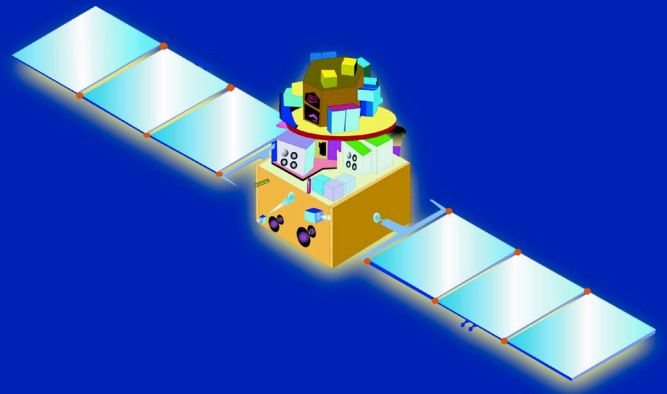




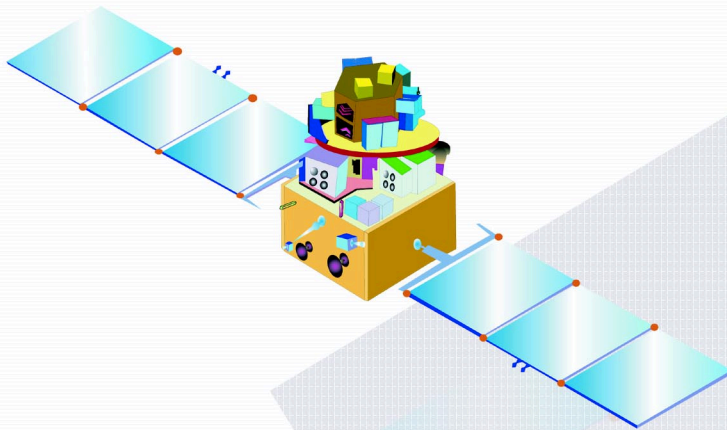
# Resourcesat - 1 (IRS P6)



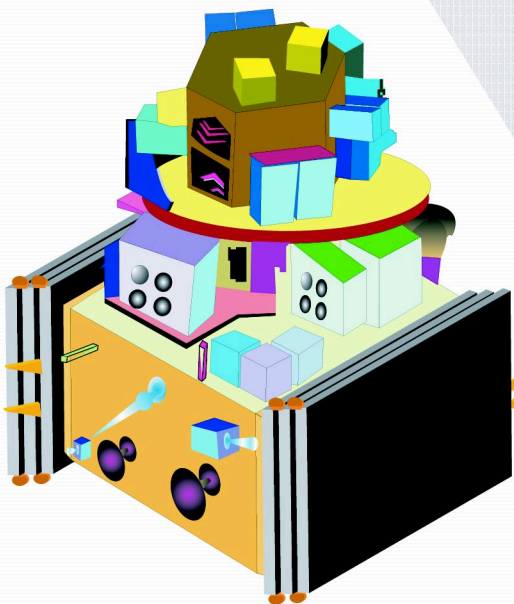
Resourcesat - 1  
for all your resource management applications of  
today and tomorrow







Deployed configuration of Resourcesat - 1



Stowed configuration of Resourcesat - 1

### Overview

Optimal management of resources has become a critical requirement in these days of increased industrial development and growing population. With ever increasing pressure on the resources it has become essential to monitor the existing resources for optimum utilisation. Keeping these requirements in mind, The Department of Space (DOS), Govt. of India has launched a series of Indian Remote Sensing Satellites such as IRS-1A, 1B/1C, 1D, IRS P2 and IRS P3. Data from these satellites have helped in the areas of Integrated Mission for Sustainable Development (IMSD), National level Crop Acreage and Production Estimation (CAPE), Wasteland Inventory, Land Slides Zonation, Forests Inventory Mapping, etc.

### Generation Next

Resourcesat - 1 is conceptualised and designed to provide continuity in operational remote sensing with its superior capabilities. The main objective of Resourcesat - 1 is not only to provide continued remote sensing data for integrated land and water management and agricultural and its related applications, but also to provide additional capabilities for applications. Apart from making data available in real time to the Ground Stations in its visibility area Resourcesat - 1 with its ability to record data anywhere in the world with its advanced On Board Solid State Recorder, has entered into new dimensions of meeting the requirements of Resource Managers globally.

## Orbit and Coverage Details



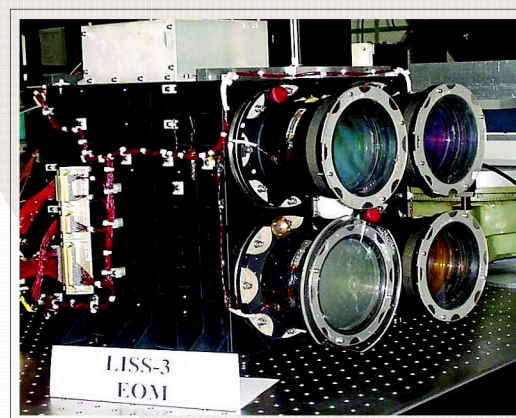
Orbit/Cycle Visits / year	341
Semi major axis	7195.11km
Altitude	817 km
Inclination	98.69 deg
Eccentricity	0.001
Number of Orbits/day	14.2083
Orbit period	101.35 min
Repetivity	24 days
Distance between adjacent paths	117.5 km
Distance between successive ground tracks	2820 km
Ground trace velocity	6.65 km/sec
Equatorial crossing velocity	10:30 Am $\pm$ 5 min At Descending node

## Payloads

The Resourcesat - 1 is designed to provide multispectral, monoscopic and stereoscopic imageries of the earth's surface with it's advanced on-board sensors. Linear Imaging and Self Scanning Sensor (LISS-III), an Advanced Wide Field Sensor (AWiFS) and a High Resolution Multispectral Sensor LISS-IV constitute main payload of Resourcesat.

### LISS III

The LISS-III sensor is identical to the LISS-III flown in IRS-1C/1D spacecrafts except that the spatial resolution of SWIR band (B5) has been improved to 23.5 m (same as B2, B3, B4).

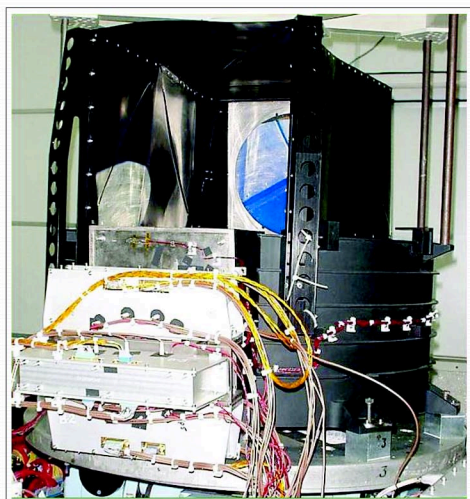


LISS III Camera

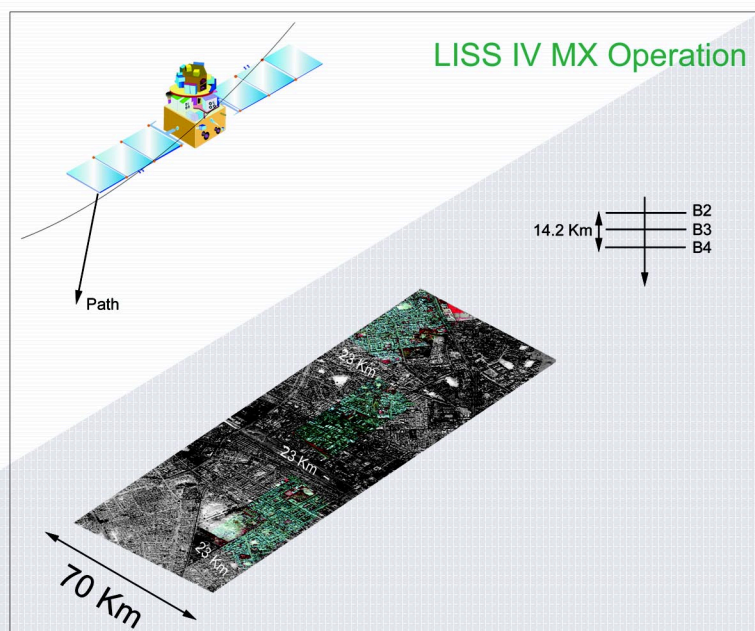


**LISS IV**

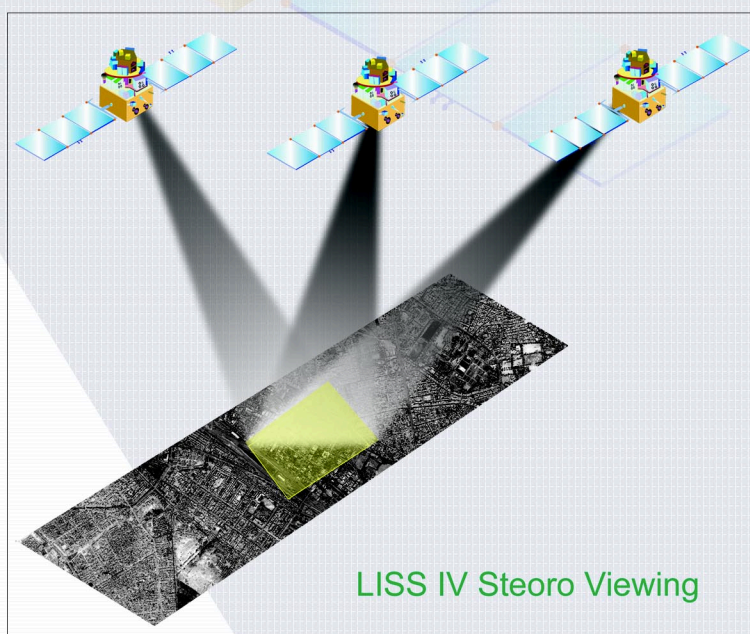
LISS-IV is a high resolution multi-spectral sensor operating in three spectral bands (B2 0.52 - 0.59, B3 0.62 - 0.68, B4 0.77 - 0.86). LISS-IV provides a ground resolution of 5.8 m (at nadir) and can be operated in either of two modes: In Multi-spectral mode (Mx) LISS-IV covers a swath of 23 km. (selectable out of 70 km. total swath) in three bands, while in mono mode (Mono) the full swath of 70 km. will be covered in any one single band which is selectable by ground command (nominally in B3 – red band). In multispectral (MX) mode the data corresponding to any 4000 pixels of each spectral band is transmitted, this sub-set of 4000 pixels can be selected anywhere out of 12,000 pixels available. Consequently there is no path based scheme for MX mode. The user has to specify his area of interest in terms of lat/long. The LISS-IV can be tilted upto  $\pm 26$  deg. in the across the track direction thereby providing a revisit period of five days.



LISS IV Camera

**Enhanced Visual Information**

LISS IV MX Operation

**Unique Manoeuvrability**

LISS IV Stereo Viewing

LISS IV Stereo Viewing

# RESOURCESAT - 1

## AWiFS

AWiFS sensor is an improved version compared to the WiFS sensor flown in IRS-1C/1D. AWiFS operates in four spectral bands identical to LISS-III, with a spatial resolution of 56 m. and covering a swath of 740 kms. To cover such a wide swath, the AWiFS camera is split into two separate electro-optic modules, AWiFS-A and AWiFS-B which are tilted by 11.94 deg. with respect to each other.



AWiFS Camera

## Sensors - Specifications

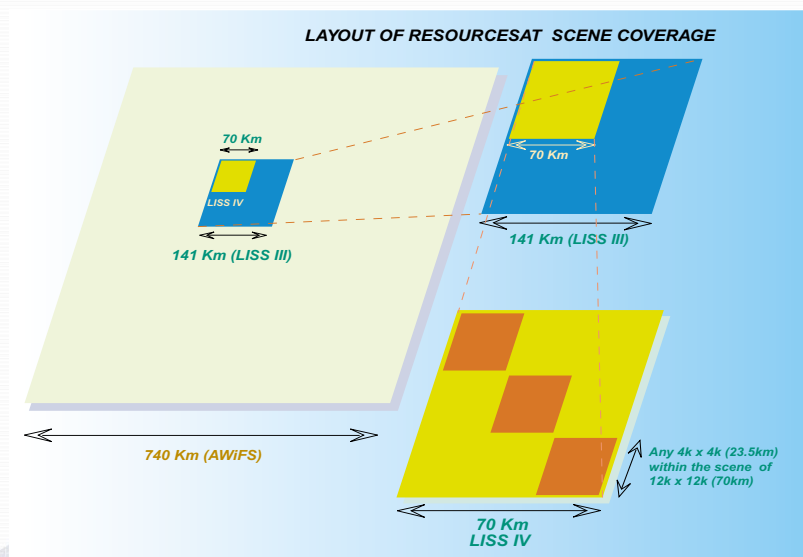
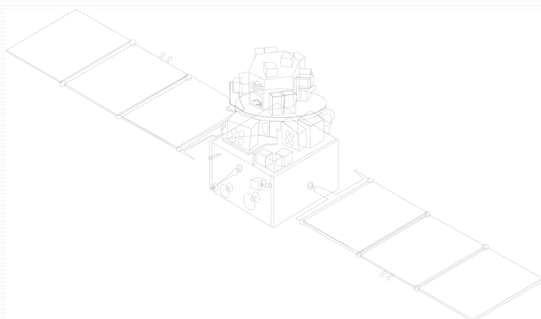
Specifications	LISS-4	LISS III	AWiFS
IGFOV	5.8 m at nadir (Across Track)	23.5 m	56 m at nadir (Across Track)
Spectral Bands	B2 0.52 - 0.59 B3 0.62 - 0.68 B4 0.77 - 0.86	B2 0.52 - 0.59 B3 0.62 - 0.68 B4 0.77 - 0.86 B5 1.55 - 1.70	B2 0.52 - 0.59 B3 0.62 - 0.68 B4 0.77 - 0.86 B5 1.55 - 1.70
Swath	23.9 km (Mx) 70 kms (Mono)	141 km	740 km (Combined) 370 km (Each head)
Integration time	0.877714 msec	3.32 msec	9.96 msec
Quantization	10 Bits Selected 7 Bits will be transmitted by the data handling system	7 Bits SWIR band has 10 bit quantisation, selected 7 bits out of 10 bits will be transmitted by the data handling system	10 Bits
No. of gains	Single gain (Dynamic range obtained by sliding 7 bits out of 10 bits)	4 for B2, B3 and B4. For B5 (Dynamic range obtained by sliding 7 bits out of 10 bits)	1

Sensors specifications

Payload	Resolution (Metres)	Swath (km)	Revist	Image Size km x km	Overlap km	Sidelap Equator km
<b>LISS III</b>						
Visible	23.5	141	24 Days	142 x 141	7	23.5
SWIR	23.5	141	24 Days	142 x 141	7	23.5
<b>LISS-4</b>						
Mono	5.8	70	5 Days	70 x 70	2.5	5 With in LISS III
Mx	5.8	23	5 Days	23 x 23	14.2	
<b>AWiFS</b>						
	56 (Nadir) 70 (End pixel)	737	5 Days	738 x 737	82 %	84 %

Resourcesat - 1 overlap and sidelap between scenes



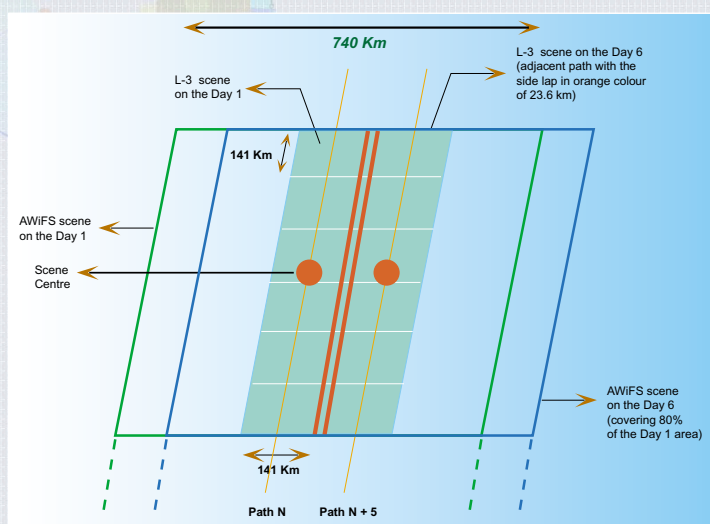


Resourcesat - 1 Scene Coverage

## Repetivity

- LISS-III has a repetivity of 24 days and consecutive paths are covered with the separation of 5 days and the inter path distance is 117.5 km. leaving a side lap of 23.5 km.
- AWiFS provides 5 day revisit for 80% of the area covered.
- In the case of LISS-IV, as in the case of 1C/1D, 4 monoscopic scenes of A,B,C,D are defined in one LISS-III scene. Because of its tilting capabilities a given area can be viewed more than once within one cycle. This provides a revisit of 5 days and the creation of stereo pairs for satellite photogrammetric work.

## Extensive Coverage



Repetivity & Coverage Pattern of Resourcesat - 1

## Data Products

Based on the feed back from the user community the data products for Resourcesat - 1 mission are designed to:

- Provide continuity to existing products.
- Exploit the advanced capabilities of the on-board sensors.
- Provide additional features based on user feedback/requirements.

## RESOURCESAT - 1

Data products can be categorised as standard and value added products. Value added products are generated by further processing of standard corrected data. Data products are supplied in both photographic and digital media. Various options like different digital formats, re-sampling methods, etc. are available to the user community.

### Data products are classified into

- Scene based standard products
- Scene based georeferenced products
- Map based geocoded products
- Floating geocoded products
- Ortho-rectified geocoded products

The oblique viewing capability of LISS-IV sensor can be used to acquire stereo pairs. A stereo pair comprises of two images of the same area, acquired on different dates and from different angles.

One of the parameters from which the quality of a stereo pair can be judged is the base/height (B/H) ratio. B/H ratio is the ratio of distance between two satellite passes and satellite altitude. Stereo products are available from LISS-IV Mono mode only. Two scenes selected on two different dates, satisfying the users B/H ratio are supplied as a stereo pair. The data is only radiometrically corrected and are supplied on digital media.

Resourcesat - 1 has an On Board Solid State Recorder (OBSSR) of 120 Giga Bits recording capacity to record the data beyond the visibility cone of the Shadnagar Earth Station. Using the OBSSR Resourcesat can record 18 min. of data from LISS III and AWiFS or 18 min. of LISS IV Data. The recorded data can be played back during the night pass of the satellite over the Shadnagar Station.

## Data Products - Description

S.No	Product Type	Level of Correction	Area Covered (Km x Km)	No. of Bands	Output
1.	Scene based	Standard	23 x 23	3 Mx bands	Digital / Photographic
			70 x 70	Mono	Digital / Photographic
		Geo referenced	23 x 23	3 Mx bands	Digital
			70 x 70	Mono	Digital
2.	Map sheet based	Geo coded	7.5' x 7.5'	3 Mx bands	Digital / Photographic
			7.5' x 7.5'	Mono	Digital / Photographic
			15' x 15'	Mono	Digital / Photographic
3.	Point based	Geo coded	5' x 5'	3 Mx bands	Digital / Photographic
				Mono	Digital / Photographic
4.	Basic stereo pair	Radiometrically corrected	70 x 70 Km	Mono	Digital
5.	Ortho Image	Ortho Rectified (External DEM)	7.5' x 7.5' (Stereo graphic)	Mono	Digital / Photographic
		Ortho Rectified (External DEM)	7.5' x 7.5'	Mono	Digital / Photographic
		Ortho Rectified (External DEM)	15' x 15'	Mono	Digital / Photographic
6.	LISS III + LISS IV (Mono) Geocoded	Merge	15' x 15'	3	Digital / Photographic
			70 x 70 Km	3	Digital / Photographic

### LISS IV Products

S.No	Product Type	Level of Correction	Area Covered (Km x Km)	No. of Bands	Output
1.	Path row based * (With or without shift product)	i. Raw	141 X 141	4	Digital
		ii. Radiometrically corrected	141 X 141	4	Digital
		iii. Standard	141 X 141	3	Photographic
		iv. Geo Referenced	141 X 141	4	Digital
2.	** Floating quadrant product	Standard	70 x 70	3	Photographic
		Geo referenced	70 x 70	4	Digital
3.	+ Map Sheet based product	Geo coded	28 x 28	3	Photographic
			15' x 15'	4	Digital
4.	Ortho Image	Ortho Rectified (GCP + External DEM) Geo referenced	15' x 15'	4	Digital
				3	Photographic

\* Shift : Scene can be shifted along the track from 10 % to 90 % of the scene size in steps of 10 %.

\*\* Quadrant : Twelve quadrants, similar to IRS-1C/1D

+ Geocoded : MapSheet/Floating

### LISS III Products



Resourcesat-1 LISS-IV Multispectral (Mx) image of part of Kuwait

S.No	Product Type	Level of Correction	Area Covered (Km x Km)	No. of Bands	Output
1.	Path row based (with or without shift)	Raw	370 x 370	4	Digital
		Radiometrically corrected	370 x 370	4	Digital
		Standard	370 x 370	3	Photographic Digital
		Geo referenced	370 x 370	4	Digital
2.	Map sheet based	Geo coded	1° x 1°	3	Photographic Digital
				4	Digital

## AWiFS Products

## Data Ordering



Users can view the data using our advanced digital browsing facility and place indents using the User Order Processing System (UOPS). Those who have further data requirements and OBSSR requirements, can provide details through UOPS so that the satellite is suitably programmed and the data made available to the user. These data products can be delivered by conventional methods of speed post / courier or by electronic delivery.

Antrix Corporation, with their marketing arrangements with Space Imaging, USA can provide down link licence agreements for foreign Ground Stations to receive Resourcesat data directly. Antrix can also provide the necessary s/w and h/w for upgrading existing Ground Stations or for establishing new Ground Stations for the reception of Resourcesat data.

For further details about Data Products please contact :

NRSA Data Centre (NDC),  
National Remote Sensing Agency (NRSA),  
Department of Space (DOS),  
Government of India,  
Balanagar, Hyderabad – 500 037,  
Andhra Pradesh, I N D I A  
Phone : +91 (0) 40 23 87 85 60, 23 88 44 22, 23 88 44 23  
Fax : +91 (0) 40 23 87 86 64, 23 87 81 58.  
E-Mail : [sales@nrSA.gov.in](mailto:sales@nrSA.gov.in)  
Website : <http://www.nrSA.gov.in>

For information on down link license and Ground Stations please contact:

Antrix Corporation Limited,  
Antariksh Complex,  
Near New BEL Road,  
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Phone : +91 (0) 80 341 62 74  
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E-Mail : [info@antrix.org](mailto:info@antrix.org)  
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