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**ACTIVITIES OF NATIONAL REMOTE SENSING
CENTRE**

DEPARTMENT OF SPACE

**PUBLIC ACCOUNTS COMMITTEE
2012-2013**

SIXTIETH REPORT

FIFTEENTH LOK SABHA



**LOK SABHA SECRETARIAT
NEW DELHI**

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PUBLIC ACCOUNTS COMMITTEE
(2012-2013)

(FIFTEENTH LOK SABHA)

ACTIVITIES OF NATIONAL REMOTE
SENSING CENTRE

DEPARTMENT OF SPACE

Presented to Lok Sabha on 30.8.2012
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LOK SABHA SECRETARIAT
NEW DELHI

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1. Shri Devender Singh — *Joint Secretary*
2. Shri Abhijit Kumar — *Director*
3. Ms. Miranda Ingudam — *Under Secretary*

*Elected *w.e.f.* 29th August, 2011 *vide* the vacancy occurred *vice* Smt. Jayanti Natarajan appointed Minister *w.e.f.* 12th July, 2011.

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INTRODUCTION

I, the Chairman, Public Accounts Committee (2012-13), having been authorised by the Committee, do present this Sixtieth Report (Fifteenth Lok Sabha) on '**Activities of National Remote Sensing Centre**' based on the C&AG Report No. 21 of 2010-11 (Performance Audit), relating to the Department of Space (DoS).

2. The above-mentioned Report of the Comptroller and Auditor General of India was laid in Parliament on 18th March, 2011.

3. The predecessor Public Accounts Committee (2011-12) took up the subject for detailed examination and report. A Sub-Committee headed by Dr. Girija Vyas, MP and a Member of the Committee was specifically constituted for the purpose. The Sub-Committee procured written reply and took evidence of the representatives of the Department of Space on the subject at their sitting held on 11.01.2012. The subject was subsequently carried forward by the successor Committee (2012-13) for examination. The Draft Report was placed before the main Committee for consideration and adoption. The Committee adopted the Draft Report at their sitting held on 23.08.2012. The Minutes of the sittings are appended to the Report.

4. For facility of reference and convenience, the Observations and Recommendations of the Committee have been printed in thick type and form Part-II of the Report.

5. The Committee thank their predecessor Committee and the Sub-Committee for taking oral evidence of the Department of Space and obtaining the requisite information on the subject.

6. The Committee would also like to express their thanks to the representatives of the Department of Space for tendering evidence before the Sub-Committee and furnishing information that the Committee desired in connection with the examination of the subject.

7. The Committee place on record their appreciation of the assistance rendered to them in the matter by the Office of the Comptroller and Auditor General of India.

NEW DELHI;
28 August, 2012

6 Bhadrapada, 1934 (Saka)

DR. MURLIMANO HAR JOSHI
Chairman,
Public Accounts Committee.

REPORT

PART - I

I. INTRODUCTORY

National Remote Sensing Centre (NRSC), a unit of Indian Space Research Organisation (ISRO) is the nodal agency for remote sensing activities, which involves acquisition and archival of satellite/aerial remote sensing data and its dissemination. NRSC is also a vital unit in the chain of activities involved in the design, development, realization, launch and utilization of remote sensing satellites in the country. Erstwhile National Remote Sensing Agency (NRSA) was an autonomous organisation under the Department of Space (DoS) upto August 2008. It was converted into a Government organisation with effect from 1st September 2008. The Remote Sensing Data Policy of India, 2001 vested NRSC with the sole authority to acquire and disseminate all remote sensing data in the country subject to specific guidelines stipulated to protect national security interests.

2. During the years 2003-04 to 2008-09, NRSC received grants from the DoS and incurred an expenditure of ₹ 657.78 crore which was exclusive of the cost of satellites and their launching. During the same period, NRSC generated internal revenue of ₹ 528.25 crore from the sale of data products and remote sensing application projects. From 1st September 2008, NRSC became a centre of DoS and, therefore, received money as budget allocation from DoS instead of grants-in-aid.

3. The major objectives of the NRSC are acquisition and processing of remote sensing data from various Indian and foreign remote sensing satellites and their supply to users in India and abroad; airborne remote sensing for aerial photography, aero-magnetic survey and aerial laser terrain mapper etc.; and remote sensing application projects.

II. AUDIT REVIEW

4. The Performance Audit of the activities of NRSC was conducted by the C&AG between June 2008 to May 2009 covering six years, from 2003-04 to 2008-09. The main objectives of the Performance Audit were to assess:—

- Effectiveness of utilisation of the remote sensing satellites, acquisition and processing of remote sensing satellite data.
- Whether the sale of data products resulted in maximisation of revenue.
- Effectiveness of airborne remote sensing and completion of projects on time.
- Whether the remote sensing application projects were helping in the efficient management of national resources in the fields of agriculture, water resources, urban development and disaster management.

- Whether adequate training on remote sensing was imparted.
- Whether the financial management was effective in aiding NRSC in carrying out its mandated activities.

5. The critical Audit observations are as under:

- Performance of three out of the seven remote sensing satellites were below their maximum capacity in terms of the number of remote sensing satellite data captured by them. The revenue realised from seven satellites in operation was not up to the desired level. The satellites were planned without adequate thematic data need assessment. Idling of acquired IRS data was high due to non-adoption of appropriate marketing strategy. There were also delays in data processing impacting the delivery of available data products.
- The efforts of NRSC were not adequate in customising the data according to the needs of private users and also in exploring the possibility of widening the customer base. The sale of data products to private users did not improve as recommended by the Standing Committee of Parliament of DoS. Further, there was scope for enhancing the rates of IRS data products in line with international rates.
- Aircrafts performing the task of aerial remote sensing could not be put to use to their maximum capacity.
- NRSC did not adequately co-ordinate with various agencies for effective implementation of remote sensing application projects . Further, there were instances of deficiencies in planning and implementation, non/partial achievement of the objectives, delays in completion of projects etc., which adversely impacted on the success of these projects.
- There was shortfall in the enrolment in long term courses. Further, the number of private persons trained for promoting the sale of data products was lower than participants from the Government sector.
- There was substantial amount of unutilised balances available with NRSC under Government projects, despite which it continued to receive advances for special projects from DoS and from other Government users. Budgeting of NRSC was not realistic indicating lack of control on income and expenditure and poor monitoring of projects. There was reduction of revenue/loss of interest due to irregular fixation/delayed fixation of agency commission payable to Antrix Corporation Limited (ACL) in the sale of satellite data. Internal control and internal audit were not commensurate with the requirement of NRSC.

6. Against the aforesaid backdrop, the Public Accounts Committee (2011-12) selected the subject for detailed examination and Report. For this purpose a Sub-Committee under the Chairmanship of Dr. Girija Vyas, MP and a Member of the PAC was constituted to examine the issue in detail. The Sub-Committee obtained

background material and detailed written reply from the DoS. They also took oral evidence of the representatives of the DoS on 11.01.2012 and sought Post Evidence Replies from them. Based on these oral and written depositions by the DoS, the Committee examined the performance of the NRSC and identified some very important issues and pinpointed certain lacunae as discussed in the succeeding paras.

III. UTILISATION OF REMOTE SENSING SATELLITES, DATA ACQUISITION AND PROCESSING

Capacity utilization of Indian Remote Sensing (IRS) satellites

7. During the period of Audit review, NRSC was mainly acquiring remote sensing data from seven Indian Remote Sensing satellites and a few other foreign satellites. Audit review revealed that three remote sensing satellites-IRS-P3, IRS-1C and IRS-P4—could utilize only 32, 45 and 50 per cent of their maximum capacity due to technical problems in the spacecrafts. The performance of these three out of the seven remote sensing satellites was below their maximum capacity in terms of remote sensing satellite data captured by them.

8. In the above context, the Secretary, DoS explained during evidence:—

".....there was reference about three satellites. One was the experimental satellite IRS-P3. In IRS-P4 satellite, there was a power failure and we had to stop one of the sensors working in those days. Another satellite was at the end of its life. In fact, the designed life is three to five years but we went up to 10 years. It was in bad shape. This is one thing which could be kept in mind."

9. On being asked specifically that whether the lower capacity utilization of these three remote sensing satellites had an impact on remote sensing application projects of national importance and assessment made by the DoS regarding the same, the DoS in a written reply submitted as follows:

"The three remote sensing satellites referred to in the audit were IRS-P3, IRS-1C and IRS-P4 (Oceansat-1). The details of their performance are given below.

Satellite	Launch Date	Designed Life	Decommission Date	Period of service	Purpose
IRS-1C	December 28, 1995	3 years	September 21, 2007	11 years and 8 months	Operational
IRS-P3	March 21, 1996	3 years	January, 2006	9 years and 10 months	Experimental
IRS-P4 (OCEANSAT)	May 26, 1999	5 years	August 8, 2010	11 years and 2 months	Operational

All the three satellites referred to in question have performed beyond their designed life time of 3/5 years. The satellites have not under performed, but have provided vital data for management of land, water and ocean related studies.

IRS-P4, as against the designed life of 5 years, has continued to function beyond 10 years. During the period of audit (2002-2008), IRS-P4 completed the nominal life and there was reduction in spacecraft power, which was quite expected, and hence had resulted in limited data acquisition. However, the data over Indian region including Indian Ocean was being covered and hence did not affect the data requirements of Indian users. As the satellite worked well beyond its life and continued to provide important data of ocean applications, the overall performance of the satellite exceeded the designed capacity of the mission. The data has been operationally used for the Potential Fishing Zone forecast and serving the fishermen community.

Similarly, IRS-1C did operate for nearly 12 years, as against the designed life of 3 years. During period of audit it had completed nominal mission life period and hence showed variations in annual data acquisition numbers. IRS-1D was launched to ensure continuity of service by IRS-1C. The data from IRS-1C & 1D supported the requirements of the user community and there has been no deficit in terms of meeting the data requirements of the users. IRS-1C was particularly used for applications related to land resources, urban and rural development in India and also there was global demand for this satellite data."

DoS, claiming that the user data needs were met from these satellites, further explained:—

"The Remote Sensing application projects did not suffer during the operational period of the above satellites. The major projects serviced with these satellites are:

- (i) Potential Fishing Zone (PFZ) forecast: The project was initiated prior to the launch of IRS-P4. After the launch of IRS-P4, the required products for fishing community were derived continuously and serviced regularly on an operational basis. This satellite also attracted a lot of global attention and many users from other countries were provided with this data. The project is still ongoing and services are continued with Oceansat-2, the follow on satellite of IRS-P4.
- (ii) Many applications projects, including national missions, were carried out during the IRS-1C/1D time frame: Crop Acreage and Production Estimate (CAPE), Rajiv Gandhi Drinking Water Mission, Integrated Mission for Sustainable Development (IMSD), National Wasteland mapping, National Land Use Mapping, Wetland mapping, Coastal Zone Mapping, Urban Sprawl studies etc. In addition, many projects were carried out by different State Governments, Academia and NGOs addressing locale specific requirements. Particularly, Watershed development and monitoring was one such project.

All these projects were successfully implemented using IRS-1C/1D datasets and some of the projects are still continuing with follow on satellite data like Resource sat-1 (IRS-P6)."

10. The Committee desired to be apprised of the mechanism formulated by the DoS for utilisation of remote sensing satellites to their full potential. The DoS explained as under:—

- (a) "Considering the importance of Natural Resources Management in the country, the Planning Commission, Govt. of India has set up National Natural Resources Management System (NNRMS), in 1985, with Department of Space (DoS) as the nodal agency. The NNRMS framework has been established as a unique network involving Central & State Government agencies, private sectors, academia and non-governmental organisations. NNRMS facilitates integration of satellite remote sensing data with conventional techniques towards management of natural resources and development planning in the country. The Planning Committee of NNRMS (PC-NNRMS) along with Standing Committees has been addressing the greater utilization of application of remote sensing in the country. NNRMS, has since evolved into an operational set-up wherein the various users like Central/State Governments, private/voluntary agencies, industries, universities/research institutions, are partners towards providing vital inputs for decision making at all levels (national, state/regional, district, taluk/block, panchayat/village), towards management and development of natural resources.
- (b) Apart from the above, a large number of interaction meetings are being held with various users ministries/departments on the need basis to address the issues concerning utilization of remote sensing for natural resources development.
- (c) Due to such mechanisms, many ministries/departments have started institutionalization of remote sensing within their own departments. For example, Ministry of Forest and Environment has set up a good remote sensing applications and data processing infrastructure for providing biennial forest cover of the country; Ministry of Earth Science has setup a similar mechanism under Indian National Centre for Ocean Information Services (INCOIS), Hyderabad which provides necessary information to the fishermen and coastal user community with respect to ocean resources. Many such institutionalization activities are happening in other user ministries too. This is one of interesting outcome of the concept of National Natural Resources Management System whose objective is to see that the user ministries internalize the remote sensing applications while ISRO/DoS provides all technical guidance/assistance and also provide required satellite data for national development.
- (d) The Earth Observation satellite missions are designed primarily to cater to Indian region with the required revisit cycles, based on the applications and swath/resolution of the sensors. However the satellite will have capability to

operate in every orbit subject to power availability/balance and this capacity can be offered to International Ground Stations. ANTRIX has been coordinating such activity and over 30 ground stations have been established internationally for utilization of data from IRS satellites in their visibility cone. NRSC also acquires some global data by using polar ground station at Svalbard, Norway for IRS-P6 & IRS-P5 satellites. Thus the overall acquisition from these satellites exceeds the designed requirements of covering the Indian region.

- (e) The number of scenes acquired itself is a function of several parameters like payload, power demand, resolution, swath, repeat coverage cycle, scene size, besides the cloud cover limitations due to imaging in optical region. Essentially it is based on the mission management strategy to ensure optimum use of available resources to meet the user requirements and at the same time to enhance the mission life. It is this strategy that enabled most of the IRS satellites to work much beyond the designated mission life."

Recovery of expenditure/Return on investment

11. The proposal to launch remote sensing satellites is approved taking into account user requirements and data needs. For calculating Return on Investment (RoI), the capital expenditure on launch of remote sensing satellites and the yearly expenditure on operations and maintenance of satellites are compared with the revenue to be generated from the sale of data products generated from each satellite. While no benchmark relating to recovery to expenditure incurred or RoI was fixed by DoS, as brought out by Audit, the total capital expenditure on the seven satellites in operation during the Audit review period *i.e.* 2003-08 was ₹ 1468.59 crore. The Committee were informed that operational returns were negative in all the years 2003-08 and ranged from ₹ 96.87 crore to 134.27 crore indicating that realization from sale of data products was not sufficient to match even its yearly operational expenditure.

12. In the above context, the Committee enquired from the DoS to furnish the figures of operational returns from remote sensing satellites from 2008 onwards. In response, DoS provided following data:

Financial year	Data Sales from IRS Missions (₹ in Lakhs)	Access Fee/Royalty Earned through International Ground Stations by ANTRIX (₹ in Lakhs)
2008-09	3890	5040
2009-10	2278	2969
2010-11	3898	2893

The total revenue for the financial years 2008-2009, 2009-2010 and 2010-2011 work out to ₹ 8930, 5247, 6791 lakhs respectively with the grand total working out to be ₹ 20,968 lakhs for the three years. However, the vetted comments of the Audit on this reply of DoS are reproduced below:—

"According to the information furnished by the Principal Pay and Accounts Office of DoS, it received the non-tax receipts from the sale of data products and Access Fee/Royalty credited to DoS revenue receipt major head of account '1425-102—Space research' in the Finance Accounts of DoS as follows:

Financial Year	Revenue from the data Sales from IRS Missions and access Fee/Royalty earned through International Ground Stations by (₹ in Lakhs)
2008-2009	2612
2009-2010	2409
2010-2011	6176.50
Total	11197.50
Difference	9770.5 (87.25%)

From the above two tables there is a total difference of ₹ 9770.5 lakhs which is 87.25 percent of the receipt credited in Finance Accounts of DoS. Considering the fact that Antrix transfers 60 percent of the revenue received by it from the royalty income to DoS, the difference would work out to ₹ 5409.70 lakhs which is 48.31 percent."

13. Asked to enumerate the reasons for the downward trend displayed in the Access Fee Royalty earned through International Ground stations by Antrix, the DoS stated that due to reasons related to spacecraft operations, available downlink time from the satellites earmarked for International Ground Stations (IGS) got reduced, which led to reduction in overall earnings with respect to access fee and royalty. Further, from 2009 the number of IGS receiving data from IRS-P6 and Cartosat-1 also got reduced.

14. When enquired further about the action taken or proposed to be taken to improve returns from remote sensing satellites, the DoS in a written note submitted that:—

- “(a) The data from Earth Observation satellites is only an input to the applications related to natural resource management, disaster information support and the return on investment primarily is the benefit accrued from such applications. Accordingly the satellite, its launch, etc., are viewed as infrastructure created by government for public good services and expenditure is not expected to be recovered from only the sale of data products.

- (b) As per the approved Remote Sensing Data Policy (RSDP-2011) of Department of Space, Government of India, the spacecraft systems are considered to be public good infrastructure in space for national development and the emphasis is on the outreach of the data products rather than cost recovery. As per this Policy, NRSC strives to recover only the costs involved in the ground segment operations and addresses elements such as the depreciation, maintenance, and consumables as well as the overheads. The overall data products prices are determined by a high-power Pricing Committee set up by Deptt. of Space.
- (c) In addition, there are increasing global trends to make data freely available for public good services as seen in the data policy of National Aeronautics and Space Administration (NASA)/ National Oceanic and Atmospheric Administration (NOAA) for Landsat, Brazil and China for China-Brazil Earth Resources Satellite (CBRES) data, SPOT-VEGETATION Programme and Global Monitoring for Environment and Security (GMES) services of European Space Agency (ESA) etc.,. It can thus be seen that NRSC's pricing policy is in tune with the global trend with respect to public funded organisations. Internationally, GEO, the Group on Earth Observation, of which India is a founder member has also prepared guidelines for data supply/ sharing and ensuring free data supply. For example, today Oceansat 2 satellite with its Scatterometer plays a unique role of providing data to global user community through European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT)/EUMETCAST mechanism. Availability of Scatterometer data within three hours of acquisition and processing is essential for assimilation in atmospheric models, an important activity, worldwide and ISRO has a mandate (through ISRO-EUMETSAT cooperation agreement) to support this activity. Hence an operational setup was devised to meet these austere timing requirements. The operational setup comprises of, Data capture system, data exchange gateway, high-speed data link and the processing systems at Shadnagar and EUMETSAT. The high speed 45 Mbps IPLC dedicated network link between Svalbard and Shadnagar ground stations was established in December 2010 and operationalized. All the 14 orbits for SCAT acquisition at Svalbard are scheduled and the Raw data acquired at TROMSO & Svalbard Ground Stations is transferred to Shadnagar through high speed network link from Jan. 2011. The data products generated at Shadnagar were transferred to EUMETSAT using this link. During contingencies like link failures, transfer of raw data files from Svalbard to EUMETSAT ADP and DPGS systems shall be enabled.
- (d) Antrix Corporation Ltd., provides earth station and data receiving facilities to many users outside the country which does provide revenue to ANTRIX. This has made IRS satellite series a popular competitor in the international market and the data and other services provided is well sought after in the international market."

15. To a related concern of action taken or proposed to be taken by the DOS to generate optimum operational returns from Remote Sensing Satellites, the Committee were apprised as under:—

"As per the Remote Sensing Data Policy (RSDP-2001 & 2011) of Government of India, the spacecraft systems are considered as public good infrastructure for national development. Hence, the emphasis is on enhancing the outreach of the data products and recover only the remote sensing data products generation cost. The costing and pricing of satellite data products are finalised by a high-power committee setup by Deptt. of Space."

Data Need Assessment

16. Data need assessment in various remote sensing applications, such as resources survey, mapping applications, oceanographic application etc., is to be made to help in planning the payloads of operational remote sensing satellites prior to their launch. NRSC delivers its satellite products for thematic remote sensing applications in the areas of urban planning, drought monitoring, land use and land cover mapping, underground water resource mapping, mineral prospecting, environmental impact analysis etc. The Audit pointed out the NRSC, however, did not assess the number of data products required in these thematic sectors to plan remote-sensing satellites realistically. The satellites were planned without adequate thematic data need assessment. The extent of data gap against the data need in specific areas could not, therefore, be assessed.

17. Taking note of the above Audit observation, the Committee desired to know the mechanisms put in place in NRSC to ensure that remote sensing satellites are planned after assessment of the need in thematic sectors so that the plans are realized. In a written note, DoS elucidated the mechanism as under:—

- (a) "Deptt. of Space plans & realizes satellites after a detailed exercise which includes feasibility studies, joint experiments, technical aspects, national technical committees and discussions in ISRO Council and Space Commission before satellites are launched.
- (b) A unique mechanism under NNRMS exists which was decided by the Government about three decades back. Accordingly, there are 9 standing Committees (each one of) which is chaired by the Secretary of the respective user ministries with member secretaries drawn from different centres of ISRO/DoS. These committees represent almost all the important themes that the line departments would like to have. The chairmen of these committees and other secretaries under the chairmanship of Member (Science), Planning Committee form a Planning Committee, NNRMS (PC-NNRMS) which reviews the various programs of the user ministries and also looks at the newer applications requirements, which in turn could lead to newer satellite missions, payloads and sensors. The current status of applications (in the country and global scenario) under various themes is discussed in the standing committee

meetings, during their regular meetings with stakeholders. The requirements of datasets of the users form the basis for feasibility studies for new missions.

- (c) The data products procured by users are utilized for multiple themes/ applications and the users always do not indicate the exact end use. It could also be due to the fact that users are optimizing the data use across multi-disciplines in terms of synergistic and simultaneous usage. That is, once the satellite remote sensing data is procured, it could be used for not only agriculture related aspect, it could also be used for urban sprawl study, forest cover, land degradation, general land use pattern etc.
- (d) A study team was constituted by Chairman, ISRO in July, 2009 to critically examine various Indian Earth Observation (EO) requirements and generate a strategic plan document for Indian Earth Observation programme by examining the observations requirements *vis-a-vis* existing/proposed satellite missions, availability of data from International missions, technological advances and indigenous capabilities.

Preliminary recommendations of the committee were presented in the recently held PC-NNRMS meeting as well as in Standing Committees and DoS is in process of consolidating all feedback before prioritizing new missions.

- (e) Efforts are being made to collect information on the intended use for data products disseminated by NRSC. Towards this, a Customer Relations Management (CRM) module is being developed under Integrated Multi-Mission Ground Segment for Earth Observation Satellites (IMGEOS) project to monitor and manage user requirements with the scope for acquiring theme-wise requirement as well as utilization of Earth Observation data.
- (f) Regular feedback is taken from users during the regular user interaction meet organized by NRSC."

18. Elaborating the IMGEOS project, the Director, NRSC explained during evidence:—

"One of the activities which relates to the turnaround time, capacity to generate and supply products is the Integrated Multi-mission Ground Segment for Earth Observations Satellites (IMGEOS) which is being implemented at NRSC. The first phase has been commissioned. There, one of the objectives is that within one hour of the completion of S a pass, we would be able to place on web a product for a user to download. This is one thing which we actually have done. Simultaneously, it has a three-tier storage structure which has all the work elements to sue the data from the storage so that the number of products which can be generated per day will also be significantly larger."

19. On being asked by the Sub-Committee to state the status of the CRM module that is being developed under IMGEOS project, the DoS explained that the CRM software development has been taken up in collaboration with an academic institute. It was further stated that detailed discussions on the requirements, design and implementation of the pilot software were completed and based on the feedback,

modifications are being carried out in the software which is expected to be delivered for beta testing during 1st quarter of 2012 and the CRM will be put in operation in 2012.

Utilisation of acquired data

20. The Audit review revealed that the percentage of idling of the acquired data from Indian Remote Sensing Satellites ranged from 53 to 95 per cent. Since the operation remote sensing satellites were launched with a specific designed capacity to meet the data needs of the country and the region, data acquired should have been adequately utilized if the data need assessment was realistic. In addition, the Tenth Five Year Plan document had also envisaged a quantum jump in technological ability, application expansion, aggressive marketing and virtual dissemination of knowledge keeping in mind the requirements of remote sensing user community in the country and the region. Audit further observed that idling of acquired IRS data was high due to non-adopting of appropriate marketing strategy and failure to conduct the need assessment prior to launching satellites.

21. In the above context, the Sub-Committee asked the DoS to state specifically actions initiated for fixing targets for utilization of acquired scenes. In reply, the DoS clarified that NRSC fixes the annual targets for data dissemination and sales taking into account the capability to provide data with respect to data processing and the user requirements. The DoS also submitted the target fixed and achieved for the past three years as follows:—

Sl. No.	Financial Year	Targets Fixed (Number of products)	Realised (Number of products)
1.	2008-09	35,000	41,000
2.	2009-10	45,000	50,000
3.	2010-11	55,000	67,000

DoS further stated that in order to improve the data sales/utilization, following actions have been initiated:

- (i) Satellite data products' price level was reduced by more than 50% with respect to the price of 2006-07, keeping in view national development and service to societal development purposes.
- (ii) Increasing awareness on Indian Earth Observation data through Bhuvan web portal, which has attracted the attention of lot of users, organizations and common man of the IRS capabilities.
- (iii) NRSC's participation & exhibition stalls in all major National & International symposiums.

- (iv) Advertisements in professional journals in the area of remote sensing & Geographic Information System (GIS).
- (v) Establishment of web portals for scientific data dissemination from satellites such as OCEANSAT-2, MODIS, IMS-1 etc.
- (vi) Supply of Global Area Coverage data from Oceansat-2 freely on web.
- (vii) Proactive development of newer applications in various fields and interaction with other ministries for utilizing the satellite data in their developmental plans through standing committees.
- (viii) Conduct of user interaction meeting/open forum meetings at least once every year.
- (ix) Publication of promotional materials like brochures/bulletins/news letter etc.

22. In the same context of utilization of acquired data, Director, NRSC while deposing before the Sub-Committee explained as follows:—

"The second important thing is the total data off-take, the utilisation. For that, as you may be aware, we have established a website called 'Bhuvan'. 'Bhuvan' has put in three dimension and two dimension, one coverage of India and resolution of the whole world which the people can see. Then, in the past six months, what we have done is that the data which is more than two years old, coverage has been put for free download by users because we found that 90 per cent of the data is only pertaining to the past two years. Earlier that data off-take is not there. So, to encourage more use, we have put that. Then, to make available the results of the remote sensing application programme, we have put the entire national land-use, land-covered dataset also for people freely to use from the web. In fact, we have consciously, in the past six-eight months worked very hard to increase the accessibility and usage of the data and products."

NRSC archival policy

23. NRSC has a system of archiving the data acquired by the operational Indian and foreign satellites. According to NRSC archival policy, the policy is to be revised once in five years. However, as specifically pointed out by Audit, NRSC did not revise its archival policy after December 2004, as of January 2010.

24. In the above context, the Sub-Committee desired to know the status of availability of archived data in NRSC. The DoS responded as under:—

"Remote Sensing data is a comprehensive, permanent, and impartial record of the land surface. Archival of satellite data is a national asset which keeps historical record of the condition of the resources, such as natural, man-made, climatic/ weather etc. and provides a clear & consistent record of observable surface phenomena. Such archived data is important to monitor the environmental/climatic change, to quickly understand temporal changes in deforestation, desertification, environmental changes, disasters and natural hazards.

(a) NRSC has been acquiring and archiving data from various satellites since 1980's.

Satellite	Duration	No. of scenes
LANDSAT MSS	1983-1992	11990
LANDSAT TM	1986-2001	43692
SPOT	1988-1990	14000
ERS	1991-2004	32500
IRS-1A	1988-1991	28880
IRS-1B	1991-1999	64980
IRS-1C	1996-2007	357674
IRS-1D	1998-2009	543755
IRS-P4	1999-2010	17129
IRS-P6	2004-2011*	509748
IRS-P5	2005-2011*	695095
CARTOSAT-2	2007-2011*	92448
IMS-1	2008-2011*	55289
OCEANSAT-2	2009-2011*	4822

*Currently operating satellites.

(b) Based on the recommendation of Archival Policy Committee for IRS satellites, four season cloud free data from IRS satellites for each year have been archived till 2004. Considering the data requirements for studies on climate change, long-term change detection, legal issues, etc. and the recent advances in the technology for data archival, including the media for storage, all data acquired since 2004 have been archived systematically. The total available in the archives, scene-wise Meta data information about the data acquired including Quick Look is available to the user community through NRSC website. There is a special committee formed on the data Archival for all IRS data at NRSC."

25. Asked to explain the provisions to upgrade the archival system in NRSC, DoS submitted that:—

"Archival systems are being upgraded periodically based on the need and contemporary technologies. Historically data was archived on High Density Digital Tapes (HDT), which were read using High Density Digital Tape Recorders (HDTR). As these became obsolete, all the archived data has been transcribed

on to Digital Linear Tapes (DLTs). At present, the data is archived on DLTs, DVDs and CDs. The media is decided depending on the volume of data. Currently the project "Integrated Multi-mission Ground segment for Earth Observation Satellites (IMGEOS)" is being implemented in which all the data that is acquired will be archived on a three-tier Storage Area Network (SAN), which has a LTO-5 tape library as the third tier."

26. In response to another specific query of the Sub-Committee about the efforts made to spread awareness in the concerned and interested sectors about availability of information in NRSC, DoS replied that for this purpose, NRSC has made wide publicity to the user community on the availability of archived data sets through web, advertisements, workshops and awareness programmes. DoS further stated that data older than the specified period are supplied at a discount and it is also planned to offer selected coarser data free on web.

Data processing facility

27. The Audit scrutiny revealed that there were delays in data-processing impacting the delivery of available data products. Time taken in the delivery of satellite products increased during the period 2002-09 indicating decline in the efficiency of data processing.

28. When the Sub-Committee sought details about the steps taken to fix targets for optimizing the time taken for the data processing at NRSC, the DoS explained:—

“(a) In order to streamline data processing, DoS has approved a project on 'Integrated Multi-mission Ground Segment of earth observation satellites (IMGEOS)'. This project has been conceived to enable faster and efficient data products and services for the users, both online and media transfer. The Interim Facility is already in place in Shadnagar Complex for Resourcesat-2 and Oceansat-2 satellites.

The major performance goals are:

- Deliver data products to user within 60 minutes of acquisitions for emergency needs and within a day for any other standard requests.
 - Create user friendly browsing, product ordering and delivery environment through web portal and delivery of products to the user when he wants, where he wants, and in a form that is useable by him.
 - Develop mission independent operations environment.
 - Re-engineer entire chain with state-of-art facility realizing Integrated Multi-mission processes/systems adapting to future missions with minimum lead time from satellite launch-to-product launch.
- (b) The turnaround time for Standard Products is 3 days and 5 days for special products. With the implementation of IMGEOS, the turnaround time will improve and all standard products will be supplied within 24 hours and emergency products within 1 hour of acquisition.

- (c) The scientific data of Oceansat-2 such as Ocean Colour Monitor (OCM) sensor's Global Area Coverage (GAC) data and derived product such as Chlorophyll, Diffused Attenuation Coefficient, Suspended Sediments and Aerosol Optical Depth are being made available within 150 minutes of acquisition for the global scientific users.
- (d) Similarly the data from Scatterometer on-board Oceansat-2 is being supplied within 120 minutes after acquisition."

National Remote Sensing Coordination Committee

29. While conducting the audit review of the NRSC, the Audit highlighted the observations of the Standing Committee of Parliament on Department of Space contained in their 129th Report on Demand for Grants presented to the Houses on 26th August, 2004 that in order to increase accuracy of IRS data and also for more realistic interpretation of acquired data, the DoS needed to set up National Remote Sensing Coordination Committee to facilitate holistic implementation of the following proposals: (i) integration of Geographical Information System (GIS), Global Positioning System (GPS) and IRS technology to enhance accuracy of derived data, (ii) production and distribution of satellite data, (iii) processing of remote sensing data, (iv) using functional approach towards difficulties faced by departments for accurate interpretation of the data retrieved, (v) updating of technology at par with world standards, (vi) promotion of remote sensing applications in coordination with universities and research centres, (vii) maintenance of national archive on remote sensing data with a view to preserving data and also constantly updating it.

30. In light of this observation of the Standing Committee of Parliament on the DoS, the Sub-Committee desired the Department to furnish reasons as to why National Remote Sensing Coordination Committee (NRSCC) was yet to be set up. Responding through a written note, the DoS replied as under:—

"Setting up of National Remote Sensing Coordination Committee, proposed by Standing Committee of Parliament on Department of Space, may not serve the purpose. The proposals as suggested for implementation under this committee are diverse in nature and mutually exclusive and it is difficult to address by a single committee.

However, the suggested proposals are being addressed by various high level inter-ministerial and intra-departmental committees set up by the Department, like:—

1. Planning Committee of National Natural Resources Management System (PCNNRMS): Chaired by Member (Science), Planning Commission with Secretaries of various ministries as members for effective utilisation of space based remote sensing data for mapping, monitoring management and development of various natural resources.
2. Standing Committee of National Natural Resource Management System (SCNNRMS): Nine theme oriented Standing Committees of NNRMS addresses

utilisation of remote sensing data in various areas like agriculture, water resources, bio-resources, cartography, geology, ocean and meteorology, urban planning, rural development and capacity building.

3. Earth Observation Applications Management Council (EOA-MC) periodically reviews and recommends means and methods of integration of different technologies for resource mapping and management; critically examines the user need and suggests appropriate methodology, tools and techniques development. It also recommends required space system for addressing the user needs.
4. Indian Remote Sensing Satellite Management Council (IRS-MC) and NRSC Data Centre—Data Processing Coordination Committee review and recommends the latest technology for design and development of space systems as well as data production, distribution and archival of remote sensing data from various missions.
5. The Committees such as (i) Respond Management Council, (ii) Joint Policy Committee for Space Technology Cells, and (iii) NNRMS Standing Committee on Training and Technology address promotion of remote sensing applications in coordination with universities and research centres."

IV. SALE OF DATA PRODUCTS

31. Remote Sensing Data Policy, 2001 opened up the sale of data products on non-discriminatory basis to customers. This provided an opportunity to NRSC to customize its products to suit the requirement of private customers thereby increasing the sale of data products. The Standing Committee of Parliament on DoS in their 42nd Report presented to the Houses on 13.03.1997 felt that more and private entrepreneurs should be associated in the process of remote sensing data utilization programme. However, the Audit scrutiny revealed that the average sales to the private sector were less than 20 per cent whereas the sales to the Government Sector were more than 80 per cent during the period 2003—09.

32. In this context, when asked to state the steps taken by the DoS to increase sale of data products to private sector, the DoS stated as under:—

"Private sectors procure data for (a) projects it undertakes on behalf of government/public sector organizations, and (b) projects relevant to private sector business activities. The data sales of (a) are counted as government sector sales. However, NRSC as part of the data promotion and marketing activities conducts various programmes as below:

- (a) User Interaction Meet: it is an annual event, wherein large number of users including the private sector participates and benefit. During these meet, new missions, data services, procedure for data ordering and downloads and price discounts are presented and discussed. Feedback collected during the meet is used for improving the services.

- (b) Participation in the Workshops and Exhibition: Various products and services are displayed during the Annual Meet of major professional societies like Indian Society of Remote Sensing, Indian National Cartographic Association, Indian Society of Geomatics, Engineers Association, University programmes etc.
- (c) Advertisements: The details on the new products, services are made available through advertisements in scientific journals/magazines.
- (d) NRS/ISRO offers products and services through various portals such as Bhoosampada, Indian Forest Fire Response and Assessment System (INFFRAS), Decision Support Centre (DSC), BHUVAN, NNRMS etc."

33. DoS further submitted that due to the various promotional activities initiated, the private sector data sales has been increasing year after year as indicated by the number of new users registered for data purchase since 2006-07:—

Sector/ Year	Private Users
2008-2009	37
2009-2010	94
2010-2011	119

34. The Committee were further apprised the international market rate of high resolution satellite data was about six times that of the price of comparable IRS products. There was, therefore, scope for enhancing the revenue from the sale of data products to international customers by Rs 47.49 crore during the period 2004—08.

35. When enquired specifically about the reasons for fixing prices of IRS products lower than those of similar Products of foreign satellites, the DoS stated through a written note as under:—

- "(a) The objective of the space activities in the country is concentrated on achieving self reliance and developing capability to build and launch satellites including remote sensing satellites for management of natural resources. Hence, the remote sensing activities are pursued for supporting the developmental activities taken up by the government, rather than as commercial activities. In addition, remote sensing is treated as a public good service rather than commercial towards providing valuable and irreplaceable data for the purpose of monitoring disasters, weather forecasting, climate change and resource monitoring and planning.
- (b) The Remote Sensing Data Policy considers satellite data as 'public good', and the Government of India recognizes the importance of affordable access to Earth Observation data for national development. The prices are therefore fixed balancing the market conditions as well as adherence to the Government

Policies. The lower price is only applicable for Indian and Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC)/ South Asian Association for Regional Cooperation (SAARC) countries as decided by pricing Committee.

- (c) The IRS data available are not comparable with foreign satellite data with respect to spectral and spatial resolution. For *e.g.* the Geoeye-1/Worldview 2 data are available with 0.5m resolution with multispectral and stereo capability. There is no equivalent data from IRS. Hence the prices are not comparable.
- (d) While the price of satellite data for Indian users is low in order to promote remote sensing data utilization, for International users, the IRS prices are determined by ANTRIX and are on par with equivalent international satellite missions as indicated below:—

Satellite/Sensor	Resolution	Price Per Sq. Km. (in USD)	Remarks
SPOT	2.5 m	3.59	Multispectral
CARTOSAT-1	2.5 m	2.72	Panchromatic
IKONOS	1 m	10	Multispectral
EROS-A/B	1.9m/0.7 m	7.6-14.2	Multispectral
CARTOSAT-2	1 m	8.6	Panchromatic"

Adding to this reply, the DoS further submitted that the prices of IRS products to international customers are comparable with the international trend and therefore there is no loss of revenue and in order to maximize the sale, marketing efforts through ACL will be carried out.

36. The Sub-Committee also desired to know the action taken or proposed to be taken by the DoS to keep the prices of IRS data products at par with the International rate. The Department of Space, in this context, reiterated their position and stated as under:—

"The objective of the space activities in the country is concentrated on achieving self reliance and developing capability to build and launch satellites including remote sensing satellites for management of natural resources. Hence, the remote sensing activities are pursued for supporting the developmental activities taken up by the Government, rather than as commercial activities. In addition, remote sensing is treated as a public good service rather than commercial towards providing valuable and irreplaceable data for the purpose of monitoring disasters, weather forecasting, climate change and resource monitoring and planning. Hence for Indian users the lower rates are fixed.

However, for international users, the rates of Indian Satellite data are on par with International rates."

37. When enquired about the pricing policy followed in the DoS to revise and restructure the price of data products and service and factors taken into consideration while making such revision, the Department replied as under:—

"The satellite data products pricing is revised annually/on required basis by the Inter Centre Pricing Committee constituted by Secretary, DoS/Chairman, ISRO for Indian as well as neighbouring, BIMSTEC and SAARC countries. The Committee recommends the sensor-wise pricing considering the costing table, product demands, market strategy, equivalent products available in the market etc.

- The costing table is worked out based on Machine Hour Rate (MHR) of all the work centres/systems involved in product generation. The MHR were computed considering four elements *i.e.* Depreciation, Manpower, Consumables, and Services with additional overhead elements.
- Differential pricing is also implemented for academic/research community to encourage student and researchers to use the data in their research projects. Free data is also provided on need basis.
- The affordability and increasing the Earth Observation satellite data use is one of the prime determinant of price for the Indian users."

38. In the above context, the Secretary, DoS deposed:—

" The world over, remote sensing is considered a public good. In contrast to communication, where a transponder is in the orbit and you have a business model of utilizing it, pricing it as an internal rate of return, you can look at for these aspects. Historically, in USA, when they started the LANDSAT Programme in the 1980s as a commercial venture, whether they can survive as an industry and they found it is impossible. So, the satellite cost, launch vehicle cost, everything is subsidised by the Government because remote sensing data is essentially used for developmental applications in the country by various governmental departments and when it comes to pricing, we consciously took a decision and we are only looking at the cost related to the generation of this data products by NRSC and the price should be such that the developmental projects of the country should be enthused to take them and use it. If I may give an example, about 10 years ago, NRSC was able to give 20,000 data products to the users, but today they have gone to the level of about 65,000 data products per year. It has been a very steep increase. This rises because of the ability of the system to convince the users that remote sensing is useful, the capacity we have generated in the user departments to use them effectively and of late institutional mechanisms have been set up."

39. Touching the same aspect of pricing policy in NRSC, Director NRSC stated during evidence:—

"The other issues which have been mentioned relate to prices. In the Committee Chaired by the JS, we have worked at the total cost components because earlier we were only looking at the costs which pertained to generation within NRSC.

Now, in the Committee, we have tried to put all components of the cost in the entire chain. And, as far as the price is concerned, we are trying to work on a model where we make available the products at differentiated price for different users like Government users, DoS users, academic users and the private users. The cost of this itself is being vetted by a Director, Costs which the Secretary has also identified. So we are going through this entire exercise for that."

40. Alluding to this reply, the Secretary, DoS deposed during evidence:—

"As we explained initially, when it comes to the remote sensing satellite systems, we were only comparing the price with the cost that we have incurred for generating the data products. The cost of the satellites and the cost of launching them were not considered while calculating the cost of generation. That has been the international practice.

As Dr. Dadhwal explained, now we are doing an exercise to find out as to what is the total cost. Once, we know that, then we can fix a price as a matter of policy. So, we are doing this exercise at the present moment. This includes two things. We know the life of a satellite to which we can assume; how many products we can get out of it in an ideal situation; and then work out per product as to what would be the total cost incurred by the Government of India. This exercise is on. We also wanted this vetting to be done through an external agency. The Advisor (Cost) has been approached to help us and advise us on this subject. So, we will say that this is the cost. As he said, for the academic users, for private users and others, we will have a differentiated pricing policy. So, we would take up this as an action and go ahead with it."

V. AERIAL REMOTE SENSING PROJECTS

Delay in completion of Projects and Underperformance of Aircrafts

41. NRSC is the sole civilian provider of aerial remote sensing services in the country. These aerial projects are meant for remote sensing specific areas at required times, which is not possible through satellites. Two beach-craft aircraft equipped with navigation aids, state-of-the-art sensors like Light Detection and Ranging (LIDAR), digital camera based aerial photography systems and airborne magnetometer for aerial data acquisition and ground instrumentation were utilized for airborne remote sensing. Audit selected 36 out of 67 aerial remote sensing projects for detailed scrutiny based on materiality and also the performance of the two aircrafts in operation in terms of actual flying hours during the review period. Audit examination revealed delay in completion of aerial projects and under performance of the aircrafts due to their non-utilization to their maximum capacity as a result of non-availability of pilots and technical snags in the aircrafts. 12 aerial projects (33 per cent) costing Rs. 45.85 crore were delayed from 8 to 54 months.

42. In the above context, the Secretary, DoS stated in evidence:—

"There was a reference also to aerial remote sensing. We have two aircrafts which are used for aerial remote sensing. They go at very low altitude and conduct a very high resolution survey. We can do this only when there is fair

weather condition about four to six months in a year. Only at that time, we can use it. Certainly, in this period, there were problems in the maintenance of aircraft in some years. That was a national situation. There were not agencies having spares with them. These aircrafts are old now. They were bought in the early 90s and 2000. So, we had a problem in maintenance. In some years, especially in 2006-07 the utilisation of the aircraft was less. But we have picked up and one of the major things which we have done over the last few years for the national urban information system is we flew over 130 towns all over the country. When you identify the pockets, the aircraft has to go there, conduct the survey and bring back the data and do the analysis of the data.....In the time of disaster specially, such information becomes very useful. We have two aircraft now well maintained."

43. On being enquired about non-availability of pilots in NRSC and reasons for the same, the Secretary, DoS deposed as under:—

"At the moment we have three pilots who have been seconded by the Indian Air Force. Of course, we pay remuneration to them as per the agreement that we entered into with the Indian Air Force because they are entitled to certain allowances. From the open market we are not getting the pilots. In fact, by the year 2007, three pilots that we had either were retired or left because the market was very lucrative for them. But we still require these aircraft services for certain types of high resolution remote sensing. That is why, we are keeping that system."

44. In the course of the oral examination, the Sub-Committee pointed out that non-availability of pilots should not be the reason as there are so many pilots who are waiting for the job. The Secretary, DoS, in deposed as under:—

"But during the years 2005 to 2007 there was a boom available and even the two pilots whom we had — they are younger people — had left, and they are supposed to give a service for six months after they decide to quit. So, we could only get that much service. So, we had to keep these aircraft idle. That is why, we went to the Air Force and made this institutional arrangement. But today, the situation would be different because many of them are coming out of the market. But what happens is this. When you have the Air Force pilots with us, there is one kind of discipline for the Service. In fact, our experience has been that we have been more productive with the Air Force pilots. So, if they are available with us, it is well and good. The idea is that the two aircraft have to be utilized to the maximum extent possible during the flying period. He is taking his efforts also to get additional people.

Sir, aircraft will not fly for want of the pilots. He wants to avoid that. Sir, your suggestion is certainly to be taken note of."

45. The DoS in its written note further assured to increase the availability of pilots:—

"An institutional arrangement has been established with Indian Air Force (IAF) for obtaining pilots on deputation. Started initially in 2007 with 2 pilots for 2 years tenure each, IAF has now agreed to depute up to 4 pilots, each for 3 years deputation. Request has been made to increase the deputation period to 4 years, so as to have higher stability in operations."

46. Drawing attention to the problem of maintenance and scarcity of the spare parts for the aerial remote sensing aircraft, the Sub-Committee desired to know the efforts made by DoS in this regard. The Secretary, DoS responded in oral evidence as under:—

"We have identified agencies in the country. In fact, there are a very few of them. We try to get a comprehensive maintenance arrangement with them. When it comes to very costly spare parts like navigation system, etc. we have arrangements to get those things outside the maintenance contract. Otherwise, there are a couple of agencies who are able to do that. That is how we are now managing it. That is a difficult process. As the market changes, as the agencies change, due to the non-availability of maintenance engineers for the aircraft, we have suffered in the past for a few years."

47. As regards problem of technical snags in the aircraft, the DoS in a written reply submitted that:—

"Snag rectification needs to have proper maintenance arrangement along with quick procurement procedure for spares. Towards the same following arrangements have been made:

- A long term (3 years) comprehensive contract is signed with a Maintenance agency which has the capability to meet all the maintenance schedules of the aircraft and can also procure and supply spares.
- Earlier aircraft maintenance was done in Mumbai (except for some smaller activities in Hyderabad). With a new contract, it was made mandatory that all the schedules of aircraft be carried out in Hyderabad. This has greatly reduced the delays in fixing the snags and also facilitated better supervision on the maintenance process.
- To reduce the problems in avionics and inherent delays in sourcing the spares most of which are no longer manufactured and have to be sourced from suppliers of overhauled items, Retrofit of avionics system of the current aircraft is planned to be upgraded to modern full glass cockpit avionics suite. This is planned to be carried out on both aircraft owned by NRSC in a phased manner. Currently the retrofit activity on one aircraft is in the stage of evaluation of price bids by the vendors."

48. Asked about mechanism to replace the ageing aerial sensing aircrafts with latest ones and ensuring continuous flow of spares, the DoS submitted as under:—

"DoS has taken up extending existing aircrafts life by upgrading the avionics to modern full glass cockpit avionics for both the aircrafts in a phased manner. At an appropriate time the aspect of aircraft replacement will also be critically examined.

A comprehensive aircraft maintenance contract has been signed with an aircraft maintenance agency, which has resulted in better flow of spares to meet all the maintenance schedules of the aircraft. Avionics related spares requirement for failure maintenance is also expected to reduce after the planned avionics upgrade."

49. In the light of deficiencies noticed in utilization of aircrafts, the Sub-Committee enquired about the measures initiated by NRSC to improve operational efficiency of aircraft performing the task of aerial remote sensing. The DoS, in response, reiterated their reply as reproduced in paras 46 and 47 above.

Security vetting from various agencies

50. The Sub-Committee's examination of the subject revealed that delays in getting clearance from Ministry of Defence, Survey of India and other authorities was one of the reasons for considerable delay in completion of aerial projects. In this regard, the Secretary, DoS putforth in his oral deposition:—

".....issues related to the security clearance come because if in any area we have to do aerial remote sensing, we have to wait till seven agencies in MHA and MoD to give the clearance. We have to wait for it. Once the flying is done, again it has to be vetted by these agencies for the vulnerable areas and vulnerable points. It is a time consuming affair but we have been doing our best."

51. Elucidating this aspect of delay of completion of aerial projects, the DoS in its written reply informed as under:—

"The time required for statutory clearance of a project cannot be estimated and is not under the control of NRSC. Therefore to ensure that the user is aware of delays in commencing the project and realization of project deliverables, the following clauses are included in all MoU/agreements with the user.

1. "Project duration commences from the date of receipt of advance payment or receipt of security clearance from Ministry of Defence whichever is later".
2. "The date of delivery of products is subjected to final classification and security vetting and clearance by Ministry of Defence for data supply. If any delay occurs on account of this factor in the project schedule, it would be considered due to inevitable procedure."

52. The DoS further reiterated their stand and submitted that:—

"Considering the time involved, NRSC applies for security clearance for conducting aerial survey to the controlling authorities before signing of MoU with user. However, it is not possible to obtain advanced clearance to deliver data products to user because security vetting is a visual interpretation process by MoD after submission of data by NRSC."

VI. REMOTE SENSING APPLICATION PROJECTS

53. NRSC is responsible for enhancing the use of modern remote sensing technique by providing support for conceiving the idea of use of remote sensing techniques, planning, execution and ultimate use of outputs in various areas. Further, NRSC was also responsible for providing operational resource survey services to users by utilising modern remote sensing techniques. In this background, the National Natural Resources Management System (NNRMS) was set up in 1983 under the aegis of Planning Commission, Government of India to carry out the Indian Earth Observation Activities and was mandated to address the specific issues pertaining to applications of remote sensing in different thematic areas. Explaining the background and role of NNRMS, Director, DoS stated during evidence:—

"...the National Natural Resource System which was conceived as back as 1983 addressed this issue that the data which come from the satellites and if it gets converted into certain level of information, how it has to be used both by the Central Government agencies, the State Government agencies as well as the Non-Governmental Organisations or the voluntary organisations in actual implementation was conceived and as a follow-up of that, the Standing Committees for various resource disciplines like agriculture, rural development, environment and forests, oceanography were, in fact, formulated and the Secretary of the department concerned, the user Ministry concerned, would Chair these Standing Committees and generally in order to facilitate this process of using this information, a person from the Department of Space, the concerned Scientist would be made the Member-Secretary so that he could coordinate with that particular Ministry to formulate what kind of programmes that need to be taken up. As a part of this process, for example, in the Ministry of Agriculture, in fact one of the most important things that the space has done is to give you the crop production forecast for wheat, rice, rapeseed, mustard etc. much before the harvest so that the Government can take policy decisions on import, export, pricing, support prices or even transportation from one place to the other and on the basis of the success of this particular experiment, today the Ministry of Agriculture is setting up its own National Crop Forecasting Centre in Delhi so that they would take over the responsibility of producing, on their own, this data and the Department of Space can, in fact, concentrate more on developing new techniques of using this for much better forecast and accuracies etc.

On the other hand, the Ministry of Environment and Forests which has been extremely active has its own budget head and has used this technology for making, for example, the entire inventory of a large number of glaciers, to be precise, about 32,000 glaciers which are there in the Himalayas and how many of them are retreating, all this has been done."

54. Department of Space is the nodal agency responsible for carrying out mandate of NNRMS and the Secretariat of NNRMS is housed in the ISRO Headquarters, Bangalore. The Planning Committee of NNRMS (PC-NNRMS) oversees the end-to-end programme and provides necessary guidance for the implementation of the programme. Nine high-power Standing Committees constituted under NNRMS are mandated to address the specific issues pertaining to applications of remote sensing in different thematic areas. Each of these Standing Committees is chaired by Secretary of the respective Government departments and includes experts from major user departments/agencies. While PC-NNRMS takes up some programmes directly to be implemented by NNRMS, its Standing Committees take up programmes/projects relating to thematic areas.

55. NRSC, besides being one of the implementing agencies, was a member/member secretary of different Standing Committees of NNRMS, which coordinated the projects of national importance. The role of NRSC, therefore, extended to ensuring, by obtaining periodical feedback from users, that the deliverables supplied by them to other agencies implementing the projects of national importance were effectively utilised. Audit, however, observed that NRSC did not play a proactive role in ensuring that the project objectives were fully achieved. This was due to inadequate coordination with other implementing agencies as the Standing Committees which were to coordinate these projects did not meet regularly.

56. Drawing the attention of the DoS to the Audit observation that various Standing Committees on NNRMS did not meet periodically to coordinate and monitor effective implementation of the projects aimed to achieve vital social objectives, the Sub-Committee enquired whether the DoS ensure regular meetings of the same. In this regard, the DoS stated as under:—

"Yes, last one year (2010-11), the following meetings have been held:

Committee	Meeting Date
Agriculture & Soils	May 26, 2011
Bio-Resources	October 20, 2010
	February 10, 2010
Cartography & Mapping	July 13, 2011
	October 8, 2010
Geology & Mineral Resources	April 13, 2011
	December 23, 2010
	February 15, 2010
Ocean & Meteorology	January 4, 2011
Rural Development	June 28, 2011
Training & Technology	June 29, 2011
Urban Management	July 06, 2011
Water Resources	June 28, 2011
	May 20, 2010

It may also be noted that the PC-NNRMS met on 18 July, 2011 at New Delhi under the chairmanship of Member (Science), Planning Commission and all Standing Committees participated actively and provided varieties of inputs on the requirements for satellites and sensors for the coming 12th FYP and beyond."

57. Projects undertaken by NRSC were of two kinds *i.e.*, projects of national importance under NNRMS and operational projects which were undertaken for various users including ACL. The projects of national importance under NNRMS which were coordinated by the Standing Committees of NNRMS were:

- (i) Study on Command Area Development.
- (ii) National Wasteland Mapping.
- (iii) Rajiv Gandhi National Drinking Water Mission.

The projects of national importance directly implemented by NNRMS through various DoS/ISRO units including NRSC were:

- (i) Village Resource Centre Programme.
- (ii) Disaster Management Support Programme.

Projects of National Importance under NNRMS coordinated by the Standing Committees of NNRMS

58. The results of study in three projects of national importance—study on command area development programme, wasteland mapping mission and Rajiv Gandhi National Drinking Water Mission—using remote-sensing techniques involving substantial public spending could not be put to use as envisaged. The project of study on command area development programme was entrusted to NRSC by Ministry of Water Resources and the other two were entrusted by the Ministry of Rural Development. NRSC had assured Audit in February 2010 that efforts would be made through various NNRMS Standing Committees to urge the respective Ministries to utilise the remote sensing technology in planning and implementation of projects.

59. Responding to above Audit observations, the Secretary DoS stated during evidence:—

"There is also reference that application projects are taking more time. I may submit that these application projects are done by NRSC where there is no institutional mechanism for the user department, for example the Ocean, Agriculture, Forests. They have their own system. The Department of Water Resources got their own information system. But, there is a prioritization which the user Ministry provides in consultation with the State Governments. Phase-10 was done in five phases. Now, there is a periodical assessment of the waste land. Drinking water project was done in five phases as an understanding between the Ministry as well as the State Governments. The 5th phase is going on. The result of this has been very, very encouraging. For the ground water targeting by mere use of remote sensing data, the success rate went up from 40-45 per cent to as much as 90-95 per cent."

60. On being asked by the Sub-Committee about the efforts made by the DoS to impress upon the Ministries concerned to utilize the remote sensing technology in planning and implementation of projects, the DoS replied as under:—

"Efforts have been made to develop wide user base as well as the needs for resource management *vis-a-vis* the capabilities of IRS systems. The thrust for the utilisation of IRS data in different sectors like Agriculture, Water Resources, Forest and Environment, Geology, Soils and Land use, Ocean and Marine Resources, Rural Development, etc. through Standing Committees and State level application projects, had led to a wide range of applications. This has resulted in the proliferation of IRS data into the activities of a large number of user agencies/departments both within and outside the Government and has led to the establishment of a wide user base at different levels of management and decision-making. Due to the concerted efforts made through NNRMS, a few organisations have already established the institutional mechanism for utilisation of remote sensing data and others are in the process of the same. This is being ensured through Planning Committee—National Natural Resources Management System (PC-NNRMS) and theme oriented Standing Committees.

Following projects of different ministries have been carried out in the recent past, using Earth Observation satellite data, with extensive use:—

Ministry	Project area	DoS/NRSC projects
1	2	3
Min. of Agriculture	Agriculture Drought	<ul style="list-style-type: none"> • FASAL project • National Agricultural Drought Assessment and Monitoring System (NADAMS)
Min. of Home Affairs	Disaster Management Support	<ul style="list-style-type: none"> • Near Real Time Flood Mapping and Monitoring • Flood Forecasting and Development of Special Decision Support • System for Flood Damage Mitigation • Topographical mapping of Coastline along Indian coast with 2 km inland • National Database for Emergency Management • Monitoring & Evaluation of National Watershed Development Programme for Rainfed Areas (NWDPA) (Phase-III) using RS, GIS and MIS
Min. of Environment and Forests	Environment Snow & Glaciers	<ul style="list-style-type: none"> • Biodiversity Characterization at Landscape Level • Indian Forest Fire Response and Assessment System • National Carbon Project • National Wetland mapping • Snow and glacier mapping for Himalayas
Min. of Mines	Geosciences	<ul style="list-style-type: none"> • Natural Resources Census—National Geomorphological and lineament mapping on 1: 50,000 Scale

1	2	3
Min. of Rural Development	Land Resources and Rural Development	<ul style="list-style-type: none"> • National Land use Land Cover Map using Multi-temporal Advanced Wide Field Sensor (AWiFS) • Natural Resources Census - National Land Use Land Cover Mapping on 1:50,000 scale using temporal IRS-Linear Imaging Self-Scanning Sensor (LISS) III data • Nationwide mapping of land degradation using multi-temporal satellite data • National Wastelands Monitoring on 1:50,000 scale using temporal IRS-LISS III data • National Wastelands Change Analysis on 1:50,000 Scale using temporal IRS-LISS III data • Rajiv Gandhi National Drinking Water Mission (RGNDWM)
Min. of Tribal Affairs	ITDA	<ul style="list-style-type: none"> • Comparative Assessment and Macro Level Planning of Integrated Tribal Development Areas using Geoinformatics
Min. of Power	Power & Infrastructure	<ul style="list-style-type: none"> • Topographic Mapping from satellite images for Selapass area adjacent to Tawang basin in Arunachal Pradesh, for construction of tunnel for all weather connectivity • Hydropower Sites Investigation using Geospatial Techniques
Min. of Urban Development	Urban Studies & Rail/Road Infrastructure	<ul style="list-style-type: none"> • National Urban Information System (NUIS)
Min. of Water Resources	Irrigation	<ul style="list-style-type: none"> • Assessment of Irrigation Potential (I.P.) created in AIBP funded • Irrigation Projects (53) in India using Cartosat - 1 Satellite Data • Satellite Data based Evaluation of Irrigation Tanks Identified under National Project for Repair, Renovation and Restoration (NPRRR) of Water Bodies Directly Linked to Agriculture • Assessment of Waterlogging and Salt and /or Alkaline Affected Soils in the Commands of all Major and Medium Irrigation Projects in the country • Reservoir sedimentation assessment of major reservoirs
	Snow & Glacial Lakes	<ul style="list-style-type: none"> • Snowmelt Runoff Forecasting in Himalayan River Basins using Remote Sensing Inputs • Inventory and Monitoring of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basin
	ICT applications	<ul style="list-style-type: none"> • Generation of Database and Implementation of Web Enabled Water Resources Information System (India-WRIS) in the Country."

Projects of National Importance Directly Implemented by NNRMS through DoS/ISRO Units Including NRSC

61. The Committee note that in NNRMS projects *viz.*, Village Resource Centre and Disaster Management Support Programme, NRSC could not provide desired results. The review of performance of Village Resource Centre coordinated by NRSC (regional coordinator in the States of Andhra Pradesh and Orissa) covering the period from October, 2007 to August, 2008 revealed that targets for setting up VRC nodes could not be achieved. Expert centres were utilizing only 51 per cent of the allocated slots and nodes participating in programme were only 13 per cent. In Disaster Management Support programme, 92 per cent of the funds amounting to ₹ 86.90 crore released to NRSC for the above programme as well as assets worth ₹ 7.80 crore remained unutilized with NRSC.

62. In the above context, the Sub-Committee desired to be apprised of the latest position of setting up of VRC Nodes in various States of the country. The DoS intimated to the Committee the following:—

"At present, 473 VRC nodes have set up in 22 States/UTs across the country. The State-wise details are: Andhra Pradesh - 34; Assam - 13; Bihar - 19; Delhi - 2; Gujarat - 15; Jharkhand - 26; Karnataka - 58; Kerala - 21; Madhya Pradesh - 24; Maharashtra - 18; Meghalaya - 1; Nagaland - 8; Orissa - 44; Rajasthan - 21; Tamil Nadu & Puducherry - 58; Uttarakhand - 18; Uttar Pradesh - 30; West Bengal - 10; Sikkim - 19; Himachal Pradesh - 30 and Andaman & Nicobar Islands - 4."

63. Asked about the improvement made or suggested by the DoS to achieve timely delivery of desired results in NNRMS projects, the DoS responded as under:—

"The Department has taken all requisite steps through a series of internal reviews to ensure that desired results of VRC and DMSP are simultaneously achieved. There has been some problem in the recent past due to non-availability of satellite communication bandwidth. However, necessary steps are taken to re-allocate communication bandwidth through INSAT system and recently launched GSAT 12 satellite. It may be noted that both VRC and DMSP have made significant impacts in their respective areas. Some of those achievements are brought out below:

(a) Village Resource Centre (VRC)

VRC Regional node at NRSC was started in October, 2007 to manage, support, evaluate and improve the societal service programmes including natural resources utilization in and around the VRCs set up in A.P. and Orissa.

VRCs in A.P. and Orissa are making good impact on the users. It is especially very good in a number of VRCs in Orissa where the following results are reported:—

- Job opportunities improved. 14 women got road construction work under NREG scheme.

- The forest right committees formed in many villages due to interactions and follow-up programmes on forest right bill.
- A Self Help Group received claims after interaction programme on RTI Act.
- Special coaching helped 3 girls pass HS in I class in Kansamari.
- Awareness on AIDS & sanitation improved.

In Andhra Pradesh, the villages served by VRCs were benefited with the knowledge on tank rehabilitation, micro financing, AIDS control, alternative livelihoods, etc.

- Agricultural advisories were provided to farmers by Acharya N.G. Ranga Agricultural University.
- Training on painting, weaving, electrical works, computer operations, tailoring, etc. were provided to local youth by Swamy Ramananda Thirtha Rural Training Institute.
- Health Camps were conducted by Govt. Ayurveda Hospital and Dhan foundation to showcase services through VRC network.
- Health and diagnostic services were extended by Byrraju foundation through VRCs.

Several rural mass awareness camps were conducted in A.P. and Orissa with the association of concerned NGO partners to provide direct rural services like health, education, livelihood, agriculture, etc. to showcase the tele-services that are available through VRC network.

(b) Disaster Management Support Programme (DMSP)

National Remote Sensing Centre (NRSC) provides aerospace products and services to the concerned State and Central Governments Departments in respect of six natural disasters viz., Floods, Cyclone, Agricultural Drought, Earthquake, Landslides and Forest fires. Floods, Agricultural Drought and Forest fires are being executed annually on regular basis whereas Cyclone, Landslides and Earthquake are being monitored on event basis. Brief details of these activities are given below:

Floods & Cyclone Disaster

For flood and cyclone disaster management, a close watch is being kept on the flood situation in the country and major flood events occurred are monitored using satellite data. Flood inundation maps prepared from analysis of satellite data are furnished in near real-time to the Ministry of Home Affairs (MHA), Central Water Commission (CWC) and State Disaster/Relief Department.

The information is used for flood relief management. List of the flood maps prepared during last four years is given below:—

List of the Flood Maps

Year	State	No. of Satellite data used	No. of Maps
2011	Assam	10	25
	Bihar	7	18
	Uttar Pradesh	1	1
	Orissa	2	2
	West Bengal	2	3
	Kerala	1	1
	Total		50
2010	Andhra Pradesh	7	20
	Assam	22	103
	Bihar	13	65
	Uttar Pradesh	15	37
	West Bengal	1	1
	Chhattisgarh	1	1
	Punjab & Haryana	10	34
	Kerala	1	1
	Manipur	1	1
	Tripura	1	1
	Tamil Nadu	4	7
	Delhi	4	6
	Uttarakhand	1	1
		1	1
Total		279	
2009	Andhra Pradesh	4	7
	Assam	12	36
	Bihar	17	130
	Gujarat	2	2
	Uttar Pradesh	8	28
	West Bengal	2	9
	Karnataka	1	1
	Orissa	7	62
Total		275	
2008	Andhra Pradesh	4	12
	Assam	17	38
	Bihar	37	284
	Gujarat	1	1
	Punjab	1	1
	Uttar Pradesh	14	16
	West Bengal	6	22
	Orissa	16	110
Total		484	

Customized software was developed for generation of flood inundation maps and provide to Government of Bihar which is operationally used by the Flood Management Information System Cell (FMISC), of Water Resources Department, Govt. of Bihar.

Further, using the historic flood inundation information derived from satellite data for the past 10 years, flood hazard atlas for Assam was prepared in association with NDMA, CWC and Government of Assam. Based on the specific request from State Governments, information on changes in river configuration, bank erosion, monitoring flood control works, etc., are also provided for selected river reaches. The information is used for flood mitigation by respective State Governments.

Mobile based application for relief management was developed for real time collection and transmission of ground information to central server for effective organization of relief management. A prototype live demonstration was organised at Assam and appraisal on the application was made to NDMA.

Agricultural Drought

Prevalence and severity of agricultural drought is assessed fortnightly and monthly situation reports are furnished for 13 States during the kharif season (June to October). Using various indices, are favourable for sowing is identified. Using the frequency of drought occurrence along with relevant ancillary information, drought vulnerability is being done on pilot basis. The Information on agriculture drought is provided to Ministry of Agriculture and respective State Government and it is used for contingency crop planning and drought declaration.

Forest Fires

Forest Fire products are being generated during fire season (Feb.-June) from analysis of satellite data everyday within a few hours of the satellite pass. Active fire locations with overlay of State boundaries are provided to the identified nodal officers of State forest departments. Based on the specific request from users, burnt area products are generated using IRS AWiFS and IRS LISS-III data.

Landslides

Landslide hazard zone maps for selected pilgrim routes in the Himalayan region of Uttarakhand and Himachal Pradesh States have been prepared and management maps suggesting suitable measures for reducing the associated risk have been generated and provided to concerned user departments for taking necessary measures. These maps were provided to respective State Governments for implementing suggested management practices to minimize the risk.

Earthquake

Very High-resolution data are used for post-disaster assessment in the dense urban clusters. Remote sensing data can provide the basic inputs on the structural fabric of the terrain. The lineament map is one of the important inputs for delineating the seismo-tectonic province. For the October 8, 2005 earthquake

in J&K, Cartosat-1 stereoscopic data (2.5m resolution) has been used to map the road blockages due to landslides and the fully collapsed buildings were identified in the Punch and Uri region of the J&K. The first assessment maps were provided to MHA.

Web Portal on DSC Services

The information and the products generated from space data sets for disaster management have been posted on to the exclusive DSC website, on NRSC website besides ISRO Bhuvan geo-portal for maximum outreach.

Capacity Building

Exclusive one-week training course on 'Space Enabled Geoinformation for Disaster Management' is being organised annually exclusively for the State Government officers to enable them for better utilisation of products derived from space data sets for disaster management. In addition, faculty support is provided on regular basis to the various training programmes for State and Central Government officials organised by National Institute of Disaster Management (NIDM), MHA."

Operational Projects for ACL

64. NRSC undertook projects on behalf of ACL, the commercial arm of DoS, towards establishment/upgradation of ground station facility of ACL. It was brought out by Audit that in four out of seven operational projects of ACL, chargeable overheads were not levied resulting in under-costing of these projects by Rs. 83.43 lakh. In two completed projects, NRSC did not raise demand for balance dues of Rs. 1.85 crore from ACL.

65. Responding to the above observations by Audit, the DoS submitted to the Committee as under:—

“(a) Under-costing, non-levy of chargeable overheads etc. from ACL

NRSC was extending required support of M/s ACL in the establishment of various international ground stations. One of the activities under this understanding was the development of required S/W which is unique for each ground station for data reception/processing, NRSC was undertaking this responsibility, as it has got the required expertise in this field. The amounts provided for this activity were not funded by M/s ACL directly. For the support extended, M/s ACL was transferring a portion of the revenues earned by them from IGS towards access fee and royalty to NRSC and out of such receipts only, NRSC had earmarked certain funds (which otherwise should have been provided in centre budget) on need basis, to meet the expenses related to in house development of S/W. For effective monitoring of the expenditure a separate project code was given and the activity was only an in house development. As M/s ACL had not directly funded for this activity, no overheads were charged.

(b) Processing facility for SVALBARD Data at NRSC at a cost of Rs. 10 Lakhs on civil works.

Some minor civil works modification costing Rs. 10.00 lakhs (approx) were undertaken by NRSA in 2006 to establish "Processing facility for SVALBARD Data." Subsequently in July 2006, NRSA sent a proposal costing Rs. 65.66 lakhs to M/s ACL for establishing a total facility inclusive of fixed cost plus recurring expenditure for one year.

However, NRSC did not receive any clearance from M/s ACL for the proposal. Hence there were no dues pending with M/s ACL.

(c) Upgradation of existing Data Reception station for IRS P-6 at DIPAC, Delhi. (PC 1246)

A duly signed MoU was entered into with M/s ACL for the upgradation of Defence Image Processing and Analysis Centre (DIPAC) facility at Delhi at a total cost of Rs. 3.50 crores, which includes 15% overhead + 4.5% Departmental charges. 50% advance amounting to Rs. 1.75 crores also was received as per MoU terms.

However, subsequently there was a change in scope of work and M/s ACL procured and supplied some of the major deliverables such as Servers etc. NRSC could complete the total work within the 50% advance received. Hence, no further demand was raised on M/s ACL for transfer of additional funds. Hence, there was no amount due from M/s ACL.

Adding to this reply, DoS has further submitted:—

"Under costing of other projects

A conscious approach has been adopted to charge reduced rate of overhead on case-to-case basis depending on the project's criticality, national importance, scale, promotional requirements to exploit full potential in a particular sector etc.

The abortives (unsuccessful flying due to bad weather, etc.) as a separate line item will be seen only in projects where the actual quantum of work is known and the project cost is estimated accordingly. For sensor calibration projects for users like DRDL and LRDE the actual quantum of work is not known prior to flying activity and the project cost is recovered by billing after the work is completed. In such cases the abortive flying is included in the actual number of flying hours for which billing is done. Therefore in such cases separate line item of abortive flying will not be seen in project bill/estimate."

Other operational projects

66. The Committee note that NRSC also undertook operational projects for various users other than ACL for delivery of maps and processing remote sensing data for urban planning, mining, water resources, impact evaluation of development programmes, etc. On being asked to intimate the status of completion of operational

projects undertaken by NRSC for various users, the DoS in a written note submitted as under:

"The status of completion of operational projects (of value more than ₹100 lakhs) undertaken by NRSC for various users since 2001 is given below:

Aerial Application Projects			
Sl. No.	Project title	Project Commencement	Project completion
1	2	3	4
1.	Aerial Photography and Large scale digital topographic mapping of 28 towns in India under Ph-II	Jan. 2001	Jan. 2005
2.	LiDAR survey for Krishana-Godavari river linking project	Mar. 2001	Dec. 2006
3.	Aerial Photography of Delhi Development Authority	Jan. 2003	Jun. 2004
4.	Topographic mapping of Garland canal and Service canal diverting water from Netravati and Bhadravati rivers	Apr. 2003	2011
5.	Aerial Photography of 16 places in Karnataka	Jan. 2004	Feb. 2006
6.	Aerial Photography of Kolkata Municipal Corporation area	Jan. 2004	Dec. 2004
7.	Aerial Photography and Mapping of Maldives	Feb. 2004	Feb. 2005
8.	Aerial Photography of Abhujmad area	Feb. 2005	Mar. 2007
9.	Aerial Photography of Mumbai, Chennai and Ahmedabad cities	Apr. 2005	Mar. 2008
10.	Aerial Photography and Orthophoto generation of Nizamabad district	Oct. 2005	Jan. 2008
11.	Utility Mapping and Geo Spatial database generation	Jan. 2006	Jun. 2011
12.	Development of methodology for volumetric analysis of overburden for CMPDI	Aug. 2006	Apr. 2009
13.	Feasibility assessment study of the proposed gas pipeline using geospatial data and gis techniques (RGTIL)	Jan. 2007	Jun. 2007

1	2	3	4
14.	Aerial photography of 132 towns spread all over India for NUIS	Oct. 2007	Jan. 2011
15.	Topographical mapping of Coastline of India using Cartosat-2 data	Jan. 2008	Apr. 2008
16.	Generating DEM for entire Indian Coast	Jan. 2008	Apr. 2008
17.	Aerial Photography and Orthophoto generation for 10 towns in Chhattisgarh	Dec. 2010	Aug. 2011
18.	Aerial Photography over 10 coal mines for Sol	Jan. 2011	July. 2011

Satellite remote sensing application Projects

Sl. No.	Project title	Project commencement	Project completion
1	2	3	4
1.	National Wasteland Mapping Phase I (12 districts) Phase II (134 districts) Phase III (89 districts) Phase IV (Remaining districts of Madhya Pradesh not covered under Phase I, II & III) Phase V (Rest of the country including Union territories and islands that are not covered under Phases I to IV)	Oct. 86 1987 1992 1992 1997	Apr. 87 1988 1995 1995 1999
2.	National Wasteland Updation Project (NWUP-2003)-Entire country	2003	Apr. 2005
3.	National Wasteland Monitoring Project (NWMP-2006)-Entire Country	2005-06	Dec. 2009
4.	National Wasteland Change Analysis (NWCA-2010)-Entire Country	2008-09	Feb. 2011
5.	Rajiv Gandhi National Drinking Water Mission Phase I (Andhra Pradesh (part), Kerala, Karnataka, Chhattisgarh, Madhya Pradesh & Rajasthan) Phase II (Orissa, Gujarat, Jharkhand & Himachal Pradesh)	Dec. 1998 Aug. 2001 Oct. 2002 (Orissa, Gujarat, & Himachal Pradesh)	2002 2005

1	2	3	4
	Phase III A (Maharashtra, Uttarakhand, Assam, Andhra Pradesh (remaining part Jammu & Kashmir and Punjab)	Feb. 2007	2009 (except Maharashtra & J&K by Jun. 2011)
	Phase III B (West Bengal & Uttar Pradesh in part, Arunachal Pradesh & Haryana)	Mar. 2008	Dec. 2010
6.	Assessment of Irrigation Potential created in AIBP Funded Irrigation Projects- Phase I (53 nos.) using Cartosat 1 satellite data	April 2007	46 projects were completed by April 2009. (The deferred 7 projects were completed by December 2009 as concurred by User for the want of field data)
7.	Satellite Remote Sensing Based Evaluation Study of Irrigation Projects Covered under CAD Programme	April 1998	May 2001
8.	Satellite Data based Evaluation of Irrigation Tanks Identified under NPRRR of water bodies Directly Linked to Agriculture	July 2007	Feb. 2010
9.	Snowmelt runoff forecasting in Sutlej Basin using RS Inputs for BBMB	Oct. 2000	Sep. 2009
10.	Inventory of Glacial Lakes/Water Bodies in the Himalayan Region of Indian River Basins	July 2010	15th March 2011
11.	Biodiversity Characterisation at Landscape Level using Satellite Remote Sensing and GIS		
	Phase I	Jan. 1998	Dec. 2002
	Phase II	Jun. 2003	Jun. 2007
	Phase III	Jan. 2008	Jun. 2011

67. Audit scrutiny revealed that in 21 out of 60 user projects test-checked by Audit, completion was delayed by 8 to 54 months impacting the effective utilization of

various users at NRSC. Asked to furnish reasons for delays in these projects, the DoS submitted as under:

“NRSC prepares maps using aerial and satellite data for use by users. These maps/projects require inputs/corroborating information from user agencies/other agencies. When flow of this information is delayed, the project slips.”

Project code/(Cost in Lakh of ₹)	Project title [time escalation]	Reasons for delay
1	2	3
Aerial Projects		
1208 (66.19)	Large Scale Mapping of 11 towns of Andhra Pradesh Urban Services for Poor (APUSP) [34 Months]	The delay in execution of project was due to non-receipt of scheduled payments from Govt. of AP. However, all the outstanding payment has been realized from APUSP by June 2008.
1120 (63)	Topographical survey for Godavari-Krishna Link Project [40 Months]	The procurement action of LiDAR system was in place in line with the project commitments made. This technology is new and was hitherto not used in India.
1059 (130.32)	Topographical survey for Godavari-Krishna Link Project [54 Months]	There were delays by US government in providing export license to subsystems with sensitive technology. MoD clearance also took long time which added further delay in operationalisation of the ALTM system.
1155 (1549.4)	ALTM mapping for Garland command and Catchment area for WRDO. [48 Months]	Due to default by the user, the project is suspended pending settlement of dues. WRDO could not finalise the yield, which was an important parameter for the design of the entire project. Due to this, area of the flying could not be decided.
1223 (65.77)	Aerial mapping for National Thermal Power Corporation (NTPC) over Loharinag [25 Months]	The delay was due to factors beyond our control, such as, unfavourable weather conditions and time required for security vetting of the data by multiple agencies under the control of Ministry of Defence.
1222 (138.99)	Aerial mapping of Chhattisgarh [20 Months]	The delay was due to difficulties in ground control survey due to naxal problem. The problem was circumvented by carrying out rectification of photographs using external controls.

1	2	3
1185 (121)	Aerial photography and Mapping over Kolkata Municipal Corporation [33 Months]	The delay was caused due to change in user specifications and addition of Ortho-photo as deliverables. Besides this the starting of Aerial Photography itself got delayed because during the first attempt there was a lot of haze which affects the quality of acquired data.
1183 (110.06)	Aerial photography of 16 places in Karnataka for KRSAC, Bangalore [48 Months]	Out of 16 towns, 13 were completed and data supplied to user within time. The work for remaining towns got delayed due to unfavourable weather conditions and delay in security clearance.
1153 (38)	Aerial triangulation & photogrammetric mapping of Chennai [8 months]	The project was delayed due to technical snag in the aircraft.
694 (843)	Aerial photography of 28 towns in India Phase II 13 towns [8 months]	Aerial photography and mapping of 13 towns in Phase-II got delayed due to season dependent factors. Further, these towns are spread all over the country and the work of control survey involved considerable logistic challenges.
1070 (1439)	Aerial photography of 28 towns in India Phase III 15 towns [26 months]	Aerial photography and mapping of 15 towns in Phase-III got delayed due to season dependent factors. Further, these towns are spread all over the country and the work of control survey involved considerable logistic challenges.
1240 (20)	Preparation of Base Maps for additional Shimla planning area [13 months]	The delay was due to difficult terrain and inclement weather conditions prevailing in Shimla and its surroundings, which affected field data collection.
Satellite Projects		
1061 (63.32)	Integrated land & water Resources conservation using RS&GIS in Mandsoar, Ministry of Rural Development [35 months]	The project was completed in June 2003 and not in March 2005. In an internal review, it was decided to use the hydro-geomorphological maps and other base layers under preparation for this study area covered in Rajiv Gandhi National Drinking Water Mission (RGNDWM) in order to optimize the efforts and resources. Hence there was a delay of 1 year 3 months.

1	2	3
1217 (17.61)	Inventory and change Detection study of surface water resources [20 Months]	Main reasons for the delay was in getting necessary inputs from the project sponsoring agencies themselves, which were essential for completing the study.
1127 (498)	National Wasteland Mission (2003) [12 Months]	Main reasons for the delay was in getting necessary inputs from the project sponsoring agencies themselves, which were essential for completing the study.
1264 (346.25)	National Wasteland Mission (2005) [8 Months]	Main reasons for the delay was in getting necessary inputs from the project sponsoring agencies themselves, which were essential for completing the study.
1204 (14.20)	Ecological impact agreement of Khelgaon NTPC [20 Months]	Main reasons for the delay was in getting necessary inputs from the project sponsoring agencies themselves, which were essential for completing the study.
1063 (46.08)	Delineation of Season-wise cropped irrigated Area [9 Months]	Main reasons for the delay was in getting necessary inputs from the project sponsoring agencies themselves, which were essential for completing the study.
1118 (346.27)	Integrated resource information system for desert area [11 Months]	The project was initiated in June 2002 and was expected to be completed by July 2004. The said project was completed for the states of Karnataka, Haryana and Rajasthan by July 2004. However, in case of Gujarat there was a delay in completing the soil theme data base which was handled by All India Soil & Land use Survey Organisation, Delhi. This was communicated to the sponsoring agency, <i>i.e.</i> , Ministry of Rural Development, Govt. of India, who in turn approved the extension of project till 31st March, 2005 (<i>Vide</i> letter No. 5-19/2001- The dated 21st February, 2005), thereby resulted in a delay of 3 months only. However, this communication got inadvertently missed our attention while responding to earlier audit queries.
1252 (61.82)	Prioritisation of watershed using remote sensing and GIS techniques [12 months]	The draft report of the project was submitted to MRD in May 2007 and the comments were clarified in the final report submitted in November 2007.

1	2	3
1201 (195.69)	Mapping in geo-database creation using high resolution satellite data for Hyderabad Urban Development Authority HUDA [36 months]	HUDA had expressed their inability to supply the input required for the remaining component of the work. Hence it has been jointly decided (by NRSA & HUDA) to close the project and return the funds meant for this activity to HUDA.

68. In reply to a specific query, the DoS further explained the mechanism in place to ensure timely and efficient execution of projects of national importance undertaken by NRSC. The DoS submitted that in NRSC, for every operational user project, a regular project progress review mechanism has been introduced through monthly meetings of heads of divisions. Project management software has been implemented that enables the project team to bring the project status to the notice of NRSC management and also to seek guidance. Extensive discussions are held with concerned project sponsoring agency for finalization of project proposal and various clauses of MoU. In respect of all the user projects, MoUs are signed with the project sponsoring agencies as well as with the partner institutes carrying out the assigned tasks wherein the responsibilities of NRSC, Partner Institutes and Sponsoring Agencies are clearly mentioned for timely completion of the projects. Product Realisation Plan (Technical manual) is prepared for each project which describes the Product specification, Input Satellite data, Ground truth, Base maps, ancillary data, etc., Pre-processing of data & data preparation and image analysis and interpretation, Field verification process, Post field data analysis and interpretation/correction, Final product generation (Map/report/statistics) and Quality Assurance Mechanism and Accuracy Standards. A core team is established for each project for better project management in the process of continuous improvement in project handling, NRSC has formed an exclusive project coordination cell for aerial projects from 2007 onwards. This cell coordinates regularly with users for project inputs, realizing payments etc for smooth execution of projects as per MoUs. A Project coordinator is identified for each project to deal with the project monitoring for scheduled completion. The progress of projects is also reviewed once in 2 months to address the issues if any during the project execution.

69. An amount of Rs. 4.99 crore was outstanding from users in the projects test-checked by Audit. Asked to indicate the present status of these dues, DoS responded that:—

"Out of the amount of Rs. 4.94 crores, stated by Audit, Rs. 3.41 crores have been realised till date and Rs. 1.53 crores are still outstanding.

This amount of Rs. 1.53 crores due includes Rs. 83.43 lakhs due from M/s. ASCO Ltd. against whom legal proceedings were taken up and the matter is also being pursued with Government officials of West Bengal to render help in unearthing the assets of the Company.

Another major amount of Rs. 26.26 lakhs (as against Rs. 27.99 lakhs pointed out by audit) is due from Bruhat Bangalore Mahanagara Palike, Bangalore. Efforts are being made to recover this amount. Efforts are also on to realize the balance dues of Rs. 0.43 crores from various other users (29 cases)."

70. Audit further pointed out that NRSC could not obtain necessary inputs from Water Resources Development Organisation (WRDO) of Karnataka for execution of a project and the project was kept in abeyance from December 2005. The expenditure of Rs. 4.64 crore, therefore, did not serve the intended purpose and Rs. 2.07 crore remained to be recovered from WRDO. Asked categorically to state attempts made to revive the project, DoS responded as under:—

"The project was kept in abeyance as the user has not paid the amount as per the terms of the MoU/agreement. Subsequently, user has split the project into two phases. The area surveyed by NRSC was treated as phase-I. The project was continued upon receipt of payment from the user and data products were delivered to user. NRSC has received from WRDO, in January, 2010, an amount for the value of work executed *i.e.* Rs. 2.22 crores, which includes the dues of Rs. 2.07 crores as pointed out by audit. User has intimated in principal withdrawal of balance work from MoU. Therefore, reviving the project depends on the need and initiative of the user."

71. It has been brought out by Audit that reievew of balances available under Government projects implemented by NRSC disclosed unutilised aggregate sum of Rs 75.14 crore in 46 projects. On being enquired about this unutilised aggregate sum, DoS submitted:—

- "Break-up of 46 projects amounting to Rs. 75.14 crores mentioned in this para is as under:

	Nos.	Amount (Rs. in Crores)
DoS Funded Project	28	8.67
DMSP Aircraft	01	64.99
User Projects	17	1.48
Total	46	75.14

- Out of 28 DoS projects 21 projects have been completed. Subsequent to governmentalisation, the unspent balances of 20 completed projects (amounting to Rs. 5.37 crores—excluding Rs. 0.10 crores paid to work centres) and 5 ongoing projects (Rs. 2.26 crores) was returned back to DoS in January, 2009. The balance fund available in one completed project (₹0.58 crores) was returned to ISRO Hqrs in August, 2008.

The balance fund available in the remaining 2 on-going projects (Rs. 0.36 crores) was remitted to Government account and kept under "8443-Civil Deposits for Work done" account. Presently, expenditure, if any, against the ongoing projects, is being incurred against authorisation issued by ISRO Hqrs only and hence there is no blockage of funds at present.

- 17 user projects are funded by non-DoS organisation such as DBT, DOD, Min. of S&T, INCOIS, etc., and ANTRIX for various application projects.

Subsequent to governmentalisation, the unspent balances as on 31.08.2008 in these projects were remitted to government account and kept under "8443—Civil Deposits for work done" account. On detailed review, it is found that 16 projects have been completed and one project is in progress. Action is being taken to transfer the balance amount of Rs. 1.37 crores to the Government Revenue/refund to the respective Agencies.

- The other project under which Rs. 64.99 crores are available is towards procurement of Aircraft for Disaster Management Support Programme (DMSP)."

72. Under-costing of Rs. 2.52 crore was pointed out in 12 out of 60 user projects test-checked by Audit. The Sub-committee desired to know whether Department of Space have taken any action to recover or adjust the amounts undercharged. In response, DoS stated:

"The under costing was due to undercharging of overheads (10 cases involving Rs. 1.95 crore) and undercharging of rates for certain services (two cases involving Rs. 0.57 crore).

In all the 10 cases, regarding variation in overhead charges, it is to state that a conscious approach was adopted to charge reduced rate of overhead on case-to-case basis depending on the projects's criticality, national importance, scale, promotional requirements to exploit full potential in a particular sector etc.

In respect of other two cases regarding under-charging on account of abortive charges, it may be noted that the abortive charges as a separate line item will be seen only in projects where the actual quantum of work is known and the projects cost is estimated accordingly. For sensor calibration projects for users like DRDL and LRDE, the actual quantum of work is not known prior to flying activity and the project cost is recovered by billing after the work is completed. In such cases, the abortive flying is included in the actual number of flying hours for which billing is done. Therefore in such cases separate line item of abortive flying will not be seen in project bill/estimate.

In view of the above explanations, there is no case for recovery/adjustment of the above said charges as they do not amount to under charging."

73. The Committee learnt that in two projects, NRSC completed the work without signing MoU as required which in turn rendered the recovery of dues of Rs. 1.11 crore difficult. Asked to specify action taken with regard to these projects, DoS replied:—

“Rs. 83.43 lakhs due from M/s. ASCO Ltd. against whom legal proceedings were taken up. Ministry of Law & Justice, Branch Secretariat, Kolkata have nominated Sri S.S. Sarkar, Addl. Govt. Advocate, to handle the Execution Petition (EP) before the Hon'ble High Court of Kolkata. The EP has been filed and is pending. However, the Schedule of Assets of the Company is to be placed before the High Court for attachment. The Company is not existing in any of its known addresses in Kolkata, as confirmed through site inspections. The Department of Space has also addressed letters to the Chief Secretary, West Bengal, and to the Commissioner of Police, Kolkata, to render help in unearthing the assets of the Company. The matter is being pursued.

Another major amount of Rs. 26.26 lakhs is due from Bruhat Bangalore Mahanagara Palike, Bangalore. Efforts are being made to recover this amount."

VII. TRAINING IN REMOTE SENSING

74. Indian Institute of Remote Sensing (IIRS), Dehradun, a unit of NRSC, is the focal point for long and short-term courses and refresher courses for training in remote sensing. It conducts customised courses for professionals, for the period ranging from four days to 24 months. The main function of Indian Institute of Remote Sensing, Dehradun (IIRS) is capacity building through education at post-graduate level in the application of remote sensing and geo-informatics for natural resource management.

75. With regard to the enrolment of students in various courses conducted by IIRS, Audit observed that there was shortfall in long-term courses such as M.Sc., M.Tech and Post-Graduate Diploma.

76. Asked by the Sub-Committee to elaborate on their plans to increase enrolment in long-term training courses, the DoS stated as under:—

- (a) "Indian Institute of Remote Sensing, ISRO, Department of Space plan to advertise more widely the details of the long term training courses to ensure full capacity enrolment in Post Graduate Diploma, M.Sc. and M. Tech. courses.
- (b) Parallel to that concerned user Departments and the University shall be contacted through mail and the post to sponsor their middle level officers for attending these long term training courses.
- (c) For attracting users Departments to depute their officers for long term courses, Govt. Officials will be provided flexibility in choosing option to complete their project work module at parent department in same year or in two years after initial training of first module of 4 months during first year.
- (d) It is also proposed to organize 'Annual User Meet' based on interactions with users Departments and including their feedback in our long term training programmes.
- (e) NNRMS Standing Committee on Training & Technology will also take appropriate steps towards conducting long term training programmes."

77. In addition to the training at IIRS, NRSC at Hyderabad campus provides short term training to the users of data products, as a part of its promotional activities. NRSC, at its Hyderabad campus, conducted three to eight short term courses for 85 to 180 participants during the period under Audit review. However, percentage of private persons trained against total number of trainees was only 14.53 percent.

78. To a specific concern of the Committee, the Department responded that ISRO has advertised about the available long term courses in National Newspapers in different zones to achieve suitable increase in private participants in their training programmes.

VIII. FINANCIAL MANAGEMENT

79. Audit review revealed significant deficiencies in financial management system of NRSC which are discussed in the succeeding paragraphs.

Excessive release of grants

80. The Committee have been informed that NRSC had an opening balance of Rs. 90.04 crore at the beginning of the year 2003-04 which had increased to Rs. 373.93 crore at the end of 2007-08 due to accumulation of unspent balances. NRSC incurred overall surplus of Rs. 11.90 crore during 2003-08 against which a general purpose grant of Rs. 67.54 crore was received. Instead of refunding these unspent balances, NRSC deposited these substantial balances available with them in bank accounts and earned interest of Rs. 81.43 crore.

81. On being asked about current unspent balances with NRSC and reasons for the same, the DoS explanation was:—

"Subsequent to governmentalisation as on 1.9.2008, all the unspent GIA and unspent money in DoS funded Projects (except the fund received for DMSP Aircraft) were refunded to DoS/remitted to Government account. Money received for User Paid Consultancy Projects and deposits received for supply of satellite data only are continued under depository works."

Budgeting and Budgetary control

82. It was brought out by Audit that revenue earned by NRSC varied between (+) 17 per cent to (-) 29.84 per cent, NRSC centre expenditure varied between (+) 20 per cent to (-) 30 per cent and variable expenditure incurred by NRSC varied between (-) 42 per cent to (+) 58 per cent against its estimations, during 2003-09 indicating deficiencies in planning of its resources.

83. In the above context, the Committee desired to know the major source of revenue for NRSC and plans about expanding the same, the DoS replied as under:—

"In view of the governmentalisation of NRSC from 2008 onwards, the centre's focus is more on public good services and projects of national importance. The revenue expansion no longer exists. However, all efforts are made to expand the user base on a continuous basis by providing varieties of services through newer means like ftp based data delivery, quick turn-around-time from IMGEOS and BHUVAN portal for data visualisation and services.

Presently, receipts against satellite data dissemination are the major source of revenue for NRSC. Other sources of revenue are consultancy projects (including aerial survey projects) in remote sensing and GIS for central ministries/ departments like Rajiv Gandhi national drinking water mission, Wasteland monitoring, Irrigation potential assessment under AIBP funded projects, etc.

NRSC's focus is currently on executing projects for national imperatives such as Disaster information support, natural resources census, national geospatial data outreach, etc."

84. During the course of oral examination of the representatives of the DoS, the Sub-Committee pointed out that in addition to remote sensing, which approximately accounted for Rs. 60 to 80 crores of receipt of Department of Space, other major areas of receipts of the Department are from lease of transponders and launch vehicle operations. Further, the Sub-Committee desired distinct reflection of large receipts through appropriate accounting arrangements by opening of minor head which brings in public domain separately receipts on account of lease of transponders, sale of data products and other remote sensing operations and from launch operations.

85. Responding to the above, the Secretary DoS stated:—

"In fact, the launch operations or launch services provided to the other countries or the commercial lease of transponders are handled through the Antrix Corporation, that is another public sector undertaking which is a part of the Department of Space and not as a part of the National Remote Sensing Centre.

When it comes to the remote sensing data part of it, for the national users, it is handled by the National Remote Sensing Centre. But when it comes to the international customers that is either they acquire the data from their own ground stations or we sell the data, that is taken care of by the Antrix Corporation. So, NRSA's role here is only for the national users or remote sensing data.

Till, September, 2008, it was functioning as an autonomous society on account of the NRSC. So, the Department of Space use to take into account the revenue they generate and only the balance amount was going to them as the grant from the Government.

After September, 2008, we converted that into a centre of ISRO, a Government entity. Now, the Government accounting principals on revenue generation and putting it as a part of the revenue to the Consolidated Fund of India, that is being practiced.

As far as the Antrix Corporation is concerned, the three points that were mentioned, comes as the revenue of Antrix and it comes back to the Government as the investor in that."

86. Asked to indicate the current trends of NRSC's budget against actual amounts expended, DoS furnished the following information:—

(Rs. in crores)

	RRE	Expenditure	%
2008-09	108.73	104.86	96.44
2009-10	147.21	147.19	99.98
2010-11	197.25	196.13	99.43

87. Responding to a specific query of the Committee regarding action taken for utilising the resources optimally, DoS stated:—

"In order to ensure that the resources are utilized optimally, quarterly reviews of the expenditure *vis-a-vis* the budget allocation are carried out by Additional Secretary, DoS. Periodical reviews are carried out internally and a thorough review of spendability of funds before the end of financial year is carried out and funds deployed optimally so as to minimise the surrenders."

Work centre advances, dues from ACL and dues from the sale of satellite products

88. Audit scrutiny revealed outstanding work centre dues, dues from ACL and dues from the sale of satellite data amounted to be Rs. 7.09 crore, Rs. 93 lakhs and Rs. 3.93 crore respectively. On being enquired about the present status of the amounts outstanding and steps taken by the Department of Space to recover or adjust the same, the DoS in a written note explained as under:—

- “(a) Against the work centre advances, outstanding dues of Rs. 7.09 crores, Rs. 0.71 crores has been adjusted and Rs. 6.38 crores is awaiting adjustment for which efforts are on the obtain Utilization certificates for adjustments. Further, of the Rs. 6.38 crores, Rs. 1.29 crores is outstanding from M/s. Engineering Projects Indian Limited (EPIL) alone for Water Resources Development Organisation (WRDO) project which has been short closed and the amount will be adjusted against work done by M/s. EPIL and Rs. 4.57 crores is pending adjustment from Government Departments.
- (b) Dues from ACL: Rs. 93 lakhs has been received in full from M/s. ACL—Action Closed.
- (c) Dues from Sale of Satellite data products: Similarly, the dues from sale of satellite data products amounting to Rs. 3.93 crores have been realized. — Action Closed.”

89. Further enquired about the mechanism employed by the DoS to ensure timely recovery of dues, the DoS submitted:—

- “(a) NRSC as a policy insists a 100% advance payment for supply of data products. However, for some of the DoS Users including M/s. Antrix Corporation Ltd. and for some other Government Agencies for emergency applications like disasters, data products were supplied without insisting for advance payment.
- (b) However, a critical review of the same was taken up and presently all the data products are being supplied against advance payments only and an MoU with M/s. Antrix was also signed which takes care of advance deposits payable to NRSC.
- (c) Similarly, for all project related activities also the amounts receivable are being monitored by way of MoUs with respective agencies which incorporates terms and conditions of milestone payments, arbitration, etc., and work centre advances are also based on MoUs.”

Internal control and internal audit system

90. Audit review revealed that internal control and internal audit were not commensurate with the requirement of NRSC. Moreover, the scope of internal audit was mainly restricted to establishment matters.

91. As regards, the frequency of internal audit carried out in NRSC, its scope and effectiveness, the Department of Space stated as under:—

"The periodicity of Internal Audit conducted at NRSC by Internal Audit Wing (IAW) of DoS is as follows:

Audit Period	Conducted during
01.04.2005 to 31.03.2006	04.12.2006 to 12.12.2006
01.04.2006 to 31.03.2007	03.12.2007 to 11.12.2007
01.04.2007 to 31.03.2009	15.02.2010 to 05.03.2010"

It was further submitted that restructuring of Internal Audit Wing of DoS has been taken up vide Office Order No. B. 11011/6/2011-Sec. 2 dated 27.07.11, to centralize the Internal Audit Wing at Antariksh Bhavan at DoS, Bangalore under the overall control of CCA which envisages conducting Internal Audit of each centre on an annual basis and following changes in the existing system/processes/procedures have been proposed:—

- (a) To dissolve the existing decentralized Internal Audit Wing in the five major Centres of ISRO and establish a centralised Internal Audit Wing at DoS, Bangalore.
- (b) Audit calendar: to draw up an audit calender for the entire department covering all ISRO/DoS establishments. The audit period would be from May to January and the period from February to April shall be used for follow up and reconciliation.
- (c) Entry and Exit meetings would be organized at each of the Centres which would be chaired by Controllers/Directors of the Centres with participation by CCA, DoS, Sr. Head (IA), alongwith the Audit team.
- (d) To cater to training periodically to enhance the skills and knowledge in the area of audit to the personnel of centralised IAW.
- (e) To draw an Audit plan to cover all the activities which have bearing on the reliability of accounts and records in all four areas of administrative system and decentralized entities like CMD etc.

Commission charges to ACL

92. The Committee observe that the pricing Sub-Committee of NRSC had fixed (January 2008) the revenue-sharing between NRSC and ACL in the ratio of 50:50 for the

sale of IRS data to foreign clients. The revenue share between NRSC and ACL was fixed at 35 per cent, the remaining 15 per cent being re-seller's commission. For similar services, DoS was paying to ACL an agency commission of 15 to 20 per cent. Thus, NRSC was paying additional commission charges of 15 to 20 per cent to ACL and this resulted in reduction of NRSC revenue in the range of Rs. 1.44 crore to Rs. 1.92 crore during 2004-05 to 2007-08.

93. In this context, the Sub-Committee desired to know about the commission charges payable by NRSC to ACL in the MoU between DoS and ACL for international distribution of satellite data. The Committee were apprised that NRSC is not paying any commission charges to ACL, which is sharing the revenue as charges towards international data products to NRSC. These charges were described as favourable for NRSC.

94. The Sub-Committee also desired to know the measures taken by the DoS to ensure that the interests of NRSC are taken care of. In response, the Department submitted as under:—

- "(a) Department of Space *vide* order No. B.31012/05/2009-Sec. 5 dated October 5, 2009 approved for payment of charges by ACL to NRSC based on the gross revenue recognised by Antrix (after allowing towards re-seller commission) on account of sale of data products in the ratio of 60:40 (NRSC:ACL).
- (b) NRSC entered into MoU with Antrix concerning the International distribution of IRS Satellite Data.
- (c) ACL is also, similar to other users, making advance payment for supply of data from NRSC. ACL is keeping the revolving deposit of Rs. 30.00 lakhs with NRSC and recouping the same periodically. There is no outstanding receivable from ACL to NRSC as on date."

PART II

OBSERVATIONS AND RECOMMENDATIONS

1. National Remote Sensing Centre (NRSC), a unit of the Indian Space Research Organisation (ISRO) under the Department of Space (DoS) is the nodal agency for operational remote sensing activities and the sole authority to acquire, process and disseminate the remotely sensed satellite data products withing India. It also undertakes remote sensing application projects of national importance being part of the National Natural Resources Management System (NNRMS), a body of the Planning Commission of India. The applications of remote sensing technology in particular, have emerged as cost effective means for efficient management of national resources in the fields of agriculture, water resources, urban development and disaster management. The DoS incurred an investment of Rs. 2206 crore towards cost of seven remote sensing satellites and other related programmes during 2003-08. The Performance Audit of NRSC by CAG covering a period of six years between 2003-04 to 2008-09, through scrutiny of selected project files and analysed data products, revealed glaring lapses such as underutilization of remote sensing satellites, poor revenue generation through sale of data products; under performance of aerial remote sensing aircraft; deficiencies in planning and implementation of remote sensing application projects undertaken by NRSC thereby severely affecting timely realization of expected benefits, shortfall in the enrolment in training courses in remote sensing and poor financial management as discussed in the succeeding paragraphs.

2. The Committee are concerned to note that three (IRS-P3, IC and P4) out of seven remote sensing satellites could utilize only 32, 45 and 50 per cent of their maximum capacity, which in the absence of their designed capacity, were assessed by Audit on the basis of comparison of actual number of scenes acquired by these satellites. The Committee find that the satellites could not be put to use to their maximum capacity due to technical problems in the spacecrafts and the impact of lower capacity utilization on remote sensing application projects of national importance was not assessed by NRSC. The Department of Space (DoS) justified that all the three satellites in question have performed beyond their designed life 3-5 years and the overall performance of the satellite exceeded the designed capacity of the mission. The DoS further claimed that there had not been any deficit in terms of meeting data requirements and remote sensing application projects did not suffer during the operational period of the satellites. The Committee find the reply deficient as it gives a relative assessment of the performance of satellites based on designed life time of the satellite and does not address the core issue of assessment of the performance of the satellites based on its designed capacity and the actual number of scenes captured. The Committee, therefore, recommend that important parameters such as the design capacity of satellites should be carefully worked out and planned so as to enable an accurate and scientific assessment of performance of satellites

based on their actual capacity to capture scenes. The Committee further desire that emphasis of the Department of Space should be on the maximum and effective data acquisition by the satellites rather than utilizing the satellites beyond their designed life as the lower capacity utilization of these satellites adversely impacts remote sensing application projects of national importance.

3. The Committee note that various mechanisms have been formulated by the DoS for utilization of remote sensing satellites to their full potential. These include setting up of the National Natural Resources Management System (NNRMS) for integration of satellite remote sensing data with conventional techniques towards management of natural resources and development planning in the country, holding of interaction meetings with various user Ministries/Departments on need basis, institutionalization of remote sensing in many Ministries/Departments, upgradation of the capacity of the Earth observation satellites and the mission management strategy to ensure optimum use of available resource. The Committee desire that the synergy of information obtained from remote sensing and complimentary geomatics technologies such as Geographical Information System (GIS), Global Positioning System (GPS), Cartography, Graphical Processing, Statistics, Photogrammetry, etc. alongwith ground based socio-economy data should be utilized judiciously for achievement of national development goals as set out in the NNRMS. The Committee further recommend that DoS should ensure effective implementation of the mechanisms put in place to optimize the performance of the remote sensing satellites and also institute a robust monitoring system so that there are quantifiable positive outcomes.

4. The Committee are dismayed to note that while the total capital investment on the seven satellites in operation during the Audit review period was Rs. 1468.59 crore, operational returns were negative in the years 2003-08 and ranged from Rs. 96.87 crore to Rs. 134.27 crore indicating that realization from sale of data products was not sufficient enough to match its yearly operational expenditure. The Department of Space claimed in self-justification that the spacecraft systems are considered to be infrastructure for national development and public welfare and the emphasis is on the outreach of the data products rather than cost recovery. It was further asserted by DoS that the pricing policy of NRSC was in tune with the increasing global trend of making data freely available for public services. The Committee do not find the Department's justification convincing in so far as the relevant provision in the Remote Sensing data Policy, 2011 provides only an assurance from the Government for a continuous and improved observing/imaging capability from its own Indian Remote sensing satellites programmes as a national commitment and as a 'public good' and does not provide to give usable remote sensing satellite data free of cost. While acknowledging that remote sensing satellites are indeed public good infrastructure with the mission towards sustainable national development, the Committee, however feel that a balanced segregation can surely be worked out based on various data types and needs of various users. The Committee also feel that appropriate customized packaging of remote sensing data by way of adequate value addition and making them fit for synergistic and simultaneous applications will definitely enhance the marketability of such data and bring about increase in the net

returns. The Committee, therefore, recommend that the Department should enhance their data marketing capability by way of appropriate packaging of data and value addition. The Committee also recommend that the Pricing Committee in the DoS should adopt a sustainable balanced approach to meet the twin objectives of making certain category of data available as public good free of cost while also simultaneously pricing another set of marketable category to bring about positive returns.

5. The Committee note with concern the huge discrepancy between the statistical figures on the revenue from the data sales from IRS Missions and Access fee/Royalty earned through International Ground Stations furnished by DoS to the Committee and that obtained by Audit from the Principal Pay and Accounts Office of DoS. The total revenue generated in three financial years from 2008-2011 amounted to Rs. 20968 lakh as calculated from the table furnished by the DoS to the Committee whereas the Audit vetting of the aforesaid data reveals an inflation in the figure by 48.31 per cent (Rs. 9770.50 lakh), with the corresponding figure furnished being Rs. 11197.50 lakh. The DoS owes an explanation to Parliament on the discrepancy within six months of the presentation of this Report.

6. As regards the downward trend in the earnings through Access fee/Royalty from the International Ground Stations (IGS) by antrix, the Committee recommend that the DoS explore the possibility of collaboration with global remote sensing ground stations and research centres to establish closer linkages, more reliable and faster data sharing and analysis, shared archives and near real time data access among different countries and also establishing networks with higher bandwidth for distribution of archival repositories and provision of real time access.

7. The Committee note that a realistic thematic data need assessment in various remote sensing applications is required to enable the planning of the payloads of operational remote sensing satellites prior to their launch so that the data acquisition capacity of the satellites are in tune with the expected needs. In this context, the Committee are dismayed at the Audit revelation that satellites were planned without adequate thematic data need assessment and therefore, the extent of data gap against the data need could not be assessed. The Committee observe that the Department's reply, by their own admission, underlines the imperatives of data need assessment for planning the payloads of satellites. The Committee appreciate the Department's efforts to collect information on the intended use for data products disseminated by NRSC and development of a CRM module under IMGEOs project, which is expected to be put in operation in 2012, and hope that the module is made operational within the stipulated time and monitored at the highest level to attain the objectives. The Committee also desire that collection of information by Customer Relations Management (CRM) module may be institutionalized and contain clear outcomes and DOS should ensure that a realistic assessment of data needs is conducted exhaustively to enable a scientific correlation in the planning and operationalisation of remote sensing satellites.

8. Huge idling of IRS data ranging between 53 to 95 per cent, as highlighted by Aduit, has engaged the attention of the Committee. This is a pointer to the fact that data need assessment was not based on any scientific study and lacked marketing capability. The Committee note that the Department of Space have made some efforts

to initiate action to improve the utilization and sale of data by way of reduction in price level of satellite data products, increasing awareness through Bhuvan web portal, advertisements, publication of promotional materials, etc. The Committee, however, cannot help observing that reduction in sale prices of data to encourage their utilization might prove to be counterproductive as it is sure to bring down the net returns which are already negligible. The Committee, therefore, recommend that the DoS should set up a comprehensive mechanism to bring about optimum utilization of satellite data while also increasing the net returns from sale of such data. The Committee should like to be apprised of the mechanism so involved and the tangible outcome thereof.

9. Notably, the efficiency of data processing is measured in terms of turn-around time, *i.e.*, the processing time required to process the data into a finished product from the time of receipt of request for data. The Committee deplore the decline in efficiency of data processing as there has been increase in the turn-around time, which has in turn adversely impacted timely delivery of data products to the users. The Committee expect that the DOS make earnest efforts to operationalize the project on Integrated Multi-Mission Ground Segment of Earth Observation Satellites (IMGEOS) which has been purportedly conceived to enable faster and efficient data products and services for users so as to bring about reduction in the turn-around time for standard products to 24 hours and emergency products to 1 hour after acquisition. The Committee are of the considered view that establishment of robust operational remote sensing, geo-spatial information systems and supporting infrastructure are critical to securing accurate and timely access to both archival and real or near-real time reliable data. Keeping this in view, the Committee desire the Department to enhance the present infrastructure for remote sensing encompassing organizational, computational, educational and bandwidth components, particularly as relates to time critical anticipation, disaster mitigation and emergency responses to both natural and manmade catastrophes. To this end, the Committee further impress upon the Department to strengthen and upgrade their software and other related geo-matics technologies associated with the processing of data at par with the best international standards so as to ensure a quantum jump in the efficiency of data processing. The Committee also desire that ideal turn-around time be fixed for different categories of data processed at NRSC and a stringent mechanism be installed to monitor actually obtained turn-around time *vis-a-vis* prescribed.

10. The Standing Committee of Parliament on Department of Space had observed in their 129th Report presented to both the Houses on 26th August, 2004 that in order to increase accuracy of IRS data and also for more realistic interpretation of acquired data, DOS needed to set up National Remote Sensing Coordination Committee to facilitate holistic implementation of the following proposals: (i) integration of Geographical Information System (GIS), Global Positioning System (GPS) and IRS technology to enhance accuracy of derived data, (ii) production and distribution of satellite data, (iii) processing of remote sensing data, (iv) using functional approach towards difficulties faced by departments for accurate interpretation of the data retrieved, (v) updating of technology at par with world standards, (vi) promotion of remote sensing applications in coordination with universities and research centres,

and (vii) maintenance of national archive on remote sensing data with a view to preserving data and also constantly updating it. The Committee deplore the reluctance of the DoS to set up the National Remote Sensing Coordination Committee for a variety of reasons but, apparently, the DoS have not been able to guide, implement and monitor the works of multifarious programmes and agencies in an integrated and efficient manner. Since the integration of satellite data with complimentary geo-spatial/geo-matics technologies such as GIS, GPS, Cartography, Photogrammetry, Digital Elevation Model (DEM) has become inevitable for enabling immediate display of intelligible, interpretable real-time data for various applications, which is in consonance with the Standing Committee's recommendation of integration of various technologies, the Committee, recommend that an integrated approach should be taken and a unified overarching Coordination Committee be constituted to obviate scope for delays and duplication of work performed by various agencies and for their effective monitoring.

11. The Committee are in agreement with the views of the Standing Committee of Parliament on DoS contained in their 42nd Report presented to both the Houses on 13.03.1997 that more and private entrepreneurs should be associated in the process of remote sensing data utilisation programme as there is a huge scope of value addition to the remote sensing data and using it in marketable form in several sectors. The Committee are, however, dismayed to note that efforts of NRSC are not adequate in customizing the data according to the needs of private users and also exploring the possibility of widening the customer base resulting in very low levels of average sales to the private sector. Audit examination revealed that the average sales to the private sector were less than 20 per cent whereas the sales to the Government sector were more than 80 per cent during the period 2003-2009. The Committee recommend that a comprehensive mechanism for promotion of sale of data to private users incorporating therein effective sensitization programmes, training modules for efficient handling of such data and also value addition, customization and appropriate packaging of data to enhance their utility for multipurpose applications should be brought about and the Committee apprised accordingly.

12. The Committee are surprised to find that the international market rate of high resolution satellite data was about six times more than the price of comparable IRS products. The Department's response in this regard, that IRS data available are not comparable with foreign satellite data with respect to spectral and spatial resolution and hence their prices are not comparable, indicates an urgent need for further enhancement in the quality of IRS data in order to reach cutting edge compatibility in the international market. Reposing immense faith in the intellectual and technological capabilities, potential and future prospects of our space science and scientists, the Committee exhort DoS to put in place suitable mechanisms in consultation and collaboration with renowned scientists and technocrats leading to constant technological upgradation, elimination of bottlenecks and enhancement of quality and credibility of IRS data.

13. The Committee have been given to understand that DoS has undertaken an exercise to gauge the total cost of remote sensing satellite systems and data products. While earlier only the cost incurred for generating data products was taken into consideration, now cost of the satellites and their launching will also be taken into account. The Committee also appreciate that the costing and pricing are being finalized by a high-power Committee set up by DoS and a differentiated pricing policy is being considered for different users like Government users, DoS users, academic users, private users, etc. The Committee, however, impress upon DoS to finalise and implement this pricing policy with a sense of urgency after due legal and financial vetting and the Committee be apprised within six months of its finalisation.

14. The Committee are deeply concerned to note the delay in completion of aerial projects and under performance of aerial remote sensing aircraft due to non-availability of pilots and technical snags. The Committee further note that 12 aerial projects constituting 33 per cent of those scrutinized by Audit, costing Rs.45.85 crore, were delayed from 8 to 54 months. The Secretary, DoS, in evidence, attributed the non-availability of pilots to greener pastures available in the aviation market. Needless to say, this acute shortage of manpower to fly the aerial remote sensing aircraft is a major handicap in the smooth functioning of aerial remote sensing projects. The Committee are, however, informed that an institutional arrangement has been established with the Indian Air Force (IAF) for obtaining pilots on deputation and efforts are being made to increase the deputation period so as to have higher stability in operations. The Committee feel that besides such institutional arrangements, other avenues for induction and retention of pilots by devising attractive wage structure and other incentive packages should be explored so as to obviate scope for delays in projects and under performance of aircraft due to want of pilots. The Committee also desire that DoS may also explore the possibility of having a tie-up with various prestigious aviation academies and institutes in the country by obtaining their services and finally absorb these skilled pilots.

15. The Committee are informed that a three year comprehensive contract has been signed with a maintenance agency for reduction in delays in fixing technical snags, better flow of spare parts and facilitation of better supervision in carrying out maintenance work. Retrofit of avionics system of two beach-craft owned by NRSC has also been planned to be carried out in a phased manner. As regards the replacement of ageing aircraft, the Committee were assured by DoS that the matter will be critically examined at an appropriate time. The Committee are surprised to note that it is only on being pointed out by Audit, the Department initiated steps to address the issue of technical snags of the aerial remote sensing aircraft. Needless to say, the DoS needs to be proactive and take appropriate measures so that the work of remote sensing is not hampered due to technical snags.

16. The Committee cannot absolve the delay in completion of aerial remote sensing project on the ground that inter-agency consultations take time and that no time-frame can be predicted for such consultations. Mindful of the imperative need for expeditious release of the data collected by the remote sensing aircraft by the end users, the Committee hardly need to emphasize the urgency for efficient coordination

between the agencies concerned. The Committee would like to be apprised of the new mechanism put in place to facilitate timely release of the data collected by the NRSC.

17. The Committee note with concern lack of effective and periodic co-ordination in the implementation of projects of national importance under the National Natural Resources Management System. Projects such as planning of irrigation schemes; mapping of wasteland to enable reclamation and rehabilitation thereof; and identification of drinking water sources could not fructify well in time for want of efficient and regular coordination. The Committee are particularly perturbed to note that even in the face of extreme water stress all over the country, the DoS failed to extend the much needed vital assistance in the implementation of the Rajiv Gandhi National Drinking Water Mission. Further, notably, the various Standing Committees under the NNRMS did not hold the regular meetings as mandated. The DoS needs to review the mandate of these Committees as also the desirability of replacing by a more efficient and reliable system and the Committee apprised.

18. The Committee are pained to note that the Village Resource Centre (VRC) and Disaster Management Support Programme (DMSP) which are projects of national importance directly implemented by NNRMS through DoS, could not achieve the desired results. Audit review of performance of VRC coordinated by NRSC covering the period from October, 2007 to August, 2008 revealed that targets for setting up VRC nodes could not be met. DoS, on being questioned by the Committee submitted that 473 VRC nodes have been set up in 22 States/UTs across the country. The Committee expect the DoS to set up remaining VRC nodes at the earliest so that the aim of making satellite based services directly accessible to rural population is fully achieved. The Committee note that in DMSP, 92 per cent of the funds amounting to Rs. 86.90 crore released to the NRSC as well as assets worth Rs. 7.80 crore remained unutilized with the NRSC. The Committee seek explanation of the DoS for non-utilisation of almost the whole of the funds released for coping with floods, agricultural drought, earthquake, landslides, forests fires, etc., The Committee also desire that further release of funds for DMSP may be withheld until Utilisation Certificates for the previous amounts released are submitted to the satisfaction of the DoS. Further, taking note of the fact that the VRC and DMSP could not discharge their assigned mandate due to non-availability of satellite communication bandwidth, the Committee desire the Department to take appropriate steps to enhance their technological capacity to meticulously tackle such problems so that such vital national projects are not rendered dysfunctional.

19. The Committee are concerned to note that there were instances of relaxation of terms of payment, short realization of revenue, etc., in the projects undertaken by NRSC on behalf of ACL and other users. Audit review revealed that in four out of seven such operational projects of Antrix Corporation Ltd. (ACL), chargeable overheads were not levied resulting in undercosting of these projects by Rs. 83.43 lakh and in two completed projects, NRSC did not raise demand for balance dues of Rs. 1.85 crore from ACL. The Committee find, on further examination, that no overheads were charged as no dues were apparently pending with ACL during the implementation of the projects. Apparently, there is an urgent need for prior planning

and fixing of clear objectives of projects and also observing greater transparency in the execution of projects according to canons of financial propriety. The Committee, therefore, recommend that in future, the Department should not only avoid resorting to such deviations in the costing policy but should also establish sound practices in the management of their projects so as to obviate financial mismanagement.

20. The Committee further note that in operational projects for various users other than ACL, there were shortcomings such as delays in completion of projects, outstanding dues, wasteful expenditure, blocking of funds, undercosting of projects and undertaking of projects without MoU rendering recovery of dues difficult. The Committee find that the reasons attributed for delays in many of these projects includes *inter-alia* non-receipt of scheduled payments from users, installation of new technology, time taken for security vetting, unfavourable weather conditions, naxal problems creating difficulties in ground survey, subsequent change in user specifications, logistics challenges and also time taken for getting necessary inputs from the project sponsoring agencies. The Committee were assured that various mechanisms are being put in place in NRSC to expedite the process of completion of projects and minimise delays in carrying out operational projects such as conduct of regular monthly project progress review meetings, holding of extensive discussions and signing of MoU with project sponsoring agencies to bring about standardization of uniform costing methodology, review of costing policy, preparation of Product Realisation Plan in the form of a Technical Manual, formation of a core team for management of each project, etc. The Committee would like to be apprised of the corrective action taken to fulfil the assurances given to them in each area of deficiency/shortcoming.

21. The Committee note that the Indian Institute of Remote Sensing (IIRS), Dehradun, a unit of NRSC, is the focal point for long and short-term courses and refresher courses for training in remote sensing and its main function is capacity building through education at post-graduate level in the application of remote sensing and geo-informatics for natural resource management. Taking cognizance of the fact that capacity building is crucial in the endeavour towards optimum utilization of remote sensing satellite applications, the Committee find the shortfall in the enrolment in long term courses as well as lower percentage of private persons trained for promoting sale of data products alarming. The DoS has enumerated various measures such as issue of advertisements, deputations, interactive meetings, etc., to increase enrolment in long-term courses. The Committee would like to be apprised of the outcome of such measures to make good the shortfall in enrolment for various courses and any further review taken to apply more innovative corrective measures.

22. The Committee are constrained to note that an amount to the tune of Rs. 6.38 crore was awaiting adjustment as outstanding work centre dues. Though the DoS reported subsequent adjustment of Rs. 0.71 crore, the Committee recommend that the DoS scrupulously follow the financial instructions to adjust outstanding advances paid to its work centres. The Committee, while acknowledging that certain

situations may demand instant supply of data for emergency applications without payment of 100 per cent advance, desire that the Department's policy should also recognise such exigencies and incorporate appropriate institutional mechanism for a time bound recovery of outstanding dues.

23. The Committee take serious note of the fact that revenue earned by NRSC varied between (+) 17 per cent to (-) 29.84 per cent against its estimation during 2003-09 indicating deficiencies in planning of its resources. The DoS has claimed that all efforts are being made by them to expand the user base on a continuous basis by providing varieties of services through newer means like ftp based data delivery, quick turn-around-time from IMGEOs and BHUVAN portal for data visualisation and services. Having regard to the dictum that increase in revenue is one of the most significant markers of financial growth of any organization, the Committee wish to impress upon the DoS not to undermine the importance of revenue generation but initiate measures for self reliance in their financial operations. The Committee also recommend that DoS/NRSC need to overhaul their management system to exercise better monitoring and control over their financial activities.

24. The Committee are startled to note the absence of regular and effective internal control and internal audit system in the NRSC. The Committee further find that the DoS neither indicated the scope of internal audit nor were operational issues covered in internal audit. The DoS has informed that restructuring of internal audit wing (IAW) of DoS has been taken up and some changes in the existing procedures have been envisaged such as dissolving of decentralised audit wing, establishing a centralised internal audit wing at DoS, Bangalore, preparing an audit calendar for the entire department covering all ISRO/DoS establishments, periodic training of IAW personnel and Organization of entry and exit meetings at each of the centres etc. The Committee desire that this restructuring of internal audit system of NRSC be finalised and implemented expeditiously so that accounting, financial and administrative matters in NRSC do not suffer from want of efficient and effective internal control system and the Committee apprised.

25. To sum up, the Committee find that many significant deficiencies and fundamental weaknesses have resulted in underutilization of remote sensing satellites and their applications which have certainly stalled timely achievements of important national development goals with vital social objectives like food security, conversion of wastelands into usable land, water security through drinking water missions, environment security through disaster management support programmes, etc. The Committee observe that these shortcomings would also definitely impinge upon the nation's endeavour to be the frontrunner in remote sensing technologies, a promising tool in the struggle for sustainable development. The Committee also recognize that timely access to both archival and real time multispectral earth observation data determines the level of emergency preparedness, disaster mitigation, early warning

vulnerability assessment, adaptive responses and humanitarian relief associated with a wide array of disasters besides providing cost effective solutions to the natural resources and protection problems. The Committee, therefore, exhort the Department of Space to take note of their considered suggestions/recommendations, as highlighted in the preceding paragraphs to overcome the deficiencies that bedevil the effective utilization of remote sensing technologies.

NEW DELHI;
28 August, 2012
6 Bhadrapada, 1934 (Saka)

DR. MURLIMANO HAR JOSHI
Chairman,
Public Accounts Committee.

APPENDIX I

MINUTES OF THE FIRST SITTING OF SUB-COMMITTEE-II OF PUBLIC ACCOUNTS COMMITTEE (2011-12) HELD ON 11TH JANUARY, 2012

The Sub-Committee sat on Wednesday, the 11th January, 2012 from 1130 hrs. to 1215 hrs. in Room No. '63', Parliament House, New Delhi.

PRESENT

Dr. (Km.) Girija Vyas — *Convener*

MEMBERS

Lok Sabha

2. Shri Anandrao Vithoba Adsul

SECRETARIAT

1. Shri Abhijit Kumar — *Director*
2. Smt. A. Jyothirmayi — *Deputy Secretary*

Representatives of the Office of the Comptroller and Auditor General of India

1. Shri Jayant Sinha — Pr. Director (RC)
2. Ms. Geetali Tare — Pr. Director (SD)

Representatives of the Department of Space

1. Dr. K. Radhakrishnan — Secretary (DoS)
2. Dr. R.R. Navalgund — Director, SAC
3. Dr. V.K. Dadhwal — Director, NRSC
4. Shri A. Vijayanand — Joint Secretary
5. Shri V. Koteswara Rao — Scientific Secretary, ISRO

2. At the outset, the Convener welcomed the Member, and the representatives of the Office of the C&AG of India to the sitting of the Sub-Committee. The Audit Officers then briefed the Convener on various issues concerning the subject '**Activities of National Remote Sensing Centre (NRSC)**'.

3. Thereafter, the representatives of the Department of Space were called in. Welcoming them to the sitting of the Sub-Committee, the Convener informed them that the sitting had been convened to take evidence of the representatives of the Department of Space on various issues brought out in the C&AG Report on the activities of NRSC

which included underperformance of three (out of seven) remote sensing satellites, negative operational returns, insufficient efforts of NRSC in customizing data products and so on.

4. The Secretary and other Officers of the Department of Space first briefed the Committee about the role and activities of NRSC and the various initiatives taken for effective implementation of remote sensing. After that, the representatives of the Department of Space responding to Audit Observations also responded to the queries of the Members which included optimization of revenue through marketing of IRS data, transparency in accounting and reasons for shortage of pilots. During the sitting, an on-the-spot study visit to Hyderabad in first week of February, 2012 was proposed for further examination of the subject.

5. The Convener thanked the representatives of the Department of Space for deposing before the Sub-Committee and furnishing information in connection with the examination of the subject. The Convener also thanked the Officers of the C&AG of India for providing valuable assistance to the Sub-Committee in examination of the subject.

The witnesses, then withdrew.

A copy of the verbatim proceedings of the Sitting has been kept on record.

The Sub-Committee, then adjourned.

APPENDIX II

MINUTES OF THE TENTH SITTING OF THE PUBLIC ACCOUNTS COMMITTEE (2012-13) HELD ON 23RD AUGUST, 2012

The Public Accounts Committee sat on Thursday, the 23rd August, 2012 from 1500 hrs. to 1600 hrs. in Room No. '51', (Chairman's Chamber), Parliament House, New Delhi.

PRESENT

Dr. Murli Manohar Joshi — *Chairman*

MEMBERS

Lok Sabha

2. Dr. Baliram
3. Shri Sandeep Dikshit
4. Shri Anant Kumar Hegde
5. Shri Bhartruhari Mahtab
6. Shri Sanjay Nirupam
7. Shri Shripad Yesso Naik
8. Dr. Shashi Tharoor
9. Shri Dharmendra Yadav

Rajya Sabha

10. Shri Prasanta Chatterjee
11. Shri Prakash Javadekar
12. Shri Sukhendu Sekhar Roy
13. Shri N.K. Singh
14. Prof. Saif-ud-Din Soz

SECRETARIAT

1. Shri Devender Singh — *Joint Secretary*
2. Shri Abhijit Kumar — *Director*
3. Shri D.R. Mohanty — *Deputy Secretary*
4. Smt. A. Jyothirmayi — *Deputy Secretary*
5. Ms. Miranda Ingudam — *Under Secretary*
6. Shri A.K. Yadav — *Under Secretary*

Representatives of the Office of the Comptroller and Auditor General of India

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| 1. Ms. Shubha Kumar | — | Director General (Report Central) |
| 2. Ms. Geetali Tare | — | Pr. Director (Scientific
Departments) |
| 2. *** | *** | *** |
| 3. *** | *** | *** |
| 4. The Committee then took-up the following Draft Reports for consideration: | | |
| (i) Draft Report on ' Activities of National Remote Sensing Centre '; | | |
| (ii) *** | *** | *** |
| (iii) *** | *** | *** |
| (iv) *** | *** | *** |

5. After some discussions, the Committee adopted the Draft, Reports and authorized the Chairman to finalise the four Reports adopted by them, in light of their suggestions and the factual verifications received from the Audit and present the same to the House on a date convenient to him.

6. The Chairman thanked the Members for their valuable suggestions on the consideration of the Draft Reports and Selection of additional subjects.

The Committee, then adjourned.

***Matters not related with this report.