

DEPARTMENT OF SPACE**DEMAND NO.86****Department of Space**

A. The Budget allocations, net of recoveries, are given below:

		<i>(In crores of Rupees)</i>								
Major Head	Budget 2003-2004			Revised 2003-2004			Budget 2004-2005			
	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	
Revenue	1569.97	318.47	1888.44	1490.97	324.16	1815.13	1836.01	331.29	2167.30	
Capital	480.03	...	480.03	459.03	...	459.03	563.99	...	563.99	
Total	2050.00	318.47	2368.47	1950.00	324.16	2274.16	2400.00	331.29	2731.29	
1. Secretariat - Economic Services	3451	...	4.15	4.15	...	4.15	4.15	...	4.27	
Space Research										
Space Technology										
Launch Vehicle Technology										
2. Geo -Synchronous Satellite Launch Vehicle	3402	70.00	...	70.00	80.45	...	80.45	36.78	...	
3. GSLV MK-III Development.	3402	66.27	...	66.27	88.51	...	88.51	164.00	...	
	5402	213.73	...	213.73	161.49	...	161.49	326.00	...	
<i>Total</i>		280.00	...	280.00	250.00	...	250.00	490.00	...	
4. Cryogenic Upper Stage (CUS) Project	3402	15.41	...	15.41	15.19	...	15.19	9.92	...	
	5402	1.29	...	1.29	1.19	...	1.19	1.00	...	
<i>Total</i>		16.70	...	16.70	16.38	...	16.38	10.92	...	
5. Polar Satellite Launch Vehicle - Continuation Project	3402	59.00	...	59.00	72.93	...	72.93	122.50	...	
	5402	8.00	...	8.00	...	...	...	...	...
<i>Total</i>		67.00	...	67.00	72.93	...	72.93	122.50	...	
6. Vikram Sarabhai Space Centre (VSSC)	3402	68.03	96.65	164.68	103.48	96.66	200.14	86.98	93.75	
	5402	8.87	...	8.87	25.75	...	25.75	25.29	...	
<i>Total</i>		76.90	96.65	173.55	129.23	96.66	225.89	112.27	93.75	
7. Indian Space Research Organisation - Inertial Systems Unit(IISU).	3402	11.20	...	11.20	12.51	...	12.51	12.06	...	
	5402	0.59	...	0.59	2.85	...	2.85	1.90	...	
<i>Total</i>		11.79	...	11.79	15.36	...	15.36	13.96	...	
8. Liquid Propulsion Systems Centre	3402	36.39	33.41	69.80	41.30	35.48	76.78	52.56	39.80	
	5402	9.19	...	9.19	4.42	...	4.42	8.07	...	
<i>Total</i>		45.58	33.41	78.99	45.72	35.48	81.20	60.63	39.80	
9. GSLV Operational (Continuation) Project	3402	96.55	...	96.55	75.02	...	75.02	141.96	...	
	5402	3.45	...	3.45	4.98	...	4.98	8.04	...	
<i>Total</i>		100.00	...	100.00	80.00	...	80.00	150.00	...	
10. Space Capsule Recovery Experiment	3402	31.43	...	31.43	16.00	...	16.00	19.15	...	
	5402	...	...	...	...	...	...	1.75	...
<i>Total</i>		31.43	...	31.43	16.00	...	16.00	20.90	...	
Total - Launch Vehicle Technology		699.40	130.06	829.46	706.07	132.14	838.21	1017.96	133.55	
Setellite Technology										
11. IRS P5(Cartosat)	3402	8.49	...	8.49	9.19	...	9.19	1.64	...	
	5402	1.92	...	1.92	1.81	...	1.81	...	...
<i>Total</i>		10.41	...	10.41	11.00	...	11.00	1.64	...	
12. IRS P6 (Resourcesat)	3402	9.14	...	9.14	12.11	...	12.11	0.86	...	
	5402	1.29	...	1.29	4.89	...	4.89	0.10	...	
<i>Total</i>		10.43	...	10.43	17.00	...	17.00	0.96	...	
13. G-SAT-2	3402	10.00	...	10.00	13.95	...	13.95	...	...
14. Cartosat-2 Satellite	3402	52.90	...	52.90	63.51	...	63.51	30.81	...	
	5402	23.59	...	23.59	11.49	...	11.49	10.09	...	
<i>Total</i>		76.49	...	76.49	75.00	...	75.00	40.90	...	
15. Oceansat-2 (IRS-II B/C)	3402	20.00	...	20.00	...	...	...	19.50	...
	5402	...	...	...	...	...	...	0.50	...
<i>Total</i>		20.00	...	20.00	...	...	...	20.00	...
16. Resourcesat-2	3402	...	...	...	...	...	...	5.00	...
17. ISRO Satellite Centre	3402	55.89	35.30	91.19	39.17	36.96	76.13	73.69	36.17	
	5402	61.16	...	61.16	45.22	...	45.22	47.28	...	
<i>Total</i>		117.05	35.30	152.35	84.39	36.96	121.35	120.97	36.17	
18. Laboratory for Electro-Optics System	3402	9.17	...	9.17	8.28	...	8.28	9.15	...	
	5402	1.27	...	1.27	2.50	...	2.50	1.98	...	
<i>Total</i>		10.44	...	10.44	10.78	...	10.78	11.13	...	
19. G-SAT 3 (Edusat)	3402	74.00	...	74.00	43.99	...	43.99	19.50	...	
	5402	1.00	...	1.00	1.01	...	1.01	0.50	...	
<i>Total</i>		75.00	...	75.00	45.00	...	45.00	20.00	...	

No.86/ Department of Space

		(In crores of Rupees)									
Major Head		Budget 2003-2004			Revised 2003-2004			Budget 2004-2005			
		Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	
20.	Kalpana-1 (METSAT-1)	3402	4.92	...	4.92	19.31	...	19.31	...	...	...
		5402	0.08	...	0.08	1.69	...	1.69	...	...	...
	<i>Total</i>		<i>5.00</i>	...	<i>5.00</i>	<i>21.00</i>	...	<i>21.00</i>	...	...	...
21.	RISAT-1	3402	45.00	...	45.00	32.00	...	32.00	115.00	...	115.00
		5402	5.00	...	5.00	3.00	...	3.00	10.00	...	10.00
	<i>Total</i>		<i>50.00</i>	...	<i>50.00</i>	<i>35.00</i>	...	<i>35.00</i>	<i>125.00</i>	...	<i>125.00</i>
22.	G.SAT-4	3402	24.00	...	24.00	25.00	...	25.00	70.00	...	70.00
		5402	1.00	...	1.00	...	...	...	...	...	...
	<i>Total</i>		<i>25.00</i>	...	<i>25.00</i>	<i>25.00</i>	...	<i>25.00</i>	<i>70.00</i>	...	<i>70.00</i>
Total - Satellite Technology			409.82	35.30	445.12	338.12	36.96	375.08	415.60	36.17	451.77
Launch Support, Tracking Network & Range Facility											
23.	Satish Dhawan Space Centre - SHAR	3402	48.49	42.00	90.49	52.83	43.29	96.12	45.40	46.98	92.38
		5402	32.90	...	32.90	28.13	...	28.13	18.72	...	18.72
	<i>Total</i>		<i>81.39</i>	<i>42.00</i>	<i>123.39</i>	<i>80.96</i>	<i>43.29</i>	<i>124.25</i>	<i>64.12</i>	<i>46.98</i>	<i>111.10</i>
24.	Second Launch Pad & Common Facilities	3402	0.16	...	0.16	0.15	...	0.15	0.20	...	0.20
		5402	20.31	...	20.31	72.24	...	72.24	8.20	...	8.20
	<i>Total</i>		<i>20.47</i>	...	<i>20.47</i>	<i>72.39</i>	...	<i>72.39</i>	<i>8.40</i>	...	<i>8.40</i>
25.	ISRO Telemetry, Tracking & Command Network	3402	13.03	12.31	25.34	13.65	11.79	25.44	14.64	11.24	25.88
		5402	9.45	...	9.45	13.59	...	13.59	16.78	...	16.78
	<i>Total</i>		<i>22.48</i>	<i>12.31</i>	<i>34.79</i>	<i>27.24</i>	<i>11.79</i>	<i>39.03</i>	<i>31.42</i>	<i>11.24</i>	<i>42.66</i>
26.	Radar Development Cell	3402	0.88	...	0.88	0.88	...	0.88	1.06	...	1.06
		5402	0.25	...	0.25	0.45	...	0.45	0.25	...	0.25
	<i>Total</i>		<i>1.13</i>	...	<i>1.13</i>	<i>1.33</i>	...	<i>1.33</i>	<i>1.31</i>	...	<i>1.31</i>
Total-Launch Support, Tracking Network & Range Facility			125.47	54.31	179.78	181.92	55.08	237.00	105.25	58.22	163.47
Total-Space Technology			1234.69	219.67	1454.36	1226.11	224.18	1450.29	1538.81	227.94	1766.75
Space Applications											
27.	Space Applications Centre	3402	67.07	42.10	109.17	68.38	42.50	110.88	108.38	42.56	150.94
		5402	7.81	...	7.81	5.91	...	5.91	9.10	...	9.10
	<i>Total</i>		<i>74.88</i>	<i>42.10</i>	<i>116.98</i>	<i>74.29</i>	<i>42.50</i>	<i>116.79</i>	<i>117.48</i>	<i>42.56</i>	<i>160.04</i>
28.	Development and Educational Communication Unit	3402	23.28	4.07	27.35	22.74	3.88	26.62	19.35	3.60	22.95
		5402	10.38	...	10.38	11.48	...	11.48	11.77	...	11.77
	<i>Total</i>		<i>33.66</i>	<i>4.07</i>	<i>37.73</i>	<i>34.22</i>	<i>3.88</i>	<i>38.10</i>	<i>31.12</i>	<i>3.60</i>	<i>34.72</i>
29.	National Natural Resources Management System	3402	54.80	...	54.80	46.72	...	46.72	45.36	...	45.36
30.	Remote Sensing Application Mission(RSAM)	3402	8.00	...	8.00	6.00	...	6.00	6.67	...	6.67
31.	Regional Remote Sensing Service Centers(RRSSC)	3402	5.00	...	5.00	5.52	...	5.52	5.64	...	5.64
		5402	0.67	...	0.67	0.75	...	0.75	1.07	...	1.07
	<i>Total</i>		<i>5.67</i>	...	<i>5.67</i>	<i>6.27</i>	...	<i>6.27</i>	<i>6.71</i>	...	<i>6.71</i>
32.	National Remote Sensing Agency	3402	6.46	2.54	9.00	6.46	2.54	9.00	6.46	7.54	14.00
33.	Disaster Management System	3402	10.00	...	10.00	13.50	...	13.50	15.30	...	15.30
34.	North Eastern Space Applications Centre	3402	5.00	...	5.00	5.00	...	5.00	5.00	...	5.00
Total - Space Applications			198.47	48.71	247.18	192.46	48.92	241.38	234.10	53.70	287.80
Space Sciences											
35.	Physical Research Laboratory	3402	23.21	6.70	29.91	23.67	6.70	30.37	25.50	7.00	32.50
36.	National MST Radar Facility	3402	3.50	...	3.50	3.50	...	3.50	4.00	...	4.00
37.	RESPOND	3402	10.00	...	10.00	10.50	...	10.50	12.00	...	12.00
38.	Sensor Development	3402	28.15	...	28.15	21.97	...	21.97	5.42	...	5.42
39.	Megha-tropiques	3402	5.20	...	5.20	3.20	...	3.20	5.08	...	5.08
40.	Astrosat	3402	10.00	...	10.00	...	...	...	29.00	...	29.00
		5402	...	...	...	...	...	...	1.00	...	1.00
	<i>Total</i>		<i>10.00</i>	...	<i>10.00</i>	...	...	...	<i>30.00</i>	...	<i>30.00</i>
41.	Indian Lunar Mission - Chandrayan - 1	3402	...	...	...	...	...	...	55.00	...	55.00
		5402	...	...	...	...	...	...	15.00	...	15.00
	<i>Total</i>		...	...	...	...	...	...	<i>70.00</i>	...	<i>70.00</i>
42.	ISRO Geosphere Biosphere Programme (ISRO GBP)	3402	...	...	...	...	...	...	12.46	...	12.46
43.	Others	3402	7.21	1.00	8.21	7.69	1.27	8.96	2.91	1.20	4.11
		5402	...	...	...	...	...	...	...	...	...
	<i>Total</i>		<i>7.21</i>	<i>1.00</i>	<i>8.21</i>	<i>7.69</i>	<i>1.27</i>	<i>8.96</i>	<i>2.91</i>	<i>1.20</i>	<i>4.11</i>
Total - Space Sciences			87.27	7.70	94.97	70.53	7.97	78.50	167.37	8.20	175.57

		(In crores of Rupees)								
Major Head	Budget , 2003-2004			Revised, 2003-2004			Budget, 2004-2005			
	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	
Direction & Administration / Other Programmes										
44. Special Indigenisation/Advance Ordering	3402	28.08	...	28.08	16.78	...	16.78	19.54	...	19.54
45. Others	3402	4.40	28.66	33.06	3.41	29.35	32.76	3.41	29.44	32.85
	5402	5.12	...	5.12	1.78	...	1.78	6.72	...	6.72
	<i>Total</i>	9.52	28.66	38.18	5.19	29.35	34.54	10.13	29.44	39.57
Total - Direction & Administration / Other Programmes										
		37.60	28.66	66.26	21.97	29.35	51.32	29.67	29.44	59.11
INSAT Operational										
46. Master Control Facility	3252	6.71	9.58	16.29	5.97	9.59	15.56	8.25	7.74	15.99
	5252	25.26	...	25.26	18.65	...	18.65	19.80	...	19.80
	<i>Total</i>	31.97	9.58	41.55	24.62	9.59	34.21	28.05	7.74	35.79
47. INSAT-3 Satellites (Including Launch Services)	3252	250.05	...	250.05	202.94	...	202.94	89.60	...	89.60
	5252	24.95	...	24.95	31.37	...	31.37	2.40	...	2.40
	<i>Total</i>	275.00	...	275.00	234.31	...	234.31	92.00	...	92.00
48. INSAT-4 Satellites(Including Launch Services)	3252	183.50	...	183.50	177.61	...	177.61	299.32	...	299.32
	5252	1.50	...	1.50	2.39	...	2.39	10.68	...	10.68
	<i>Total</i>	185.00	...	185.00	180.00	...	180.00	310.00	...	310.00
Total - INSAT Operational										
		491.97	9.58	501.55	438.93	9.59	448.52	430.05	7.74	437.79
49. Aid Materials & Equipment-Gross Deduct-Transfers to Functional Major Head	3606	...	0.02	0.02	...	0.14	0.14	...	0.02	0.02
Net-Aid Materials & Equipment	3606	...	-0.02	-0.02	...	-0.14	-0.14	...	-0.02	-0.02
	<i>Total</i>	...	...	...	...	...	...	...	...	...
Grand Total										
		2050.00	318.47	2368.47	1950.00	324.16	2274.16	2400.00	331.29	2731.29
C. Plan Outlay*										
	Head of Dev	Budget Support	IEBR	Total	Budget Support	IEBR	Total	Budget Support	IEBR	Total
1. Space Research	13402	2050.00	...	2050.00	1950.00	...	1950.00	2400.00	...	2400.00

1. **Secretariat – Economic Services:** Provision is made for expenditure to be incurred on the Secretariat of the Department of Space.

2. **Geo-Synchronous Satellite Launch Vehicle (GSLV) Project:** The GSLV is configured by replacing the upper two stages of PSLV by a single cryogenic stage and the six solid strap-on motors by four liquid strap-on motors derived from the PSLV second stage. GSLV will be capable of placing 2 tonne INSAT-class satellites into Geo-synchronous Transfer Orbit. The first developmental flight of GSLV, viz., GSLV-D1, was launched successfully on April 18, 2001, and the G.SAT-1 satellite was injected in orbit.

3. **GSLV Mk-III Development:** GSLV Mk-III is intended to develop a cost effective launch vehicle capable of launching 4 tonne class of communication satellites in Geo-synchronous Transfer Orbit (GTO). The first developmental flight of the vehicle is targeted for realisation during 2007-2008. The sanctioned cost of the Project, approved in May 2002, is Rs. 2498 crores.

4. **Cryogenic Upper Stage (CUS) Project:** The objective of the Project is to develop and qualify an indigenous restartable cryogenic stage employing liquid oxygen as oxidiser and liquid hydrogen as fuel for the upper stage of GSLV. The cryogenic engine has been successfully developed and tested for its full flight duration. The first flight of the indigenous cryo stage is targeted for flight testing by GSLV during 2005-2006.

5. **PSLV Continuation Project:** These launch vehicles are capable of placing 1000-1200 kg class IRS satellites in Sun Synchronous Polar Orbit, 1 tonne class METSAT satellites into

Geo-Synchronous Transfer Orbit (GTO), and 2800 kg class satellites in Low Earth Orbit.

The fifth in the series, the PSLV-C5, has been successfully launched on October 17, 2003, injecting the 1360 kg IRS-P6 (Resourcesat) satellite in Sun Synchronous Polar Orbit. PSLV-C6 is targeted for launch during the second quarter of 2004 with IRS-P5 (Cartosat) as the payload.

6. **Vikram Sarabhai Space Centre:** This is the lead Centre for the development of satellite launch vehicles and sounding rockets. The research and development activities of the Centre are mainly in the areas of avionics, aeronautics, launch vehicles, materials, mechanical engineering, solid propulsion, composites, propellants, systems reliability, polymers and chemicals. VSSC has extension centres at Valiamala housing the major facilities of the Polar Satellite Launch Vehicle (PSLV) and the Geo-Synchronous Satellite Launch Vehicle (GSLV) Projects, and at Vattiyookavu for the development of reinforced plastics and composites (the Reinforced Plastics Facility). An Ammonium Perchlorate Experimental Plant (APEP) is located at Aluva, near Cochin. VSSC also supports the (i) Thumba Equatorial Rocket Launching Station (TERLS), the international sounding rocket range, (ii) Rohini Sounding Rocket (RSR) Programme, and (iii) Space Physics Laboratory (SPL), which carries out research in atmospheric and related space sciences.

7. **ISRO Inertial Systems Unit (IISU):** The major task of IISU is to pursue a strong research and development programme in the critical area of inertial systems, navigation software, actuators and mechanisms, and to realise the flight units of these systems for the launch vehicle and satellite programmes.

- 8. Liquid Propulsion Systems Centre (LPSC):** The Liquid Propulsion Systems Unit (LPSC) with its facilities located at Thiruvananthapuram, Mahendragiri and Bangalore, is the lead centre in the area of liquid propulsion encompassing earth storable and cryogenic propulsion systems for launch vehicle and spacecraft programmes.
- 9. GSLV Operational:** After successful completion of the GSLV developmental programme, in order to cater to the launch of 2 tonne class of INSAT satellites into Geo-Synchronous Transfer Orbit (GTO) during the Tenth Plan and beyond, the GSLV-Operational Project has been conceived. The Project envisages three operational flights (F01, F02 & F03) and advance action for the subsequent three operational flights (F04, F05 & F06).
- 10. Space Capsule Recovery Experiment:** The main objective of the Space Capsule Recovery Experiment is to develop the critical technologies related to re-entry and to conduct micro-gravity research experiments. These are planned to provide technological inputs for future advance reusable launch vehicle systems
- 11. IRS-P5 (Cartosat):** The main objective of IRS-P5 (Cartosat) project, sanctioned in July 1997, is to design and develop, launch and operate an advanced space-based mission with enhanced spatial resolution for large-scale thematic mapping applications and to further stimulate applications in the newer areas of cartography, urban management, disaster assessment and relief planning & management, environmental impact assessment and GIS applications.
- 12. IRS-P6 (Resourcesat):** The main objectives of IRS-P6 (Resourcesat), sanctioned in July 1997, are to provide continued remote sensing data services on an operational basis for integrated land and water resources management at micro-level with enhanced multi-spectral/spatial coverage and stereo viewing capability, and to further carry out studies in advanced areas of user applications like improved crop discrimination, crop yield, crop stress, pest/disease surveillance, disaster management and GIS applications. The satellite has been successfully launched on-board PSLV-C5 on October 17, 2003.
- 13. G.SAT-2:** The satellite carrying transponders for communications was successfully launched on-board GSLV-D2 on May 08, 2003.
- 14. Cartosat-2:** The objective of Cartosat-2 Project is to support high precision large-scale cartographic mapping and thematic applications.
- 15. Oceansat-2:** Taking into account the increased use of space imageries for different applications and continued Earth Observation services required from the IRS satellites, provision has been made for Oceansat-2, which will be mainly for ocean biology and sea state applications.
- 16. Resourcesat-2:** Provision has been made for Resourcesat-2, taking into account the increased use of space imageries for different applications and continued Earth Observation services. The satellite will be mainly for crop applications, vegetation dynamics and natural resources census applications.
- 17. ISRO Satellite Centre (ISAC):** The ISRO Satellite Centre (ISAC) at Bangalore is the lead centre for satellite technology. The research and development activities carried out in ISAC are grouped under electronics systems covering digital systems, power, communications and spacecraft assembly & testing; mechanical systems covering structures, thermal systems and spacecraft mechanisms & control.
- 18. Laboratory for Electro-Optics Systems (LEOS):** The Laboratory for Electro-Optics Systems (LEOS), working under the overall umbrella of the ISAC, is responsible for development and production of sensors which include earth sensors, star sensors, sun sensors, magnetic sensors, temperature sensors and optical gyros for satellites and launch vehicles. LEOS is also responsible for fabrication of various types of optics for satellite cameras and radiometers and development of indigenous detectors for spacecraft use.
- 19. G.SAT-3 (Edusat):** The primary objective of G.SAT-3 is to provide education to the masses of the country. The satellite is planned to be launched during 2004 on-board GSLV. The utilisation of G.SAT-3 will be mainly to demonstrate and operationalise the concepts of multicasting interactive multimedia for the education sector. A sustainable distance education service, primarily for school, college, higher education and non-formal education, will be set up as a supplementary communications medium using advanced ground technology of convergence.
- 20. Kalpana-1 (METSAT-1):** The prime objective of the Project is to support the India Meteorological Department in ensuring availability of meteorological services such as Cyclone Warning Dissemination Service, Meteorological Data Collection and Weather Imagery on a continuous basis. Kalpana-1 (METSAT-1) was successfully launched on September 12, 2002, onboard PSLV-C4, and is working satisfactorily.
- 21. RISAT-1:** Radar Imaging Satellite (RISAT) with active microwave sensors, mainly synthetic aperture radar, is intended to provide all-weather, day and night imaging capability providing vital inputs during khariff season for various agricultural and disaster applications. Besides, with the known sub-surface penetration and the relief measurements capabilities, the microwave imaging from RISAT will aid many other resources management applications, either in a stand-alone mode or in complementary to electro-optical sensors. The satellite is targeted for launch during 2007.
- 22. G.SAT-4:** The satellite will be utilised for conducting various experiments in the communications area and early introduction of geo-based navigation system. The G.SAT-4 is primarily designed as a Ka-band mission. It will also carry a payload for early introduction of geo-based navigation and accuracy & integrity enhancement of Global Positioning System.
- 23. Satish Dhawan Space Centre-SHAR:** The Satish Dhawan Space Centre-SHAR (SDSC-SHAR) is the principal operational centre for launching Sounding Rocket and Satellite Launch Vehicles. The activities at SDSC-SHAR are grouped under vehicle assembly & static test operations, range operations, liquid storage & service facilities and solid propellant space booster plant.
- 24. Second Launch Pad and Common Facilities:** The Second Launch Pad & Common Facilities are being established at the Satish Dhawan Space Centre-SHAR to provide redundancy to the existing launch pad and also to enable launch of future advanced launch vehicles. The Second Launch Pad is nearing completion, and the PSLV-C6 is targeted for launch using the Second Launch Pad during 2004.
- 25. ISRO Telemetry, Tracking and Command Network (ISTRAC):** The ISRO Telemetry, Tracking and Command Network (ISTRAC) provides mission support to low-earth orbit satellites as well as for launch vehicle missions. The other major

responsibilities of ISTRAC are to carryout mission operations for all operational remote sensing and scientific satellites, to provide TTC services from ignition till satellite injection into orbit and to estimate the preliminary orbit in space in case of launch vehicle missions and to take up developmental activities for providing flawless TTC and mission operations services. ISTRAC has established a network of ground stations at Bangalore, Lucknow, Mauritius, Sriharikota, Port Blair and Thiruvananthapuram.

26. Radar Development Cell (RDC): Radar Development Cell (RDC) is responsible for research, development and productionisation of radars.

27. Space Applications Centre (SAC): The main activities of the Space Applications Centre at Ahmedabad include Research and development work in space applications which are primarily aimed at national development. It is also involved in the development of payloads for remote sensing and communication satellites. The activities of SAC are grouped under microwave systems, satellite communication applications, sensor development, image and information processing and remote sensing applications. The Centre has facilities for mechanical and electronic systems fabrication.

28. Development and Educational Communication Unit (DECU): The Development and Educational Communication Unit (DECU) at Ahmedabad is involved in the conception, definition, planning, implementation and socio-economic evaluation of developmental space applications. The major activities of DECU include Training and Development Communication Channel (TDCC), Gramsat Programme (GP), including Gramsat Pilot Projects (GPP), Tele-Health (TH) missions including Tele-medicine (TM), Tele-Education (TE) missions, including Edusat related and new satellite communication applications.

29. National Natural Resources Management System (NNRMS): The National Natural Resources Management System (NNRMS) has the objective of ensuring optimal management/utilisation of natural resources by integrating information derived from remote sensing data with conventional techniques. The NNRMS umbrella includes a large cross-section of Government Departments/Agencies, which are responsible for resources management sectorally and other agencies associated in developmental activities.

A large number of remote sensing application projects in the fields of agriculture, forestry, environment, geology, ground water, disasters (flood, drought, earthquake & landslide), etc., are being carried out under the aegis of NNRMS.

NNRMS also provides support to States towards establishment/augmentation of RS & GIS infrastructure facilities, and sponsors training programmes towards generation of trained manpower & support towards setting up of RS/GIS facilities for strengthening the educational programmes with RS/GIS curricula.

30. Remote Sensing Applications Mission (RSAM): The main goals of the Remote Sensing Applications Missions (RSAM) are to (i) evolve newer applications/R&D programmes based on technology trends leading to operational applications programmes; (ii) guiding total remote sensing applications programmes towards implementation of remote sensing-based solutions, and (iii) steering commercial activities of remote sensing involving development of value-added services.

31. Regional Remote Sensing Service Centres (RRSSCs): Regional Remote Sensing Service Centres (RRSSCs) have been established under the National Natural

Resources Management System (NNRMS) at Bangalore, Dehradun, Jodhpur, Kharagpur and Nagpur with the primary objective of providing remote sensing application services to the users in the region for better planning and optimal utilisation of natural resources and also to bring about awareness amongst the users on the potential of remote sensing.

RRSSCs have implemented many Remote Sensing and GIS-based user projects for various agencies covering agriculture/ horticulture, geology, water resources, forestry & environment, urban applications, coastal & ocean applications, disaster management, etc.

32. National Remote Sensing Agency (NRSA): The National Remote Sensing Agency (NRSA) at Hyderabad is the nodal agency for operational remote sensing activities in the country covering the whole gamut of activities from archival of satellite and serial remote sensing data and their dissemination, to providing value addition for their application. NRSA also operates a fleet of instrumented aircraft and has a satellite data receiving station at Shadnagar, near Hyderabad. The Indian Institute of Remote Sensing (IIRS) of NRSA, located at Dehradun imparts training in various disciplines of remote sensing to user scientists.

33. Disaster Management System: Department of Space/ ISRO has initiated a programme for Disaster Management Support to be implemented during the Tenth Five Year Plan. The major goal of the Programme is to provide decision support through Space-based information on the disasters, their impact, etc. The main components of the Disaster Management Support Programme are (i) Establishment of a Decision Support Centre, (ii) ALTM Surveys & Hazard Zonation, (iii) Database creation & query shell development, (iv) Emergency Communication Support, (v) Airborne SAR Development, (vi) R&D Support for DMS, (vii) Decision Support Tools Development, and (viii) International Charter Support.

34. North Eastern-Space Applications Centre (NE-SAC): The North Eastern-Space Applications Centre (NE-SAC), an autonomous institution under the Department of Space, is a joint initiative of the Department and the North Eastern Council (NEC) and is registered under the Societies' Registration Act. The main objective of NE-SAC is to develop a high-technology infrastructure that will enable the North-Eastern States to adopt space technology inputs into their developmental activities and to develop a strategy to blend space science with human resource development. NE-SAC strives to identify projects benefiting the North Eastern States to be taken up for execution by the Centre as well as jointly with the State Remote Sensing Applications Centres and other agencies.

35. Physical Research Laboratory (PRL): The Physical Research Laboratory (PRL) at Ahmedabad is an autonomous institution mainly funded by the Department of Space through grant-in-aid. PRL is one of the premier research institutions in the country carrying out basic research in several areas of experimental and theoretical physics and earth sciences. PRL is also responsible for the administration of the Udaipur Solar Observatory. Research activities in the area of infrared astronomy, solar and plasma astrophysics, solar and galactic astronomy, geo-cosmo physics, planetary atmospheres, solar-terrestrial physics, laboratory astrophysics, theoretical physics and archaeology & hydrology are carried on.

36. National MST Radar Facility (NMRF): The National Mesosphere, Stratosphere & Troposphere Radar Facility (NMRF) at Gadanki, Tirupati in Andhra Pradesh, is an autonomous

institution under the Department of Space. The state-of-the-art MST Radar Facility for enhancing the scientific understanding of atmospheric, climatic and allied natural phenomena is available to scientists from various institutions and universities to conduct advanced research in atmospheric and space sciences and related disciplines.

37. RESPOND: Sponsored Research (RESPOND) Programme is aimed at strengthening the academic interaction with colleges, universities, institutes of technology and research institutions. The activities supported under RESPOND include (a) research and development projects in space sciences, applications and technology (b) space technology cells (c) space science and applications cells (d) space education programmes (e) ISRO chairs and (f) conferences, symposiums, publication and promotional activities relevant to Indian Space Programme.

38. Sensor/Payload Development : Advanced activities related to scientific payloads development for space science and planetary mission in different institutions and universities are covered under sensor development.

39. Megha-Tropiques: Megha-Tropiques is an ISRO-CNES of France joint mission and is intended for studying water cycle and energy exchanges in the tropics using a satellite platform. The mission envisages development of a satellite using the French PROTEUS bus and mission specific payloads, which will be jointly developed by ISRO and CNES.

40. Astrosat: With the successful working of the Indian X-ray Astronomy Experiment payload on-board the IRS-P3 satellite, a dedicated and state of the art Indian Multi-wavelength Astronomy satellite, 'ASTROSAT', is planned during the Tenth Plan period. The objective of this mission is timing and spectral studies of different types of galactic and extra-galactic celestial sources in ultra-violet, soft X-ray and hard X-ray bands to understand the nature of X-ray sources, high energy process in them and their surroundings.

41. Indian Lunar Mission – Chandrayaan-1: The main objective of the Indian Lunar Mission – Chandrayaan-1 is for expanding the scientific knowledge about the Moon, upgrading the technological capability and providing challenging opportunity for planetary research for a large number of growing young people of the country benefiting the human society at large. The Mission, including the establishment of Deep Space Network, is planned to be realised in a time span of five years. The Chandrayaan-1 is targeted for launch in 2008 on-board the PSLV.

42. ISRO Geosphere Biosphere Programme (ISRO GBP): This Programme encompasses the study of land-air-ocean interaction, past climate, changes in atmospheric composition, aerosols, carbon cycle, bio-mass estimation, biodiversity and other related areas of scientific investigation.

43. Space Sciences - Others: Under Space Sciences – Others, provisions have been included for (a) Balloon Facility (b)

Conferences/Symposia (c) Space Science Promotion (d) Multi-Agency Funded Projects (e) Acoustic Test Facility (f) Micro-gravity Research Application (g) Space Station Experiments.

44. Special Indigenisation/Advance Ordering: Indigenisation required ISRO to have interface with the Indian Industry to develop various electronic components, materials, chemicals, etc.

45. Other Programmes - Others: Under Other Programmes – Others, provisions have been made for the following:

- (a) ISRO Headquarters, Bangalore, with Liaison Offices at Delhi, Mumbai, Paris and Washington, provide overall direction and scientific, technical & managerial support to ISRO centres/units and co-ordination of the projects and programmes of the Department.
- (b) International co-operation includes the provisions for the Centre for Space Services and Technology Education in Asia and the Pacific (CSSTE-AP) and Search & Rescue Project.
- (c) Civil Engineering Division (CED) is responsible for all civil, electrical and air conditioning works required for the various programmes of the Department of Space.

46. Master Control Facility (INSAT-MCF): The Master Control Facility (MCF) located at Hassan in Karnataka is responsible for initial orbit raising, payload testing and in-orbit operation of all geostationary satellites. MCF has integrated facilities comprising satellite control earth stations with associated electronics. The Satellite Control Centre (SCC) is the nerve centre for satellite control operations. A back-up MCF (MCF-B) with essential facilities to manage the satellite operations is being established at Bhopal, Madhya Pradesh.

47. Indian National Satellite-3 (INSAT-3) Satellite (including Launch Services): The objectives of INSAT-3 Spacecraft Project are to (i) build five INSAT-3 satellites (INSAT-3A to 3E) keeping flexibility for mid-course corrections to accommodate emerging requirements, carry out mission planning, launch campaign and initial phase operations, and (ii) establish required programme elements for carrying out the same.

48. Indian National Satellite-4 (INSAT-4) Satellites (including Launch Services): The fourth generation INSAT-4 Satellite series has been planned to meet the capacity and service requirements projected for the Tenth Five Year Plan period. A total of 7 satellites are planned to be launched under INSAT-4 series. The objective of the Project is to design and develop high power satellites with 12 C-band and 12 Ku-band transponders which will enhance the capacity of the INSAT system considerably.