CHAPTER - III

Department of Space

3.1 EDUSAT Utilisation Programme

EDUSAT, launched by the Department of Space (DOS) in September 2004 was India's first thematic satellite dedicated exclusively for educational services to provide distance education service to remote areas of India. The total investment was ₹549.09 crore comprising of direct investment of ₹282.76 crore towards the launch of the spacecraft and further expenditure of ₹266.33 crore on establishment of ground network.

It was observed in audit that EDUSAT failed to effectively achieve its objectives due to deficiencies in planning for the network connectivity, content generation and failure to have a robust management structure. There were deficiencies in actual implementation of the programme such as delay in establishment of ground network, idling of network connectivity, disparities in the allocation and idling of satellite bandwidth, inadequate content generation and deficiencies in monitoring and evaluation. The replacement strategy for the existing satellite was also deficient resulting in idling of operational networks. Thus, the objectives of implementation of EDUSAT could not be met fully even at the end of its life.

3.1.1 Introduction

3.1.1.1 Recognising the importance of education in national development and the challenges faced in the field of education on a number of fronts like the adult and continuing education, school education, higher education and professional education, it was felt that a promising technology, in particular, a satellite based system could provide an optimal solution in achieving the necessary growth and appropriate quality in education and also its reach in remote parts of the country.

Accordingly, on a proposal made by DOS /ISRO in August 2002, an exclusive Education Satellite (EDUSAT) was launched on 24 September 2004. The specific factors that formed the basis of the launch of the exclusive satellite were:

(a) An acute shortage of qualified teachers both at school level and higher education including engineering and other technical subjects.

(b) A massive drop out of students at school level.

(c) A need for formal and non-formal and continuing education to the vast masses of the country though satellite, viz., EDUSAT in view of a very large population of illiterates and rural literacy.

(d) Need to supplement curriculum based teaching, provide effective teacher training, facilitate community participation and enable interaction between scholars and research.

(e) Need to provide a quantum jump in providing access to education to remote areas and improving the quality of education.

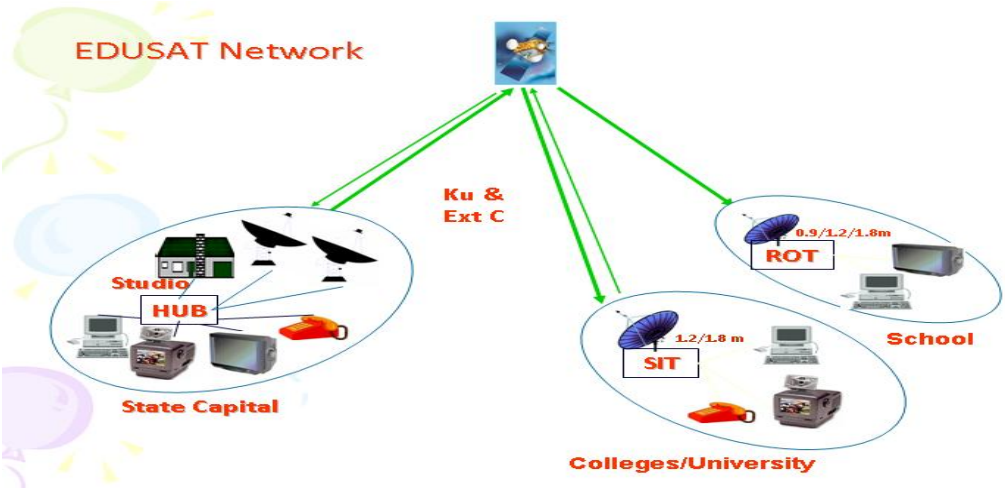
The programme to utilise EDUSAT was known as EDUSAT Utilisation Programme (EUP). EUP was to be utilised by various national and regional users. The national users were to be Indira Gandhi National Open University (IGNOU), National Council of Education Research and Training (NCERT), Integrated Disease Surveillance Programme (IDSP) and National Council of Science Museums (NCSM). The regional users were to be state governments, universities, colleges and schools.

EDUSAT had six transponders[20] in Ku-band and six transponders in extended C Band with a capacity of 36 MHz each. The total satellite capacity of 12 transponders of EDUSAT was therefore 432 MHz. The operational life of the satellite was seven years.

EDUSAT network was to have hub and studio facility at state capital/ designated place of users, Satellite Interactive Terminals (SITs) at universities/ colleges and Receive Only Terminals (ROTs) at schools. ISRO provided one hub and 10 terminals to each State/Union Territory free, the cost of establishing rest of the hubs and terminals was to be borne by the respective States/Union Territories. Educational programmes were to be aired from the studio facility. While SITs are two way audio and video communication,

[20] Transponders perform the task of being both transmitters and responders. It is an electronic device used in satellite which receives a particular signal from a source, it strengthens signal before sending it to a predefined location. Each transponder will have bandwidth of tens of megahertz.

enabling interaction of student and teacher for engineering colleges, teachers training institutions, etc., ROTs are one way audio and video delivery terminals for primary and secondary education, as shown in the diagram below:-



There was one national beam and five regional beams provided by ISRO through EDUSAT to cater to the educational requirements of the nation as a whole and also of the regions separately. As of September 2011, there were 47 hubs available in EUP. One hub was capable of supporting eight networks. Each of these networks could support a maximum of 500 SITs primarily for universities/colleges and any number of ROTs primarily for schools. Therefore, EUP had capacity to support 376 networks and in turn 1.88 lakh SITs and any number of ROTs.

ISRO decommissioned EDUSAT on 30 September 2010 at the end of sixth year of its operation due to power constraints in the satellite.

3.1.1.2 A Chronology of important events of EUP

August 2002	Meeting of the Secretary, DOS and representative of DOS/ISRO with Minister of Human Resources Development and its officials on the idea of launching an exclusive satellite for Education
August 2002	Space Commission approved development of an exclusive satellite for education at a cost of ₹85 crore.
May 2003	Space Commission approved EDUSAT Utilisation Programme for ₹98 crore.
August 2004	News Letter of ISRO on EDUSAT stated that regional hubs would be operational within six months from the date of launch of EDUSAT i.e., by March 2005
September 2004	National Core Group (NCG) was constituted to look after the management issues on a long term basis.

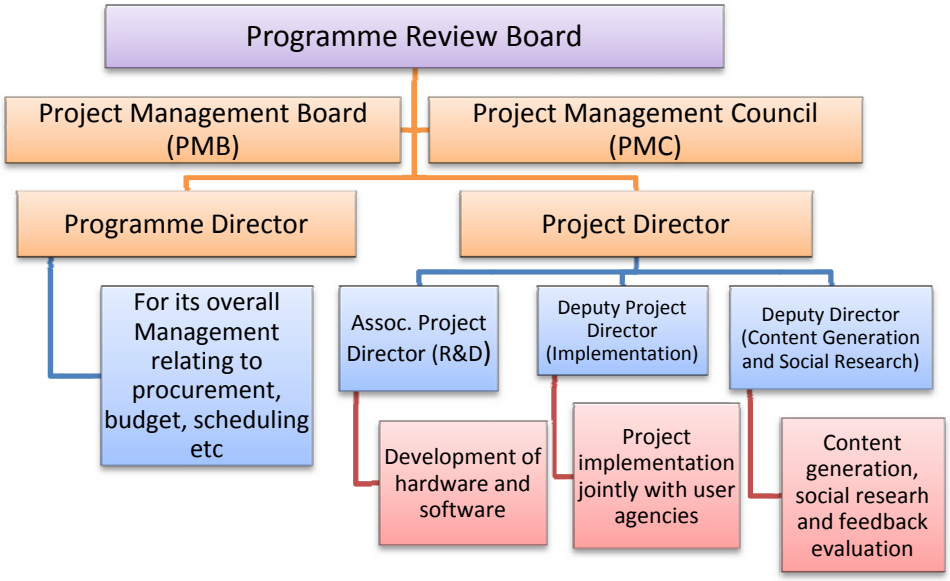
September 2004	Inter Departmental Programme Review Board (PRB) and DOS/ ISRO level Project Management Board (PMB) and Project Management Council (PMC) was constituted considering the large scope of work, complexities involved and keeping in mind the follow up/coordination and user interfaces required for EDUSAT utilisation.
September 2004	EDUSAT was launched using GSLV-F01.
September 2004	National Institute of Advanced Studies (NIAS) conducted an impact assessment study on the pilot phase of EUP for 13 weeks.
October 2004	Meeting of NCG in Delhi in which it was decided that one hub would support eight to 10 sub-hubs (EDUSAT networks).
November 2004	First meeting of PMB.
December 2004	Meeting of NCG in which it was decided that funding at Central and State level was very critical and the possibility of a Centrally Sponsored Scheme (CSS) to be explored. User agencies were directed to keep enabling provision in their budget for EDUSAT activities. The possibility of commercial renting out of the satellite to ensure commercial viability was also discussed.
January 2005	PMC meeting.
April 2005	Second meeting of PMB. It was decided that each state will have minimum one hub with a bandwidth of around 4.5 MHz with three simultaneous channels and 1200 SITs.
June 2005	First meeting of PRB
August 2005	Meeting of NCG
April 2006	A proposal to fund EUP on CSS mode was initiated by Ministry of Human Resources Development
September 2008	10 networks of EDUSAT were shifted to another satellite due to power constraints in the EDUSAT
June 2009	Another seven networks of EDUSAT shifted to other satellite
August 2009	ISRO stated that licensing scheme built into the hubs is that hubs can support a maximum of 500 interactive terminals and any number of receive only terminals
May 2010	13 networks of EDUSAT were shifted to other satellites
September 2010	EDUSAT was decommissioned in its sixth year of operation due to power constraints in the satellite

3.1.1.3 The main objectives of EUP were:

- To provide support to education through low cost ground segment and reach the unreached people of India in every nook and corner;
- To provide sustainable distance education service and support formal and non-formal education in India.

3.1.1.4 At the national level, a Core Group was formed which comprised of Vice Chancellor, IGNOU as the Chairman, representatives from ISRO, University Grants Commission (UGC) and National University of Educational Planning and Administration (NUEPA). The Core Group was constituted in September 2004 to finalise the programme schedule of EDUSAT and to look after management issues relating to EDUSAT on a long term basis.

In addition to the above, EDUSAT utilisation Project Management Board (PMB), Project Management Council (PMC) and Programme Review Board (PRB) were also constituted for direction, guidance and overall management of EDUSAT. An organisation chart of EUP is detailed below:-



3.1.1.5 DOS spent ₹282.76 crore on EDUSAT and its launch and ₹266.33 crore[21] on establishment of ground network as of March 2013.

3.1.1.6 Audit test checked the implementation of EUP during May 2009, January – March 2011, October 2011 and June - July 2013 covering the period up to March 2013. Out of 83 networks established in 48 hubs of 35 States/ UTs, 47 networks established in 30 hubs in 14 States/Union Territories were selected for detailed study. Similarly, out of more than 80 purchase orders issued to various contractors for the installation and commissioning of networks, 19 purchase orders consisting of 24 hubs and 15,123 terminals (1,990 SITs and 13,133 ROTs) were selected for detailed scrutiny. Important issues relating to deficiencies in planning, execution and decommissioning of EDUSAT are discussed in the succeeding paragraphs.

[21] Includes ₹180.79 crore shared by various States/institutions.

3.1.2 Issues in planning of the EUP

3.1.2.1 Failure to obtain the revised financial sanction for EUP from the appropriate authority

According to the instructions issued by the Ministry of Finance in May 2003, approval of the Union Cabinet is necessary for undertaking projects estimated to cost more than ₹100 crore. Therefore, DOS was to obtain the approval of the Union Cabinet for incurring expenditure above ₹100 crore under EUP.

Actual expenditure incurred on establishment of ground network of EUP was ₹266.33 crore. DOS however had obtained the approval of the Space Commission for incurring expenditure of ₹98 crore only. The financial sanction for the escalation in project cost was not obtained from the appropriate sanctioning authority as was being done by DOS in other projects such as Space Capsule Recovery Experiment (SRE) II project.

ISRO stated (August 2009) that Space Commission had approved the programme and added that the EDUSAT programme was an approved budget item of ISRO every year. DOS stated (February 2010) that annual budget proposals containing projections of expenditure for EUP of the DOS had been voted by the Parliament thereby providing authorisation for incurring the expenditure. Approval of the Union Cabinet was mandatory since actual expenditure under the project was ₹266.33 crore.

3.1.2.2 Non-fixation of target date and action plan for the establishment of ground network

The connectivity between hubs and the ground networks comprising of interactive terminals and receive only terminals were to be realised in three phases. These were pilot phase, semi-operational phase and operational phase. In the pilot phase, INSAT 3A/3B satellites were used to ensure that the technology worked with satellite based solution. In the semi-operational phase, EDUSAT was used to establish national and regional networks. In the operational phase, the users were to procure ground segment with technical support from ISRO and the network was to become fully operational. A time bound schedule and action plan in terms of number of ground networks to be established under each phase needs to be fixed to ensure timely establishment of ground networks.

It was observed in audit that specific target dates were not fixed for each of these phases. A time bound programme schedule with action plan and details regarding establishment of networks, hubs, SITs, ROTs, etc., were not

fixed. A definite programme indicating targets, action plans for each year of operation, milestones, etc., was also not in place. Thus, non-fixation of definite target dates and non-preparation of action plan for the three phases of EUP delayed the implementation of the project. Further, there was no documentation to show the completion of each phase (pilot phase, semi-operational phase and operational phase) of the project.

ISRO while admitting the audit observation stated (August 2009) that while broad objectives and action plans were made by ISRO, the exact numbers were not taken as targets as there were uncertainties with respect to end users' participation, preparedness, budget allocation, etc. The reply of ISRO/DOS pointed out to the lack of definite plans. Thus, DOS did not ensure end user participation, user preparedness and financial resources prior to launch of EDUSAT and rolling out of EUP.

3.1.2.3 Inadequate plan of action for running educational programmes

The educational programmes prepared by content experts needs to be aired from the studio facility associated with hub. The contents so generated were to be run through the EDUSAT ground network. Therefore content generation constituted a vital component of EUP. The educational programmes to be generated had to be in different languages, accurate, authentic and credible besides being consistent with the prescribed syllabus. Through an order issued in September 2004, ISRO took upon themselves the responsibility of content generation jointly with user agencies.

Audit observed that there was no definite plan of action for content generation/utilisation in ISRO and there was no single source identified for co-ordination and monitoring.

ISRO stated (August 2009) that while implementing the EDUSAT programme, all stakeholders had agreed that the content generation should be the responsibility of user agencies like State Governments/Departments/ Universities. It added that ISRO through its unit viz., DECU[22] took significant steps to guide the users by publishing a guideline book on content generation. DOS stated (February 2010) that state level registered societies were established for looking after content generation. However, ISRO failed to discharge its proactive role and coordinate content generation effectively. The assessment mechanism for the reach of educational services to the targeted people by ISRO was also not on record.

[22] Development and Educational Communication Unit

3.1.2.4 Ineffective monitoring and evaluation mechanism

In view of the large number of agencies involved in the implementation of EUP, it was essential to have a robust structure in place to co-ordinate and monitor implementation. EUP envisaged the following monitoring and evaluation mechanism.

- A coordinating body involving Ministry of Human Resources Development (MHRD), state governments, user agencies like UGC, DST[23], AICTE[24] etc., and ISRO.

- Constitution of various agencies like an independent education authority/EDUSAT co-ordination committee/EDUSAT Advisory Group etc., at various stages of implementation of EUP.

- ISRO as a technology provider and partner was responsible for content generation, social research feedback and evaluation, pilot programme production and research studies as well as utilisation jointly with user agencies and MHRD. Users were required to ensure continuous content/educational programmes to these networks and also to ensure the safe custody of these ground networks. Therefore, tripartite MOUs were required to be entered into by ISRO with MHRD and concerned State/national users, defining the specific responsibilities of each entity.

Audit observed that against the above monitoring and evaluation mechanism envisaged, DOS/ISRO did not put these mechanisms in place as discussed below:-

- The coordinating body was not created to ensure full utilisation of the services provided by EDUSAT. Non-creation of a body to coordinate between different stakeholders delayed actual implementation of EUP. DOS stated (February 2010) that a high level inter-departmental Programme Review Board was constituted for smooth co-ordination and optimal utilisation of EDUSAT network. The reply is not acceptable, since a Programme Review Board which is an inter-departmental board, consisting of members of ISRO/DOS and various central agencies/universities did not have representatives from user states and as such, effective coordination was not possible. Further, the National Core Group and Programme Review Board comprising of the representatives of MHRD, however, did not meet after August 2005.

[23] Department of Science and Technology.
[24] All India Council for Technical Education.

- Education authority/EDUSAT co-ordination committee/EDUSAT Advisory Group was not constituted as envisaged. Without furnishing specific reasons for non-constitution of management structure as envisaged, ISRO stated (August 2009) that all possible efforts within the powers of DOS/ISRO had been made to effectively utilise EDUSAT as a technology provider and partner. Further, without furnishing the details of reporting structure, ISRO stated that it was being streamlined.

- A tripartite MOU as envisaged was not entered into. ISRO noted the observation in August 2009 and DOS stated (February 2010) that MHRD took the responsibility of getting MOU signed by user agency in September 2005. Without furnishing signed copy of the tripartite MOU, DOS merely added that tripartite MOU method already existed.

3.1.2.5 Financial resources for EUP

In a high level meeting under the Chairmanship of Secretary of the Department of Secondary and Higher Education, Government of India in December 2004, it was deliberated that the funding of the project at the Central and State level is very critical for the success of the programme and possibility of a Centrally Sponsored Scheme (CSS) was to be explored.

Though the idea of a CSS to fund EUP was mooted in November 2003, MHRD initiated the proposal only in April 2006 to utilise EDUSAT fully. CSS proposed an investment of ₹2,456 crore to utilise EDUSAT fully, including ₹1,628.03 crore towards ground network connectivity and ₹590 crore towards content generation. The scheme did not materialise and in the meantime, EDUSAT was decommissioned. DOS stated (February 2010) that MHRD funding was part of country wide funding of EUP and this funding was out of context with respect to EDUSAT.

The reply of DOS needs to be viewed in light of the fact that EDUSAT had remained grossly underutilised and the modalities to ensure full utilisation of EDUSAT including funding for the programmes should have been worked out by DOS before launch of the satellite. However, even at the end of its life (at the end of sixth year of its operation), action plan for full utilisation of EDUSAT was not in place.

It was, therefore, evident that a definite source of funding was not identified for the users towards expansion of their network connectivity and content generation even at the end of the life of EDUSAT (September 2010). Inadequate planning of financial resources therefore resulted in underutilisation of the satellite.

Recommendation 1:

DOS/ISRO need to plan their satellite based application programmes only after ensuring that definite plans in terms of finances and infrastructure are in place so that the satellites are utilised fully.

3.1.3 Issues in execution of EUP

3.1.3.1 Establishment of network connectivity

(a) Delay in establishment of ground networks

A total expenditure of ₹549.09 crore was incurred towards EDUSAT and EUP as on March 2013. EDUSAT was launched in September 2004 and was to remain in operation for seven years i.e., up to September 2011. Therefore timely utilisation of satellites by establishing network would ensure effective utilisation of scarce satellite resources.

The regional EDUSAT networks were expected to be operational in six months after the launch of EDUSAT (i.e. by March 2005). The test check of records relating to establishment of network in 14 states revealed that there were delays in the establishment of EDUSAT. The delay has been worked out from the scheduled date of operationalisation of the network to actual date of operationalisation of the network. The delays in the test checked cases were as under:-

Table 5- Delay in establishment of selected networks

Sl. No.	Networks	Scheduled date of Operationalisation[25]	Actual date of operationalisation *	Delay in months
1.	Odisha	March 2005	January 2009	46
2.	Maharashtra (YCMOU Nasik Hub)	March 2005	August 2008	41
3.	Arunachal Pradesh	March 2005	May 2008	38
4.	Punjab	March 2005	January 2008	34
5.	Madhya Pradesh (RSK)	March 2005	September 2007	30
6.	Haryana	March 2005	May 2007	26
7.	Integrated Disease Surveillance Programme	April 2007	March 2011**	48
8.	Rajasthan	March 2005	October 2006	19

[25] The national beams of EDUSAT were operational from November 2004 and its five regional beams were operationalised six months from its launch viz., March 2005. Actual date of operationalisation of the networks was requested for computing the delay, which was not furnished. Thus, from the information available in the network file, actual date of operationalisation of the 14 networks test checked in audit were arrived at.

9.	West Bengal	March 2005	Training for the site coordinators completed by July 2006	16
10.	Jammu & Kashmir (Srinagar Hub)	March 2005	Srinagar hub was inaugurated in May 2006	14
11.	Karnataka (Interactive)	March 2005	March 2006	12
12.	Delhi	March 2005	March 2006	12
13.	Tamil Nadu	March 2005	October 2005	7
14.	Kerala	March 2005	October 2005	7

* After supply, installation, testing, commissioning and operationalisation and imparting of training
**37 SITs are yet to be installed.

- The delays in the establishment of networks ranged from seven months to 46 months in these 14 states indicating idling of satellite resources during the operational life of the satellite.

- In 50 *per cent* of the cases there was a delay of more than one year but less than two years.

- In 29 *per cent* of the cases there had been delay of more than two years.

DOS stated (February 2010) that delay was due to significant delays in arranging road permits by the user agencies and site readiness for the installation of the equipment. The reply of DOS needs to be viewed in light of the fact that the management structure to address these issues though envisaged was not put in place. It was also evident that the delay was due to absence of definite target dates and implementation plan for various phases of the project together with lack of funds with user states.

(b) Delay in the establishment of network due to deficiency in the management of network contracts

DOS/ISRO established the network in the user states by releasing purchase orders to the firms such as Bharat Electronics Limited, Hughes Network Systems India Limited, etc.

Test check of 19 out of 84 orders issued by ISRO till March 2009 for installation and commissioning of hubs and terminals revealed delays in completion by one to 35 months. DOS in February 2010 cited reasons such as delay in obtaining road permit, site readiness and holidays at schools for the delay in installation and commissioning. In these 19 cases test checked, liquidated damages of ₹17.39 crore leviable on contractors for delays in completion could not be levied as States/UTs delayed readying the sites of installation.

ISRO stated (August 2009) that a suitable clause to recover the charges on account of non-readiness of site from the user States/UTs was being incorporated in the MOUs entered subsequently with users. It added that it might not be feasible to implement this in the old MOUs at this stage. The fact remains that liquidated damages were not/could not be levied for delays in installation and commissioning.

(c) Underutilisation of EDUSAT in terms of network connectivity

DOS/ISRO incurred substantial sums towards EDUSAT and its utilisation programme. Further, the operational life of the satellite is limited and valid for seven years. The scarce satellite resource, therefore, needs to be utilised to its maximum potential to achieve the intended objective of EUP to ensure that satellite based education reach the unreached poor people of India.

Audit, however, observed that there was underutilisation of EDUSAT, both in terms of network connectivity and in terms of satellite resource utilisation as discussed below:

- As per the norm one hub supports eight networks. Therefore 47 hubs that were available in EUP as of September 2011 should have supported 376 networks. As against this, EDUSAT supported only four networks in 2004-05, 12 in 2005-06, 31 in 2006-07, 46 in 2007-08, 51 in 2008-09, 52 in 2009-10 and 42 networks in its final year of 2010-11 as detailed in the table below:

Table 6- Status of the establishment of EDUSAT Networks from 2004-05 to 2010-11 (Sepember2010)

No.	Year	Networks	Percentage of Networks not established against a maximum of 376 networks a year possible [100-(col.3 x 100/ 376)]	Percentage of Networks not established against a maximum of 136 networks a year possible [100-(col.3 x 100/ 136)]
1.	2004-05 (EDUSAT was launched in September 2004)	4	99	97.06
2.	2005-06	12	97	91.18
3.	2006-07	31	92	77.21
4.	2007-08	46	88	66.18
5.	2008-09	51	86	62.50
6.	2009-10	52	86	61.77
7.	2010-11 (EDUSAT was decommissioned in September 2010)	42	89	69.11
	Average	34	91	75

- As would be seen from the table above, the under utilisation, when compared to the maximum capacity of 376 networks round the year, varied from 99 *per cent*[26] in 2004-05 to 89 *per cent*[27] in 2010-11 with an average of 91 *per cent*[28] over the period. This resulted in idling of satellite capacity, which impacted availability of educational programmes to the intended target groups.

  ISRO stated (September 2009) that considering the transponder availability at the end of the life of the space craft, maximum number of networks EDUSAT can support was only 136. DOS stated (February 2010) that EDUSAT supported 96 networks (70 *per cent*) as of February 2010, in the fifth year of operation and all hubs were to be customised to the user requirements and every hub would not be capable of supporting eight networks. The replies of ISRO and DOS need to be viewed in the context of the fact that the action plan prepared by ISRO clearly stipulated that each regional network could handle maximum eight networks. Further, even after accepting the contention of ISRO, EDUSAT could support only up to a maximum of 52 networks during its operational life which was only 38 *per cent*[29] of the capacity.

- Going by the contention of DOS that EDUSAT could only support 136 networks, there was still an underutilisation of EDUSAT to the extent[30] of 69 *per cent* at the end of September 2010. Thus the objective of reaching satellite based education to the un-reached poor masses remained unachieved to a large extent despite incurring huge expenditure for the purpose.

- Against the capability of each network to support 500 SITs, none of the 61 networks[31] of EUP established as of March 2009 supported its maximum capacity. Similarly, against the capability of each network supporting any number of ROTs, only 18 networks (30 *per cent*) supported ROTs. This resulted in under utilisation of network and entailed inadequate reach of educational programmes. Without indicating network capability of each hub established under EUP, DOS stated (February 2010) that technically it was incorrect to derive the utilisation factor from the capabilities of the hub. The reply of DOS is contrary to earlier replies of August 2009 furnished by ISRO that the

[26] Considering eight network per hub [100-(4x100/376)].
[27] Considering eight network per hub [100-(42x100/376)].
[28] Average of 4, 12,31, 46,51,52 and 46 is 35 [100-(35x100/376)]
[29] 52 x100/136
[30] [100 - (42 x 100 / 136)]
[31] 52 networks of EDUSAT and nine networks shifted to INSAT 4CR satellite

licensing scheme built into the hubs supported a maximum of 500 SITs and any number of ROTs. States could not exploit the hub capacity. Some of the networks did not have ROTs as the State Governments had not allocated sufficient funds to start the network which confirm ineffective coordination with states in pre-launch phases.

- Audit also observed from the Bandwidth Utilisation Statement of March 2009 furnished by ISRO that a separate bandwidth of 2.3 MHz was allocated to Bhabha Atomic Research Centre (BARC) hub without a regular network resulting in idling of hubs. Thus, the bandwidth allocated to this hub was not utilised. Without indicating number of SITs and ROTs connected to BARC, DOS stated (February 2010) that it was a fully functional network for CBSE schools. The reply of DOS was not acceptable in view of the fact that the status of the EDUSAT Network furnished by ISRO in May 2009 revealed that network consisting of SITs and ROTs was not established for this hub.

Though the success of EUP depended on network connectivity, this could not be ensured by ISRO. Thus, there were inordinate delays ranging from seven months to almost four years in establishment of networks, resulting in under utilisation of satellite in terms of network connectivity averaging to 90 *per cent* during the life of the satellite. There were losses due to non-utilisation of network connectivity, establishment of network connectivity when optimal terminals were not available and inadequate penetration of ROTs at the primary school level. Similarly, there were instances of underutilisation of hubs and network connectivity due to non-establishment of adequate terminals. As a result, reach of the educational programmes beamed by EDUSAT could not reach all the user agencies, specially the states.

DOS stated (February 2010) that a co-ordination mechanism from DOS/ISRO was identified in September 2004 and that the response from the user agency was lacking which led to delay in establishing the network. It added that funding from the State Governments was needed to increase the population of terminals. The reply is to be viewed in the context that a management structure was not constituted and a mechanism to fund network connectivity and content generation though envisaged was not put into practice for the successful implementation of EUP. Lack of coordination with user agencies for timely action regarding site preparedness and arrangement for establishing network was evident.

(d) Satellite capacity allocation and utilisation in state networks

The transponder capacity/bandwidth of various Indian satellites is a national resource and should be allotted judiciously and in a most transparent manner to derive maximum benefit. Bandwidth is the space to enable users to utilise EUP and is expressed in megahertz (MHz). Higher the bandwidth more could be the networks, channels, programmes etc. EDUSAT had six transponders in Ku-band and six transponders in extended C Band each with a capacity of 36 MHz. Thus, a total bandwidth of 432 MHz was available for allocation. The allocation of bandwidth was to take into account the target groups. Of the twelve transponders, seven (six C band and one Ku band) were for National beams and five (Ku band) were for regional beams for imparting education in regional languages. PMB of EUP decided in April 2005 that each state would have a minimum one hub with a bandwidth of around 4.5 MHz, with three simultaneous channels and 1,200 SITs. Details of bandwidth allocation, target groups and connectivity in various states[32] are as follows:

Table 7- Status of state-wise allocation of Satellite Capacity at the end of March 2009

No.	States	Satellite capacity Allocation	Population – Target groups (Figures in lakhs)				Connectivity		
			Total	Rural	Child	Illiterates	Network	SITs	ROTs
1.	Andhra Pradesh	1.50	762.10	554.01	101.72	362.76	1	0	2,100
2.	A&N Islands[33]		3.56	2.40	0.45	1.03	1	25	0
3.	Arunachal Pradesh	3.40	10.98	8.70	2.06	6.13	1	47	0
4.	Assam	3.40	266.55	232.16	44.98	126.40	0	0	0
5.	Bihar	0.00	829.98	743.17	168.05	518.89	0	0	0
6.	Chandigarh	0.00	9.00	0.92	1.16	2.57	0	0	0
7.	Chattisgarh	2.25	208.33	166.48	35.55	96.61	1	47	0
8.	Dadra & Nagar Haveli	0.00	2.20	1.70	0.40	1.17	0	0	0
9.	Daman & Diu	0.00	1.58	1.00	0.21	0.51	0	0	0
10.	New Delhi[34]	27.87	138.50	9.45	20.17	41.86	1	32	0
11.	Goa	3.00	13.47	6.77	1.46	3.62	0	0	0
12.	Gujarat	12.30	506.71	317.41	75.32	208.43	2	0	1,210
13.	Haryana	10.00	211.44	150.29	33.36	90.51	5	509	10,032
14.	Himachal Pradesh	0.00	60.77	54.82	7.93	20.36	0	0	0
15.	Jammu & Kashmir	8.64	101.43	76.27	14.86	53.36	2	100	0
16.	Jharkhand	0.00	269.45	209.52	49.57	151.68	0	0	0
17.	Karnataka	19.61	528.50	348.89	71.82	224.16	6	59	3093

[32] Source: EDUSAT Bandwidth Allocation Statement as of March 2009 furnished by ISRO (this statement did not include the bandwidth allocated to states such as Andhra Pradesh, Lakshadweep and Odisha), 2001 Census data of states.

[33] Supported from INSAT-4A.

[34] Band width allocation to National beam such as IGNOU, NCERT and Mahabharat included.

Table 7- Status of state-wise allocation of Satellite Capacity at the end of March 2009

No.	States	Satellite capacity Allocation	Population – Target groups (Figures in lakhs)				Connectivity		
			Total	Rural	Child	Illiterates	Network	SITs	ROTs
18.	Kerala[35]	5.76	318.41	235.74	37.93	63.56	5	100	1,400
19.	Lakshadweep[36]		0.60	0.34	0.09	0.16	1	13	21
20.	Madhya Pradesh[37]	13.91	603.48	443.81	107.82	287.56	6	220	1,084
21.	Maharashtra[38]	11.09	968.78	557.78	136.70	329.13	1	41	0
22.	Manipur	3.40	22.93	15.91	3.09	8.56	0	0	0
23.	Meghalaya	3.40	23.18	18.65	4.68	11.61	1	51	0
24.	Mizoram	3.40	8.88	4.48	1.44	2.27	1	16	0
25.	Nagaland	3.60	19.90	16.47	2.90	8.58	1	43	0
26.	Odisha	6.60	368.04	312.87	53.59	169.68	2	60	80
27.	Puducherry[39]	0.00	9.74	3.26	1.17	2.78	0	0	0
28.	Punjab	9.16	243.58	160.97	31.72	96.02	2	307	0
29.	Rajasthan	9.00	565.07	432.93	106.51	288.05	2	82	300
30.	Sikkim	3.40	5.40	4.81	0.78	2.23	0	0	0
31.	Tamil Nadu	8.25	624.05	349.22	72.35	218.81	4	493	0
32.	Tripura	3.60	31.99	26.54	4.37	11.77	1	50	0
33.	Uttar Pradesh	0.00	1,661.97	1,316.58	316.25	904.77	0	0	0
34.	Uttarakhand	0.00	84.89	63.10	13.60	33.84	0	0	0
35.	West Bengal[40]	10.64	801.76	577.49	114.14	329.80	3	126	680
	Total	187.18	10,287.20	7,424.91	1,638.20	4,679.23		2421	20,000

The position emerging from the table and the response of ISRO on them are brought out and discussed below:

(e) Underutilisation of EDUSAT satellite capacity for education

As against the available satellite capacity of 432 MHz only 187 MHz (43 *per cent*) was allocated to EDUSAT user agencies. Audit further noticed from EDUSAT Bandwidth Utilisation Statement of March 2009 that 27 *per cent* of the available bandwidth was utilised for other purposes like private TV Channels (1.5 *per cent*), telemedicine (8.9 *per cent*), disaster management (8.3 *per cent*) and village resource centre programmes (8.3 *per cent*). 30 *per cent* of the satellite capacity was not utilised at all.

57 *per cent* of the satellite capacity of EDUSAT was idling during the fifth year of its operation, which stopped working in its sixth year of operation. Thus,

[35] Include IIM, Bangalore network with two SITs.
[36] Coupled with Kerala.
[37] Included Rajiv Gandhi Project for EDUSAT Supported Elementary Education (RGPEEE) Sidhi network supporting 1,084 ROTs(Receiving Terminals) .
[38] Include Yashwantrao Chavan Maharashtra Open University (YCMOU) with 41 SITs.
[39] Coupled with Tamil Nadu.
[40] Include National Council of Science Museums with six SITs.

during the entire life of the satellite, the scarce and valuable satellite capacity was idling and could not be put to use for the purpose of reaching quality education to the poor rural masses.

ISRO stated (August 2009) that transponders' usages for telemedicine programme, disaster management support programme and village resource centre programme were integral part of education in various fields of learning and hence they cannot be treated in isolation. The fact is that EDUSAT satellite which was launched exclusively for education was utilised for the purposes other than its intended use. Further a major chunk of the satellite capacity remained idle defeating the primary objectives of EDUSAT.

(f) Disparity in allotment of satellite capacity among states

The valuable and scarce satellite resources needs to be allocated to individual states uniformly keeping in view the target group of each state. The target group in the states is illiterate population, child population and rural population. Audit observed the disparities in allotment of satellite capacity as of the fifth year of the operation (satellite was in operation for six years) of EDUSAT as indicated below:

- In 22 out of 35 States/UTs constituting 63 *per cent*, the allocation of bandwidth was less than the decided average of 4.5 MHz. In 10 out of 35 States/UTs, the bandwidth allocation was more than the maximum of 6.5 MHz envisaged. DOS stated (February 2010) that there was no decided average. The reply is contrary to the decision made in the second meeting of EDUSAT Utilisation PMB held in April 2005 that each state would have a minimum one hub with a bandwidth of around 4.5 MHz.

- The states of Uttar Pradesh, Bihar, Jharkhand, Uttarakhand and Himachal Pradesh were not provided any bandwidth as of March 2009, despite the target groups (child population) in these states constituting a large chunk (33.90 *per cent*) of the total population. ISRO stated (August 2009) that continuous efforts were being made to implement EDUSAT network in Uttar Pradesh and Bihar. It also stated that Jharkhand and Uttarakhand had established networks. EDUSAT Network was yet to be established in Uttar Pradesh (June 2013) which was having illiterate population of nine crore, the largest among all the states.

- The states like Punjab (Illiterate population: 96 lakh) and Haryana (Illiterate population: 90 lakh) were allotted higher bandwidth than states having more illiterate population like Assam (Illiterate

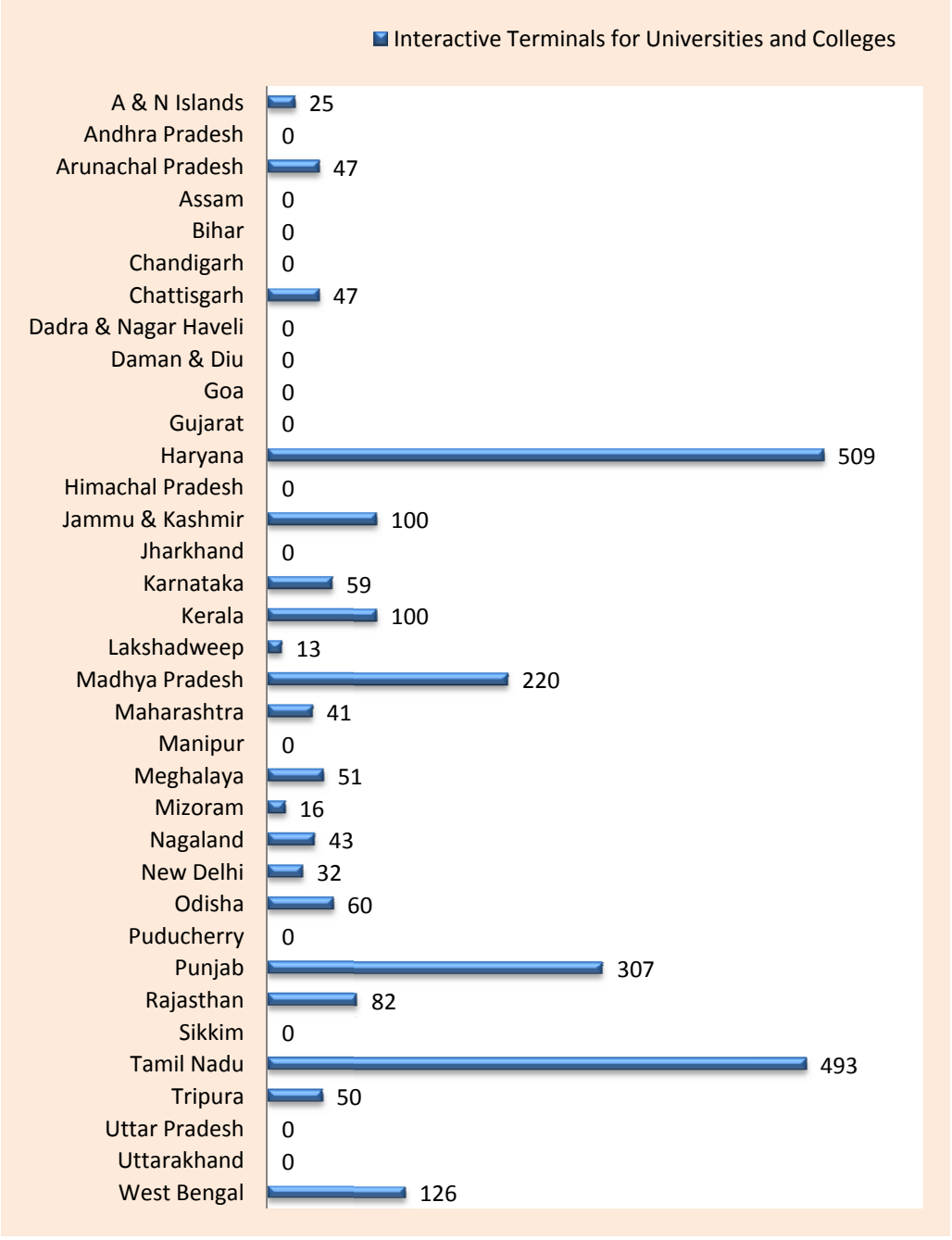
population: 126 lakh) and Odisha (Illiterate population: 170 lakh). ISRO, while admitting the fact that bandwidth allocation was not uniform, stated (August 2009) that with appropriate approvals, best performing users were provided with additional channels keeping in view effective utilisation of bandwidth on EDUSAT. DOS stated (February 2010) that states with enhanced funding were given additional bandwidth so that such states can become role model for others to follow. The reply goes against DOS/ISRO policy of providing fixed bandwidth to each state and allotment based on target groups.

- Despite terminals to utilise bandwidth not being in place, in four states (Assam, Goa, Manipur and Sikkim) total bandwidth of 13.20 MHz was allotted, resulting in idling of bandwidth. DOS stated (February 2010) that bandwidth was reserved for Uttar Pradesh and Himachal Pradesh in extended C-Band and ISRO stated (August 2009) that it was necessary to reserve minimum bandwidth for each state so that bandwidth was allotted in equitable manner for all the states to start off their programmes. Thus, non-establishment of ground network had resulted in idling of satellite capacity reserved for the states. According to its bandwidth utilisation statement of March 2009, ISRO, however, did not reserve bandwidth for states such as Uttar Pradesh, Bihar, Jharkhand, Uttarakhand and Himachal Pradesh.

(g) Failure to establish educational terminals for colleges and universities

The satellite capacity allocated to each state was to be used to its maximum potential by establishing interactive and receive only terminals. Interactive terminals are established in colleges and universities to promote quality education in higher, technical and professional education sector. To achieve this objective, EDUSAT Utilisation PMB in its second meeting (April 2005) decided that each state would have a minimum one hub with a bandwidth of around 4.5 MHz, with three simultaneous channels and 1,200 SITs. The graphical representation of the establishment of interactive terminals in the States is given in chart 4.

Chart 4- Satellite Interactive Terminals for Universities



Audit observed the following disparities as of the fifth year of operation of EDUSAT (satellite was in operation for six years) in the establishment of interactive terminals against the envisaged number of SITs for colleges and universities:

- None of the 35 States/Union Territories had achieved envisaged level of 1,200 interactive terminals. None of the 12 States/Union Territories which were allocated bandwidth of more than 4.5 MHz, had achieved envisaged level of 1,200 interactive terminals. ISRO stated (August 2009) that target of 1,200 SITs in each state was not

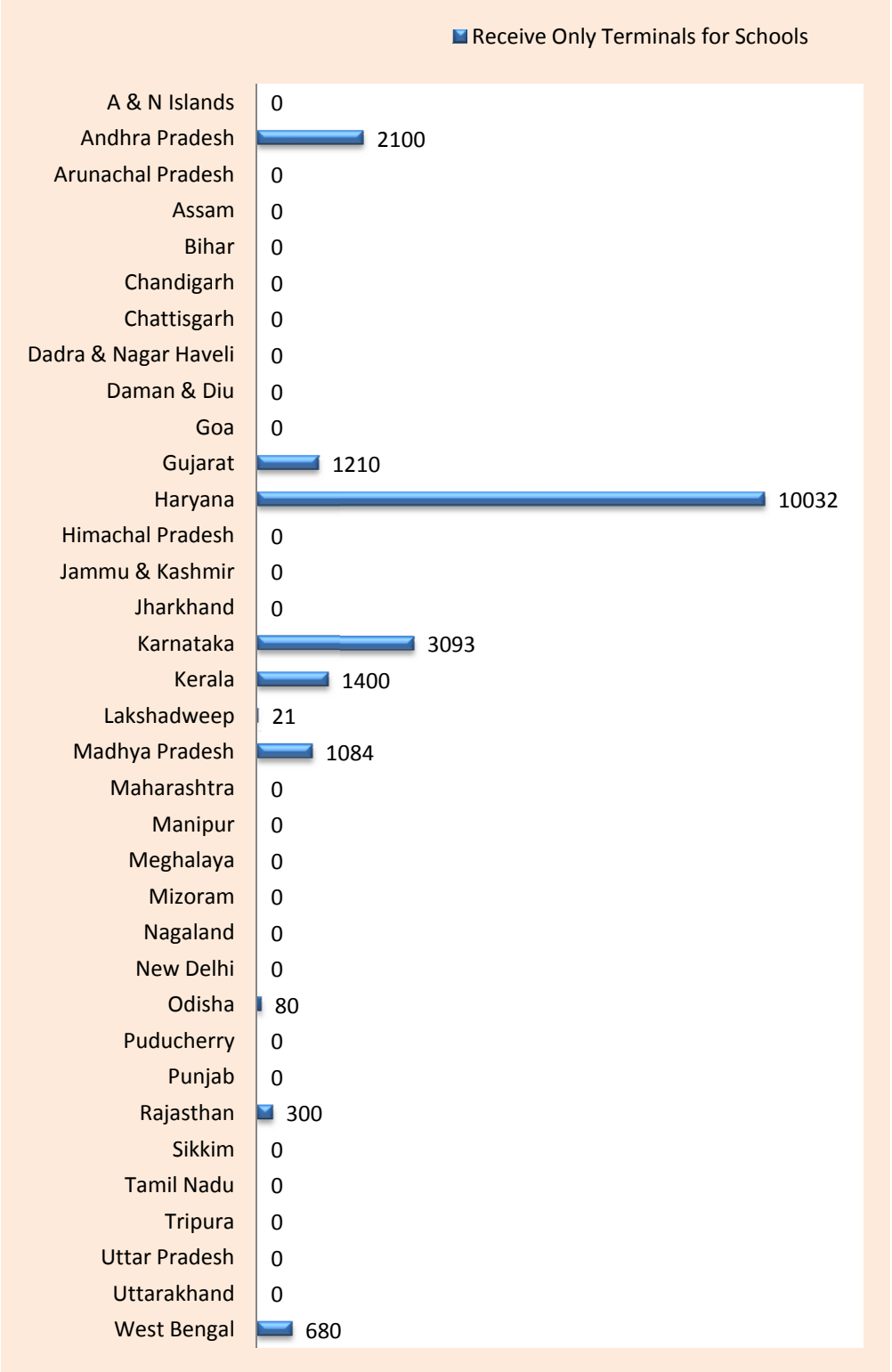
stated in any of the project plans and DOS stated (February 2010) that 1,200 SITs were not taken as a target. The fact, however, remained that in the second meeting of EDUSAT Utilisation PMB held in April 2005, it was decided that each state would have a minimum one hub with a bandwidth of around 4.5 MHz, with three simultaneous channels and 1,200 SITs.

- In 13 states neither networks nor interactive terminals were established.

(h) Failure to establish educational terminals for schools

EUP was conceived as a sustainable distance education alternative primarily for the primary school and mass non-formal education for areas where experienced teachers were not available. Receive Only Terminals (ROTs) were basically used to provide primary school education to masses. It was envisaged in the EDUSAT Action Plan that each network can have unlimited number of ROTs. The graphical representation of the establishment of receive only terminals in the States is given in chart 5.

Chart 5- Receive Only Terminals for Schools



Audit observed the following disparities as of the fifth year of operation of EDUSAT (satellite was in operation for six years) in the establishment of receive only terminals for schools:

- From the status of ROTs established, it is evident that out of 30 States/UTs where EDUSAT network was in place, only 10 (33 *per cent*) States/UTs had penetration of ROTs among primary schools and poor masses, thereby resulting in non-achieving of the objectives in 90 *per cent* of the cases.

- Large states having substantial illiterate population such as Uttar Pradesh, Bihar, Maharashtra, Tamil Nadu, Odisha, Jharkhand and Assam had no ROT at all. Thus the objective of reaching quality education to the primary schools in the bigger states was not achieved as of the fifth year of operation of the satellite.

ISRO stated (August 2009) that ROT channel could not be established due to non-readiness in terms of local infrastructure, content and budgetary support from the State Government. DOS stated (February 2010) that most of the states had not made clear plans for implementation due to inadequate budgetary support. This risk could have been mitigated effectively, had the management structure to execute and co-ordinate various activities of EUP been set up as envisaged.

Thus, satellite capacity allocation to states was not uniform and did not follow the declared policy of ISRO. Whereas five important target population states were not allocated any satellite capacity, in another two states the allocation was not commensurate with the target population. There were cases of idling of satellite capacity, allotment of EDUSAT satellite capacity to private TV channels etc. As a result, the reach of educational services to the user agencies could not be ensured.

(i) Thefts of EDUSAT network hardware

Out of 1,065 ROTs established free of cost by ISRO for Rajiv Gandhi Project for EDUSAT Supported Elementary Education, to cover mainly primary schools in Madhya Pradesh, 174 solar plates, 14 television sets and 165 other items, costing in all ₹3.62 crore, were stolen. DOS could not initiate specific action to redeem the losses and stated in February 2010 that IGNOU was the custodian. The reply needs to be viewed in the light of the fact that ISRO did not sign any tripartite[41] agreement as envisaged which could have safeguarded losses due to such events. Further, there were thefts in Odisha, Rajasthan and Tamil Nadu Regional Networks too.

[41] Between ISRO, user and MHRD.

3.1.3.2 Inadequate Content generation

The education content is required to be generated and streamed through the networks. A full time education programme channel would require 6,570 educational programmes per year with three repeat programmes at the rate of 18 hours a day.

Audit observed that:-

- A Deputy Project Director level officer was responsible in ISRO for content generation and social research feedback evaluation. The details of content generation in the networks established under EUP, however, were not available with ISRO except for three networks. As a result, ISRO was not aware of the extent of utilisation of the satellite for educational purposes. The impact evaluation undertaken by the National Institute of Advanced Studies (NIAS), Bengaluru on the pilot phase of EUP had also reported that the content generation was not up to the required level.

- In three networks, against the requirement of 6,570 educational programmes per year for one channel, YCMOU[42] network was conducting 936 programmes (14.25 *per cent*) per year, Karnataka network was conducting 558 programmes (8.49 *per cent*) per year and Sidhi network was conducting only 150 programmes (2.3 *per cent*) per year.

3.1.3.3 Deficiencies in monitoring and evaluation

A comprehensive project evaluation includes several distinct elements. Monitoring of the project would ensure that the project objectives are being implemented as planned. A project monitoring system enables continuous feedback on the status of its implementation to identify specific problems and risks so that these risks could be mitigated to achieve the desired results. Monitoring and evaluation of the project would also focus on process evaluation to analyse the operational requirements of the project in its interaction with the users and stake holders and focuses on problems in service delivery.

A large number of stake holders comprising Central Government and State Government agencies were involved in the implementation of EUP. It was, therefore, essential to have a structured monitoring and evaluation mechanism to improve the project outcome for the stake holders.

[42] Yashwantrao Chavan Maharashtra Open University.

There were significant delays in the establishment of networks at the users premises due to reasons such as non-readiness of site, delay in obtaining road permits, etc. This clearly indicated lack of monitoring mechanism to coordinate with different stake holders. These delays occurred when the scarce and valuable satellite capacity meant exclusively for education was idling.

Though a number of national level, inter-departmental and departmental committees were in place the committees did not meet periodically during the period between 2004 to 2010 (when EDUSAT was in operation) to carry out their mandated role. Thus monitoring and evaluation through these committees were deficient as discussed below:-

- A National Core Group (NCG) comprising representatives from IGNOU, ISRO, UGC and National Institute of Educational Planning and Administration (NIEPA) was constituted in September 2004 to prepare programme schedule beginning with the launch of EDUSAT and to look after long term management issues in implementation. However, this could not ensure an adequate plan for preparedness when EDUSAT became operational by November 2004. It failed to prepare an action plan for full utilisation of potential of EDUSAT, plan for proper satellite capacity allocation and plan for timely establishment of networks and allied activities. The scrutiny of files maintained in ISRO revealed that NCG did not meet after August 2005.

  Without furnishing specific reply to the shortcomings in the efficiency of the monitoring mechanism available, ISRO stated (August 2009) that while introducing new technology like EDUSAT, most of the elements could be checked end to end only after satellite was made operational and there needed to be a significant time period after launch to realise the ground segment. Reply of ISRO needs to be viewed in the light of the fact that delay in establishing ground network itself occurred due to management issues such as non-readiness of site by the users, delay in shipments and delays in obtaining road permits etc., which had significant impact on the utilisation of EDUSAT. Further, the core group was constituted only one month before the launch of EDUSAT and no action plan for full utilisation of potential of EDUSAT was prepared.

- DOS/ISRO in September 2004 constituted Programme Review Board (PRB) which is an interdepartmental board, consisting of Secretary, DOS, Secretary, MHRD, Vice Chancellor IGNOU, Chairman UGC, Director, NCERT, members from ISRO/DOS (excluding

representatives from user states). Further, DOS/ISRO level Project Management Board (PMB) and Project Management Council (PMC) were also constituted in September 2004. These three committees were constituted by DOS/ISRO considering the larger scope of work, complexities involved and keeping in mind the follow up/ coordination and user interfaces required for EDUSAT utilisation.

Audit observed that inter-departmental committee, PRB met only once in June 2005. While PMC met only once in January 2005, PMB met only twice in November 2004 and April 2005.

- Satellite Communication Programme Office (SCPO) of ISRO was responsible for overall management of EUP within ISRO. It was observed in audit that it did not possess information on operationalisation of various networks, number of free and paid hardware supplied, utilisation of networks, content generation etc.

Without furnishing copies of periodic Management Information System reports that helped in monitoring EUP, ISRO stated (August 2009) that annual report of ISRO and monthly report of DECU provided consolidated progress of EUP.

Thus, the committees empowered to look after long term management issues in implementation of EUP and also to carry out follow up, coordination and user interface issues met only during the first year of the operation of the satellite. Therefore the monitoring and evaluation mechanism of EUP was flawed during the remaining five years of operation of EDUSAT.

3.1.3.4 Impact evaluation study conducted by NIAS

ISRO entrusted the impact evaluation of pilot phase of EUP to National Institute of Advanced Studies (NIAS), Bengaluru for completion within 13 weeks from September 2004. NIAS conducted the study between October 2004 and April 2005 in 100 colleges under Visvesvaraya Technological University which was a user of services of EDUSAT in the pilot phase. Some of the observations of the impact evaluation were:

- Performance of SITs was poor during the pilot phase. It was functional in few colleges and seldom used. In 40 *per cent* of the colleges, terminals (ROTs and SITs) were not functioning for different periods of time. DOS merely stated in February 2010 that based on these inputs SIT configuration were reworked and the new configuration was designed and deployed.

- The project had been successful in 32 *per cent* of colleges, partially successful in 47 *per cent* and failed to take off in 21 *per cent* of the colleges.

- Only 27 *per cent* of students watched pilot sessions and lack of awareness about sessions among students was 41 *per cent*. A log book of connectivity, audio/video quality, strength of attendance was not available.

The Impact analysis report concluded that there was a gap between planning and execution which led to a lack of sense of ownership and engagement among the actual users. Despite availability of feedback in April 2005 no measures were taken to improve the effectiveness in utilisation of EDUSAT in further stages. EDUSAT satellite was in operation during the period from 2004 to 2010, the feedback system was, however, not available after April 2005.

Recommendation 2:

In satellite based application programmes wherein stakeholders other than DOS/ ISRO were to be involved, DOS/ISRO may constitute a management structure to sort out issues that would come up during the implementation of the programme.

Recommendation 3:

ISRO should allocate bandwidth to all users in the most objective and transparent manner to avoid differential treatment and subjectivity in the allocation of bandwidth.

Recommendation 4:

ISRO also needs to impress upon users to improve utilisation of bandwidth by creating an appropriate management structure so that the precious national resource is utilised optimally for the benefit of unreached masses and rural population.

3.1.4 Deficiencies in replacement planning of EDUSAT subsequent to its decommissioning

3.1.4.1 Fund requirement for the replacement satellite

Education is a subject in the concurrent list of the Constitution of India and therefore Ministry of Human Resource and Development of the Central Government and State Governments are responsible for preparing and implementing programmes relating to education. The specific role of DOS in its satellite based space application programme was to undertake proof of concept/technology demonstration of the space application programmes so that users could replicate the validated technology and use the satellite capacity.

Audit, however, observed that in EUP, DOS went beyond its scope of demonstration of satellite based education technology and its validation on pilot scale and took on to itself the entire Edusat Utilisation Programme including the role of expansion of ground network connectivity across the country, content generation and monitoring and evaluation.

Based on the direction of the Ministry of Finance and Planning Commission, DOS had decided to charge all the users of INSAT including Government users for social benefit etc. including Department of Telecommunication, All India Radio, Doordarshan, BSNL since 2001. INSAT Coordination Committee (ICC) is an inter-departmental coordination mechanism constituted by the Cabinet Secretariat to plan and allocate the communication satellite capacity from INSAT system. ICC also endorsed the decision of the Government to charge all users of INSAT. It was decided to charge above the floor rate of ₹2.50 crore per unit for the transponders from the Government users. DOS, however, launched a satellite exclusively for education and the satellite capacity was provided free of cost to its users.

After the life of EDUSAT, substantial sum of money (₹700 crore and above) was required to launch and maintain its replacement satellite. The replacement satellite needed to be launched to ensure continuity of the satellite capacity for the ground network connectivity established with substantial investment. Therefore, there needed to be clarity and assurance from the users on the funding aspect and satellite capacity charges (transponder lease charges) need to be collected from the users to make EUP sustainable. Audit, however, observed that there was no clarity/assurance on the funding for the replacement satellite.

After the decommissioning of the EDUSAT in September 2010 the networks operated in the 12 transponders of EDUSAT were shifted mainly to other operational communication satellites such as INSAT 4CR and GSAT-8. The

transponder charges charged for these operational satellites were around ₹ five crore per transponder per year. Though the Central Government decided to charge all the Government users including the users of social benefit, DOS provided the satellite capacity free of cost to its users.

3.1.4.2 Deficiency in planning replacement satellite for EDUSAT

The designed life of EDUSAT was seven years viz. upto September 2011. According to the status of EDUSAT network furnished by ISRO in June 2013, 83 networks consisting of 48 hubs, 4,652 SITs and 51,429 ROTs were established as of June 2013.

The replacement strategy to EDUSAT transponders was to be planned in its orbital slot at 74^{o} East to have continuity for operational EDUSAT networks. ISRO planned replacement to EDUSAT transponders in GSAT-14 only in 12^{th} Five Year Plan period (2012-2017). It was, therefore, evident that ISRO could not plan replacement for EDUSAT transponders in time to provide continuity to operational EDUSAT networks. Inadequate planning of replacement strategy for EDUSAT had resulted in idling of operational networks of EDUSAT networks at the time of decommissioning of EDUSAT in September 2010. Prior to decommissioning of EDUSAT in September 2010, there were onboard power constraints leading to reduction in the number of operational transponders. Due to these constraints 10 networks were shifted to INSAT 4CR satellite in September/October 2008, seven networks shifted to the same satellite in June/July 2009 and another 13 networks shifted in May 2010. Thus, a total of 30 networks were shifted prior to decommissioning of the satellite. Out of 74 networks established in EUP prior to its decommissioning, two networks for Andaman and Nicobar Islands were operating through INSAT 4A. The balance 42 networks were operating in EDUSAT. Idling of these operational networks is explained below:

- 42 networks were idling for more than three months from September 2010 to December 2010.
- 23 networks were idling for more than seven months from September 2010 to April 2011.
- 18 networks were idling for more than one year from September 2010 to April 2011.
- 13 networks were idling for more than two and half years from September 2010 to June 2013.

ISRO stated (March 2011) that prior to decommissioning of EDUSAT, there were on-board power constraints leading to reduction in number of operational transponders. It added that EDUSAT power anomaly leading to de-commissioning was unexpected and premature incidence. The reply is not tenable since ISRO planned replacement to EDUSAT transponders in GSAT-14 only in 12th Five Year Plan period (2012-2017), even though EDUSAT was to complete its designed life by September 2011. Operational EDUSAT networks in Ku band transponders were shifted to INSAT 4CR satellite. This satellite was launched to provide DTH[43] and telecom services in the country. Inadequate replacement strategy to EDUSAT had therefore impacted services planned under INSAT 4CR also.

3.1.4.3 Diversion/lending of ISRO funds

In terms of guidelines[44] of ISRO, works executed by it on behalf of other bodies were to be from deposits obtained from them. Appropriate departmental charges were to be levied for these deposit works. It was observed in Audit that instead of the aforesaid arrangement, ISRO signed an MOU with Antrix Corporation Limited (ACL) in September 2005, authorising the latter to raise demand and collect cost including their commission and taxes. During the period 2003-09, ISRO incurred a total expenditure of ₹180.79 crore from its budget head instead of against deposits collected from users on whose behalf the works were executed. Appropriate departmental charges aggregating ₹12.65 crore[45] were also not levied and collected. Such a violation resulted in diversion of ISRO's budget of ₹180.79 crore and loss of departmental charges of ₹12.65 crore. The cost realised by ACL was transferred to ISRO with delays ranging from one to three years resulting in loss of interest of ₹24 crore. Further, specific network and its elements should have been finalised to utilise the satellite fully by its launch and operationalisation in November 2004, duly taking into account requirement of users.

ISRO stated (August 2009) that DOS guidelines regarding deposit works to be executed from deposits obtained from them were not followed since the specification of state specific EDUSAT network and its elements were not finalised and added that ACL was involved to take up further expansion activities on a commercial model. DOS stated (February 2010) that in order to ensure speedy execution of the project, ACL was involved. Reply of ISRO/ DOS needs to be viewed in light of the fact that ISRO's guidelines of 2001 prescribed undertaking of works on deposit basis.

[43] Direct to Home
[44] June 2001.
[45] Seven *per cent* of ₹180.79 crore.

DOS admitted in February 2010 that delay in the installation of networks was due to non-readiness of the sites by users and delays in certifying the work which led to delayed transfer of money to ISRO. Without citing specific cases, ISRO stated that in some cases ACL had to return money to the user. The reply of ISRO is not acceptable, since the amount for deposit work should in the first instance have been placed with ISRO and not ACL. Accordingly the amount remitted to ISRO as deposit work could also have been returned in such exceptional cases. ISRO agreed to furnish details of hubs and terminals to Accounts Division in future to raise demands on ACL.

Recommendation 5:

In satellite based application programmes of DOS/ISRO, it should implement replacement strategy for the existing satellite in advance to avoid interruption to its satellites based operational programmes.

3.1.5 Conclusion

EDUSAT, launched by the DOS in September 2004 was India's first thematic satellite dedicated exclusively for educational services to provide distance education service to remote areas of India with a total investment of ₹549.09 crore. The investment of the satellite was not returned since the intended benefit of the programme was largely not met.

EDUSAT was in operation for six years from September 2004 to September 2010. 57 *per cent* of the satellite capacity of the EDUSAT was idling as late as the fifth year of its operation. The bigger states with higher illiteracy such as Uttar Pradesh and Bihar did not have an EDUSAT network even in the fifth year of operation of the satellite. In fact Uttar Pradesh, which had an illiterate population of more than nine crore, did not have any network as of June 2013. None of the states and Union Territories could achieve envisaged 1,200 interactive satellite based educational terminals meant for colleges and universities. Large states having substantial illiterate population such as Uttar Pradesh, Bihar, Maharashtra, Tamil Nadu, Odisha, Jharkhand and Assam did not have satellite based receive only educational terminals meant for schools. The objective of reaching quality education to the primary schools in the bigger states was not achieved even as late as the fifth year of operation of the satellite. Thus, the objective of reaching quality primary, higher, technical and professional education to the unreached poor masses of the country remained unachieved.

In addition to non-achievement of the objectives of the EUP, there were deficiencies relating to its planning, implementation of projects in the area of

establishment of ground network for the satellite, generation of the education contents for the ground networks and monitoring and evaluation of the programme to effectively coordinate activities among the stake holders of the project. There were considerable delays in establishment of ground networks. The underutilisation of satellite in terms of network connectivity averaged to 91 *per cent* during the life of the satellite which resulted in idling of hubs which impacted availability of educational programmes. Bandwidth allocation to states was not done transparently as the same was not allotted uniformly to all states against the declared policy of ISRO. Inadequate replacement strategy planning for EDUSAT had resulted in idling of operational EDUSAT networks and impacted services planned under INSAT 4CR.

Thus, the objectives of implementation of EDUSAT could not be achieved even at the end of its life.

3.2 Parking of a foreign satellite in Indian Administration coordinated orbital slot

Department of Space allowed a foreign private satellite service provider to park its satellite in an orbital slot coordinated by the Indian Administration and meant for Indian Satellites, in violation of the country's SATCOM policy and International Telecommunication Union's radio regulations.

Orbital slot is the position of geo-stationary satellite above earth. Member countries under the framework of United Nations acquire these orbital slots through a coordination process at International Telecommunication Union (ITU)[46].

Orbital slots once allocated can be held by a member country for seven years. If the country does not use them within the stipulated period of seven years, the slot allocated would lapse. Hence each country has to prepare orbital slot filings for country-specific slots and occupy the allocated slots within the due diligence period. The long-drawn process of filing and coordination with ITU and due diligence principle make filings for India-specific orbital slot an important and critical

[46] The International Telecommunication Union is the United Nations specialized agency for information and communications technologies, which allocates global radio spectrum and satellite orbits.

activity. Thus an orbital slot, availability of which is scarce and is hence a valuable resource, is required to be used optimally and judiciously and also to be protected.

Indian Administration in ITU is represented by the Wireless Planning and Coordination (WPC) Wing of the Department of Telecommunications. There are no regulatory provisions in the International Radio Regulations[47] (IRR), for permitting the use of orbital position coordinated by the Administration of a country by a third party. Therefore an orbital slot acquired by Indian administration is to be coordinated for Indian satellite systems only.

Further, the norms, guidelines and procedures of SATCOM Policy approved by Union Government in January 2000, as applicable to satellites developed by DOS or private Indian satellites, stipulated the following mechanisms by which satellite capacity could be made available to private parties:

- Paragraph 2.5 of the guidelines allows the INSAT Co-ordination Committee (ICC) to earmark a certain percentage of capacity for use by those non-governmental users who have been authorised by law. Operations with INSAT and providing services in India will be subject to the party obtaining the requisite operating and frequency/siting license from the concerned authorities.

- The paragraph 2.7 of the guidelines allows DOS to build up capacity for a non-government party at its request based on commercial considerations.

- The paragraph 3.1 of the guidelines authorises the Indian Administration (WPC) in consultation with DOS and other concerned regulatory authorities to inform, notify, co-ordinate and register satellite systems and networks by and for Indian private parties following certain well-defined and transparent norms.

Accordingly ICC earmarks certain percentage of the capacity of Indian Satellites (INSAT) owned by Government of India on a non-exclusive basis to Indian private users. These satellites in INSAT system are placed in Indian Administration coordinated orbital slots. The responsibility of ISRO in the customer specific satellites is to make a satellite and launch it into the orbital slot made available by the customer. The SATCOM policy does not provide parking of foreign satellites in the Indian orbital slot.

[47] Radio regulations are prepared by ITU member states and contain general rules for the assignment and use of frequencies by the member states. The regulations have the status of an international treaty and are binding on the ITU member states.

In the course of audit, it was observed that ISRO allowed Intelsat, an international private satellite organisation to place their satellite at 55°E in an orbital location coordinated by the Indian Administration. The foreign satellite was also allowed non-Indian coverage. Audit scrutiny, further, revealed that:

The Indian communications satellite INSAT 2DT stopped functioning from February 2003. Its replacement satellite INSAT 3E was planned for launch in later part of 2003. ISRO leased in 16 transponders from Intelsat[48] (having 68 transponders in all) for one year (February 2003 to February 2004) as a stop gap arrangement to ensure continuity of services of INSAT 2DT. The foreign satellite was shifted to the orbital location of INSAT 2DT viz. 55°E. As per the terms of the agreement, ISRO was to pay a sum of USD two million as Earnest Money Deposit, USD 5.6 million upon deployment of the satellite to 55°E and half yearly charges of USD 7.6 million to Intelsat for the services of 16 transponders. The remaining 52 transponders of the Intelsat satellite were allowed to function from this orbital slot free of cost.

Audit also observed that although the replacement satellite to INSAT 2DT, INSAT 3E was launched in September 2003, ISRO allowed the Intelsat satellite IS 702 to continue to function from the same location. ISRO signed another agreement with Intelsat (March 2004) requesting Intelsat to place its satellite IS 702 at 54.85°E nominally collocated with INSAT 3E, 55°E, as a backup to INSAT 3E free of charge. Intelsat was allowed to use INSAT's ITU filings for non-Indian coverage. The agreement, initially valid for five years up to March 2009, was extended seven times up to August 2011.

It is pertinent to note that there was also no existing practice in ISRO to provide backup to operational satellites.

Thus ISRO allowed the use of a valuable Indian Administration coordinated orbital slot which was meant for Indian satellites, by a foreign private satellite service provider for non-Indian coverage thereby violating the country's SATCOM Policy and ITU's radio regulations. In the process, ISRO extended undue benefit to the foreign party.

ISRO stated (September 2012) that each country adopts the country specific radio regulation and added that usage of orbital slot coordinated or owned by member countries by private parties was an international practice. Department of Space further added (July 2013) that the strategy of locating Intelsat to 55°E was to acquire additional orbital slot in Ku band for the Indian Administration and protect the coordination rights which otherwise would have been elapsed rather than generating revenue.

[48] IS-702 satellite

The reply of ISRO needs to be viewed in the light of WPC clarification (March 2004) with regard to continuation of Intelsat IS-702 at 55°E. It confirmed the settled view, " fully known to DOS" that there are no regulatory provisions in radio regulation for permitting the use of this orbital position by a third party and also stated that DOS would remain the operator for the proposed satellite system to use the orbital slots which are being coordinated for Indian Satellite Systems. Further, the question of lapsing of orbital rights for the location 55°E also did not arise as the replacement satellite INSAT 3E was launched within one year whereas the due diligence period for occupying an orbital slot is seven years.

It is evident that Indian Administration coordinated orbital slots were to be used by Indian satellites. By allowing a foreign satellite to occupy the Indian slot, ISRO violated the country's SATCOM policy as well as the ITU radio regulations and thereby extended undue benefit to the foreign private firm.

3.3 Loss due to unsafe transport and belated insurance of consignment

Liquid Propulsion Systems Centre, Mahendragiri did not ensure safe sea transport of a Liquid Hydrogen Storage Tank procured at a cost of ₹6.15 crore resulting in extensive damage to the consignment, due to which additional expenditure of ₹1.36 crore was incurred on repair. Insurance claim of ₹3.39 crore was also rejected by the Insurance Company due to delay in obtaining the cover.

Liquid Propulsion Systems Centre, Mahendragiri (LPSCM) is a unit of Indian Space Research Organisation (ISRO), Department of Space (DOS), responsible for the development and testing of liquid rocket engines. To meet the need for the augmentation of liquid Hydrogen storage for Cryogenic project (C25), LPSCM placed a purchase order on Gardener Cryogenics, USA (manufacturer) (March 2006) for the design, fabrication and supply of 125 kilo litres Liquid Hydrogen Storage Tank at a cost of USD 1,316,778.86[49] ex-works[50] Bethlehem, PA USA to be despatched by sea with a delivery period of 15 to 17 months. The consignment was despatched in November 2007 and LPSCM made a total payment of ₹5.71 crore during the period June 2006 to December 2008 to the manufacturer against the purchase order.

[49] Including USD 25,778.86 as cost of spares and accessories

[50] According to the International Trade Rules INCOTERMS 2000, under an ex-works transaction, the seller places the goods at the disposal of the buyer at the seller's premises and the buyer has to bear all costs and risks involved in transporting the goods from the seller's premises.

Since the transaction was processed on ex-works basis, the responsibility for all costs and risks involved in transportation of the goods from the manufacturer's premises to the destination lay with LPSCM. The shipment of the consignment upto Mahendragiri, including ocean freight, transportation charges, customs charges, etc. was entrusted to Balmer Lawrie & Co. Ltd. (freight forwarder) who was the authorised air consolidation agent of DOS, for USD 109,804 and ₹44.47 lakh was released as advance (February 2008).

While taking delivery of the consignment (February 2008), it was noticed that the storage tank had suffered heavy damage during the voyage. A Committee was constituted (March 2008) to assess the external damages to the storage tank. The Committee recommended replacement of the damaged components and repair of the external damages to the tank. Accordingly, LPSCM placed two separate purchase orders on the manufacturer for replacement of the damaged items (May 2009) at a cost of USD 93,585 and repair of dents and support assistance (September 2010) through a local firm Gamma Technik at a cost of USD 207,200. The manufacturer completed the repair work by February 2011.

The manufacturer informed LPSCM (May 2011) that while repairing the damages to the storage tank it was discovered that the inner supports of the tank had yielded and expressed the view that the damage to the internal supports of the tank would not have occurred if the tank was properly secured to the deck of the ship. This indicated that adequate care was not taken in the transportation of the storage tank.

LPSCM incurred an expenditure of ₹42.25 lakh towards replacement of the damaged items and ₹93.87 lakh for the external repair work. Another Technical Expert Committee was constituted (June 2012) which assessed the internal damages to the tank. The Expert Committee recommended a set of eight tests for the operation of the tank. The storage tank was finally commissioned in May 2013, after lapse of over five years from the date of procurement.

In this regard audit observed that:

i. Before entrusting the sea shipment of the storage tank to their air consolidation agent, LPSCM neither ascertained the transportation requirements for the safe sea voyage of the cargo from the manufacturer nor obtained reasonable assurance on the expertise and experience of the freight forwarder in this field.

ii. LPSCM did not take an all risk insurance policy to cover risks of damage to the high value consignment during the sea voyage. The

freight forwarder took an insurance policy for the consignment with National Insurance Company Limited for a value of ₹5.68 crore belatedly only in January 2008 i.e after the consignment had encountered bad weather and had been damaged during the voyage (December 2007). The fact that the consignment had already suffered damage was not disclosed at the time of taking insurance. Consequently, the insurance claim preferred by LPSCM for an amount of ₹3.39 crore (November 2008) was repudiated by the insurance company (November 2011) on the ground that the insurance was taken after the consignment had already suffered damage.

Thus LPSCM entrusted a high value shipment to the freight forwarder for transportation by sea without adequately addressing the safety requirements of the ocean freight and also failed to insure the consignment in advance to safeguard against the risks involved in the long sea journey. This had resulted in loss of ₹3.39 crore towards the insurance claim and additional expenditure of ₹1.36 crore on repair work besides non-utilization of the storage tank for the intended purpose.

DOS, while admitting that there was no agreement with the freight forwarder for transportation of sea consignments, stated (February 2013) that the damage to the consignment occurred due to unforeseen rough weather and hence the incident fell under the “force majeure” condition. DOS also stated that the consignment was not insured since the item was a robust hardware meant for outdoor installation and did not come under the classification of extremely delicate, highly sensitive, sophisticated equipment of fragile nature to qualify for special insurance measures. DOS further added that LPSCM had preferred a claim with the freight forwarder to reimburse the extra

expenditure incurred by the Department due to the damage of the consignment in transit.

The reply given by DOS is not acceptable in view of the fact that the responsibility for the safe shipment of the storage tank lay with LPSCM. LPSCM failed to take adequate measures to ensure safe passage of the high value consignment as well as to protect its interests against the risks involved in the transportation. LPSCM did not get the consignment insured in advance against all risks which include rough weather during sea voyage even though insurance of costly equipment purchased from abroad which are not easily replaceable is enabled under the financial powers of DOS. While DOS in its reply stated that claim to reimburse the additional expenditure incurred due to damage of the consignment was made, it did not furnish any document in support of its claim.

Thus failure to take sufficient care in ensuring safe transportation of the Liquid Hydrogen Storage Tank over a long sea journey and timely insurance of the consignment resulted in additional expenditure of ₹1.36 crore[51] on repairs without any option to mitigate these losses through insurance.

[51] ₹42.25 lakh (replacement of parts) plus ₹93.87 lakh (repair work)