

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 2002-2003			Revised 2002-2003			Budget 2003-2004		
		Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total
Revenue		1637.75	313.87	1951.62	1542.85	313.87	1856.72	1569.97	318.47	1888.44
Capital		312.25	...	312.25	307.15	...	307.15	480.03	...	480.03
Total		1950.00	313.87	2263.87	1850.00	313.87	2163.87	2050.00	318.47	2368.47
1. Secretariat - Economic Services	3451	...	3.85	3.85	...	4.03	4.03	...	4.15	4.15
Space Research										
Rocket Development										
2. Geo -Synchronous Satellite Launch Vehicle	3402	101.13	...	101.13	85.13	...	85.13	70.00	...	70.00
3. GSLV MK-III Development.	3402	163.00	...	163.00	101.96	...	101.96	66.27	...	66.27
	5402	17.00	...	17.00	73.04	...	73.04	213.73	...	213.73
<i>Total</i>		<i>180.00</i>	...	<i>180.00</i>	<i>175.00</i>	...	<i>175.00</i>	<i>280.00</i>	...	<i>280.00</i>
4. Cryogenic Upper Stage (CUS) Project	3402	15.56	...	15.56	18.61	...	18.61	15.41	...	15.41
	5402	0.82	...	0.82	0.77	...	0.77	1.29	...	1.29
<i>Total</i>		<i>16.38</i>	...	<i>16.38</i>	<i>19.38</i>	...	<i>19.38</i>	<i>16.70</i>	...	<i>16.70</i>
5. Polar Satellite Launch Vehicle - Continuation Project	3402	40.28	...	40.28	55.94	...	55.94	59.00	...	59.00
	5402	20.00	...	20.00	8.06	...	8.06	8.00	...	8.00
<i>Total</i>		<i>60.28</i>	...	<i>60.28</i>	<i>64.00</i>	...	<i>64.00</i>	<i>67.00</i>	...	<i>67.00</i>
6. Vikram Sarabhai Space Centre	3402	64.55	97.09	161.64	59.37	96.91	156.28	68.03	96.65	164.68
	5402	15.15	...	15.15	17.87	...	17.87	8.87	...	8.87
<i>Total</i>		<i>79.70</i>	<i>97.09</i>	<i>176.79</i>	<i>77.24</i>	<i>96.91</i>	<i>174.15</i>	<i>76.90</i>	<i>96.65</i>	<i>173.55</i>
7. Indian Space Research Organisation - Inertial Systems Unit(IISU).	3402	8.72	...	8.72	9.50	...	9.50	11.20	...	11.20
	5402	1.41	...	1.41	1.01	...	1.01	0.59	...	0.59
<i>Total</i>		<i>10.13</i>	...	<i>10.13</i>	<i>10.51</i>	...	<i>10.51</i>	<i>11.79</i>	...	<i>11.79</i>
8. Satish Dhawan Space Centre - SHAR	3402	40.34	41.77	82.11	54.40	41.48	95.88	48.49	42.00	90.49
	5402	19.23	...	19.23	15.43	...	15.43	32.90	...	32.90
<i>Total</i>		<i>59.57</i>	<i>41.77</i>	<i>101.34</i>	<i>69.83</i>	<i>41.48</i>	<i>111.31</i>	<i>81.39</i>	<i>42.00</i>	<i>123.39</i>
9. ISRO Telemetry, Tracking & Command Network	3402	12.79	11.35	24.14	14.92	11.26	26.18	13.03	12.31	25.34
	5402	11.13	...	11.13	9.98	...	9.98	9.45	...	9.45
<i>Total</i>		<i>23.92</i>	<i>11.35</i>	<i>35.27</i>	<i>24.90</i>	<i>11.26</i>	<i>36.16</i>	<i>22.48</i>	<i>12.31</i>	<i>34.79</i>
10. Liquid Propulsion Systems Centre	3402	27.86	33.35	61.21	31.02	32.95	63.97	36.39	33.41	69.80
	5402	12.69	...	12.69	5.23	...	5.23	9.19	...	9.19
<i>Total</i>		<i>40.55</i>	<i>33.35</i>	<i>73.90</i>	<i>36.25</i>	<i>32.95</i>	<i>69.20</i>	<i>45.58</i>	<i>33.41</i>	<i>78.99</i>
11. Second Launch Pad & Common Facilities	3402	0.70	...	0.70	0.34	...	0.34	0.16	...	0.16
	5402	44.30	...	44.30	69.66	...	69.66	20.31	...	20.31
<i>Total</i>		<i>45.00</i>	...	<i>45.00</i>	<i>70.00</i>	...	<i>70.00</i>	<i>20.47</i>	...	<i>20.47</i>
12. Radar Development Cell	3402	0.98	...	0.98	0.91	...	0.91	0.88	...	0.88
	5402	0.60	...	0.60	0.31	...	0.31	0.25	...	0.25
<i>Total</i>		<i>1.58</i>	...	<i>1.58</i>	<i>1.22</i>	...	<i>1.22</i>	<i>1.13</i>	...	<i>1.13</i>
13. GSLV Continuation Project	3402	20.00	...	20.00	30.93	...	30.93	96.55	...	96.55
	5402	5.00	...	5.00	3.87	...	3.87	3.45	...	3.45
<i>Total</i>		<i>25.00</i>	...	<i>25.00</i>	<i>34.80</i>	...	<i>34.80</i>	<i>100.00</i>	...	<i>100.00</i>
14. Space Capsule Recovery Experiment	3402	19.00	...	19.00	8.43	...	8.43	31.43	...	31.43
	5402	1.00	...	1.00	0.22	...	0.22	...	...	...
<i>Total</i>		<i>20.00</i>	...	<i>20.00</i>	<i>8.65</i>	...	<i>8.65</i>	<i>31.43</i>	...	<i>31.43</i>
Total - Rocket Development		663.24	183.56	846.80	676.91	182.60	859.51	824.87	184.37	1009.24
Setellite Development										
15. IRS P5(Cartosat)	3402	15.09	...	15.09	25.04	...	25.04	8.49	...	8.49
	5402	2.11	...	2.11	5.50	...	5.50	1.92	...	1.92
<i>Total</i>		<i>17.20</i>	...	<i>17.20</i>	<i>30.54</i>	...	<i>30.54</i>	<i>10.41</i>	...	<i>10.41</i>
16. IRS P6(Resourcesat)	3402	10.06	...	10.06	13.29	...	13.29	9.14	...	9.14
	5402	6.94	...	6.94	4.35	...	4.35	1.29	...	1.29
<i>Total</i>		<i>17.00</i>	...	<i>17.00</i>	<i>17.64</i>	...	<i>17.64</i>	<i>10.43</i>	...	<i>10.43</i>
17. G-SAT-2	3402	10.00	...	10.00	13.00	...	13.00	10.00	...	10.00

		<i>(In crores of Rupees)</i>								
Major Head		Budget 2002-2003			Revised 2002-2003			Budget 2003-2004		
		Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total
18. IRS-IIA (Cartosat-2) Satellite	3402	50.46	...	50.46	29.64	...	29.64	52.90	...	52.90
	5402	10.10	...	10.10	18.74	...	18.74	23.59	...	23.59
	<i>Total</i>	<i>60.56</i>	<i>...</i>	<i>60.56</i>	<i>48.38</i>	<i>...</i>	<i>48.38</i>	<i>76.49</i>	<i>...</i>	<i>76.49</i>
19. IRS-II B/C	3402	5.00	...	5.00	...	...	...	20.00	...	20.00
20. ISRO Satellite Centre	3402	40.73	35.47	76.20	48.83	35.03	83.86	55.89	35.30	91.19
	5402	28.20	...	28.20	10.20	...	10.20	61.16	...	61.16
	<i>Total</i>	<i>68.93</i>	<i>35.47</i>	<i>104.40</i>	<i>59.03</i>	<i>35.03</i>	<i>94.06</i>	<i>117.05</i>	<i>35.30</i>	<i>152.35</i>
21. Laboratory for Electro-Optics System	3402	10.64	...	10.64	7.77	...	7.77	9.17	...	9.17
	5402	3.55	...	3.55	4.65	...	4.65	1.27	...	1.27
	<i>Total</i>	<i>14.19</i>	<i>...</i>	<i>14.19</i>	<i>12.42</i>	<i>...</i>	<i>12.42</i>	<i>10.44</i>	<i>...</i>	<i>10.44</i>
22. G-SAT 3 (Edusat)	3402	10.00	...	10.00	7.00	...	7.00	74.00	...	74.00
	5402	...	...	...	...	...	...	1.00	...	1.00
	<i>Total</i>	<i>10.00</i>	<i>...</i>	<i>10.00</i>	<i>7.00</i>	<i>...</i>	<i>7.00</i>	<i>75.00</i>	<i>...</i>	<i>75.00</i>
23. METSAT	3402	28.19	...	28.19	24.58	...	24.58	4.92	...	4.92
	5402	6.81	...	6.81	5.42	...	5.42	0.08	...	0.08
	<i>Total</i>	<i>35.00</i>	<i>...</i>	<i>35.00</i>	<i>30.00</i>	<i>...</i>	<i>30.00</i>	<i>5.00</i>	<i>...</i>	<i>5.00</i>
24. RISAT-1	3402	28.00	...	28.00	...	...	...	45.00	...	45.00
	5402	2.00	...	2.00	...	...	...	5.00	...	5.00
	<i>Total</i>	<i>30.00</i>	<i>...</i>	<i>30.00</i>	<i>...</i>	<i>...</i>	<i>...</i>	<i>50.00</i>	<i>...</i>	<i>50.00</i>
25. GSAT-4	3402	...	...	...	...	...	...	24.00	...	24.00
	5402	...	...	...	...	...	...	1.00	...	1.00
	<i>Total</i>	<i>...</i>	<i>...</i>	<i>...</i>	<i>...</i>	<i>...</i>	<i>...</i>	<i>25.00</i>	<i>...</i>	<i>25.00</i>
Total - Satellite Development		267.88	35.47	303.35	218.01	35.03	253.04	409.82	35.30	445.12
Space Applications										
26. Space Applications Centre	3402	59.27	40.24	99.51	49.76	41.24	91.00	67.07	42.10	109.17
	5402	12.97	...	12.97	9.33	...	9.33	7.81	...	7.81
	<i>Total</i>	<i>72.24</i>	<i>40.24</i>	<i>112.48</i>	<i>59.09</i>	<i>41.24</i>	<i>100.33</i>	<i>74.88</i>	<i>42.10</i>	<i>116.98</i>
27. Development and Educational Communication Unit	3402	1.15	4.18	5.33	5.83	3.99	9.82	23.28	4.07	27.35
	5402	29.59	...	29.59	7.73	...	7.73	10.38	...	10.38
	<i>Total</i>	<i>30.74</i>	<i>4.18</i>	<i>34.92</i>	<i>13.56</i>	<i>3.99</i>	<i>17.55</i>	<i>33.66</i>	<i>4.07</i>	<i>37.73</i>
28. National Natural Resources Management System	3402	40.13	...	40.13	26.63	...	26.63	54.80	...	54.80
29. Remote Sensing Application Mission(RSAM)	3402	8.10	...	8.10	5.32	...	5.32	8.00	...	8.00
30. Regional Remote Sensing Service Centers(RRSSC)	3402	4.97	...	4.97	4.92	...	4.92	5.00	...	5.00
	5402	0.73	...	0.73	0.74	...	0.74	0.67	...	0.67
	<i>Total</i>	<i>5.70</i>	<i>...</i>	<i>5.70</i>	<i>5.66</i>	<i>...</i>	<i>5.66</i>	<i>5.67</i>	<i>...</i>	<i>5.67</i>
31. National Remote Sensing Agency	3402	7.46	2.54	10.00	7.46	2.54	10.00	6.46	2.54	9.00
32. Disaster Management System	3402	10.00	...	10.00	2.80	...	2.80	10.00	...	10.00
33. North Eastern Space Applications Centre	3402	5.00	...	5.00	5.00	...	5.00	5.00	...	5.00
Total - Space Applications		179.37	46.96	226.33	125.52	47.77	173.29	198.47	48.71	247.18
Space Sciences										
34. Physical Research Laboratory	3402	19.82	6.70	26.52	19.93	6.70	26.63	23.21	6.70	29.91
35. National MST Radar Facility	3402	...	...	...	...	...	...	3.50	...	3.50
36. RESPOND	3402	...	...	...	...	...	...	10.00	...	10.00
37. Sensor Development	3402	16.40	...	16.40	2.15	...	2.15	28.15	...	28.15
38. Megha-tropiques	3402	5.35	...	5.35	2.13	...	2.13	5.20	...	5.20
39. Astrosat	3402	...	...	...	...	...	...	10.00	...	10.00
40. Others	3402	20.33	0.85	21.18	16.83	1.15	17.98	7.21	1.00	8.21
Total - Space Sciences		61.90	7.55	69.45	41.04	7.85	48.89	87.27	7.70	94.97
Other Programmes										
41. Special Indigenisation/Advance Ordering	3402	...	...	...	...	...	...	28.08	...	28.08
42. Others	3402	26.19	28.30	54.49	12.18	28.41	40.59	4.40	28.66	33.06
	5402	3.52	...	3.52	2.35	...	2.35	5.12	...	5.12
	<i>Total</i>	<i>29.71</i>	<i>28.30</i>	<i>58.01</i>	<i>14.53</i>	<i>28.41</i>	<i>42.94</i>	<i>9.52</i>	<i>28.66</i>	<i>38.18</i>
Total - Other Programme		29.71	28.30	58.01	14.53	28.41	42.94	37.60	28.66	66.26

(In crores of Rupees)

Major Head	Budget, 2002-2003			Revised, 2002-2003			Budget, 2003-2004			
	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	
INSAT Operational										
43. Master Control Facility	3252	5.30	8.18	13.48	7.11	8.18	15.29	6.71	9.58	16.29
	5252	12.90	...	12.90	12.02	...	12.02	25.26	...	25.26
	<i>Total</i>	<i>18.20</i>	<i>8.18</i>	<i>26.38</i>	<i>19.13</i>	<i>8.18</i>	<i>27.31</i>	<i>31.97</i>	<i>9.58</i>	<i>41.55</i>
44. INSAT-3 Satellites	3252	256.20	...	256.20	187.92	...	187.92	250.05	...	250.05
(Including Launch Services)	5252	38.50	...	38.50	20.67	...	20.67	24.95	...	24.95
	<i>Total</i>	<i>294.70</i>	<i>...</i>	<i>294.70</i>	<i>208.59</i>	<i>...</i>	<i>208.59</i>	<i>275.00</i>	<i>...</i>	<i>275.00</i>
45. INSAT-4 Satellites(Including Launch Services)	3252	429.00	...	429.00	546.27	...	546.27	183.50	...	183.50
	5252	6.00	...	6.00	...	...	...	1.50	...	1.50
	<i>Total</i>	<i>435.00</i>	<i>...</i>	<i>435.00</i>	<i>546.27</i>	<i>...</i>	<i>546.27</i>	<i>185.00</i>	<i>...</i>	<i>185.00</i>
Total - INSAT Operational		747.90	8.18	756.08	773.99	8.18	782.17	491.97	9.58	501.55
46. Aid Materials & Equipment-Gross Deduct-Transfers to Functional Major Head	3606	...	0.02	0.02	...	0.02	0.02	...	0.02	0.02
	3606	...	-0.02	-0.02	...	-0.02	-0.02	...	-0.02	-0.02
<i>Net-Aid Materials & Equipment</i>	<i>Total</i>	<i>...</i>	<i>...</i>	<i>...</i>	<i>...</i>	<i>...</i>	<i>...</i>	<i>...</i>	<i>...</i>	<i>...</i>
Grand Total		1950.00	313.87	2263.87	1850.00	313.87	2163.87	2050.00	318.47	2368.47
C. Plan Outlay*										
	Head of Dev	Budget Support	IEBR	Total	Budget Support	IEBR	Total	Budget Support	IEBR	Total
1. Space Research	13402	1950.00	...	1950.00	1850.00	...	1850.00	2050.00	...	2050.00

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:** GSLV will be capable of placing 2,500 kg INSAT-2 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. The second developmental flight, viz., GSLV-D2, is planned for launch during the fourth quarter of 2002-2003 carrying G.SAT-2 with special purpose communication transponders.

3. **GSLV MK-III Development:** GSLV Mk-III, capable of launching 4 tonne class of satellites in Geo-synchronous Transfer Orbit (GTO), is a cost effective vehicle largely derived from the existing technologies.

4. **Cryogenic Upper Stage (CUS) Project:** The objective of the Cryogenic Upper Stage Project is to develop and qualify a restartable Cryogenic Stage using Liquid Oxygen and Liquid Hydrogen for the upper stage of GSLV.

5. **Polar Satellites Launch Vehicles (PSLV) Continuation Project:** These launch vehicles are capable of placing 1000-1200 kg class IRS satellites in Polar sun Synchronous Orbit and 2800 kg class satellites in Low Earth Orbit. The first of the operational flight of PSLV-C series (PSLV-C1) was successfully launched from Sriharikota on September 29, 1997, and the second, PSLV-C2, on May 26, 1999. PSLV-C2 injected IRS-P4 (Oceansat) as well as two foreign satellites, KITSAT-3 and TUBSAT, heralding India's entry into commercial launch vehicle market. The third flight, PSLV-C3, was successfully launched on October 22, 2001, with the Technology Experiment Satellite (TES), PROBA of Belgium and BIRD of Germany. The fourth flight, PSLV-C4, was successfully launched on September 12, 2002, injecting the 1060 kg METSAT in the Geosynchronous Transfer Orbit (GTO). This is the first time that a PSLV has been used to put a satellite in GTO.

6. **Vikram Sarabhai Space Centre:** This is the lead Centre for all rocket and launch vehicle programmes. 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. The main thrust of the work in the Centre is towards indigenous development of rockets and satellite launch vehicles with their associated control and guidance systems and electronics.

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 for satellite launch vehicles and allied inertial components and systems for satellite programmes of ISRO.

8. **Satish Dhawan Space Centre-SHAR:** The Sriharikota (SHAR) Centre is the main launch centre of ISRO. It caters to the production of solid propellant rocket boosters, qualification of rocket motors and their sub-systems, integration, check-out and launch of satellite launch vehicles, launch of balloons and sounding rockets, liquid propellants and cryo propellants, tracking and telecommand stations, range & flight safety, storage and servicing facilities.

9. **ISRO Telemetry, Tracking and Command Network (ISTRAC):** The ISTRAC has the prime responsibility to provide TTC and Spacecraft Control support for ISRO's near-earth orbit and Launch Vehicle missions. To realise its objectives, ISTRAC has an integrated ground network stations at Bangalore, Lucknow, Sriharikota, Port Blair, Thiruvananthapuram, Mauritius, Bearslake, Biak Indonesia and Brunei, and a multi-mission Spacecraft Control Centre co-located with the Bangalore Ground Station. It is also in-charge of operations of the Local User Terminal/Mission Control Centre (LUT/MCC) under the International Programme for Satellite Aided Search and Rescue.

10. **Liquid Propulsion Systems Centre (LPSC):** LPSC is the lead centre for R&D in liquid and cryogenic propulsion stages for launch vehicles and auxiliary propulsion systems for both launch vehicles and satellites. It has the responsibility of research and development in cryogenic engines, propulsion systems including fluid components, spacecraft propulsion systems engineering, transducer manufacturing and precision fabrication.

11. **Second Launch Pad and Common Facilities:** The Second Launch Pad being established at Satish Dhawan Space Centre-SHAR to provide redundancy to the existing launch pad and also to enable launch of future advanced launch vehicles.

12. **Radar Development Cell (RDC):** Radar Development Cell (RDC) is responsible for research, development and production of radars.

13. **GSLV-Continuation Project:** After the successful completion of GSLV developmental programme, in order to cater to the launch of 2.5 tonne class of satellites into Geo-Synchronous Transfer Orbit (GTO), the GSLV-Continuation Project is planned. The GSLV-C Project provides for three operational flights and procurement and fabrication of long-lead items and materials for the subsequent three flights.

14. **Space Capsule Recovery Experiment:** The Space Capsule Recovery Experiment is to develop the critical technologies related to the re-entry and to conduct microgravity research experiments. These are planned to provide technological inputs for future advanced reusable launch vehicle systems.

15. **IRS-P5 (Cartosat):** The main objective of the project is to design, 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 and management, environmental impact assessment and Geographical Information Systems (GIS) applications. The satellite is targeted for launch during 2003-2004 on-board PSLV-C6.

16. **IRS-P6 (Resourcesat):** The main objective of the project is 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 Geographic Information System (GIS) applications. The satellite is targeted for launch during 2003 on board PSLV-C5.

17. **G.SAT-2:** The main objective of the project is to design and develop a communication test satellite for the second developmental flight of GSLV. The satellite is planned to be launched during the current financial year on-board GSLV-D2.

18. **IRS-II A (Cartosat-2):** The objective of IRS-IIA Satellite (Cartosat-2) Project is to support high precision large-scale cartographic mapping and thematic applications. The satellite is planned to be launched during 2003-2004 onboard PSLV-C7.

19. **IRS-IIB/C (Oceansat-2/Resourcesat-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 IRS-II B/C Satellites (Oceansat-2 and Resourcesat-2). While Oceansat-2 will be mainly for ocean biology and sea state applications, Resourcesat-2 will be mainly for crop applications, vegetation dynamics and natural resources census applications.

20. **ISRO Satellite Centre (ISAC):** ISAC is the lead centre for satellite technology and is entrusted with the prime responsibility of implementing indigenous spacecraft projects for various scientific, technological and applications missions. The research and development activities of this centre cover digital systems, power systems, communications, altitude control, spacecraft assembly and testing, structures, thermal control, spacecraft mission computers, etc.

21. **Laboratory for Electro-Optics Systems (LEOS):** LEOS under the overall umbrella of ISRO Satellite Centre (ISAC), carries out research and development in the field of electro-optic sensors and systems for launch vehicles and satellites.

22. **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 the third developmental flight of GSLV.

23. **METSAT:** Taking advantage of the Geo-stationary Transfer Orbit (GTO) capability of the indigenous PSLV and in response to pressing user requirements, the first meteorological satellite, METSAT-1, carrying Very High Resolution Radiometer (VHRR) and Data Relay Transponder (DRT) was successfully launched on September 12, 2002, onboard PSLV-C4.

24. **RISAT-1:** The Radar Imaging Satellite (RISAT-1) with active microwave sensors, mainly synthetic aperture radar, is intended to provide all-weather capability crucial for many vital applications including agriculture, forestry, soil moisture, hydrology and disaster management support applications. RISAT-1 is mainly for crops, terrain and flood inundation and damage assessment applications, specifically during cloud season.

25. **G.SAT.4:** The satellite will be utilised for conducting various experiments in the communication area, early introduction of geo-based navigation system and for providing advanced technologies in bus system. The satellite is planned for launch during 2005.

26. **Space Applications Centre (SAC):** SAC is entrusted with the task of research and development works in satellite communications, remote sensing, geodesy and meteorology. It is also responsible for the development of payload for remote sensing and communication satellites and for the planning and execution of the identified application projects and for generation of necessary hardware and software for such projects.

27. **Development and Educational Communication Unit (DECU):** DECU is involved in the conception, definition, planning, implementation and socio/techno-economic evaluation of space applications programmes. Its primary functions include organising space application experiments and demonstrations providing communication support for application projects, planning and policy studies on the application of space technology, production of video programmes on education, transfer of technology/expertise and social science research on the society-technology interface.

28. **National Natural Resources Management System (NNRMS):** The main objective of the NNRMS is optimal management of the country's natural resources using remote sensing data in conjunction 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, flood, drought, earthquake and landslide are being carried out under the aegis of NNRMS. Some of the other activities planned include Natural Resources Census, Large Scale Mapping, Land Use/Land Cover Mapping, Soils and Land Degradation Mapping, Geomorphological Mapping, Urban Information System and inputs to Disaster Management System (DMS).

29. **Remote Sensing Applications Mission (RSAM):** The main aim of RSAM has been to pursue the goals of NNRMS through (i) development and utilisation of operational remote sensing applications, (ii) evolving newer applications/R&D programme based on technology trends leading to operational applications programmes, (iii) guiding total applications programmes for implementation of remote sensing based solutions, and (iv) steering commercial activities of remote sensing involving development of value added services.

30. Regional Remote Sensing Service Centres (RRSSCs): The RRSSCs have been established as part of NNRMS to provide visual/digital analysis support to national projects and users to develop specific theme oriented software packages, evolve/develop operational methodology in newer areas of applications and impart training on remote sensing, digital image processing and Geographical Information System. There are, at present, five RRSSCs located at Bangalore, Dehradun, Jodhpur, Kharagpur and Nagpur.

31. National Remote Sensing Agency (NRSA): NRSA, an autonomous body under the Department of Space, is responsible for acquisition, processing and dissemination of satellite and aerial remote sensing data, training of user scientists in various applications/studies for resource mapping/disaster monitoring and essential research and development activities in all its areas of operations.

32. Disaster Management System: With the vast experience gained through operational use of space data, the concept of a space-based observation and communication system for disaster management is being evolved in the country. The mechanism encompasses many capacity building measures, viz., establishment of a Decision Support Centre (DSC) interfacing with National & State Disaster Management Systems, reorganising the infrastructure for the real-time and conjunctive use of aerial and satellite services, and supportive R&D efforts. The main objective of this service is to provide timely information, meeting the user needs in terms of content, turn-around-time and format. Such information will be disseminated to the Central and State User Agencies. ISRO is also participating in the International Charter on Space & Major Disasters aimed at efficient use of space technology in disaster management through developing long-term working relationship between civil protection authorities and space agencies.

33. North Eastern - Space Applications Centre (NE-SAC): The NE-SAC, an autonomous institution under the Department of Space, has the responsibility to provide an operational high-technology infrastructure to enable the North Eastern States to adopt space technology inputs into their developmental activities and to blend space science with human resource development. The Centre will address areas in natural resources management and developmental communications, besides encouraging space science research in the region.

34. Physical Research Laboratory (PRL): The PRL, an autonomous institution under the Department of Space, is the premier institution for research in space and allied sciences. It is also entrusted with the management of the Udaipur Solar Observatory (USO) and the Infrared Observatory at Mount Abu, Rajasthan.

35. 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.

36. RESPOND: The Sponsored Research (RESPOND) Programme supports research and developmental activities at the R&D and academic institutions in the Space Science, Application and Technology areas of relevance to ISRO Projects/ Programmes.

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

38. Megha-tropiques: Megha-tropiques, an ISRO-CNES (France) joint mission, has been formulated as a result of detailed

studies carried out on global observation of climate. The prime responsibility of ISRO will be the development of micro-wave multi frequency imaging radiometer payload along with the associated structural interface and thermal control, besides launching the satellite on-board PSLV.

39. Astrosat: With the successful working of the Indian X-ray Astronomy Experiment Payload on-board the IRS-P3 satellite, a dedicated state of the art Indian Multi-wavelength Astronomy satellite 'Astrosat' is planned. The principal objective of this mission is timing and spectral studies of different types of galactic and extra-galactic celestial sources to understand the nature of X-ray sources, high energy process in them and their surroundings. This satellite is planned for launch on-board PSLV.

40. Others: Under Space Sciences - Others, provisions have been included for the following:

- (a) ISRO Geosphere-Bio-sphere Programme
- (b) Balloon Facility
- (c) Symposia/Conferences
- (d) Space Promotion and Inter-agency Space Science Project
- (e) ISRO Computer Network/Software Development
- (f) Multi-Agency Funded Projects
- (g) Acoustic Test Facility
- (h) Micro-gravity Research Application Recovery Modules
- (i) Space Station Experiments

41. Special Indigenisation/Advance Ordering: Provision has been made for the procurement of critical materials/components which have long procurement/ manufacture lead times and for indigenous development of strategic items.

42. 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.

43. Master Control Facility (INSAT-MCF): INSAT-MCF is responsible for control and operation of INSAT and G.SAT satellites in orbit including monitoring the health of the satellites, orbit manoeuvres, station keeping and on orbit operation of the satellites.

44. Indian National Satellite-3 (INSAT-3) Satellites (including launch services): The objective of INSAT-3 Spacecraft Project is (i) to 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) to establish required programme elements for carrying out the same. INSAT-3B was launched on March 22, 2000, and INSAT-3C on January 24, 2002. INSAT-3A is scheduled for launch during the fourth quarter of 2002-2003 and INSAT-3E during 2003-2004.

45. Indian National Satellite-4 (INSAT-4) Satellites (including launch services): The fourth generation INSAT-4 satellite series has been planned to meet the capacity & service requirements projected for the Tenth Five Year Plan. One of the primary considerations in configuring the INSAT-4 has been the planned availability of GSLV MK-II with a lift-off capability of 2 tonne satellites. A total of 7 satellites are planned for launch under INSAT-4 series.