

Chapter 2 – Planning of satellite capacity

Satellite capacity for any satellite based communication services including DTH service are required to be planned after assessment of the market demand duly taking into account technical challenges involved in the type of service, strategic, societal and national importance of the service, competing priorities, financial considerations, etc. This chapter brings out the implications of the policy adopted by DOS for planning, realising and providing satellite capacity for DTH service and highlights issues noticed by audit in this regard.

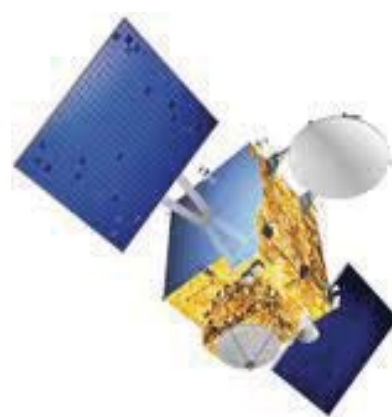


Figure 2: Communication Satellite

2.1 Formulation of SATCOM Policy

The procedure for allocation of satellite capacity (transponders) has been discussed in Chapter 1. As mentioned in Para 1.3, DOS put up (May 1997) a cabinet note for a broader SATCOM policy, duly considering the opinion of the stakeholders through interdepartmental consultation exercise involving Department of Science and Technology, Ministry of Finance, Ministry of Industry, Ministry of Defence, Ministry of Home Affairs and Ministry of Information and Broadcasting (MIB). The proposal suggested having a 'closed sky' policy in DTH service whereby the satellite would be provided by INSAT system or an Indian satellite⁶ only. DOS gave the following reasons for adopting this policy:

- Large number of foreign satellite systems were set to provide a variety of communication services throughout the world including DTH services. These operators were pressing for a very open regulatory regime everywhere particularly in developing countries so that they could gain access to the vast markets and provide unrestricted trans-border communication and equipment movement.
- Unlike terrestrial systems, a foreign based satellite system did not bring in investment to India in establishment of infrastructure or in production activity.
- The economic harm to INSAT System and protection of a technological base that had been built up over three decades was one of the most important considerations.

⁶ A private satellite belonging to Indian Private Industry could register and be notified as an Indian satellite.

- Allowing Indian private parties to lease capacity from foreign satellites for TV services might stifle the growth of INSAT system or similar Indian systems. DTH service providers could even buy satellites already in orbit to begin the services, which could hurt the nascent satellite manufacturing capability in India.
- By allowing uplinking to foreign satellites from India it would *de facto* be recognised that India was part of the 'service area' for these satellites in the International Radio Regulatory framework, which was significant, as orbit spectrum was a very valuable resource not only from the point of view of providing services to the people, but also from a financial⁷ angle.
- Operations with foreign satellites from Indian soil could be permitted on case to case basis for Government agencies or in the event of certain capacity leased by INSAT system to augment or replace its own capacity.
- Closed sky policy was also considered significant for reasons of security, industrial policy, development of Indian space industry, bringing investment into India by prospective service providers, creation of jobs in India in the high-tech areas, ability to deal with telecommunications/broadcasting and space related international trade and tariff issues on equal footing, ability to demand reciprocity, etc., where considered necessary.
- Advanced market economies around the world prohibited the use of foreign systems. Most of the countries in the Asian region had banned reception of signals from the foreign satellites.

Except MIB, all Ministries/Departments agreed to the proposal of DOS. MIB, however, advocated for an 'open sky' policy interalia citing the following reasons:

- This approach looked more democratic.
- It provided a competition to INSAT and made more capacity available to the users.
- Government could retain INSAT as a captive resource.
- As the uplinks would be in India, Government could exercise reasonable control over the material broadcast.
- It would create jobs and market for uplink equipment.
- As Indian parties were presently permitted to hire transponders on foreign satellites, there was no reason to reverse this policy.

⁷ Around 1996 USA auctioned an orbit-spectrum slot for DTH TV for close to US \$ 685 million.

- It would supplement and strengthen national efforts to improve Indian information infrastructure. A 'closed sky' policy was not likely to help in developing economy including the information infrastructure.

The Union Cabinet of India finally approved (January 2000) the 'open sky' policy and allowed Indian and foreign satellites to be used in DTH services with the condition that proposals envisaging use of Indian satellites would receive preferential treatment. To ensure this, ICC prescribed (June 2001) a back to back arrangement whereby DOS would acquire and allocate necessary transponder capacity from foreign satellites to meet the specific requirements of private customers. Antrix, after aggregating the requirements of the Indian customers, would enter into back to back agreements with foreign satellite owners for **short term periods, so that the service could be brought back to INSAT system as and when Indian satellite capacity was available.**

2.2 Planning and realisation of DTH satellites

Though many firms were interested in providing DTH services in India, the scarcity of transponders was a major constraint. Till July 2011, 6,000 transponders were available the world over, of which India had 200 transponders. DTH services were provided through Ku band transponders. A 3,000 kg communication satellite could carry upto 24 Ku band transponders. Unlike other satellite based communication services which require transponder capacity up to 36 MHz (equivalent to one transponder) for various applications, the requirement for DTH service is of the order of minimum of five transponders (180 MHz) going up to 18 to 24 transponders for providing 300 to 400 channels. Therefore, availability of Ku band transponders was the most important consideration while planning satellite capacity for DTH service.

DTH service is location specific. Since the TV dish antenna of the DTH customer has to be facing the satellite, satellite capacity should be available at a particular position in the sky continuously and permanently. Any change in the position of the satellite would result in migration expenses to the DTH service provider and inconvenience to the customer. Therefore, additional Ku band transponders were required to be provided continuously at the same position in the sky to ensure continuity of service.



Figure 3: Small Dish TV antenna

In the above scenario, development and realisation of satellites for DTH service, their maintenance and uninterrupted operations were critical. It required adhering to timeliness of launches, coordination of sufficient orbital slots and protecting strategic interest. Further, for DOS, being a satellite builder and conducting research and development in

communication satellite development sector, it was a big opportunity to harness its research efforts towards establishment of indigenous satellite communication technologies for the DTH sector and in the process, generate revenue for the government.

The year wise position from July 2004 onwards, of demand raised by DTH service providers for satellite capacity, capacity available with DOS and satellite capacity allocated by DOS to the DTH service providers is detailed in the **Annexure II**.

A summary of yearwise allocation of capacity to DTH service providers from INSAT system and foreign satellites is at Table 1.

Table-1: Yearwise allocation of satellite capacity to DTH Service from 2004 to 2013

Period	Name of service provider/Number of Ku band transponders allocated from INSAT System				Name of service provider/Number of Ku band transponders allocated from foreign satellite system						Total number of transponders allocated
	INSAT 4A (83°E)	INSAT 4B (93.5° E)	INSAT 4CR (74° E)	Total number of transponders	NSS-6 ⁸ (95° E)	ST ⁹ (88° E)	MEASAT ¹⁰ (91.5° E)	SES ¹¹ (108.2° E)	Asiasat ¹² (100.5° E)	Total number of transponders	
July 2004				0	Dish TV / 6.5					6.5	6.5
July 2005				0	Dish TV / 9					9	9
July 2006	Tata Sky/12			12	Dish TV / 9					9	21
July 2007	Tata Sky/12	DD/5		17	Dish TV / 9					9	26
July 2008	Tata Sky/12	DD/5, Sun DTH/6.25	Airtel/ 6.5	29.75	Dish TV / 11	Videocon/4.5	Reliance/8			23.5	53.25
July 2009	Tata Sky/12	DD/5, Sun DTH/6.25	Airtel/ 6.67	29.92	Dish TV / 12	Videocon/3	Reliance/8			23	52.92
July 2010	Tata Sky/12	DD/5, Sun DTH/3	Airtel/ 6.67	26.67	Dish TV / 12	Videocon/9	Reliance/9, Sun DTH/1			31	57.67
July 2011	Tata Sky/12	DD/5, Sun DTH/1	Airtel/ 7	25	Dish TV / 12	Videocon/9	Reliance/9, Sun DTH/4	Airtel/ 11	Dish TV / 6	51	76
July 2012	Tata Sky/12	DD/6, Sun DTH/1	Airtel/ 4.5	23.5	Dish TV / 12	Videocon/12	Reliance/9, Sun DTH/4	Airtel/ 11	Dish TV / 6	54	77.50
July 2013	Tata Sky/12	DD/6, Sun DTH/1		19	Dish TV / 12	Videocon/15	Reliance/9, Sun DTH/4	Airtel/ 11	Dish TV / 6	57	76

⁸ Owned by SES World Skies, USA

⁹ Owned by Singapore Telecommunications Ltd., Singapore

¹⁰ Owned by MEASAT Satellite Systems Sdn., Malaysia

¹¹ Owned by SES World Skies, USA

¹² Owned by Asia Satellite Telecommunications Co. Ltd., Hongkong

The satellite wise position of allocation of capacity to DTH service providers is given in Table 2.

Table-2: The Satellites providing DTH service in India as on 31 July 2013

Sl. No.	DTH Satellite	Date of launch	Orbital Location	Number of Ku band transponders in the satellite	Number of Ku band transponders allocated for DTH service	DTH service Provider/ Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
INSAT SYSTEM						
1	INSAT 4A	22-Dec-2005	83° E	12	12	Tata Sky
2	INSAT 4B	12-Jan-2007	93.5° E	12	7	Six transponders were allocated to DD and one was allocated to Sun DTH. The remaining five were not allocated to any commercial user and kept with DOS.
3	INSAT 4CR	02-Sep-2007	74° E	12	0	Initially capacity was allocated to Airtel. Later, due to decommissioning of another satellite of DOS (GSAT 2), Airtel was vacated from INSAT 4CR to accommodate services offered by GSAT 2. Therefore, as of July 2013, no transponders were allocated for DTH service. More than 11 ¹³ transponders were allocated for non-DTH applications such as Edusat ¹⁴ users.
4	GSAT 8 (INSAT 4G)	21-May 2011	55° E	24	0	Three transponders were allocated to Government users ¹⁵ for their information and communication technology related programmes in DTH platform and 16.75 transponders were allocated for non-DTH use. The remaining 4.25 transponders were not allocated to any commercial user and kept with DOS.
5	GSAT 10	29-Sep-2012	83° E	12	0	None were allocated for DTH service. All transponders were kept with DOS.
	TOTAL INSAT			72	19¹⁶	

¹³ One transponder is equivalent to 36 Mhz. Of the 432 MHz available on the 12 transponders, 412 MHz was allocated to various users and 20 MHz was kept with DOS.

¹⁴ India's first thematic satellite dedicated exclusively for educational services to provide distance education service to remote areas of India.

¹⁵ Two transponders were allocated to Ministry of Human Resource Development (MHRD) and one to Government of Gujarat/ BISAG.

¹⁶ Excluding the three transponders allocated to Government users for information and communication technology related programmes in DTH platform.

Sl. No.	DTH Satellite	Date of launch	Orbital Location	Number of Ku band transponders in the satellite	Number of Ku band transponders allocated for DTH service	DTH service Provider/ Remarks
FOREIGN SATELLITE SYSTEMS						
6	NSS-6 (USA)	Not available	95° E	12	12	Dish TV
7	MEASAT-3 (Malaysia)	Not available	91.5° E	13	13	Reliance, Sun DTH
8	SES-7 (USA)	Not available	108.2° E	11	11	Airtel
9	ST-2 (Singapore)	Not available	88° E	15	15	Videocon
10	Asiasat-5 (Hongkong/ China)	Not available	100.5°E	6	6	Dish TV
	TOTAL FOREIGN			57	57	

Audit findings on planning and realisation of the satellites are discussed in the following paragraphs.

2.2.1 Deficiencies in launching planned satellites

DOS entered into transponder lease agreements with the DTH service providers during the period 2004 to 2007. On signing the agreements, DTH satellite capacity was to be realised to meet the needs of the service providers. During March 2004 to February 2007, total satellite capacity of 52.5 to 80.5 Ku band transponders was committed by DOS to seven DTH service providers in transponder lease agreements signed with them, as detailed in Table 3.

Table-3: Satellite capacity committed by DOS to service providers in chronological order

Sl. No.	Service provider	Date of agreement	Satellites planned to be used	Number of transponders committed (Range from -to)	Number of transponders actually allocated as of July 2013	Satellites actually used	Date of commencement of service
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.	DD	18 March 2004	INSAT-4A/4B	6	6	INSAT-4B	15 July 2004
2.	Dish TV	27 May 2004	NSS-6	6.5	12 6	NSS-6 Asiasat	1 June 2004
3.	Sun DTH	19 February 2005	INSAT-4B	4-9	1 4	INSAT-4B MEASAT	15 January 2008
4.	Reliance	28 June 2005	GSAT 8	6-18	9	MEASAT	15 April 2008
5.	Tata Sky	12 November 2005	INSAT-4A	12-18	12	INSAT-4A	1 May 2006
6.	Airtel	26 December 2006	GSAT 8	12-15	11	SES	1 Jan 2008
7.	Videocon	27 February 2007	GSAT 8	6-8	15	ST	1 Feb 2008

It can be seen from the above table that DOS could not provide satellite capacity (Ku band transponders) on domestic satellites as planned. This was a consequence of DOS not being able to realise its planned communication satellites. Non-realisation of satellites with Ku band transponders in time led to migration of DTH service providers to foreign satellite systems, which is discussed in the succeeding paragraphs.

(i) Inability to realise satellites with Ku band transponders

During the Eleventh Five Year Plan (2007-12) period, DOS planned to launch nine¹⁷ satellites with an aggregate of 218 Ku band transponders for various applications, including DTH. Of the nine satellites, two satellites (GSAT 8 and GSAT 15) were earmarked for DTH applications. Out of nine satellites planned, DOS could eventually realise only three¹⁸ satellites with 48 Ku band transponders during eleventh plan period, which was only 22 *per cent* of the target.

Two satellites, namely GSAT 9 and GSAT 15 were not launched citing non-availability of launch vehicle GSLV. Audit, however, observed that two other satellites, viz. GSAT 8 and GSAT 10 were realised through procured launches¹⁹. Audit also observed that DOS spent ₹250 crore and ₹345.36 crore for the procured launches of GSAT 8 and GSAT 10 satellites respectively. In spite of having sufficient funds, DOS did not consider procured launches for

¹⁷ INSAT 4 CR, GSAT 8, GSAT 9, GSAT 10, ACTS-1, GSAT 11, ACTS-2, GSAT 13 and GSAT 15.

¹⁸ INSAT 4 CR, GSAT 8 and GSAT 10.

¹⁹ Launching satellites by procuring foreign launch vehicle

its ready satellites or acquire satellite in orbit and position it under the orbital slot coordinated by India. Instead, it surrendered available funds. During the last five years (2008-09 to 2012-13), DOS surrendered amount ranging from ₹792 crore to ₹2,809 crore²⁰ annually. Dr. Kasthurirangan committee²¹ also subsequently recommended (April 2011) to resort to lease of satellites to meet the additional demand of transponders.

While agreeing to the inordinate delay in realisation of satellites in Eleventh five year plan period, DOS stated (December 2012) that Dr. Kasthurirangan's committee recommendations were available only in April 2011 and not at the beginning of Eleventh Plan. DOS further stated that the procured launch vehicle route was not cost effective for 2,000 kg class of satellites. DOS added (March 2014) that surrender of funds were due to budget cut imposed by Ministry of Finance.

The reply needs to be seen in light of the fact of the growing demand for Ku band transponders for various applications including DTH services and inability of DOS to meet demands as initially envisaged from domestic satellite capacities which resulted in DTH service providers moving to foreign satellites and loss of opportunity to effectively utilise the Indian coordinated orbital slots. The reply of DOS regarding cost effectiveness of procured launches is also not acceptable since GSAT 8 and GSAT 15 were 3,000 kg class of satellite. GSAT 8 was finally launched (2011) through procured route and GSAT 15 was planned to be realised through procured launch.

Further, DOS had explained (September 2013) while furnishing the Action Taken Note to Paragraph 5.46 of Report No.1 of 2011-12 that huge surrenders were due to revision of budget provision brought about by complex nature of space technology and developmental uncertainties taking into account development status of the projects.

(ii) Forced migration of DTH service providers to foreign satellite systems

Failure to realise its planned satellites together with other problems led to a forced migration of DTH service providers to foreign satellites as described in Table 4.

²⁰ Amount surrendered were: ₹ 800.98 crore in 2008-09, ₹ 792 crore in 2009-10, ₹ 1,265.29 crore in year 2010-11, ₹ 2,809 crore in 2011-12 and ₹ 1,835.03 crore in 2012-13, averaging to ₹ 1,500.46 crore a year.

²¹ A GSLV/SATCOM Programme Review and Strategy formulation committee was set up on 25 December 2010 chaired by Dr. Kasturirangan, former Chairman of ISRO. Kasturirangan committee recommended building of 3,000 kg plus class of satellite (GSAT 8 type of configuration with 24 transponders and GSAT 10 type with combination of C, Extended C and Ku bands) may be adopted for meeting the future requirements and to replace the ageing satellites with C-Band and Extended C band capacity and also to add the Ku band capacity. The Committee recommended that Bulk 'procured launches' may be considered till indigenous Geostationary Satellite Launch Vehicle (GSLV MK III) became operational.

Table 4: Impact due to delay in realisation of communication satellites

Name of satellite	Intended purpose of Ku band transponders in the satellite	Reason for non-realisation of satellite for DTH service	Impact
GSAT 8 (INSAT 4G)	DTH for Reliance, Airtel and Videocon	The launch of GSAT 8 was planned in 2007 but it was actually launched in May 2011, after delay of more than three years.	Airtel was allocated capacity on INSAT 4CR and Reliance and Videocon moved (2008) to foreign satellites MEASAT and ST respectively.
INSAT 4CR	DTH for Airtel	Due to de-commissioning of two satellites of DOS (Edusat in September 2010 and GSAT-2 in March/April 2011), Airtel was vacated from INSAT 4CR in order to accommodate the services of these satellites and to meet their additional capacity requirements.	Airtel moved (2011) to foreign satellite SES.
INSAT 4B	DTH for Sun DTH	Four transponders of INSAT 4B were switched off (July 2010) due to power problems in the satellite.	Sun DTH consequently moved (September 2010) to foreign satellite, MEASAT-3.
GSAT 9	Earmarked as spare	DOS planned to launch satellites GSAT 9 during March-June 2008 (earmarked as spare) and GSAT 15 (for DTH applications) during January- March 2012. Both these satellites could not be launched due to non-availability of indigenous launch vehicle, GSLV.	DOS was unable to bring back DTH service providers to INSAT system due to non-availability of satellite capacity.
GSAT 15	DTH applications		

DOS attributed (June 2010/ March 2014/ June 2014) the delay in launch of GSAT 8 to changes in design of the satellite and modifications carried out in its solar array system and associated power systems, which were prompted due to failure of the power systems reported in two other satellites viz. W2M²² and INSAT 4B. DOS added that after examining the prevailing situation in 2011 when GSAT 8 was finally launched, ICC decided to allot transponders of GSAT 8 to more important national and government services, which could only be met through INSAT/GSAT capacity. DOS also stated that failure of INSAT 4B and GSLV were unexpected contingency situations. DOS further stated that best efforts were being made such as accelerated realisation of increased number of high power satellites to support DTH services and procured launches, augmentation of capacity, etc., for enabling it to cater to demands of all kinds of services including DTH.

²² A project carried out by DOS for a client of Antrix.

The reply needs to be viewed in the following context:

- DOS had committed satellite capacity on INSAT 4A, 4B and GSAT 8 to DTH service providers by entering into firm transponder lease agreements with them. However, capacity was not allocated to most of the non-government DTH service providers from INSAT/GSAT systems. Except for Videocon and Dish TV (which were allocated foreign satellites from the beginning), all the other DTH service providers were using capacities on foreign satellite systems only to the extent committed in the transponder lease agreements signed with DOS, which were originally planned to be provided in the INSAT/GSAT system.
- DOS did not plan replacement strategy in advance for satellite meant for national and government users such as Edusat and GSAT 2. The replacement for Edusat was planned on GSAT 14 only in Twelfth Five Year Plan period (2012-17). Further, the planned replacement for GSAT 2 (GSAT 5P) did not materialise due to failed launch. This put added pressure on DOS to utilise the limited existing Ku band capacity for maintaining the services provided by these satellites.
- As seen from Table 3, demand for satellite capacity from licensed DTH service providers was determined by the year 2007. Non-availability of INSAT/GSAT satellite capacity at that time resulted in loss of business opportunity to DOS due to forced migration of DTH service providers to foreign satellite systems. Eventually, when satellite capacity was available on GSAT 8 (2011), DOS failed to bring DTH service providers back to INSAT/GSAT system who, by then, were established on foreign satellites.

Thus, achievement of a meagre 22 *per cent* of the target of Ku band transponders and inability to maintain the capacity already in service resulted in a squeeze on the available resources of Ku band transponders due to which DOS could not satisfactorily fulfil the competing needs of critical, strategic and commercial sectors, which led to a forced migration of commercial DTH users to foreign satellite systems.

2.2.2 Capacities created remained idle

- (i) As discussed in para 2.2.1, though GSAT 8 was planned to meet the transponder commitments made to Reliance and Videocon, the satellite launch was delayed by more than three years with the result that the service providers moved to foreign satellites. When satellite capacity was eventually available in GSAT 8 (May 2011), audit observed that the capacity was not earmarked though ICC met in July 2011 after the launch of the satellite. The satellite was finally allocated (December 2011) for non DTH use. DOS stated (March 2014) that allotment of transponders in GSAT 8 was done to strategic

and government users. DOS, however, did not comment on the idling of satellite capacity from July 2011 to December 2011.

- (ii) The 12 Ku band transponders of INSAT 4A satellite were allotted to Tata Sky on an exclusive basis. As its transponders were functioning with reduced power, Tata Sky voiced its concerns about the health of satellite and continuously represented at different levels in Government to launch GSAT 10 satellite to avoid adverse impact on its business. At the instance of Tata Sky, DOS launched (September 2012) GSAT 10 satellite having 12 Ku band transponders and positioned it at the same orbital slot (83° east) as that of INSAT 4A. ICC (November 2012) proposed that the 12 transponders of INSAT 4A could be swapped with 12 transponders in GSAT 10. This proposal was agreed to by Space Commission (April 2013).

Tata Sky, which was initially willing to swap the transponders of INSAT 4A with GSAT 10, subsequently declined (July 2013) the proposal on the ground that swapping would not provide additional capacity required by them. Audit observed that apprehending litigation from Tata Sky, DOS did not allocate capacity on GSAT 10 to any other service provider and entire 12 Ku band transponders capable of generating revenue of more than²³ ₹82.80 crore a year continued to remain idle (May 2014) since its launch in May 2011.

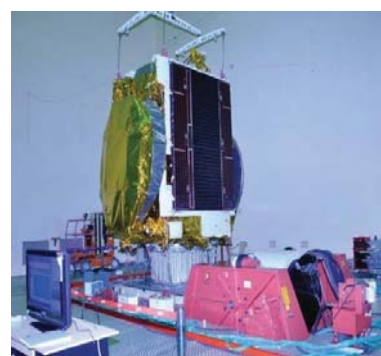


Figure 4 : GSAT 10 realisation

DOS replied (March 2014) that Ku band capacity in GSAT 10 was treated as spare capacity with appropriate approvals.

The reply is not acceptable, as spare capacity of Ku band on GSAT 10 was not a planned option, but a fall back option since Tata Sky was given exclusive first right of refusal on INSAT 4A, which is discussed in detail in para 3.4.2. Pending Tata Sky's decision, the 12 transponders could not be utilised otherwise, with the implied pecuniary loss to the public exchequer. Audit further observed that allocation of satellite capacity being the responsibility of ICC, the decision to keep satellite capacity as spare was taken without the specific approval of ICC.

²³ 12 transponders for 18 months from September 2012 to March 2014 at the rate of ₹4.60 crore per transponder in a year.

2.2.3 Dominance of foreign satellites over Indian Sky

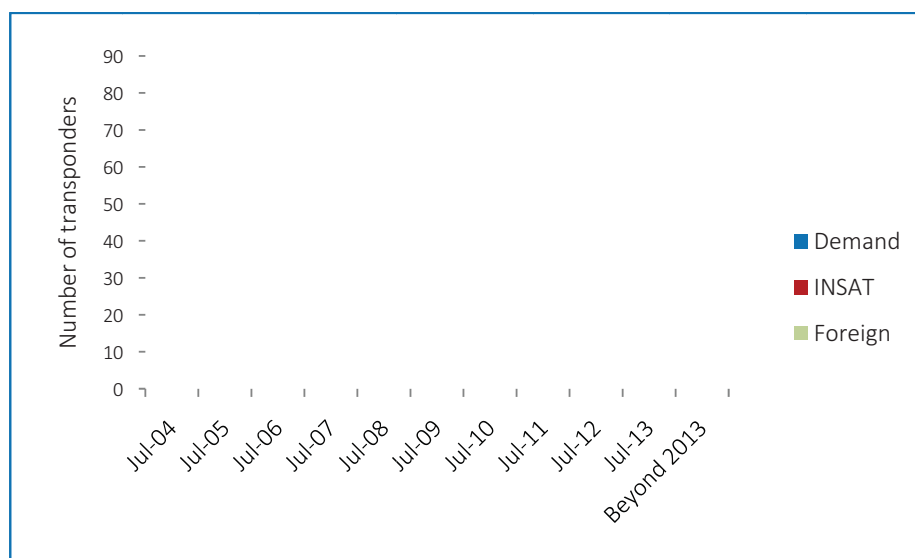
The yearwise demand for satellite capacity in the DTH sector and satellite capacity arranged by DOS either from INSAT system or from foreign satellite was as shown in Table 5.

Table-5 : Estimated demand of satellite capacity in DTH sector

Year	Number of transponders		
	Demand	Met through INSAT system	Met through foreign satellite systems
2004	24.5-30.5	0	6.5
2005	34.5-57.5	0	9
2006	46.5-72.5	12	9
2007	52.5-80.5	17	9
2008	52.5-80.5	29.75	23.5
2009	52.5-80.5	29.92	23
2010	52.5-80.5	26.67	31
2011	52.5-80.5	25	51
2012	52.5-80.5	23.5	54
2013	52.5-80.5	19	57

A comparison of demand met through INSAT systems against the foreign satellite systems showed that initially during 2006 to 2009, major portion of services were being provided through Indian satellite capacity.

Thereafter, INSAT transponders providing DTH service reduced from 30 units in 2009 to 19 units in 2013. There was a progressive increase in dependence on foreign satellite systems from 6.5 units (2004) to 57 units (2013). Based on the assessment of demand in DTH sector, a demand analysis was prepared by DOS (May 2013). According to these estimates, the demand was expected to increase to over 200 units beyond the year 2013, which was planned to be met almost entirely through foreign satellite systems. The transition of dominance from INSAT system to foreign satellite systems is illustrated in chart 1.

Chart-1 : Demand and supply position of satellite capacity to DTH service

The inability of DOS to realise its communication satellites and failure to utilise available satellite capacity led to competitive disadvantage to DOS vis-à-vis foreign satellite system. Audit observed that although there were requests²⁴ for satellite capacity from INSAT system, DOS did not consider these on the ground that these satellite capacities were not feasible to be realised in near future.

Further, it was seen that there was decreasing demand even among the existing users of INSAT system, as discussed in para 2.2.1. Out of the total 76 transponders used by Indian DTH operators (July 2013), only 19 transponders (25 *per cent* of total) belonged to Indian satellites. The remaining 57 transponders (75 *per cent* of total) were on foreign satellites. Tata Sky, which was using 12 transponders in the INSAT system, had also decided (July 2013) to migrate to foreign satellite arrangement as a permanent measure. As such, more than 90 *per cent* of the satellite capacity for the DTH service would be serviced by foreign satellites instead of INSAT system. The future requirement of transponders for DTH services was also planned to be met largely from foreign satellites.

Thus, inability to create and maintain planned capacity for DTH services along with increased dependence on foreign satellite systems even for future needs may eventually lead to a situation in which only 10 *per cent* of the Ku band requirement for DTH services will be provided by Indian satellites resulting in loss of opportunities for revenue generation and strategic interests.

²⁴ Tata Sky and Ministry of Human Resources Development requested for 87 and 38 Ku band transponders from DOS respectively.

DOS stated (March 2014) that to overcome the shortage in Ku band transponders, best efforts were being made in accelerated realisation of increased number of high power satellites to support DTH like services, procured launches and augmentation of capacity. DOS added that this coupled with revised policy for transponder allocation and pricing for which approval was awaited from Cabinet, it would be able to cater to the demand for all kind of services including DTH sector.

The reply of DOS needs to be viewed in the context that though DOS had the foresight to recognise the risks of implementing an open sky policy for allocation of satellite capacity for DTH services in protecting strategic interests, challenges to development of Indian space sector and business opportunity, etc., yet it was unable to develop a strategy and implement a plan to offset these risks.

2.2.4 Crowding of foreign satellites in orbital slots above India

Orbital slot²⁵ is the position of a 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). Any country desirous of providing satellite based services within its national boundary must obtain the approval of the ITU for operating a communication satellite in a particular orbital slot. The orbital slots positioned above a country are convenient for its application and called country specific slots for each country. The regulation towards operating a satellite is governed by the following criteria:

- Any country can cover any region of the world and the requests are recorded in ITU on 'first-come-first served' basis.
- Coordination with neighbouring satellites as identified by ITU is required to be completed.
- After coordination of the orbital slot, member countries should put their satellites in the designated orbital slots and spectrum filed should be brought to use within the 'due diligent' period of seven years from the date of filing the first request.
- The satellites should be operated continuously in a coordinated orbital slot without any discontinuity. The maximum discontinuity allowed would be three years and the position needs to be informed to ITU.

Thus, ITU coordination involving satellite bands at ITU level is a lengthy process requiring considerable lead time. This, together with the necessity to maintain the satellite fleet for

²⁵ Geo-stationary satellites have an orbital period same as the earth's rotation, such that they are always pointed at the same position in the sky. A geo-stationary orbit is achieved by placing a satellite directly above earth's equator in a certain longitudinal coordinate, which is known as the orbital slot.

long period without any discontinuity²⁶, etc., makes the orbital slot a scarce and valuable resource.

India specific orbital slots are located between 40° and 120° East. DOS had successfully placed five Indian satellites viz. INSAT 4A, 4B, 4CR, GSAT 8 and GSAT 10 at orbital slots 83°, 93.5°, 74°, 55° and 83° east respectively. Of these, only two satellites (INSAT 4A and 4B) provided capacity for commercial DTH service. As such, Indian administration needed to coordinate adequate number of Ku band orbital slots in the sky.

DOS could not achieve the targeted Ku band capacity to meet its commitments for DTH service providers during Eleventh Five Year Plan (2007-12) at the critical point when the DTH services were being introduced in India under the umbrella of 'open sky' policy. It was a fortuitous turn of events for the foreign satellite owners, who were ready at the opportune time to place their satellites over five orbital slots in Indian skies for providing DTH services in India. The five foreign satellites viz. NSS-6, Measat-3, SES-7, ST-2 and Asiasat-5 were providing DTH service and were positioned at 95°, 91.5°, 108.2°, 88°, 100.5° east respectively. Leasing of another foreign satellite Asiasat 7 in the orbital slot 83° was also under active consideration of the ICC (July 2012). However, due to the strong views of MIB against placement of a foreign satellite Asiasat 7 in the Indian orbital slot, it was ultimately decided not to proceed with leasing of the foreign satellite.

The location of DTH satellites (both foreign and Indian) servicing India can be seen in Figure 5.

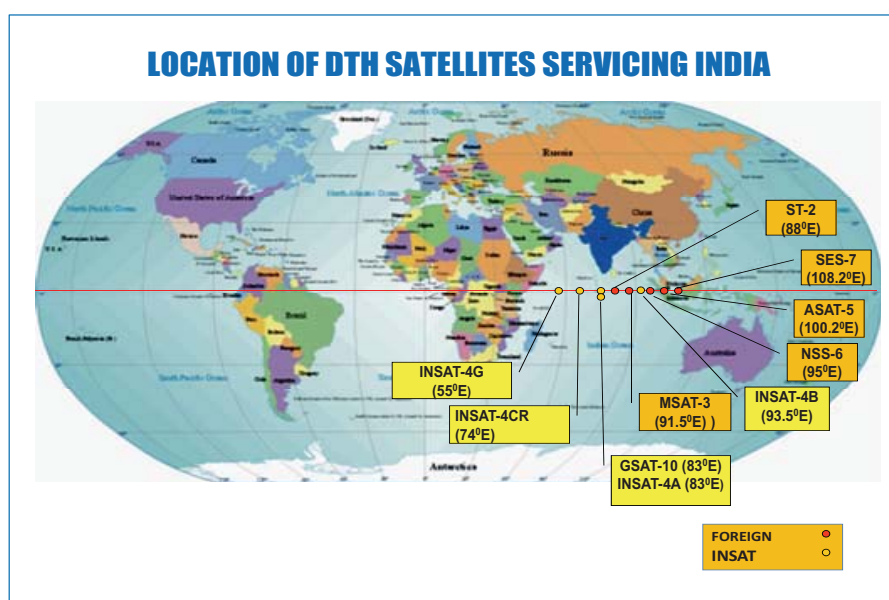


Figure 5 : Location of DTH Satellites

²⁶ The maximum discontinuity permitted is three years with the knowledge of ITU.

As can be seen from Figure 5, with the increased dependence on foreign satellite systems for DTH service, there was a crowding of foreign satellites over Indian skies, which had the following implications:

(i) Increased competition for orbital slots over Indian skies

As discussed in para 2.2.3, DTH service providers were using 57 Ku band transponders of five foreign satellites against 19 transponders in three Indian satellites. With the exit of Tata Sky, the foreign satellite utilisation which is presently 75 *per cent*, would be more than 90 *per cent*. DOS had also conceded that Ku band satellite capacity for DTH services from Indian satellites were not feasible in the near future and had planned to meet the future demand also from foreign satellites.

Crowding of the foreign satellites over India and consequent increase in demand for the orbital slots would not only affect INSAT system, but would also result in non-availability of the strategically important slots for India. The occupation of foreign satellites above India, therefore, poses a strategic disadvantage to India, as the foreign satellite owners would have priority at the slots already occupied by them in their coordination with ITU. DTH business opportunity in India would maintain steady demand for satellite capacity over India, which would not only make the coordination of orbital slots for Indian satellites a difficult exercise, but would put India at a disadvantage in the development and maintenance of its own INSAT system.

DOS replied (March 2014) that the orbital slots and coordinated space spectrum resources belonging to India will continue to remain with India and be available for various services as long as INSAT satellites were operated therein irrespective of the capacities leased by India from foreign satellites for DTH.

The reply needs to be viewed in the context that crowding of foreign satellites and steady business opportunity to foreign satellite owners would result in continued priority for them in their slots and efforts to protect Indian coordinated spectrum and additional coordination would be a difficult exercise.

(ii) Need for the coordination of more number of orbital slots

The foreign satellite owners would continue to provide satellites in their orbital slots since their satellites continue to get business from India. The need was for DOS/ISRO to aggressively capture DTH business opportunity in India in view of preferential treatment given to Indian satellite as per SATCOM policy.

DOS, therefore, needed to plan and coordinate more number of Ku band orbital slots and satellites to bring back those DTH service providers to INSAT system that had moved to foreign satellites. However, as DOS had already planned future DTH requirement from foreign satellites it needs to work out medium term and long term strategy to avoid monopoly of foreign satellites.

DOS, however, did not indicate medium term and long term strategy, but stated (March 2014) that the process of coordinating additional orbital slot /spectrum was a continuous process and was being handled by DOS on a continuous basis based on the demand, future technology advances and DOS plans.

2.3 Inability of DOS to bring back DTH service providers to INSAT system

The arrangement of foreign satellite capacity to Indian DTH industry was envisaged to be a **short term measure to ensure that the service could be brought back to INSAT system as and when Indian satellite capacity was available**. For the purpose, DOS and Antrix entered into back to back agreements with the DTH service providers and foreign satellite owners respectively so that foreign satellite capacity was arranged for the Indian DTH service providers for a short period. However this arrangement did not work favourably for DOS due to the following reasons:

- **Failure of DOS in creating/ maintaining capacities**

As discussed in the previous paragraphs, DOS could not realise its communication satellites in time. Due to these problems, most of the DTH service providers such as Reliance, Videocon, Sun DTH and Airtel moved to foreign satellites. These DTH service providers later did not prefer to return to INSAT system due to trust deficit that was created due to the following circumstances:

- (i) Reliance and Videocon, after waiting for the launch of GSAT 8 satellite, moved to foreign satellites since GSAT 8 was delayed by more than 3 years; and
- (ii) Airtel was forced to vacate INSAT 4CR to accommodate social networks of ISRO with the result that Airtel also moved to foreign satellite capacity.
- (iii) Tata Sky, the major non Government DTH service provider in the INSAT system had also decided to move to a foreign satellite. With this, more than 90 *per cent* of the satellite capacity requirement of Indian DTH service would be serviced by foreign satellites.

- **Inherent issues in migration**

DTH service is 'location specific' and requires that satellite capacity should be available at a particular position in the sky only. Any change in the position of the satellite would result in migration expenses to the DTH service provider besides causing re-orientation of dish antennas by a large number of users. The additional investment would be to the tune of ₹60 crore approximately. Therefore, bringing back of service providers from foreign satellite to INSAT system would be an improbable and difficult exercise.

As discussed in para 2.2.3, DTH service providers had to be moved to foreign satellite systems due to delayed launch of GSAT 8. Eventually, when GSAT 8 was launched (May 2011), though satellite capacity was available with DOS, it was not earmarked though meeting of ICC was convened in July 2011. Around the same time, lease agreements of at least three service providers had expired or were due to expire. Audit observed that DOS did not even attempt to bring the service providers back to INSAT/GSAT system, instead, lease agreements with the foreign satellite providers was renewed for further periods, as detailed below:

Events at the time of signing original agreement	Events after the launch of GSAT 8 (May 2011)
<p>DOS signed an agreement (February 2005) with Sun DTH for lease of transponder capacity in INSAT system. Initially 6.25 units²⁷ were given on lease in INSAT-4B and later two more transponders were given on lease in Measat 3 satellite (foreign satellite) from 22 January 2010 and 25 October 2010 through back to back agreement which was signed (October 2007) between Measat and Antrix. The period of lease of this agreement expired on 13 June 2011.</p>	<p>The service provider was not brought back to INSAT system after the expiry of the back to back agreement. Instead, a renewal agreement was entered (July 2011) between Measat and Antrix for two transponder units in Measat 3, at the rate of ₹ 4.52 crore per unit per annum.</p>
<p>DOS signed an agreement (June 2005) with Reliance for lease of transponder capacity in INSAT system. However, due to non availability of INSAT transponders at that time, Reliance was provided with lease of eight transponder units (later increased to nine in July 2011) in Measat 3 satellite (foreign) for which back to back agreement was signed (October 2007) between Measat and Antrix for a period of three years.</p>	<p>The service provider was not brought back to INSAT system after the expiry of the back to back agreement. Instead, another agreement was entered (August 2011) between Measat and Antrix for the lease of nine transponders in Measat 3 (service starting from 1 July 2011), at the rate of ₹4.52 crore per unit per annum.</p>

²⁷ 36 MHz of transponder in a year is called one unit. 6.25 units comprising 4 x 36MHz + 3 x 27MHz.

Events at the time of signing original agreement	Events after the launch of GSAT 8 (May 2011)
<p>DOS signed an agreement (April 2009) with Videocon for lease of transponder capacity in ST-1 system, as INSAT transponders were unavailable at that time. Videocon was provided with lease of 4.5 transponder units (later increased to nine) in ST-1 (Singtel) satellite (foreign) for which back to back agreement was signed (May 2009) between Singapore Telecommunications Limited (Singtel) and Antrix. The agreement expired on 29 February 2012.</p>	<p>The service provider was not brought back to INSAT system after the expiry of the back to back agreement. Instead, another agreement was entered (April 2012) between Videocon and DOS for lease of 12 transponder units in ST-2 satellite (nine transponders service started from 01 March 2012 and the remaining three started from 19 April 2012) for which back to back agreement was entered (April 2012) between Singtel and Antrix at the rate of \$ 1.07 million per unit of 36 MHz per annum.</p>

The satellite capacity on GSAT 8 was finally allocated (December 2011) to non-DTH users. Thus, back to back arrangement did not serve the purpose of bringing Indian DTH service providers back to INSAT system. Besides, due to non-allocation of available satellite capacity to DTH service providers, DOS failed to capitalise on a business opportunity of ₹115 crore²⁸ per annum.

DOS stated (March 2014) that DTH service providers could not be brought back to INSAT/GSAT due to insufficient available capacity to meet DTH requirements, as capacity on GSAT 8 was allocated to meet national and government services. The reply needs to be viewed in the light of the fact that GSAT 8 was initially planned to cater to requirements of DTH service providers (2005-07). But due to delays in its launch DTH service providers were accommodated on foreign satellites. Once capacity was allocated on foreign satellites, it was difficult to bring the service providers back to INSAT system for operational reasons such as location specific nature, bulk requirement of satellite capacity and dish migration expenses and customer inconvenience.

²⁸ Calculated for 23 transponders at the rate of ₹5.00 crore per transponder per annum.

