multi-spectral data in 4 bands. The spatial resolution for visible (two bands) and near infrared (one band) is 23.5m with a ground swath of 141 km. The fourth band (short wave infrared band) has a spatial resolution of 70.5m with a ground swath of 148 km. The repetivity of LISS - III is 24 days. WiFS camera collects data in two spectral bands with a spatial resolution of 188m and a ground swath of 810 km. By virtue of its wide swath there is huge side lap between adjacent paths. A repetivity of 3 days can be achieved by suitably combining paths. The satellite is equipped with an On Board Tape Recorder (OBTR) with a capacity of 62 Gb, for collecting data outside the visibility region of any ground station. The OBTR was capable of storing data collected for 24 minutes. The OBTR was functional during 1995-1998.

### IRS 1C Specifications

Mission Category	Operational Remote Sensing
Launch Date	December 28, 1995
Launch Site Category	Baikanur Cosmodrome Kazakhstan
Launch Vehicle	Molniya
Weight	1250 kg
Onboard Power	809 Watts (generated by 9.6 sq.metres Solar Panels)
Communication	S-band, X-band
Stabilization	Three axis body stabilized (zero momentum) with 4 Reaction Wheels, Magnetic torquer
RCS	Monopropellant Hydrazine based with sixteen 1 N thrusters & one 11N thrusters
Payload	Three solid state Push Broom Cameras: PAN (Less than 6

	metre resolution )LISS-3(23.6 metre resolution) and WiFS (189 metre resolution)
Onboard tape recorder	Storage Capacity : 62 G bits
Orbit	Polar Synchronous
Altitude	817 km Polar Sun-synchronous
Inclination	98.69 Degrees
Repetivity	24 days
Local Time	10.30 a.m.
Mission Completed	September 21, 2007

## IRS 1C Sensors

### Linear Imaging Self Scanning Sensor - 3 (LISS-3)

This sensor is configured to provide imageries in three visible bands as well as in short-wave infrared band. The resolution and swath for visible bands are 23.5 m and 142 km, respectively. The detector is a 6000 element CCD based linear array with a pixel dimension of 10 $\mu$ m by 7  $\mu$ m. The detector is placed at the focus of a refractive type optical system consisting of eight lens elements, which provides a focal length of 360 mm. The processing of the analogue output video signal is similar to that of PAN. For this camera, a 7-bit digitization is used which gives an intensity variation of 128 levels.

### Panchromatic sensor (PAN)

The PAN sensor is configured to provide the imageries of the Earth in visible spectrum, in a panchromatic band (0.5-0.75 m) with a geometric resolution of greater than 10 m and a swath of 70 km. The camera uses an off-axis reflective type optics system consisting of three mirrors for providing the required focal length. A 7 $\mu$ m pixel sized CCD is being used as the detector element. Using three linear array charge-coupled detectors covers the total swath of 70 km and each of these detectors covers a swath of about the central detector is offset from the other two detectors by a distance in focal plane that corresponds to 8.6 km on the ground. The other two detectors cover swath of 24 km each adjacent to the central CCD. These two detectors are aligned with an accuracy of 30 arc sec-1. The overlap of the central swath with the side swaths is 600 m on the ground. Each of the detectors provides four analogue outputs, which are independently

processed by video chains, converted to digital and providing a data handling system for formatting. For a PAN data compatible with the expected signal to noise ratio, a 6-bit digitization is used which gives 64 radiometric gray levels. Characteristics of PAN camera  
Geometric resolution from altitude of 817 km 5.8 m Effective focal length for optics 980 mm Swath 70 km Field-of-view for optics  $\pm 2.5^\circ$  (across track)  $\pm 0.3^\circ$  (along track)  
Spectral band 0.5-0.75  $\mu\text{m}$ .

### **Wide Field Sensor (WiFS)**

This sensor operates in two bands B3: 0.62  $\mu\text{m}$  to 0.68  $\mu\text{m}$  (Red) and B4: 0.77  $\mu\text{m}$  to 0.86  $\mu\text{m}$  (NIR). Each band uses a 2048 element CCD with an element size of 13  $\mu\text{m}$  by 13  $\mu\text{m}$ . A wide-angle refractive optics system with 8-lens elements is used with a focal length of about 56 mm. This payload required to cover a ground swath of 770 km with a resolution of 188 m. This ground swath with the selected 817 km orbit can provide the required repetivity for the intended application. To cover the 770 km, two separate band assemblies are used for each band. Thus the entire swath in each band is covered by two detectors. Each of the detectors covers half of the swath. The signal processing chain is similar to LISS-3 wherein the analogue video signal is converted to 7 bits and given to data handling system for formatting.

### **Characteristics of WiFS**

Band 3 0.62-0.68  $\mu\text{m}$  Band 4 0.77-0.86  $\mu\text{m}$  Resolution 188.3 m Swath 810 km

Radiometric resolution 7 bits Band-to-band registration  $\pm 0.25$  pixel