Regulation of navigational satellites in India

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Introduction

The importance of satellite navigation, positioning, and timing in modern economies cannot be emphasized enough. Like timing, the ability to locate one’s position or the position of various objects accurately and reliably is a growing need because of wide-ranging implications for traffic management, security, the environment, the management of natural resources, and the provision of personal services (civil and commercial).

This chapter briefly describes Indian satellite navigation program, which was conceived in 2004, and its potential within the overall context of India’s economic development. Importantly, the paper addresses national regulations and policies related to navigational satellites system, which comprises of GAGAN (GPS Aided Geostationary Augmentation Navigation satellite) and IRNSS (Indian Regional Navigation Satellite System).

Background

In 1947, India adopted a firmly democratic political system and an economic policy, tending towards a mixed economy.1 The 1990 economic reforms partially de-regulated certain sectors, including the civil aviation and telecommunications sectors. However, national strategic sectors, including ‘atomic energy’ and ‘space activities’ with emphasis on self-reliance, have always remained under the direct control of the central government and its agencies.

Among five core space treaties, India has ratified the Outer Space Treaty,2 acceded to three others,3 and is a signatory to the Moon Agreement.4 The Indian space agency, called Indian

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3 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, 22 April 1968, 672 UNTS 119 (India acceded on 9 July 1979) [Rescue Agreement]; Convention on the International Liability for Damage Caused by Space Objects, 29 March 1972, 961 UNTS 187 (India acceded on 9 July 1979) [Liability Convention]; Convention on Registration of Objects Launched into Outer Space, 14 January 1975, 1023 UNTS 15 (India acceded on 1982) [Registration Convention].
Space Research Organization (ISRO), conducts space activities, under the supervision of the Department of Space (DOS) and the Space Commission of India. Under the purview of the Prime Minister’s Office (PMO), the space program gradually expanded in the development and validation of indigenous space capability. Thus, even in the absence of a national space policy and national space law, the national space program progressed in a planned manner. The Citizen Charter is the only document, which outlines the national vision of India, informs this State’s space program.

Indian Satellite Navigation Program

The Planning Commission approved the national satellite navigation space program during the eleventh Five Year Plan (2007–12) period, given the importance and potential of commercial and strategic applications of satellite-based Positioning, Navigation, and Timing (PNT) systems.

Mission goals

The two specific goals for the Indian Satellite Navigation Program are:

A. Implementation of the Indian Satellite Based Augmentation System (SBAS) – GAGAN – for civil aviation over the Indian airspace and flight information region (FIR) at an estimated cost of approximately Rs. 7.74 billion (US$ 120 million); and (ii) Development of a Global Navigation Satellite System (GNSS) compatible receiver, and promotion of position, navigation and timing services for a variety of application areas in India.

B. Implementation of the Indian Regional Navigation Satellite System (IRNSS) for critical national applications.

GAGAN for CNS/ATM and GNSS

International Civil Aviation Organization (ICAO) has endorsed worldwide implementation of GNSS to facilitate seamless navigation across geographical boundaries. GSAT-8 and GSAT-
10 GAGAN payloads were launched successfully from Kourou, French Guiana in 2011, on board Ariane-5 launch vehicles. The two-channel GAGAN payloads provide SATNAV services with accuracy and integrity required for civil aviation applications over Indian airspace and FIR. When GAGAN is fully operational, India will be the fourth country in the world to offer safety-of-life space based satellite navigation services for civil aviation.

ICAO APV 1 certification for GAGAN SIS is cardinal for improving operational efficiency of the State’s ailing civil aviation sector. The SBAS will provide civil aviation with communication, navigation, surveillance and air traffic management (CNS/ATM) service resulting in improved safety for approaches through vertical guidance, especially in adverse weather conditions.

GAGAN also provides service for non-civil aviation end users, facilitating acceleration of economic development across India. Applications of GAGAN will include:

(i) navigation and safety enhancement of the Indian railways, roadways, ships, and spacecraft;
(ii) geographic data collection;
(iii) natural resource and land management; and
(iv) location based services for mobile, tourism, adventure sports, etc.

In July 2014, the Indian government constituted an Inter-Ministerial Group under the chairmanship of the Ministry of Civil Aviation to examine sector-specific utilization of the GAGAN system for its use in non-aviation sectors, and to develop appropriate work programs using GAGAN signals that could benefit a variety of users.

Indian Regional Navigation Satellite System (IRNSS)

The IRNSS is an independent regional navigation satellite system, capable of providing equivalent stand-alone position accuracies, which will function under civil control. It consists of seven satellites – three in the geostationary (GSO) orbit and four in a non-GSO orbit – inclined at 29 degrees to the equator, the ground segment, and user receivers. The IRNSS

13 GAGAN is the acronym for the Indian GPS Aided Geo Augmented Navigation system. India Satellite Based Augmentation System (SBAS) GAGAN was certified by DGCA-to RNP0.1 (Required Navigation Performance, 0.1 Nautical Mile) service level on December 30, 2013. The certification will enable any aircraft fitted with SBAS equipment to use the GAGAN signal in space for En-Route Navigation and Non-Precision Approaches without vertical guidance over Indian airspace. See online: ISRO www.isro.org.

14 Regulatory Approach Interoperability implementing rule on Performance Based Navigation: (SES/IOP/PBN/REGAP/1.0: Annexure A) APV1 and APV 2 (Approach Vertical) guidance Certification is issued by ICAO. These certifications are important to achieve global interoperability for civil aviation.

15 See “India’s airlines are heading for another big loss in FY2015 – but good news may be around the corner” in Centre for Aviation (CAPA), Aviation Outlook Report for India (2014). Although airlines expanded on the back demand in 2014, India’s airlines lost an estimated US$ 10.6 billion in the last seven years and have a combined debt of US$ 15.83. Clearly, the sector is growing, but not profitably.


17 The full constellation of seven IRNSS navigation satellites have been launched. These are IRNSS 1A on 1-7-2013; IRNSS 1B on 4-4-2014; IRNSS 1C on 10-11-2014; IRNSS 1D on 28-3-2015; IRNSS 1E on 16-1-2016; IRNSS 1F on 10-3-2016; and IRNSS 1G on 28-4-2016. www.isro.gov.in.
provides two types of services to users with accurate position information service, both within Indian territory and in an area extending beyond 1,500 km from India’s territorial boundary: (i) Standard Positioning Service (SPS); and (ii) Restricted Service (RS), with a position accuracy of better than 20 m in the primary service area.

Emphasis on self-reliance is the primary reason for developing IRNSS, the indigenous regional navigation satellite system. This was, in particular context to easing dependence on foreign navigation systems, accelerated by failure to secure military grade signals from the European navigational program GALILEO, in which India had initially planned to participate.18

International and domestic regulatory regime

International liability in space

India is internationally responsible and liable for damage caused in outer space in terms of the Outer Space Treaty19 read with the Liability Convention.20 As such, if fault for damage caused in outer space is attributed to Indian assets, the government is liable to pay damages/compensation to the affected State party to these international instruments. In this context, it is necessary to recall that international treaties are not self-executing under four specific circumstances enumerated in the Exceptions to Article 51 of the Constitution of India.21 Exception 1 is related to the government’s ability to fulfill international obligation related to liability provisions discussed above. This Exception postulates the mandatory requirement of a specific domestic law to entitle government to withdraw money from the Consolidated Fund of India (federal treasury) to make payment to a foreign power to fulfill India’s international treaty obligation.22

The GAGAN payloads are jointly owned by ISRO and Airports Authority of India (AAI), although the operational functions are clearly demarcated: ISRO to operate the space segment; and air navigation signal provider (ANSP) as the GAGAN SIS service provider to end users, both government and private entities. No information is available in public domain as to attribution of liability between the two entities in the context of GAGAN space assets, if any. In any event, the ownership of the space assets lies in the government of India which remains internationally liable and responsible for damage caused in outer space by GAGAN and IRNSS assets.23

18 Seema Singh, “ISRO’s Very Own GPS is Ready”, Forbes [India] (1 July 2013), online: Forbes forbesindia.com/printcontent/35511.
19 See Outer Space Treaty, supra note 2, arts VI, VII.
20 See Liability Convention, supra note 3.
21 The Constitution of India, art 51:

The State shall endeavour to—
(a) promote international peace and security;
(b) maintain just and honourable relations between nations;
(c) foster respect for international law and treaty obligations in the dealings of organized peoples with one another; and
(d) encourage settlement of international disputes by arbitration.

22 See ibid. Exception 1 to Article 51 was upheld in the decision of the Allahabad High Court in Moti Lal v U.P., 1951 All.257 F.B.
23 See Outer Space Treaty, supra note 2, arts VI, VII; Liability Convention, supra note 3.
**GNSS: liability of air navigation signal provider (ANSP)**

ICAO has debated the question of whether liability can be or should be attributed to the GNSS CNS/ATM signal provider and to the GNSS CNS/ATM augmentation signal service provider in the case of international civil aviation. The issue remains unsettled. Admittedly, the consequences of deficiency in or absence of the service, for any reason or in any manner whatsoever, will result in financial loss and damage of incalculable proportions to the user. Ordinarily, principles of the law of contract would indicate that failure on the part of a signal provider to provide signals at the contracted level, causing the user to suffer damage, would trigger liability to pay compensation for loss caused to the user, in terms of the agreement or governing law. However, the unique circumstance in which global satellite navigation CNS/ATM is contemplated to be made available to users around the world has rendered problematic, if not impossible, establishment of a framework to govern the legal liability of the GNSS/SBAS signal providers. The United States (US) and the European Union (EU) have adopted contrary positions. The US opposes the establishment of an international convention on GNSS on the ground that, because global positioning system (GPS) is being provided free of cost, no liability could be attached for loss caused or damage suffered by users on account of failure/absence/degradation/inaccuracy of the GPS. The US is supported by a number of developing countries, non-EU States among others who are setting up their own global (China) or regional satellite navigation systems (India, Japan, Brazil). The EU, however, favors strongly an international convention for GNSS. This is because, unlike the US GPS, the GALILEO GNSS system is designed as a commercial enterprise, as such will impose a user charge. For the EU, therefore, the issue of ‘liability’ and ‘compensation’ are important and critical.

**Liability of the Airports Authority of India (AAI)**

The liability principle qua GAGAN is accepted as being within the domain of ‘signals-in-the-sky’ (SIS), and not within the domain of traditional earth-based radar/station systems currently used for aeronautical navigation service in India. The AAI, the national ANSP, will provide GPS augmented GAGAN SIS for CNS/ATM to civil aviation users in Indian airspace and FIR. AAI will also provide service to non-civil aviation users. The AAI is also the national airport operator.

The Airports Authority of India Act (AAI Act)\(^{24}\) governs AAI operations as airport operator and as ANSP\(^{25}\) without demarcating functional responsibilities. As such, ANSP is viewed as adjunct to AAI’s principal function as an airport operator. In this context, the protection against prosecution granted to ANSP/AAI officers and employees, under provisions of sections 32 and 33 of the AAI Act\(^{26}\) continues to be a matter of concern. In fact, the defense under those sections advanced by the AAI in *Geetha Jethani* case\(^{27}\) was struck down by the Supreme Court.

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24 *Airports Authority of India Act, 1994*, No. 55 of 1994 (India) [AAI Act].
25 Ibid. Under *AAI Act*, *ibid*, s 12, treaty obligations relevant to air navigation service provision contained in the *Convention on International Civil Aviation*, 7 December 1944, 15 UNTS 295, ICAO Doc 7300/9 [*Chicago Convention*], arts 15, 28, have been harmonized. Thus, the AAI is the national ANSP for civil aviation within Indian airspace and also within the Flight Information Region (FIR) as required by ICAO, and charges a user fee on a non-discriminatory basis.
26 See *AAI Act*, *supra* note 24, ss 32, 33.
27 *Geetha Jethani v Airport Authority of India and Ors*, 2004 (3) CPJ 106 (Indian National Consumer Disputes Redressal Commission).
of India, which held AAI to be a service provider for the purpose of definition under section 2(o) of the Consumer Protection Act.\textsuperscript{28} The Supreme Court directed AAI to pay compensation for the wrongful death of the eight-year-old international passenger at Delhi airport, in terms of the limit prescribed in the First Schedule of the Carriage by Air Act, 1972.\textsuperscript{29}

Geetha Jethani is significant when we consider liability of AAI, in its capacity as the ANSP; particularly, as the service provider of GAGAN SIS. Even otherwise, ANSP imposes user charge for providing air navigation signals in Indian FIR\textsuperscript{30} bringing it under the Consumer Protection Act. It is clear that the obvious absence of an appropriate or relevant legal mechanism to govern ANSP in the AAI Act makes the statute wholly inadequate for regulating ANSP that provides satellite navigation services via GAGAN SIS for CNS/ATM. Going ahead, it is suggested that a new law will be required to regulate satellite navigation based ANSP, providing therein a fault based liability regime, with burden of proof on the claimant. It is difficult to foresee whether India will set out new laws which will attribute liability for damage caused on account of deficiency or defective service of GAGAN SIS service provided to end users, irrespective of whether the US GPS signals, provided free of cost to GAGAN, were inherently deficient or defective.

IRNSS policy and legal regime

A policy on distribution of IRNSS signals has not yet been announced. A responsive law and procedural regime would best serve to realize the full potential of IRNSS and GAGAN non-civil aviation end users. A robust commercial satellite navigation sector depends on certainty and predictability of policy and regulations.

Conclusion

India recognizes that satellite navigation will be one of the key enabling technologies in the twenty-first century, albeit this State does not have a legal regime in place to govern satellite navigation activities. Presently, the full contours of the multimodal dimensions of the GAGAN and GNSS are not known. Be that as it may, in defining the contours of policy and legal regime to be made applicable to the national ANSP, the Inter-Ministerial Group and the Ministry of Civil Aviation of India will be required to address several issues, preparatory to the roll out of GAGAN. The opportunity to allow the growth of a robust space industry beckons, especially keeping in mind that a growing number of young entrepreneurs are providing useful products in India based on GPS signals.

\textsuperscript{28} Consumer Protection Act, 1986 (India).
\textsuperscript{29} Carriage by Air Act, 1972 (India) (First Schedule harmonizes Warsaw Convention 1929 in context to carrier liability).
\textsuperscript{30} See Chicago Convention, supra note 25, arts 15, 28.