INDIA
LIABILITY IN CONTEXT TO THE AIR NAVIGATION SERVICE PROVIDER [+]

By

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The Global Navigation Satellite System[1] is poised to be one of the most critical technologies in the twenty-first century. Like most other technologies, GNSS was first developed for military application, and arguably, like other dual use technologies, it is a double edged sword. The 1990 Gulf War demonstrated how GNSS can be successfully deployed as a military force multiplier. Equally civilian applications of GNSS have brought lucrative returns[2] and incremental developmental benefits to countries around the world[3]. In specific context to

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[1] Global Navigation Satellite System (GNSS) is the standard generic term for satellite navigation systems that provide autonomous geo-spatial positioning with global coverage. A GNSS allows small electronic receivers to determine their location (longitude, latitude, and altitude) to within a few metres using time signals transmitted along a line of sight by radio from satellites. Receivers on the ground with a fixed position can also be used to calculate the precise time as a reference for scientific experiments.

As of 2007, the United States NAVSTAR Global Positioning System (GPS) is the only fully operational GNSS. The Russian GLONASS is a GNSS in the process of being restored to full operation. The European Union's Galileo positioning system is a next generation GNSS in the initial deployment phase, scheduled to be operational in 2010. China has indicated it may expand its regional Beidou navigation system into a global system. India's IRNSS, a next generation GNSS is in developmental phase and is scheduled to be operational around 2012. www.wikipedia.org/Satellite_navigation_system [accessed 15-March-08]

[2] Commission of the European Communities, *WHITE PAPER, Space: a New European Frontier for an Expanding Union*, Brussels, 11 November 2003 (COM (2003) 673, p. 10.
"demand for satellite navigation services and derived products around the world are growing at a rapid 25% a year and could reach €275 [billion] by 2020, in the process creating 100,000 skilled jobs."

[3] India has derived vast developmental benefits for the application of space technologies developed by the Indian Space Research Organization in conformity with the mandate of the Citizen Charter. The success of

aviation, beside the obvious requirement of adequate and reliable infrastructure[4], it is also critical to have adequate and reliable means of navigation and surveillance to safeguard precise and economic navigation by optimal routes, and to maintain safe distance of separation between aircrafts in air space. Safety is a fundamental condition for civil aviation. GNSS for air traffic management which provides the Air Traffic Controller accurate, precise and real time information (air-to-ground and *vice versa*), makes international civil aviation more efficient, economical and safe in all phases of flight, including precision landing and take off[5].

Furthermore, it would be reasonable to assume that in the coming years, once the legal status of *the sub orbit* is clarified[6], GNSS will be a critical tool for air traffic management of commercial sub orbital flights that involve international and domestic civil aviation. The blurring of the notional boundary between air space and the outer space has geopolitical implications[7]. As air space fuses into outer

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the government policy to harness space technologies for development in India is acknowledged the world over. www.isro.org/citizencharter

[4] Typically aviation infrastructure critical to safety of flight includes airports that have adequate facilities for safe maneuvering on the ground, take off and landing.

[5] Michael Milde: *Solutions in Search of a Problem*, *Legal Problems of the GNSS:* Public International Air Law Cases and Material Vol. II (Fall 2003), Ed. Dr. Michael Milde and Dr. Paul Dempsey , Institute of Air & Space Law, McGill University, Montreal, Canada

[6] ICAO (The International Civil Aviation Organization), Montreal: In the wake of the success of Spaceship One in October 2004, India had suggested in the Council that ICAO should look into the question of commercial sub orbital flights in context to the 1944 Chicago Convention. Consequently, at the thirteenth meeting of the 174th Session of the ICAO Council held March 11 2005 (C-DEC174/13) the "Concept of Sub Orbital Flight" was included as an additional agenda item for the 175th Session. Refer to ICAO Working Paper C-WP 13426 dated 30/5/2005 on *'Concept of sub orbital flights in context to the Chicago Convention'* presented by the Secretary General to the ICAO Council. www.icao.int/Hyperdocs.org [accessed 22nd -March-08].

Also information received during an interview with Dr. Sanat Kaul, Representative of India on the Council of the ICAO October 2002- October 2005.

[7] There is no written definition of where air space ends and outer space begins. However, international state practice has generally accepted that that notional boundary is located 100 kilometers (62 miles) above sea level. This notional boundary is critical because international law recognizes that a State has complete and exclusive sovereignty over the air space above its territory as stated in Article I of the 1944 Chicago Convention. Refer to *Convention on international civil aviation* (hereinafter referred to Chicago Convention), signed at Chicago on 7th December 1944. The Convention came into force on 4th April 1947. Source: ICAO Doc.7300/6(1980).

In contrast, Article II of the 1967 Outer Space Treaty eschews national appropriation by claims of sovereignty, by means of use or occupation or by any other means in context to outer space. Refer to *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies* (hereinafter referred to as the Outer Space Treaty); opened for signature on 27 January 1967, entered into force on 10 October 1967; 98 ratifications and 27 signatures (as of 1 January 2005), 18 UST 2410, TIAS 6347, 610 UNTS 205.

space, the immediate response of countries has been to re-evaluate their national security and defense policies. This is especially because in context to obligations arising out of international treaty ratifications, governments have to balance their right to exercise sovereignty and jurisdiction only over its air space as prescribed by the 1944 Chicago Convention, with the compulsions of the 1967 Outer Space Treaty which require the recognition of global public interest in outer space that assures every country the right of free access to outer space on a non discriminatory basis[8]. It may be noted that the question of the Definition and Delimitation of Outer Space has been under discussion since 1957, the year in which the erstwhile U.S.S.R launched the Sputnik. It is no surprise, therefore, that the UN General Assembly has mandated the Legal Subcommittee of the COPUOS[9] to deliberate on the issue of the Definition and Delimitation of Outer Space[10]. However, even though at the present point of time most countries seem

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[8] Ram Jakhu: *Legal Issues Relating to the Global Public Interest in Outer Space*, October 2005. This paper was prepared as part of the Advanced Methods of Cooperative Security Program at the Center for International and Security Studies at Maryland, USA. [hereinafter referred to as 'Legal issues']

[9] COPUOS: The Committee on the Peaceful Uses of Outer Space was set up by the General Assembly in 1959 (resolution 1472 (XIV) to review the scope of international cooperation in peaceful uses of outer space, to devise programmes in this field to be undertaken under United Nations auspices, to encourage continued research and the dissemination of information on outer space matters, and to study legal problems arising from the exploration of outer space. COPUOS and its two Subcommittees (Scientific & technical Subcommittee and Legal Subcommittee) meet annually to consider questions put before them by the General Assembly, reports submitted to them and issues raised by the Member States. The Committee and the Subcommittees, working on the basis of consensus, make recommendations to the General Assembly. Detailed information on the work of the Committee and the Subcommittees are contained in their annual reports. www.oosa.org/COPUOS

[10] Legal Subcommittee of the COPUOS held its 47th session in Vienna 31March 2008 – 11 April 2008 consequent to UN General Assembly Resolution 62/217 in which the General Assembly noted in paragraph 7 that the Legal Subcommittee would reconvene its Working Group on the Definition and Delimitation of Outer Space. The Working Group has been reconvened under the chairmanship of Professor Monserrat Filho of Brazil. www.unoosa.com [accessed 15-April-08].

It is of interest to note that on 1st April 2008, making a statement on behalf of his country in context to Agenda Item 1 on General Exchange of Views, the Nigerian Delegate congratulated Professor Monserrat Filho on his appointment as Chairman of the Working Group, suggested that the Legal Sub Committee of COPUOS should work closely with the ICAO to resolve the matter of 'Definition and Delimitation of Outer Space'. [The author was attending the 47th Session of the Legal Sub Committee of COPUOS as IAF Observer]

Also refer to Ram Jakhu: 'Legal Issues' *n.*7

"The question of the boundary between air space and outer space is one of the oldest still-unresolved items on the agenda of the Legal Subcommittee of COPUOS. While a majority of countries insist on the necessity of establishing such a boundary, several industrial States, led by the U.S. and a few of its allies, strongly object, claiming that the absence of a demarcation between air space and outer space has caused no problems up to now. The proponents of establishing a boundary line point out that since the legal regimes that govern air space and outer space are utterly dissimilar, clear demarcation is necessary. One advocate of this view stressed in the Legal Subcommittee of COPUOS that "definition and delimitation of outer space

to find no particular need to actually either agree on a definition or on delimitation outside the currently accepted norm of 100 kilometers above the sea level, the possibility of an agreement based on consensus cannot be ruled out[11]. It could be safely assumed that developments in aerospace technology will create a demand to revisit the scope of application of the 1944 Chicago Convention, especially in context to sovereignty of states over their air space.

In context to the discussion on GNSS, undoubtedly its civilian applications provide vital and critical tools for every country. Consequently, it is imperative to evaluate the legal implications of GNSS. In the absence of an international convention on GNSS, the paper will examine the general international developments in connection to the various legal principles involved in the implementation of GNSS for CNS/ATM. In addition, the paper will examine the present national legal regime in India which governs the operations of the Airports Authority of India, the national air navigation signals service provider.

[are] indispensable for member States to have a legal basis on which to regulate their national territories and to resolve issues arising from collisions that could occur between aerospace objects and aircraft.

A similar problem in the Law of the Sea was resolved in the 1960s when a boundary was established between the territorial sea and the high seas. This occurred after a number of States began unilaterally extending the breadth of their territorial sea to twelve miles…"

[11] "….Global Navigation Satellite Systems (GNSS) constitute one of the most promising space applications that can be used to implement the recommendations adopted during the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III). Positioning and timing capabilities based on GNSS space technologies are generating extensive emerging markets for new services and advanced applications when used either as stand-alone systems or in synergy with other systems. In recent years, the use of satellites for navigation, positioning and timing has become an increasingly significant economic activity, with industry revenues projected to grow from over 10 billion US dollars in 2002 to 15 billion US dollars in 2004.

1. User communities worldwide involved in, for example, disaster management, environmental monitoring, geometrics, precision agriculture, resource conservation, surveying, mapping, transport and timing, are becoming increasingly convinced of the need to develop GNSS that provide a safer, more reliable navigation and positioning service for civil use. This implies improving the performance of the current service in terms of accuracy, integrity, continuity and reliability.

2. International cooperation at both the political and technical levels is needed for successful implementation of satellite navigation, positioning and timing technology. System provider entities, potential contributor and end-user States, as well as users from industry, service providers and international organizations need to cooperate closely to ensure the provision of safe, seamless global satellite navigation, positioning and timing system…

3. Since it is universally accepted that differences in the pace of development around the world should not lead to incompatibility between the elements of navigation and positioning systems, it is desirable for the providers of GNSS to achieve full compatibility and interoperability of regional satellite navigation systems throughout the implementation process. "

Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999 (United Nations publications, Sales No. E.00.I.3).

In view of the aforesaid, in Part I of the Paper, the author present a brief overview of: (i) various core constellations and augmentation systems of the GNSS operating presently; (ii) proposed augmentation systems; (iii) the legal aspects of GNSS in context to its international application for civil aviation; and (iv) assess the role of the International Civil Aviation Organization ('ICAO') in context to the debate on the need to establish an international convention on GNSS. In Part II, the Paper will examine: (i) the developments in India in context to the GNSS; (ii) the proposed development and launching of the GPS inter-operable augmentation satellite GAGAN; (iii) the proposed development and launching of the Indian Regional Satellite System (IRSS); (iv) the present legal regime in context to the Airports Authority of India, the air navigation service provider and its infirmities; and (v) possible issues that will have to dealt with in context to the IRNSS. In the Conclusion, the author will offer some suggestions for an appropriate national legal regime in context to the Airports Authority of India which is designated as the signal provider for GAGAN, as well as for the IRNSS signal service provider, not as yet designated by the Government of India.

Part I

1. Core Constellations

Global Navigation Satellite Systems use two core constellations – Global Positioning System (GPS) of the United States and the Global Navigation Satellite System (GLONASS) of the Russian Federation. Other similar systems are the upcoming European Galileo positioning system; the proposed COMPASS-Bediou Navigation System of China; and the Indian Regional Navigation Satellite System (IRNSS) of India.

(i) US Global Positioning System[12]

Officially named NAVSTAR GPS, the US Department of Defense developed the global navigation satellite system in the early 1970s. GPS is managed by the United States Air Force 50th Space Wing. GPS, which is a dual use technology, is the only fully functioning GNSS that utilizes a constellation of atleast 24 Medium Earth Orbit satellites that transmit precise microwave signals that enable a GPS receiver to determine its location, speed, direction and time. The GPS constellation consists of 28 satellites orbiting at about 20,200 km in the circular orbit. The cost of maintaining the system is approximately US$750 million per

[12] GPS: The US Global Positioning System: www.wikipedia.org/Global_Positioning_System

year including the replacement of aging satellites, and research and development.

Following the shooting down of Korean Air Lines Flight 007 in 1983, President Ronald Reagan issued a directive making the system available for free for civilian use as a common good. Since then, GPS has become a widely used aid to navigation worldwide, and a useful tool for map-making, land surveying, commerce, and scientific uses. GPS also provides a precise time reference used in many applications including scientific study of earthquakes, and synchronization of telecommunications networks.

The Clinton Administration presented the 1996 US GPS Policy[13] outlining a strategic vision for the future management and use of GPS, addressing a broad range of military, civil, commercial, and scientific interests, both national and international. The goal was the management and use of GPS to support and enhance US economic competitiveness and productivity while protecting U.S. national security and foreign policy interests.

(ii) GLONASS[14]

GLONASS was developed to provide real-time position and velocity determination, initially for use by the Soviet military in navigating and ballistic missile targeting. Like the US GPS, GLONASS is also a dual use technology. It was the Soviet's second generation satellite navigation system, improving on their *Tsikada* system which required one to two hours of signal processing to calculate a location with high accuracy. In contrast, once a GLONASS receiver is tracking the satellite signals a position fix is available instantly[15].

Development on the GLONASS began in 1976, with a goal of global coverage by 1991. Beginning on 12 October 1982, the Russian core constellation for GLONASS was fully operational with 24 satellites in 1995. Thereafter, in consequence of the fall of the erstwhile U.S.S.R and collapse of the economy, the system rapidly fell into disrepair and the number of satellites in the constellation declined to just 8. However, in 2001 Russia committed itself to restoring the system and to diversify

[13] Geoff Blewitt: *Latest GPS Policy news* http://igscb.jpl.nasa.gov/mail/igsmail/1996/msg00093.html [accessed 26th-March-08]
[14] GLONASS : See www.wikipedia.org/wiki/GLONASS

[15] *ibid* It is stated that at peak efficiency system's standard positioning and timing service provide horizontal positioning accuracy within 57-70 meters, vertical positioning within 70 meters, velocity vector measuring within 15 cm/s, and time transfer within 1 μs (all within 99.7% probability).

its applications. Today, with India as a Partner, Russia aims to accelerate the programme to restore global coverage by 2009.

On May 18, 2007, Russian President Vladimir Putin signed a decree officially providing open access to the civilian navigation signals of the GLONASS system free of charge and without limitations to Russian and foreign consumers. The Russian President also directed the Federal Space Agency to coordinate work to maintain, develop and enable the system for civilian and commercial needs. Like the GPS, GLONASS is also under the control of the Russian Defense establishment, although not as frequently used as the GPS.

2. PROPOSED CORE CONSTELLATIONS

(i) GALILEO [16]

Satellite navigation users in Europe today have no alternative other than to take their positions from US GPS or Russian GLONASS satellites. Yet the military operators of both systems give no guarantee to maintain an uninterrupted service. More over, the implications of the loss; failure or the non availability of satellite navigation signals for any reason whatsoever are impossible to predict or for attendant loss to be calculated. As such, deciding to go ahead with an independent constellation of 30 satellites in the 24,000 km orbit called Galileo the EC Council of Ministers approved the program on 26th March, 2002. Unlike GPS, Galileo will stay under civilian control, increasing the European Union's strategic independence[17].

[16] European Commission: Department of Energy and Transport: GALILEO European Navigation Satellite System http://ec.europa.eu/dgs/energy_transport/galileo/index_en.htm [accessed 26-March-08]

The total estimated cost of Galileo is 3.2 billion Euros – 1.1 billion Euros for the validation and development and 2.1 billion Euros for the deployment phase.

[17] Jeffery Lewis: *US to Shut Down GPS in Crisis?* : December 16th, 2004

"The White House has completed yet another piece of its never-ending review of the Clinton-era 1996 National Space Policy. U.S. SPACE-BASED POSITIONING, NAVIGATION, AND TIMING POLICY, signed by the President on 8 December 2004, "establishes guidance and implementation actions for space-based positioning, navigation, and timing programs, augmentations, and activities for U.S. national and homeland security, civil, scientific, and commercial purposes." In other words its a GPS policy, and pretty aggressive one at that.

The policy, which also comes in a classified flavor, reportedly resulted in a directive to the Secretary of Defense (SecDef) to develop plans to shut down civil use of U.S. GPS signals in certain emergencies and to deny adversaries

Galileo is being promoted as being more accurate than GPS, giving mariners, pilots, drivers and others an almost pinpoint-accurate navigational tool. Besides civil aviation, the Galileo system is aimed at providing service to various modes of transport, communications network, intelligent highway systems, personal mobility and vehicle tracking. Galileo system proposes to offer a host of services: an open service aimed at mass-market applications leading to low cost receivers, a safety of life service for most transport applications where lives could be endangered if the performance of the navigation system is degraded without real time notice, a commercial service aimed at market applications requiring higher performance than offered by the open service, a public regulated service aimed at groups such as police, fire, ambulance, military and customs, a search & rescue service as Europe's contribution to the cooperative effort on humanitarian search and rescue compatible with the COSPAS-SARSAT system.

From the outset, the U.S. has opposed the creation of Galileo, insisting that this system will pose a threat to its national security, could interfere with military uses of GPS, and would be an unnecessary duplication of GPS[18]. The U.S. also opposed in the International Telecommunication Union the use of certain radio frequencies by the Galileo system. In fact, the U.S. opposition was so intense and persistent that in 2002 the spokesperson for Galileo "declared that under the

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access to foreign space-based satellite navigation services, such as the European Union's Galileo system. Does anybody remember when Washington claimed that Galileo was unnecessary, because we would never shut GPS down?

The Europeans have been buzzing about what the U.S. might do to Galileo in a crisis. Publication of a new Air Force Counter space Doctrine fueled these fears, after Peter Teets asked a rather provocative question in the foreword: What will we do ten years from now when American lives are put at risk because an adversary chooses to leverage the global positioning system or perhaps the Galileo constellation to attack American forces with precision? Comments like this have a way of being taken the "wrong way." An ugly row recently erupted after a British paper reported that European participants at a Royal United Services Institute conference thought they heard U.S. officials threaten "irreversible action" to deny hostile powers access to Galileo in a crisis--although other participants disputed that any threat was issued. Some of the dispute can, I think, be traced to a difference in thinking about satellite navigation. Whereas Americans tend to think of GPS as a military application that civilians are permitted to use (reflecting the military origins of GPS), much of the rest of the world sees it as a global public utility. I suspect we'll be hearing a lot about this policy by Galileo's supporters. www.defensetech.org/archives [accessed 5th –April-08]

[18] Ram Jakhu "Legal Issues" *n*.7

Galileo: Issues Still To Be Solved Before Agreement With The U.S, Brussels, 9 February 2004; available at http://www.spacedaily.com/news/gps-euro-04a.html [accessed 21-March-08]

Also see, *US Warns EU About Galileo's Possible Military Conflicts*, Brussels (AFP) 18 December 2001, available at http://www.spacedaily.com/news/gps-euro-01g.html

On 1 December 2001, the U.S. Deputy Secretary for Defense, Paul Wolfowitz, expressed his concerns to the Europeans about the "security ramifications for future NATO operations if the European Union proceeds with Galileo satellite navigation services that would overlay spectrum of the global positioning system (GPS) military M-code signals."

strain of American pressure Galileo is almost dead."[19] The underlining reasons for the American hostility toward Galileo, according to several individuals, were the loss of American monopoly on satellite navigation and the loss of hundreds of millions of dollars that its companies earn by selling the GPS-related receivers to users around the world.[20]

After four years of intense negotiations between the EU and the U.S. an agreement on major issues, including interoperability of both the systems was reached in February 2004.[21] The agreement became possible only when "the Europeans agreed to change the modulation of Galileo signals intended for government use so they would not disrupt encrypted GPS signals to be used by the US military and NATO."[22] Although several legal and procedural issues related to national security remain to be addressed, it is important to note that this agreement allows non-discriminatory access by all as required by the WTO rules related to trade in satellite navigation goods and services.

(ii) CHINA: COMPASS Navigation System[23]

The COMPASS system (also known as Beidou-2) is a project by China to develop an independent satellite navigation system. The current Beidou-1 system (made up of 4 satellites) is experimental and has limited coverage and application. However, with the COMPASS system, China plans to develop a truly global satellite navigation system consisting of 35 satellites.

The new system will be a constellation of 35 satellites, which include 5 geostationary orbit (GEO) satellites and 30 medium Earth orbit (MEO) satellites, that will offer complete coverage of the globe. There will be two levels of service provided; free service for those in China, and licensed service for the military. The free service will have a 10 meter location-tracking accuracy, will synchronize clocks with an accuracy of 50 ns, and measure speeds within 0.2 m/s. While the licensed service will be more accurate than the free service, it can be used for communication and will supply information about the system status to the users.

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[19] *ibid* Sample, Ian, "Europe and US clash on satellite system," *The Guardian*, Monday, December 8, 2003; available at http://www.guardian.co.uk/uk_news/story/0,3604,1102126,00.html

[20] *ibid*

[21] *ibid "EU and US reach agreement on GALILEO,"* available at http://www.europa.eu.int/comm/space/articles/news/news107_en.html (accessed 21 May 2004).

[22] *ibid*. "US, EU sign agreement on satellites," *Ennis*, Ireland (AFP) Jun 26, 2004, available at http://www.spacedaily.com/2004/040626094838.jljplzlh.html (accessed 28 June 2004).

[23] http://en.wikipedia.org/wiki/COMPASS_navigation_system (accessed 24th-March-08)

Two satellites for COMPASS were launched in early 2007. In the next few years, China plans to continue experimentation and setup system operations.

(iii) INDIA: Indian Regional Navigational Satellite System (IRNSS)

Government of India approved the Indian Regional Navigational Satellite System Project in May 2006. In the Union Budget presented to Parliament on 29th February 2008, the Indian Finance Minister Mr. P Chidambaram has made a budgetary allocation Rs. 270 crores (US$) for the IRNSS project.[24]. As with Galileo, the motivation for an independent satellite navigation system came primarily from the fact that access to GNSS that are under under foreign control, cannot be guaranteed in hostile situations. IRNSS is intended to be India's answer to the US GPS and will function under civilian control. The first satellite in the proposed constellation developed at a cost of Rs. 1,600 crores is expected to be launched in 2009. IRNSS is scheduled to be fully operational by 2012. IRNSS will be used for surveillance, telecommunications, transport, identifying disaster areas and public safety among others[25].

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[24] Union Budget 2007 had allocated Rs. 94 crores (US$) www.livemint.com (accessed 24th March 2008)

[25] Sagar Kulkarni, *India to develop its own version of GPS*, dated 27th September 2007 www.rediffnews.com/News/September/2007 [accessed 25th-March-08]

India will develop its own version of the Global Positioning System by launching seven satellites in the next six years, Indian Space Research Organization Chairman G Madhavan Nair said in Hyderabad on Thursday. The Indian Regional Navigation Satellite System, expected to be functional by 2012, will be used for surveillance, telecommunications, transport, identifying disaster areas and public safety among others. The satellites will be placed at a higher geostationary orbit to have a larger signal footprint and lower number of satellites to map the region, he said. The first satellite of the proposed constellation, developed at a cost of Rs. 1,600 crores is expected to be launched in 2009. Addressing a press conference on the sidelines of the 58th International Astronautical Congress, Nair said that India has the capability to launch a mission to Mars but there were no concrete proposals for research on the Red Planet. "The technological capability exists. We can use the Geosynchronous Satellite Launch Vehicle to send a 500 kg payload to Mars," he said. However, a very powerful rocket system was required to propel the spacecraft to the planet. On sending a manned mission to space, he said that the ISRO was preparing a project report on undertaking a human spaceflight. "We will submit the report to the government by March for its approval," said Nair.

He said that the mission objective of Chandrayaan-I, India's first mission to moon, was to find the basic signature of the earth's evolution, explore the terrain, look for minerals and explore the possibility of setting up a base which could be used for future planetary missions. During the IAC, Nair held bilateral talks with heads of seven space agencies, including that of the US, Russia and China. "The meetings were sort of a status review of the cooperation that already exists," he said. Nair said India is respected among the international community for developing its space program independently. "The world is highly appreciative of our space applications program and others, including the developed nations, are trying to copy it," he said.

Nair added that most of the space faring nations want to replicate India's success in the field of telemedicine and tele-education. Speaking about the Center's announcement of launching 60 missions in the next five years, he said the ISRO

Indian Space Research organization (ISRO)is building the IRNSS and it is expected that the project will be implemented in the next six-seven years. IRNSS will consist of a constellation of seven satellites and the ground segment and user receivers. Three of the satellites in the constellation will be placed in geostationary orbit and the remaining four in geosynchronous inclined orbit of 29° relative to the equatorial plane. Such an arrangement will ensure that all seven satellites will have continuous radio visibility with Indian control stations. The satellite payloads will consist of atomic clocks and electronic equipment to generate the navigation signals. The navigation signals themselves would be transmitted in the S-band frequency (2-4 GHz) and broadcast through a phased array antenna to maintain required coverage and signal strength. The satellites would weigh approximately 1,330 kg and their solar panels generate 1,400 watts. The System is intended to provide an absolute position accuracy of better than 20 meters throughout India and within a region extending approximately 1,500 to 2,000 km around it.

The ground segment of IRNSS constellation would consist of a Master Control Center (MCC), ground stations to track and estimate the satellites' orbits and ensure the integrity of the network (IRIM), and additional ground stations to monitor the health of the satellites with the capability of issuing radio commands to the satellites (TT&C Stations). The MCC would estimate and predict the position of all IRNSS satellites, calculate integrity, makes necessary ionospheric and clock corrections and run the navigation software. In pursuit of a highly independent system, an Indian standard time infrastructure would also be established.

The Indian government has stated that it intends to use the experience of creating the GAGAN system to enable the creation of an autonomous regional navigation system called the Indian Regional Navigational Satellite System (IRNSS) and that it might use the GSAT-4 satellite as a technology demonstration system phase of the proposed navigational system.

3. GNSS AUGMENTATION

The positioning services offered by the GPS or GLONASS constellations for civil aviation fall short of the accuracy, integrity, availability and continuity of service requirements of air navigation services for landing. As such augmentation

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will be able to achieve that target by outsourcing satellite building operations. "Currently, we have about five to six launches every year and we can scale it by more and more outsourcing," Nair said.

systems have been developed to the core GPS constellation for enhancing the services provided by these core constellations to meet air navigation requirement for various phases of flight - from *en route* to precision approach a landing. GNSS Augmentation involves using external information, often integrated into the calculation process, to improve the accuracy, availability, or reliability of the satellite navigation signal. There are many such systems in place and they are generally named or described based on how the GNSS sensor receives the information. Some systems transmit additional information about sources of error (such as clock drift, ephemeris, or ionospheric delay), others provide direct measurements of how much the signal was off in the past, while a third group provide additional navigational or vehicle information to be integrated in the calculation process.

The Satellite based Augmentation System (SBAS) is one form of augmentation system being developed as regional systems for large area coverage. Others are the Wide Area Augmentation System (WAAS) of USA, European Geo-stationary Navigation Overlay Systems (EGNOS) of Europe and MTSAT Satellite Augmentation System (MSAS) of Japan are the three emerging SBAS systems. These systems use navigation payloads on four Geo-stationary INMARSAT third generation satellites and the core GPS.

The importance of the augmentation systems is that these systems are compatible and interoperable. An aircraft with a suitable receiver could operate in any area of these areas – it would always have satellite navigation support available, without changing equipment.

(i) <u>INDIA: GAGAN</u>

The GPS Aided Geo Augmented Navigation or GPS and Geo Augmented Navigation system (GAGAN) is a planned implementation of a Satellite Based Augmentation System (SBAS) by the Indian government. (*Gagan* is the transliteration of a Hindi word that means sky.) It is a system to improve the accuracy of a GNSS receiver by providing reference signals. Being developed jointly by the Airports Authority of India (AAI) and the Indian Space Research Organization (ISRO), the project is being integrated with the geostationary satellite GSAT-4 and has a goal of being operational in 2008.

The area of coverage by Indian GEO (GSAT -4) is beyond the Indian FIR. In view of the large foot print of Indian GEO, the FOP configuration and the system design caters fort future expansion plans to extend GAGAN operational services over Indian GEO coverage. GAGAN consists of a space-segment and a

ground segment. The space segment is a dual frequency (L1 & L5) GPS compatible payload on GSAT-4 under the Technology Demonstration System (TDS) Phase. The ground segment consisting of 8 Indian Reference Stations (INRES), one Indian Master Control Centre (INMCC), one Indian Land Uplink Station (INLUS) and associated navigation software and communication links has been installed. In view of the developments of the GAGAN SBAS and consequent availability of signal -in-space availability there is a need to develop a legal framework.

(ii) JAPAN: Quasi-Zenith Satellite System (QZSS)[26]

QZSS is a proposed three-satellite regional time transfer system and enhancement for the GPS that would be receivable within Japan. The first satellite is currently scheduled to be launched in 2009. Authorized by the Japanese government in 2002, work on a concept for a Quasi-Zenith Satellite System (QZSS), or *Jun-Ten-Cho* in Japanese, began development by the Advanced Space Business Corporation (ASBC) team, including Mitsubishi Electric Corp., Hitachi Ltd., and GNSS Technologies Inc. QZSS is targeted at mobile applications, to provide communications-based services (video, audio, and data) and positioning information. With regards to its positioning service, QZSS can only provide limited accuracy on its own and is not currently required in its specifications to work in a stand-alone mode. As such, it is viewed as a GNSS Augmentation service. Its positioning service could also collaborate with the geostationary satellites in Japan's Multi-Functional Transport Satellite (MTSAT), currently under development, which itself is a Satellite Based Augmentation System similar to the U.S. Federal Aviation Administration's Wide Area Augmentation System (WAAS).

The satellites would be placed in a periodic Highly Elliptical Orbit (HEO). These orbits allow the satellite to dwell for more than 12 hours a day with an elevation above 70° (meaning they appear almost overhead most of the time) and give rise to the term "quasi-zenith" for which the system is named. Similar orbits are used by the Sirius Satellite Radio system. As of June 2003, the proposed orbits ranged from 45° inclination with little eccentricity, to 53° with significant eccentricity.

[26] http//en.wikipedia.org/wiki/Quasi_Zenith_Satellite_System and www.sidt.gpsworld.com (accessed 24th-March-08)

4. Legal basis for Air Navigation Services and Liability

The legal basis for the provision of air navigation facilities to facilitate international civil aviation is provided in the Chicago Convention, 1944. Article 28[27] casts full authority and responsibility on Member States to provide air navigation facilities within their air space. Further more, Article 15[28] of the Convention allows Member States to impose a user charge for the air navigational services (as also on other facilities) provided that such a charge is imposed on a non discriminatory basis. In other words, Article 28 and Article 15 of the Chicago Convention set out all the necessary elements of a valid contract as between the air navigation service provider and the air navigation service user.[29]

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[27] 1944 Chicago Convention: Article 28 :
Air navigation facilities and standard systems
Each contracting State undertakes, so far as it may find practicable, to:
(a) Provide, in its territory, airports, radio services, meteorological services and other air navigation facilities to facilitate international air navigation, in accordance with the standards and practices recommended or established from time to time, pursuant to this Convention;
(b) Adopt and put into operation the appropriate standard systems of communications procedure, codes, markings, signals, lighting and other operational practices and rules which may be recommended or established from time to time, pursuant to this Convention;
(c) Collaborate in international measures to secure the publication of aeronautical maps and charts in accordance with standards which may be recommended or established from time to time, pursuant to this Convention.
www.icao.int/en/chicago

[28] Chicago Convention, 1944
" Article 15 : Airport and similar charges

Every airport in a contracting State which is open to public use by its national aircraft shall likewise, subject to the provisions of Article 68, be open under uniform conditions to the aircraft of all the other contracting States. The like uniform conditions shall apply to the use, by aircraft of every contracting State, of all air navigation facilities, including radio and meteorological services, which may be provided for public use for the safety and expedition of air navigation.
Any charges that may be imposed or permitted to be imposed by a contracting State for the use of such airports and air navigation facilities by the aircraft of any other contracting State shall not be higher,
(a) As to aircraft not engaged in scheduled international air services, than those that would be paid by its national aircraft of the same class engaged in similar operations, and
(b) As to aircraft engaged in scheduled international air services, than those that would be paid by its national aircraft engaged in similar international air services.
All such charges shall be published and communicated to the International Civil Aviation Organization: provided that, upon representation by an interested contracting State, the charges imposed for the use of airports and other facilities shall be subject to review by the Council, which shall report and make recommendations thereon for the consideration of the State or States concerned. No fees, dues or other charges shall be imposed by any contracting State in respect solely of the right of transit over or entry into or exit from its territory of any aircraft of a contracting State or persons or property thereon."

[29] Ordinarily, a contract is guided by the principles of the law of contract. Generally, it understood that a valid contract must have all the following elements: (i) identified goods/services; (ii) seller; (iii) buyer; and (iv) that valuable consideration must flow from buyer to the seller. The absence of any of the four elements renders the contract void. Law provides that it is the obligation of both parties to the contract to fulfill their respective obligations under the agreement. Failure to do so results in a breach of contract which casts the liability on the defaulting party to pay compensation to the non defaulting party for the loss and/or damage sustained or suffered.

However, it may be noted that the 1944 Chicago Convention is silent about the liability arising out of the failure of the air navigation service provider to fulfill its obligation and consequent liability to pay compensation for such damage and loss that the user may have sustained.

In this context, it would be useful to recall that the ICAO Legal Committee studied, for more than two decades, the question related to the *Liability of Air Traffic Control Agencies*[30] . However, no decision or recommendation was ever reached on such fundamental such issues as (i) whether there is need for an international instrument or model legislation or its determination of the choice of applicable law; (ii) whether any liability is to be based on proven fault with a reversed burden of proof or whether there should be strict (absolute) liability; (iii) whether the liability is to be limited or unlimited; (iv) whether State organs providing ATC could claim jurisdictional immunity; (v) the courts of which State would have jurisdiction to consider claims etc. However, to date States have not indicted any support of an international solution on this issue.[31] Consequently, such agreements as do exist are essentially inter se the ATS service providing States and the users

5. GNSS; Chicago Convention 1944 and ICAO [32]

The years following World War II, which witnessed the rapid development of the aviation industry, inevitably created a critical need for Air Navigation Services (ANS) to be constantly technologically upgraded to ensure safely, precision and economy.[33] The ICAO responded to this challenge with a comprehensive concept known as Communications, Navigation and

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[30] Refer to ICAO Doc LC/29-WP/7.
[31] Michael Milde: *supra n.5*
[32] ICAO: International Civil Aviation Organization is a specialized UN Agency and is located in Montreal, Canada. http//www.icao.int
[33] In 1994 the *Statement of ICAO Policy on CNS/ATM systems: Implementation and Operation* articulated a policy in reference to satellite navigation systems. The policy (i) Recognized the limitations of existing terrestrial based navigation systems; , and (ii) the need to continue to fulfill the mandate of Article 44 of the Chicago Convention, 1944 through the development of the communications, navigation, surveillance/air traffic management (CNS/ATM) systems concept that utilize satellite technology.

Surveillance/Air Traffic Management (CNS/ATM). The CNS/ATM system can succeed only if it is implemented in the global context so that so that satellite navigation can gradually replace the existing individualized networks that are often dependent on poorly coordinated national infrastructure, particularly in developing countries. The second critical aspect for the successful implementation of CNS/ATM is the ICAO itself. In order that all contracting states can deploy the latest technological opportunities to overcome the deficiencies of existing technical applications, the ICAO will have to play a pro active role to ensure that member states understand, accept and implement Standards and Recommended Practice (SARP) for GNSS.[34]

ICAO deliberated the question of whether the implementation of GNSS for CNS/ATM, which is intended to be the eventual replacement of the existing air navigation systems and infrastructure, was consistent with the provisions of the Chicago Convention. Finally, it concluded that the implementation of GNSS for CNS/ATM was compatible with the Chicago Convention because the responsibility of Member States under Article 28 would remain unaffected and, therefore, no amendment would be required to facilitate its implementation. Thus the legal basis for the implementation of the CNS/ATM was established. In addition, ICAO also recognized that in providing services under Article 28 when GNSS is implemented, most States would have to rely on signals-in-space and on their augmentation provided by others. Accordingly, it has been suggested that a link between the provider or providers of signals and the States having jurisdiction under Article 28 would have to be established.

Furthermore, in 1996 ICAO amended the 1994 *Statement of ICAO Policy on CNS/ATM systems: Implementation and Operation*. Policy outlined the percepts which were to form the foundation for the implementation and operation of the CNS/ATM systems. These are (i) Universal Accessibility; (ii) Sovereignty, Authority and Responsibility of Contracting States; (iii) Responsibility and Role

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[34] Some of the most serious aeronautical disasters could have been avoided if more precise and reliable means of to support air navigation had been made available at the time and place of the accidents. In context to India, the most serious crash in the recent times was the collision of Saudi B-747 with the Kazakh IL-76 in the air space close to New Delhi on 12th November 1996 cost 351 lives. This accident could have been prevented if technology indicating the real position of each aircraft in real time to safeguard sufficient separation between the two aircrafts whose flight paths were blindly converging.

Some other fatal air crashes owing directly to inadequate or defective navigational/communication/surveillance have been (i) the American Airlines B-757 in December 1995 near Cali, Columbia; (ii) the collision of the Thai and Pakistani Airbuses near Katmandu, Nepal in September 1992;(iii) the 1977 collision of KLM and PANAM B-747 on ground at Tenerife.

Francis P.Schubert: *An International Convention on GNSS Liability: When does it become desirable?* Public International Air Law, Cases and Materials Vol. II, Institute of Air & Space Law, McGill University, Montreal (Fall 2003), pp.245.

of ICAO; (iv) Technical Cooperation; (v) Institutional Arrangements and Implementation; (v) Global Navigation Satellite System; (vi) Airspace Organization and Utilization; (vii) Continuity and Quality of Service; and (viii) Cost Recovery.

6. Outstanding Legal Issues in Implementing GNSS

(i) Sovereignty

An important concern has been whether the GNSS would infringe on the sovereignty of the Member States.[35] Indeed, Dr. Assad Kotaite, the past President of ICAO Council said that "the full implementation of an integrated global satellite-based air navigation system is bound to infringe States sovereignty"[36]. Consequently, the ICAO Council laid the basic condition that the CNS/ATM systems must neither infringe nor impose restrictions upon state sovereignty, authority, or responsibility in the control of air navigation and the promulgation and enforcement of safety regulations. The ICAO Council also said that State authority must be preserved in the coordination and control of communications and in the necessary augmentation of satellite navigation systems.

It is suggested, in context to the conditions laid down by ICAO for the implementation of GNSS, that the very technical, non-intrusive and passive nature of GNSS provides sufficient safeguards for meet those conditions. Under Article 28 of the Chicago Convention, the State has the full authority and responsibility in respect to ATS within its air space. The GNSS operations will not *per se* necessitate any changes in the delimitation of the Flight Information Region (FIR) but in the long run, some rationalization or combination of adjacent FIR could prove to be conducive to economy[37].

(ii) Liability

Whether liability can be or should be attributed to the GNSS CNS/ATM signal provider and the GNSS CNS/ATM Augmentation signal service provider, is the single most critical question that has defied solution. It is clear that ICAO accepts that GNSS for CNS/ATM is proposed to be a successor to the traditional national mechanisms presently deployed for providing air navigation services to civil aircrafts in flight. As such it will render exactly the same service to international

[35] Michael Milde: refer to supra *n.*5
[36] A. Kotaite,: "Sovereignty Under Great Pressure to Accommodate Growing Need for Global Cooperation": [December 1995] 50:10 ICAO J.21
[37] Michael Milde: *ibid. supra n. 5*

civil aviation, albeit with superior and precise technology. More over, that the foundation for the use of this critical space technology application is bound to be the universal, consistent and continuous accessibility of high quality signals-in the –sky. It needs no reiteration that the consequences of the deficiency or absence in 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 the failure on part of the signal provider to discharge its responsibility must attach the liability to pay compensation, determined by agreement by and between parties, for any damage or loss caused to the user. However, the unique circumstance in which GNSS for CNS/ATM will be made available to users around the world has rendered problematic, if not impossible, the establishment of a framework to govern the legal liability of the GNSS signal providers.

In this context, it may be recalled that the ICAO has not yet been able to arrive at a consensus on the subject of *Liability of Air Traffic Controllers*. That being said, it is not surprising that the issue of *'liability'* was raised and debated in the FANS Committee[38]; the 10th Air Navigation Conference in 1991[39] ; and the ICAO Legal Committees.[40] However, no consensus has been forthcoming as yet.

In this connection, there has been long running difference of opinion in ICAO over the need for an International Convention on GNSS. The US and EU have taken opposite stands. The moot point for disagreement is the question of fixing *liability* to the operator/service provider for damage (including commercial loss and death) suffered by users caused on account of failure/ absence/ degraded/ inaccurate GNSS signals. It needs no clarification that *liability* means the liability of compensating the affected party by paying for the loss suffered in liquidated damages calculated on certain mutually or internationally defined parameters.

The US opposes the establishment of an International Convention on GNSS[41] on the ground that because GPS is provided to users free of cost, no liability could be attached to loss caused or damage suffered by users on account of failure/absence/ degradation/inaccuracy of the GPS. This was particularly the case because GNSS is new evolving technology and there is no previous experience that could provide a yardstick to measure quantum of damage. Furthermore, GNSS is a capital intensive technology and high liability costs would cripple the enterprise. The US received support from a number of States

[38] FANS Committee: Future of Air Navigation Services Committee: See ICAO Doc.9524,FANS/4; ICAO Doc.7669, FANS (II)/4

37 Refer to proceedings of the 1991 10th Air Navigation Conference : www.icao.int/icao/en/nr/1991

[40] Refer to Report of the 28th Session of the ICAO Legal Sub Committee, ICAO Doc 9630-LC/189[1994].

[41]

in the developing world or from States outside the EU that have their own regional systems like Brazil, Japan etc.

In this context, it is important to be mindful that according to the US GPS Policy, the signals-in-the –sky will be provided free of charge globally until 2010.

The EU, on the other hand, is strongly in favor of an international convention for GNSS because the Galileo GNSS system is proposed to be a commercial enterprise that impose a user charge, as such the issue of 'liability' and 'compensation" are important and critical for its success.

Ultimately, consequent to some tough negotiation between the US and EU, ICAO Assembly Resolution A35-3 *A Practical Way Forward on Legal and Institutional Aspects of Communication, Navigation, Surveillance/Air Traffic Management (CNS/ATM) Systems* was passed by the 36th General Assembly in terms of which States were invited to transmit regional initiatives to the Council and the Council was directed to register such regional initiatives to consider their value and make them public as soon as possible in accordance to Articles 54; 55; and 83 of the Chicago Convention.[42] However, Member States have not as yet endorsed an International Convention on GNSS.

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[42] The 2004 ICAO Assembly: 36th Session: Legal Commission: Working Paper A-36-WP

(i) The Assembly adopted Resolution A31-15: *Consolidated Statement of Continuing ICAO Policies in the Legal Field*.
Part V: Legal matters of Doc.9848- Assembly Resolutions in Force (as of 8th October 2004) contains 6 resolution. Of these 3 resolutions were in respect to GNSS. These are:

1) A32-19 : *Charter on Rights and Obligations of States Relating to GNSS Services;*

2) A32-20 **:** *Development and elaboration of an appropriate long term legal framework to govern the implementation of GNSS;*

3) A35-3: *A Practical Way Forward on Legal and Institutional Aspects of Communication, Navigation, Surveillance/Air Traffic Management (CNS/ATM) Systems*

Pursuant to the aforesaid, the Secretariat Study Group on legal aspects of CNS/ATM systems finalized its work. It reviewed the current legal framework applicable to the CNS/ATM systems, identified certain inadequacies, discussed in detail a contractual framework for the systems and studied the possibility of an international convention for this purpose.

The starting proposition is that there is no legal obstacle in the implementation of the CNS/ATM system because there is nothing inherent therein which is inconsistent with the 1944 Chicago Convention. As such there was consensus that GNSS shall be compatible to the Chicago Convention, its Annexes and general principles of international law. Other elements in the framework include the ICAO Council Statement of Policy, the Exchange of Letters of ICAO respectively with the US and the Russian Federation and Assembly Resolution *A32-19: Charter on Rights and Obligations of States Relating to GNSS Services.*

PART II

INDIA

1. Present Legal Regime in respect to aeronautical navigation services[43]

(i) The Airports Authority of India ('AAI')

India ratified the Chicago Convention 1944 in 1947. The consequent international treaty obligations arising from Article 28; Article 15 and relevant Annexes in respect to the provision of aeronautical navigation facilities in national air space were harmonized into national law through the enactment of the Airports Authority of India Act 1994. The Act established the Airports Authority of India as the service provider of the aeronautical navigation facilities and other related services.[44] The 1994 Act was subsequently amended by the Airports Authority of India (Amendment) Act, 2003 ('the Act').

The Airports Authority of India is the national air navigational signals service provider which facilitates international civil aviation within the Indian air space as required under the provisions of Article 28 of the Chicago Convention and also within the Flight Information Region (FIR) as required to do by the ICAO[45].

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[43] India submitted a Working Paper at the ICAO 36th General Assembly on the subject of evolution of regional guidelines for GNSS. In this paper, the present legal regime that governs Airports Authority of India, the national the air navigation service is also stated. The WP can be viewed at www.icao.int/icao/en/a36/wp/wp-134

[44] The Airports Authority of India Act, 1994 (NO. 55 OF 1994) as amended by the Airports Authority of India (Amendment) Act 2003. The 1994 Act merged the erstwhile National Airports Authority and the International Airports Authority into a single agency. The Object of the Act states, inter alia, that it is

"An Act to provide for the constitution of the Airports Authority of India and for the transfer and vesting of the undertakings of the International Airports Authority of India and the National Airports Authority to and in the Airports Authority of India so constituted for the better administration and cohesive management of airports and civil enclaves whereat air transport services are operated or are intended to be operated and of all aeronautical communication stations ***"for the purposes of establishing or assisting in the establishment of airports"**** and for matters connected therewith or incidental thereto."

[45] A '"Flight Information Region"' ('"FIR"') is an aviation term used to describe airspace with specific dimensions, in which an Information Service and an alerting service are provided. It is the largest regular division of airspace in use in the world today.

Any portion of the atmosphere belongs to some specific FIR. Smaller countries' airspace is encompassed by a single FIR, larger countries' airspace is subdivided into a number of regional FIR. Some FIR may encompass the territorial

AAI also serves the needs of domestic civil aviation. Further more as permitted under Article 15 of the Chicago Convention, the AAI charges a user fee on a non discriminatory basis[46].

(ii) AAI and Liability

As we have discussed in Part I of this Paper, although the Chicago Convention requires its Member States to provide aeronautical navigation services within their air space and in such FIR as may be allotted by the ICAO, the Convention is silent as to the liability of the service provider. Further more, we have also noted the failure of the ICAO efforts to agree upon the matrix in connection with the Liability of Air Traffic Controllers. The effort continues to remain unresolved. The sum total of the aforesaid is that the Chicago Convention does not give rise to a treaty obligation to fix liability on either the Air Traffic Controller or on the air navigation signal service provider.

Presently, the Airports Authority of India is protected from the incidence of liability for *"any damage sustained by any aircraft or vehicle in consequences of any defect in any airports, civil enclaves, heliports, airstrips, aeronautical communication stations or other things belonging to or under the control of the Authority"* Section 33 of the Act categorically rejects the principle of the *liability* of the service provider for its acts of omission or commission committed in good faith, that result in loss or damage to the user, by granting the AAI and its officers immunity from prosecution in any court of law.[47]

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airspace of several countries. Oceanic airspace is divided into Oceanic Information Regions and delegated to a controlling authority bordering that region. The division among authorities is done by international agreement through the ICAO.

There is no standard size for FIR, it is a matter for administrative convenience of the country concerned. In some cases there may exist a horizontal division of the FIR, in which case the lower portion remains named as such, whereas the airspace above is named Upper Information Region, or UIR.

An information service and alerting service are the basic levels of air traffic service, providing information pertinent to the safe and efficient conduct of flights and alerting the relevant authorities should an aircraft be in distress. These are available to all aircraft through an FIR. Higher levels of Air Traffic Advisory and Control services may be available within certain portions of airspace within an FIR, according to the ICAO class of that portion of airspace (with regard to national regulations), and the existence of a suitably equipped authority to provide the services http://en/wikipedia.org/Flight_Information_Region

[46] Airports Authority of India Act, 1994 : See at http://www.aai.aero/ AAI_Act
Section 22 (b) states, *inter alia*, as under :

S.22(b): *empowers AAI to charge fees/rent etc for providing air traffic services, ground safety services, aeronautical communications and navigational aids and metrological services at any airports and at any aeronautical communication station; ……."*

[47] *ibid. supra n.44*

(iii) The Consumer Protection Act, 1996[48] and Vicarious Liability

That being said, it is important to know that the Consumer Protection Act 1986 ('CPA") grants legal remedy in addition to such remedies as may be available under any other law in force. These remedies are not in derogation of provisions of any other law for the time being in force.[49] The CPA grants a petitioner compensation for deficiency of service or defective service by the service provider of goods or services.

A hierarchical institutional structure supports the implementation of the CPA. At the lowest level is the Consumer Disputes Redressal Forum or District Forum located in every district in the country[50]. The District Forum has pecuniary jurisdiction to hear complaints up to the value of Rs.20, 000 (US$). Appeals against Orders of the District Forum are filed within 30 days before the State Consumer Disputes Redressal Commission[51]. The pecuniary jurisdiction of the State Commission is the value of goods or services of a value more than Rs.20,000 but less than Rs.1,0000000 (US$). Finally the National Consumer Disputes Redressal Commission hears appeals against the Orders of the State Commissions and has pecuniary jurisdiction for goods and services the value of which exceeds Rs.10000000. The National Commission is the apex consumer disputes redressal forum. Appeals against orders of the National Commission lie in the Supreme Court of India.

In the recent past the consumer forums at different levels have been granting relief to petitioners against airlines for deficiency in service including compensation for lost baggage, delayed flights etc. This has been especially true of various State Commissions in context to complaints against airlines. Although strictly, such claim should be litigated under the provisions of the Carriage by Air Act, 1972, the said law is infrequently used because of the low levels of compensation prescribed[52] and the extremely cumbersome procedure law requirements attendant to the law of torts. Thus because the CPA offers legal

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" Section 33: protects the AAI, its officers and employees and the Chairperson of the Tribunal against a suit, prosecution or other legal proceeding for anything done in good faith or intended to be done in pursuance of the AAI Act, any rule or regulation made there under or for any damage sustained by any aircraft or vehicle in consequences of any defect in any airports, civil enclaves, heliports, airstrips, aeronautical communication stations or other things belonging to or under the control of the Authority……"

[48] Consumer Protection Act, 1986, ['CPA']. Can be referred to at http://ncdrc.nic.in/1_1.html

[49] *ibid* See CPA : Section 3

[50] Presently there are 608 Districts in India. A district a geographical area created to facilitate administration. www. districts.gov.in/dstats.asp

[51] India has 29 States and 6 Union Territories which are directly administered by the federal government. Each of these 35 administrative units has a State Commission. www.haryana-online.com/states_of_india.htm

[52] India has ratified only the Warsaw Convention, 1929 and the Hague Protocol,1955. The Carriage by Air Act,1972 harmonizes the said international treaties in Schedule I and Schedule II respectively.

remedy in addition to those available under any other law presently in force, petitioners have been approaching consumer forums.

While it is difficult to predict the future, the purpose of mentioning the recent judicial trends in consumer protection law in context to the national air navigation service provider is that the said judicial trend is bound to impact the operation section 33 of the Act which protects the AAI from the consequence of liability against damage or loss caused to a consumer. Although strictly only airlines are consumer of the air navigation services provided by AAI, the fact remains that if damage or loss is caused on account of failure of the air navigation service to a consumer of the air transport service provided by the airline, the consumer would be competent in law to file for compensation not only against the airline, but also the AAI. In other words vicarious liability can be attached to the air navigation signal provider by operation of other laws in force.

A mention must be made to the 2004 National Commission judgment which was upheld by the Supreme Court of India in the matter of *Geetha Jethani Vs. Airport Authority of India and Ors*[53]. The facts of the case were that *Geetha Jethani,* an eight year old girl, had accompanied her parents to New Delhi from Dubai on board an Air India flight. On reaching New Delhi, the family proceeded from the aircraft to the Immigration Counters. In order to reach the immigration counters, the family was required to descend an escalator. However, because of some defect or malfunction in the escalator, the girl was sucked into the escalator machinery and was crushed to death. The parents filed a case under the Consumer Protection Act, 1994 against the Airports Authority of India. The AAI pleaded immunity under section 33 of the Act. AAI also pleaded that the family could not be viewed as a consumer qua the AAI. Notwithstanding, the aforesaid, the National Commission held that in view of the user charge for its facilities made available by the AAI in terms of the governing Act, the AAI could not escape the definition of a *service provider* within the meaning of the Consumer Protection Act, 1986. As such, calculating damages and borrowing from Schedule II of the Carriage by Air Act,1972 (Hague Protocol 1955), the National Commission awarded AAI to pay compensation for deficiency and defective service, a sum of 250000 gold french francs to be converted to INR at the rate of gold as on the date of judgment. In delivering judgment, the National Commission relied on the Consumer Protection Act, 1986; Airports Authority of India Act, 1994 - Section 33; Evidence Act; Civil Procedure Code; Aircraft Act, 1934 - Sections 2, 2(1), 12, 22, 25 and 42(2); Companies Act, 1956; Carriage by Air Act, 1972 - Section 4, 5(1); Fatal Accidents Act, 1855; Motor Vehicle Act; Indian Penal Code - Sections 304A and 337.

[53] Geetha Jethani Vs. Airport Authority of India and Ors : 2004 (3) CPJ 106 (National Commission)

Thus a legal precedence has been set that has brought the Airports Authority of India under the purview of the Consumer Protection Act, 1986 as a service provider. Only the future will tell whether aeronautical services provided by AAI will ever be put to the test.

2. GAGAN

(i) The Outer Space Treaty 1967[54]

GAGAN geo-augmentation satellite is a space asset. Thus it is necessary to recognize that in view of having adhered to the 1967 Outer Space Treaty Government of India bears international responsibility and liability if the said satellite causes damage in outer space to a space object of any other Member State. Although the liability for damage caused by GAGAN in outer space is not the subject matter of this paper, should such an event occur in outer space, India will be liable to pay compensation to the affected Member state. Furthermore, the Government of India is required to inform the UN Committee on Peaceful Uses of Outer Space[55] about its space activities periodically.

(ii) Liability in context to ANS

Presently, there is no specific law or guidelines that govern GNSS for CNS/ATM in India. The AAI continues to provide air navigation services using GPS for civil aviation, both international and domestic in terms of the Airports Authority of India Act, 1994, as required under Article 28 of the Chicago Convention, 1944. Additionally, India charges the users of its air navigation services as permitted by Article 15 of the Chicago Convention.

The GAGAN augmentation satellite is a joint venture enterprise between Indian Space Research Organization ('ISRO') and the Airports Authority of India. While ISRO operates the satellite and the command and telemetry control, it is the AAI which will be the provider of the GPS/GAGAN signals for CNS/ATM.

It is accepted that GPS/GAGAN GNSS for CNS/ATM comes within the domain of '*signals-in-the sky*' and not within the domain of traditional earth based

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[54] *Treaty on principles governing the activities of States in the exploration and use of outer space, including the moon and other celestial bodies'* Opened for signature at Moscow, London and Washington, on 27 January,1967. Source: 610 UNTS 205. (hereinafter referred to as 1967 Outer Space Treaty or 'OST')

[55] *supra n.9*

radar/station system currently used for aeronautical navigation service. As mentioned in the preceding paragraphs, the Airports Authority of India Act 1994 negates the *liability* of the Airports Authority of India through the *immunity from prosecution* provision contained in section 33 of the Act.

As mentioned in Part I, ICAO recognizes that in providing services under Article 28 when GNSS for CNS/ATM is implemented, most States would have to rely on signals-in-space and on their augmentation provided by others. Accordingly, ICAO has suggested that a link between the provider or providers of signals and the States having jurisdiction under Article 28 would have to be established. As such, in context to the AAI, it is possible that the U.S. and India will enter into an agreement or arrangement in context to GPS signals which will provided free of cost for augmentation by GAGAN, before being transmitted onwards by AAI to users. We know that the US opposes the attaching of any *liability* to the GPS, while current Indian law eschews liability by granting immunity to the AAI. As such, it is difficult to predict whether India will set out new guidelines or law to include liability for deficiency or defective service of GAGAN signals qua the Indian users, especially in view of the fact that the cause for deficient or defective signals may have its origin in the US GPS itself.

It would not be out of place to mention here that the US Government has repeatedly indicated its willingness to compensate for any damage that was demonstrably caused by the faulty provision of GPS service.[56] Legal channels exist for such claims, under the *Federal Torts Claim Act* (FTCA)[57] and past experience has revealed that the applicable legal system is designed to fully recover effective compensation for damages related to negligence of civil servants[58]. These arguments are sporadically echoed by experts from non-provider States, which have begun to make use of signals provided by other countries for ANS purposes. To them GNSS represents nothing more than another ANS tool, for which the existing legal framework offers satisfactory solution[59]. At the present time and until GAGAN becomes operational, India falls within this category.

In context to the present paper, if damage is caused to the GAGAN satellite that results in disabling GAGAN signals, as has been explained in the section on the

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[56] Francis P. Shubert: *An International Convention on GNSS Liability: When does it become desirable?*, Case Study :International Public Air Law Vol.II. McGill University, Faculty of Law, , Institute of Air and Space Law, Fall 2003, ed. Dr. Michael Milde & Dr. Paul Dempsey, pp.213

[57] U.S.C. 1346(b), 2671-2680 (1988)

[58] *supra n.*54

See J Epstein, "Global Positioning Systems (GPS): Defining the Legal Issues of its Expanding Civil Use" (1995) 61 J Ar. L & Com. 1 at 243-286

[59] *n.*54

Consumer Protection Act, 1986, vicarious liability could arise against the Airports Authority of India, as the air navigation service provider qua national consumers despite the immunity provided by the Act.

3. The Indian Regional Satellite System

The IRSS project was approved by the Government of India has recently, as such the full contours of its multimodal dimension not yet known. However, in defining these contours the following are some issues that would need consideration:

(i) Categories of users, including international and national
(ii) Cost allocation so that the burden does not fall disproportionately on any one category of user.
(iii) Consider the expanding civil use of IRSS beyond ANS
(iv) Whether the main GNSS provider and ANS provider will be identical
(v) Whether GNSS for CNS/ATM should be provided free of cost like GPS or priced like Galileo?
(vi) If free of cost will liability be imposed for loss of signals or degraded signals?
(vii) If service is priced, what type of liability should be imposed?
(vii) Type of liability: absolute or fault based or combination?
(ix) Limit for liability
(x) Waivers and cross-waivers
(xi) Immunity and indemnification
(xii) Linkages with ISRO in context to liability
(xiii) Force Majeure
(xiv) Exceptions
(xv) Copyright and patent protection
(xvi) Dispute resolution
(xvii) Standardized norms and licensing for GPS hand held receivers
(xviii) Standardized agreement platelet
(xix) National security

Finally, if it is found appropriate, a law should be put in place to provide licensing and standardization of norms for various categories of users by addressing issues of (i) due authorization; (ii) liability; (iii) insurance; (iv) indemnity/ cross waivers; (v) safety and security of space assets; (vi) contract & transfer of property, stamp duty, sales tax; (vi) continuing supervision mechanism; (vii) spectrum management; and (viii) dispute resolution

Conclusion

It is suggested that India must revisit its present laws governing the Airport Authority of India, since the national air navigation service provider will continue to render service once GNSS for CNS/ATM is implemented. It is suggested that the Government of India should engage in the exercise deconstruct concepts and attempt to first define "responsibility"; "damage"; "liability" and "quantum of compensation". This is an essential exercise to arrive at a conducive and balanced legal treatment of *liability* for damage caused on account of deficiency of air navigation service in terms of (i) failure of service; (ii) absence of service; (iii) inaccurate service; (iv) defective service; (v) termination; (vi) force majeure; (vii) Exceptions.

Perhaps, India could review the history of the development of private international air law and the international conventions on carrier liability in context to international civil aviation. It would also be useful to study ICAO proceedings in respect to the aforesaid to understand all the dimensions of the various aspects of *liability* that were discussed before arriving at a consensus. Furthermore the merits both the US GPS and the EU Galileo models should be evaluated.

Private International Air law brings the lesson of how the 1929 Warsaw Convention model fixed a low ceiling to carrier liability in order to afforded protection to the nascent international civil aviation industry while at the same time balancing this with the need to allow at least a modest compensation for passengers/carriers. The fact that through the seventy years of its existence, the 1929 Warsaw Convention has been amended several times to enhance the liability limit in favor of the passengers and the ultimate replacement of the Warsaw System with the Montreal Convention 1999 is an object lesson.

Thus based on the successful Warsaw Model, a legal frame work for GNSS could fix a low ceiling to liability payment thereby to offer critical protection to the nascent emerging technology owners/operators/service providers and at the same time offer some compensation to users to justifying the imposition of a user charge which Contracting States are permitted to impose (Article 15 of the Chicago Convention) for providing aeronautical navigation services/air traffic services (Article 28 Chicago Convention).

In conclusion, it is suggested that the Ministry of Civil Aviation should take the lead to formulate a clear policy in respect to satellite navigation in context to Air Traffic Management. The effort would have to be an inter-institutional effort that must necessarily involve the ISRO and the Ministry of Defense among other agencies. In the same vein, the government could consider stimulating a draft

model law as suggested in the preceding paragraphs. Consequently, it would also have to be considered whether national needs would be better served by amending the existing AAI Act or replacing it with a new legislation.