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*GNSS liability: current legal framework and perspectives for the future
from the international aviation point of view*

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Introduction

The Global Navigation Satellite Systems (GNSS) is widely considered as one of the most critical technological achievements of the 21st century. It consists in satellite-based technology that provides position, velocity and time of a receiver through the transmission of radio signals with world-wide coverage, and involves basically three components: a constellation of 24 (or more) satellites transmitting the primary signal; a ground station that elaborates the information and operates the system; the end-user receiver equipment.¹

¹ The scope of this paper encompasses on purpose only the primary signal providers, leaving the augmentation systems (like the european EGNOS) to further analysis.

Since the beginning of the 1990s, it has been regarded by ICAO as a potential key element in the development of the Communications, Navigation, Surveillance / Air Traffic Management systems (CNS/ATM).² GNSS is designed to provide air traffic controllers and aircraft pilots with accurate, real time information, rendering obsolete much of today's ground-based navigation services.³

There are currently two world-wide GNSS providers: the "Global Positioning System" (GPS), operated by the United States, and the "Globalnaya Navigatsionnaya Sputnikovaya Sistema" (GLONASS), operated by the Russian Federation. They are both dual-use, military-controlled, State-operated systems, made available for private use worldwide and free of charge.⁴

This duopoly is destined to be broken in a few years, as other similar systems are being developed. Among them, the EU-ESA Galileo System has a particular relevance: in opposition to its predecessors, it will be a civilian system, operated by a consortium of public entities and private companies for the provision of a differentiated range of commercial services.⁵ Its full operational capability is expected for 2018.

Despite the undeniable benefits, the satellite navigation entails the great risk to cause damage to human life and properties, with particular regard to its application in air navigation. The absence of an international convention explicitly regulating the GNSS liability forces the potential victims, both GNSS users and third innocent parties, to an enduring limbo of legal uncertainty.

1) Current GNSS legal framework relevant to international air traffic

At the beginning of the 1990s, ICAO was believed to have a fundamental role in the future construction of a comprehensive regulation of this subject.⁶ Indeed, it was chosen by the two powers as the most appropriate channel to offer the availability of their signal to the worldwide aviation community.

ICAO accepted the offer through "Exchange of Letters" with the US on 14 and 27 October 1994, and with the Russian Federation on 4 June and 29 July 1996.⁷ The

² ICAO, "Towards Acceptable Institutional Arrangements for the Continued Provision of GNSS for Aviation", ICAO Doc. FANS(II)/4-WP/9, 1993.

³ HUANG, *Development of the Long-Term Legal Framework for the Global Navigation Satellite System*, Annals of Air and Space Law, Vol. XXII, part I, 1997, p. 586.

⁴ GPS is currently managed by the United Air Force's 50th Space Wing. GLONASS is under control of Russian Aerospace Defence Force.

⁵ From the very beginning, Galileo was envisaged in particular by the Commission as a public-private-partnership (PPP). For a detailed analysis of Galileo future organizational framework, see VON DER DUNK, *Towards Monitoring Galileo: The European GNSS Supervisory Authority in statu nascendi*, Zeitschrift für Luft- und Weltraumrecht, 2006.

⁶ The legal basis of this expectation can be found in Chicago Convention. Art. 44, indeed, mandates explicitly ICAO "to develop the principles and techniques of international air navigation".

⁷ Attachments to ICAO State Letters LE 4/49.1 – 94/89 and LE 4/49.1 – 96/80. The operative part of the United States letter to the President of the ICAO Council dated 1 October 1994 provides: "[T]he United States intends subject to the availability of funds as required by United States law, to make the Standard Positioning Service of GPS available for the foreseeable future, on a continuous, worldwide basis and free of direct user fees. This service...will be available...on a non-discriminatory basis to all users of civil aviation, will provide horizontal accuracies of 100 metres (95 per cent probability) and 300 metres (99.99 per cent probability). The United States shall take all necessary measures to maintain the integrity and reliability of the service and expects that it

content of the exchange of letters regarded the assurance of universal accessibility, the non-discriminatory access, the integrity and reliability of the service and the respect of national sovereignty. The topic of liability for potential signal failure was substantially ignored, perhaps on purpose, due to its political sensibility.

Considering their novelty, it is then necessary to figure out how the provision of GNSS services deals with the existing public air law regime, and in particular its compatibility with the principles drafted in Chicago Convention. The principal provision, Article 28, "Air navigation facilities and standard systems", states indirectly the duty of the States to provide CNS/ATM services in their territory.⁸ It is a reflection of the general principle of State sovereignty contained in Article 1. In the case of GNSS, air navigation facilities would be partially controlled and operated by a foreign country. This could potentially jeopardize the sovereignty rights of the territorial State, and the consequent imputability of international responsibility originating from Article 28. Despite the potential problems that this inconsistency could bear, the provision seems to be flexible enough not to become a legal obstacle for the implementation and operation of such extra-territorial services. The implementation of additional bilateral agreements between Russia and United States, and States that want to avail themselves of GPS/GLONASS, may negotiate additional terms and conditions to regulate the matter and safeguard their sovereignty.⁹ In addition, the ICAO Policy document adopted on 9 March 1994 states that implementation and operation of CNS/ATM systems, in which GNSS will be a key element, shall "neither infringe nor impose restrictions upon the sovereignty of States, or their authority or responsibility in the control of air navigation and the promulgation and enforcement of safety regulations".¹⁰ In general, it is possible to say that according to ICAO's conclusions there is a full compatibility between GNSS and Chicago Convention principles, with no need for further amendments.¹¹

will be able to provide at least 6 years notice prior to termination of GPS operations or elimination of GPS-SPS."

⁸Each 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." Art. 28, Chicago Convention.

⁹ KOTAITE, *ICAO's Role with Respect to the Institutional Arrangements and legal Framework of Global Navigation Satellite Systems (GNSS) - Planning and Implementation*, Annals of Air and Space Law, 1996 Vol. XXI Part. II, p. 200-203.

¹⁰ ICAO, "Statement of ICAO Policy on CSM/ATM Systems Implementation and Operation", LC/28-WP/3-2, par. 2.

¹¹ KAUL, *Liability Implications of the Use of Global Navigation Satellite Systems (GNSS) for Communication, Navigation, Surveillance/Air Traffic Management (CNS/ATM) in Civil Aviation - with Special Focus on India*, Annals of Air and Space Law, 2010, Vol. XXXV, Part I, p. 427-430.

From a more technical point of view, reference has to be made to Annex XI to the Chicago Convention, containing SARPs related to Air Traffic Services. These are the relevant SARPs for GNSS.¹²

During the 1990s, ICAO has produced a vast amount of non-binding documents dealing with the issue, among those the most remarkable ones are the “Statements of ICAO Policy on CSM/ATM Systems: Implementation and Operation”¹³, adopted by the Council in 1994, and the “Charter on the Rights and Obligations of States Relating to GNSS Services”¹⁴, adopted in the form of the ICAO Assembly Resolution in 1998. The latter, in large part, simply elaborates certain principles of the 1994 Statements. The provisions are elaborated in a very broad form, and their content regards basically the compatibility with international law, including the Chicago Convention, the safety of international civil aviation as paramount principle, the non-discrimination principle, the safeguard of State sovereignty and authority, the assurance of continuity, availability, integrity, accuracy and reliability of the signal, the charges, the principles of co-operation and mutual assistance. In criticising their broad formulation and their non-binding efficacy, it is necessary to take in account that they were adopted in the optimistic expectation of a continuous development towards an imminent international convention on GNSS services. The avoidance of more sensitive topics, like the liability of signal providers, is indeed a hidden evidence of the legal and political problems that would have paralysed such process in the following years.

On the whole, the prevailing international public air law regime, both in its binding and non-binding tools, provides an either vague, incomplete or indirect legal framework for the provision of GNSS services. So far liability has not been regulated, leaving the potential victims without tailored remedies.

2) Liability: general considerations

The main risk implied in GNSS services is an air accident caused by a signal failure. That event gives rise to a high complexity from the legal point of view, due to a certain number of factors.

First, it meets a substantial legal vacuum. As stated above, there are neither international air law provisions, nor rules in domestic legal systems directly addressing these particular conditions. In addition, the non-commercial shape of the service, in this case, means that there is no contract between the service provider and the user, and therefore no contractual provisions dealing with liability.

In case of accident, the main potential victims would be the passengers of the aircraft, the third parties and the airline itself. On the other side, the responsible entity – at least from the causal-link point of view - would be the signal provider, i.e. the US or Russian State.

¹² MURRAY, *The Law Related to Satellite Navigation and Air Traffic Management Systems – A View from the South Pacific*, Journal of Navigation, Vol. 53, 2000, p. 335.

¹³ See *supra*, note 10.

¹⁴ ICAO “Charter on the Rights and Obligations of States Relating to GNSS Services”, ICAO Assembly Resolution A32-19.

Furthermore, the lack of a direct discipline is accompanied by the existence of a certain number of legal instruments that deal with air accidents in general, and that would be applicable also in such particular circumstances. This influence might lead, in some cases, to unfair consequences, as the final burden of compensation would not fall upon the concretely responsible entity.

The current international instruments that can be made applicable are the Warsaw Convention (WC29)¹⁵, the Montreal Convention (MC99)¹⁶, and the Rome Convention (RC52)¹⁷.

Without entering in a detailed analysis of the wide range of legal situations that this kind of “interference” could bring, it is possible to assume that, due to the presumed fault stated by these instruments, the final burden of compensation would most likely lie upon the airline. In the Warsaw Convention, the airline is presumed liable, but could escape paying damages if able to prove that “he and his agents have taken all necessary measures to avoid the damage or that it was impossible for him or them to take such measures”.¹⁸ In this case, due to the exclusivity principle, the unfair consequence is that passengers would remain without any chance to obtain compensation.¹⁹ A similar conclusion is valid in case of applicability of the Montreal Convention, for compensation amounts exceeding 113.000 SDR.²⁰ Up to this limit, on the other hand, the airline would be absolutely liable disregarding its concrete role in the causation of the damage. Finally, third parties can claim compensation under Rome Convention, stating again an absolute and limited liability upon the operator.²¹

Considering the principle of exclusivity stated by each of these conventions,²² we would have the airlines bearing the burden of compensation to passengers and third parties, as all potential claims would be in principle channelled towards them. This would make the airline the most probable entity interested in a claim against the GNSS provider.²³

There is no provision in Montreal, Warsaw, Rome Convention or elsewhere preventing the right of recourse by the carrier against third responsible parties. But, again, the question arises whether the carrier could find a legal basis upon which grounding its right.

¹⁵ Convention for the Unification of Certain Rules Relating to International Carriage by Air, Warsaw, 1929.

¹⁶ Convention for the Unification of Certain Rules for International Carriage by Air, Montreal, 1999.

¹⁷ Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface, Rome, 1958.

¹⁸ Art. 20, Warsaw Convention. It is worthy to notice that, in practice, this clause has been hardly invoked. It still constitutes, however, a potential threat to passenger’s rights in the so far not legally tested case of GNSS failure.

¹⁹ This is a fault-based liability regime, with a reversed burden of proof. The Montreal Agreement of 1966, concluded between the US Department of Transportation and a most of the airlines, changes the presumed fault liability of the original Warsaw Convention into a strict liability regime, preventing the carrier to invoke the defence provided by Art. 20.

²⁰ Art. 20, par. 2, Montreal Convention.

²¹ Art. 11 and 12, Rome Convention. Due to the limited number of ratifications, it is likely that third parties will rely on national laws rather than on the Rome Convention to seek compensation. In this case, they would not be obliged to sue the carrier, but would have the possibility to sue directly the GNSS provider according to the applicable law.

²² Art 24, Warsaw Convention; Art. 29, Montreal Convention; Art. 9, Rome Convention.

²³ This conclusion has a general validity. In a considerable amount of cases, it would be affected by status of ratification of the Treaties and by each national case law regarding the interpretation of the principle of exclusivity.

3) Responsibility and liability under the *corpus juris spatialis*

A possible solution, according to some scholars²⁴, can be found in the *corpus juris spatialis*.²⁵

Although not dealing directly with this kind of services, it is necessary to keep in mind that GNSSs are a satellite-based application, and therefore strongly linked with the discipline of international space law.

The first provision potentially dealing with the present problem is Article VI of the Outer Space Treaty (OST).²⁶ According to it, States bear international responsibility for national space activities whether carried on by the State itself or by its private entities. It is not convenient, here, to make a long digression about the exact wording of the Article and the legal problem therefore implied. It is possible anyway to present some considerations. Firstly, regarding its scope, the provision covers in general “space activities”. GNSS is a space-based technology, performed through satellites; therefore, it falls within the definition of “space activity”.²⁷

As regards to the content, on the other hand, the Article deals with international *responsibility*. The fundamental element of responsibility is the violation by a State of an international obligation, provided by a primary rule, and giving birth to a secondary system of rules that regulates the consequences of unlawful behaviours.²⁸

It is a concept strictly related to international law, and proper to State-to-State relations. The effectiveness of this legal tool for a private to seek compensation is

²⁴ See HENAKU, *The International Liability of the GNSS Space Segment Provider*, Annals of Air and Space Law, Vol. XXI, Part. I, 1996.

²⁵ Within the definition of *corpus juris spatialis* it is usual to encompass five treaties: Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1967; Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, 1968; Convention on International Liability for Damage Caused by Space Objects, 1972; Convention on Registration of Objects Launched into Outer Space, 1976; Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, 1984.

²⁶ “States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty. When activities are carried on in outer space, including the moon and other celestial bodies, by an international organization, responsibility for compliance with this Treaty shall be borne both by the international organization and by the States Parties to the Treaty participating in such organization.” Article VI, OST, 1967.

²⁷ The problem is linked to the missing definition of “space activities” in the space treaties. According to the majority of the doctrine, it is convenient to adopt a broad interpretation, and consider a “space activity” any human activity that takes part wholly or partially in outer space. See GEHRARD, in HOBE, SCHMIDT-TEDD, SCHROGL, GOH, *Cologne Commentary on Space Law, Vol. I*, Carl Heymanns Verlag, 2009, p. 109.

²⁸ For an general overview on international responsibility and the difference between primary and secondary rules, see *Draft Articles on Responsibility of States for Internationally Wrongful Acts, with Commentaries*, in Report of the International Law Commission, 53rd sess. UN Doc. A/56//10.

at least uncertain. First, the efficacy of the “Exchange of Letters” to create an international obligation to provide the signal, upon the US and Russia, towards ICAO and its member States, can be questioned. Can it be compared to a proper international agreement, with an equivalent binding efficacy?²⁹ And, assuming that, is a single signal malfunction a breach of an international obligation?

Assuming that an “Exchange of Letters” is relevant and binding from the international point of view, and that a signal failure is a breach, can Article VI OST be used by a private individual to base a civil claim against a sovereign entity? The structure of international responsibility itself, as evident, prevents a private person from that. First, only a State, having autonomous international legal personality, is entitled to bring a claim for a breach of an international obligation by another legally relevant entity. In such case, the State should carry on the claim in the interest of its citizens. The restoration of the damage would depend, therefore, on the political will of the State to enter in an international dispute.

On the whole, the great number of uncertainties and the impossibility for the private entity to sue directly the responsible State makes Article VI a far inefficient instrument to seek compensation.³⁰

Article VII OST, which can be considered the framework-provision for the subsequent Liability Convention of 1972 (LC72), on the contrary deals with so-called *State liability*.³¹ At a first glance, here the State seems to be directly responsible for the damages inflicted to a private entity, irrespective of the unlawfulness of its conduct, on an absolute liability basis according to Article II.³² There are a few problems that weaken this instrument as well. The applicability of the LC72 on the whole depends at first on the kind of damage covered. The majority of the doctrine agrees upon the idea that the wording “damage caused by a space object”, read together with other provisions of the same Treaty, means a damage caused by a physical collision.³³ Therefore, damages caused by radio signals would not be covered. In addition to this, the general *ratio* of the

²⁹ The binding efficacy of this kind of instrument seems to find a considerable legal ground in the Vienna Convention on the Law of Treaties. “States may express their consent to be bound by an “exchange of letters/notes”. The basic characteristic of this procedure is that the signatures do appear not on one letter or note but on two separate letters or notes. The agreement therefore lies in the exchange of both letters or notes, each of the parties having in their possession one letter or note signed by the representative of the other party. In practice, the second letter or note, usually the letter or note in response, will typically reproduce the text of the first. In a bilateral treaty, letters or notes may also be exchanged to indicate that all necessary domestic procedures have been completed.” Art.13, Vienna Convention on the Law of Treaties, 1969. For a further analysis of the topic, see AUST, *The Theory and Practice of Informal International Instruments*, International and Comparative Law Quarterly, Volume 35, 1986.

³⁰ Additional problems of co-ordination may arise in respect to Art. 28 of the Chicago Convention, which places the international responsibility for ATM services on the territorial State. See *supra*, par. 1.

³¹ “Each State Party to the Treaty that launches or procures the launching of an object into outer space, including the Moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air space or in outer space, including the Moon and other celestial bodies.” Art. VI, OST.

³² “A launching State shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the earth or to aircraft flight.” Art. II, LC72.

³³ See SMITH, KERREST, in HOBE, SCHMIDT-TED, SCHROGL, *Cologne Commentary on Space Law*, Vol. II, Carl Heymanns Verlag, 2010, p. 125.

Convention is to regulate relations between States and third parties that arise from a random accident. In case of GNSS, on one hand there is no contract between parties, while on the other hand the victim is benefiting from such space application, exploiting the signal free of charge, and has implicitly accepted the risks implied. As consequence, the victim can hardly be considered a pure “third party”, because there is a *de facto* relation with the provider, and neither a pure “innocent party”, due to the fact that it is taking advantage from the space application. Therefore, it is difficult to compare its position to the “innocent third parties” that LIAB aims to defend.

Last but not least, the regime provided by LIAB is highly problematic and full of inconsistencies and contradictions, and it has never been applied.³⁴ Even stretching the meaning of “damage caused by space object” and ignoring the colliding general *ratio*, it is inconvenient to extend such a problematical and, until now, purely theoretical legal regime to a new and promising space application.

4) Current potential tools

As highlighted above, neither international air law nor international space law provide a satisfying solution to GNSS liability issues. The only legal instruments available to an airline suffering damage because of a signal malfunctioning, then, are national tort laws, applicable according to the rules of private international law.³⁵ This may cause a disparity treatment between victims, depending upon the rules set by different national laws on the various aspects of damage restoration, and a subsequent situation of legal uncertainty.³⁶ Due to the lack of a contractual link between the user and the provider, national contract laws here cannot be considered useful.

Furthermore, GNSS services are currently provided by States, which are sovereign entities, in a non-commercial shape, as a non-remunerated act of generosity towards the global community. The provision of the signal then seems to fall in the category of *acta iure imperii*.³⁷

This particular category encompasses acts, which can be performed only by States and their servants, and is protected by sovereign immunity from civil claims.³⁸

³⁴ For an overview of some of the main inconsistencies presented by the LIAB, see KERREST, *Liability for Damage Caused by Space Activities, in Space Law: Current Problems and Perspectives for Future Regulation*, Eleven International Publishing, 2005.

³⁵ For an overview of the problematic application of private international law, see MAGNUS, *The Present State of TPL in Satellite Navigation and Its Shortcomings*, in ESPI Report 19, July 2009, “Policy Aspects of Third Party Liability in Satellite Navigation” p. 12-17.

³⁶ A clear example in this sense may be the different attitude towards the compensability of the indirect damages. MASUTTI, *GNSS: The Basic Principles for a European Legal Framework on TPL* in ESPI Report 19, July 2009, “Policy Aspects of Third Party Liability in Satellite Navigation”, p. 33.

³⁷ This category has to be read in opposition to *acta iure gestionis*, that are acts performed by States in then same fashion and on the same footing as private persons, for example in the subscription of commercial contracts. In this case, no immunity can be invoked for civil claims.

³⁸ For an overview of current international immunity rules, see *Convention on the Jurisdictional Immunities of States and their Properties*, codified by the International Law Commission and adopted by the UN General Assembly on 2 December 2004, A/Res/58/74.

States providing GNSS service, then, are entitled to invoke sovereign immunity to protect themselves and their servants from claims arising from an air accident caused by a signal failure, leaving again, in this way, the airline without any useful mean to seek compensation.

The situation might be slightly different with regard to GPS and the United States as signal provider, as US domestic law is applicable pursuant to the US conflict of laws rules.

Under the Federal Tort Claims Act (FTCA), the United States Government has waived immunity for claims for money damages where the loss is caused by the negligent or wrongful act or omission of a government employee acting within the scope of its office.³⁹ According to the general principle provided by this statute, then, a private person seems to be able to sue the US Government in a Federal Court for a damage arising from a GPS signal failure caused by negligence or wrongfulness.

The FTCA, on the other hand, contains two main exceptions to this waiver that may prevent a private person to successfully conclude his claim: the “foreign country exception” and the “discretionary function exception”.

The first one concerns the jurisdictional applicability of the statute, and states that the FTCA is not applicable to any claim arising in a foreign country.⁴⁰ Since the GPS has a global coverage, it is likely that a signal failure would affect a non-US citizen, using GPS service outside the United States. As a consequence, the damage would arise outside the US territory, and according to the wording of the article it appears that in this case FTCA would not apply and therefore the United States would be immune from suits.

The broad formulation of the text, anyway, may bring some uncertainty. What is the precise meaning of the expression “the claim arises in a foreign country”? As a direct case law on GPS accidents does not exist yet, we have to look at the general jurisprudence concerning FTCA. US courts have focused on the place where the negligent act occurred, rather than on the location where the harmful effects took place.⁴¹ A failure caused by a negligent data upload at the MCS in Colorado⁴², then, would make the exception not available and therefore the FTCA applicable, allowing a private to successfully sue his claim, even though the damage event took place somewhere else beyond US borders. This, unless the court held the negligent act leading to the damage as arising in outer space instead of in Colorado.⁴³ In such a case, the 1993 *Smith v. United States* case would complicate the situation, as the Supreme Court, in its decision, held that Antarctica is a foreign country within the scope of FTCA, even though it has no recognized government.⁴⁴ According to this interpretation, the substantial parallelism of the legal regime of outer space with the one regulating

³⁹ 28 U.S.C. §§ 2671-2680.

⁴⁰ 28 U.S.C. § 2680 (k).

⁴¹ See *United States v. Spelar*, 338 U.S. 221-22 (1949); *Richards v. United States*, 369 U.S. 10 (1962); *Paris Air Crash of March 3, 1974, In re*, F. Supp. 749; *Sami V. United States*, 617 F.2d, 762.

⁴² The Operational Control Segment consists of the Master Control Station (MCS), located at Schriber Air Force Base in Colorado Springs, Colorado.

⁴³ EHRHART, *A Technological Dream Turned Legal Nightmare: potential Liability of the United States under the Federal Claims Tort Act for Operating the Global Positioning System*, 33 Vand. J. Transnat'l L. 371 2000, p. 390.

⁴⁴ See *Smith v. United States*, 507 U.S. 204-205.

Antarctica⁴⁵ may lead to the applicability of the “foreign country exception” and bar a sue for a GPS-caused accident.

It seems unlikely that a court would deem the outer space as the place in which the negligent act occurred, as the human operators work on the ground. Nevertheless, this possibility – although theoretical – obfuscates the full confidence in the non-applicability of this exception.

The second main provision that may jeopardize a private claim is the “discretionary function exception”, according to which the FTCA does not apply to acts based upon the exercise or performance or the failure to exercise or perform a discretionary function or duty on the part of a federal agency or an employee of the Government, whether or not the discretion involved be abused.⁴⁶ That is the most litigated provision of the FTCA, with a fifty-years history of contradictory and complicated jurisprudence.⁴⁷

The US Supreme Court, assessing the applicability of this exception, has elaborated the so-called “Berkovitz test”.⁴⁸ It consists in two tiers: first, the judge must determine if the government employee has the ability to exercise discretion in performing his duty.⁴⁹ If this condition is satisfied, the second prong requires the judge to determine whether the discretion was of the kind that Congress intended to protect, that is, a decision involving broad policy judgement and grounded in social, economic, and political policy.⁵⁰ The exposure of GPS to civil liability may imply a disclosure of its technical aspects, and a consequent impairment of U.S. military security. The military nature of the system and its implications, therefore, may lead the Court to classify the GPS signal providing as a “unique government function”, which is a fundamental element of the second prong of the Berkovitz test, and consequently to deem the discretionary function exception applicable.⁵¹

The absence of a case law directly related to GPS signal, the technical complexity of the subject, and the military need for secrecy make any conjecture concerning the applicability of the discretionary function exception to GPS signal providing purely speculative. An airline wishing to rely on the FTCA to seek compensation from the US government, in conclusion, would face a situation of legal uncertainty, and would bear the risk to spend a large amount of money and time remaining in the end with empty pockets.

5) Perspectives for the future – regional regulation in the EU

The lack of satisfying legal instruments restates the need of an international convention, able to take in account the interest of all the stakeholders of GNSS

⁴⁵ See Art. IV, The Antarctic Treaty, 1959 and Art. II, OST.

⁴⁶ 28 U.S.C. § 2680 (a).

⁴⁷ EHRHART, supra note 43, p. 414.

⁴⁸ The “two-pronged Berkovitz test” was firstly delineated by the Court in *United States v. Varig*, but further elaboration was made in *Berkovitz v. United States* and *United States v. Gaubert*. Consequently, there is no uniformity in the doctrine as concerns the name of the test. See EHRHART, supra note 43, p. 416, note 323.

⁴⁹ See *Berkovitz v. United States*, 486 U.S. 536 (1988).

⁵⁰ See *Berkovitz*, 486 U.S. 536-37; *United States v. Gaubert*, 499 U.S. 335 (1991); *United States v. Varig Airlines*, 467 U.S. 814 (1984).

⁵¹ See EHRHART, supra note 43, p. 419-423.

services. The comprehensive panorama that this convention should deal with, on the other hand, is affected by an impressive heterogeneity of factors that undermine the close achievability of this goal.

Thanks to the upcoming operability of Galileo the nature of the service providers will soon be differentiated: on one side there will be States, operating the system under military control and entitled, from a legal point of view, to rely on the sovereign immunity defence. On the other side there will be a civilian system, operated by a private entity and exposed to the ordinary civil liability.

The nature of the service will be different as well. Non-commercial services, made available free of charge without contractual relation as act of sovereign prerogative, facing a multi-service system, centred on the CS (Commercial Service)⁵², and delivered in a contractual form with the main purpose to generate revenues. It is evident that the policy and the interests behind these different systems are largely discordant, especially from the liability point of view. While Russia and US consider the immunity as the natural counter-weight to the gratuitous character of the service, the Galileo provider would face the need to guarantee the reliability of its commercial service, even in case of an accident, in order to make it competitive in respect to the other providers.⁵³

The last heterogeneous factor is the intrinsic multimodality of the application. GNSS is far from being utilised only in civil aviation. To take into account only the means of transport involving a transnational element, it will perform a key role in maritime transportation, rail transportation, road transportation, and in a not-too-far future, most likely, space transportation. Each of them has its own legal instruments, which regulate liability with different structures, scope and effects, not foreseeing GNSS as a potential cause of accident.⁵⁴ The effort to build up a comprehensive international convention on GNSS liability, capable to deal with all these regimes and fully harmonised with each of them, is clearly a real challenge.⁵⁵

All of these factors, on the whole, have contributed to affect the ICAO decennial effort in this sense. At the present time a global, comprehensive convention regulating all GNSS legal aspects seems very far from being realised.⁵⁶

A more regulated environment is likely to take place in a regional rather than global context with particular regard to Galileo, mainly because of its commercial

⁵² Galileo will deploy a differentiated range of services. The Open Service (OS) will be free of charge and available to anyone with appropriate mass-market equipment. It shall provide position and timing performance comparable to other GNSS systems. The Safety of Life Service (SoL) is another kind of open service for application where precision is essential, and provides early warnings when it fails to meet certain margins of accuracy. The Commercial Service (CS) is a high precision service for which users will be charged with fees. The Public regulated Service (PRS), mostly for government use, will ensure Continuous availability even if other services are disabled in time of crisis. Last, the Search and Rescue Service (SAR) will broadcast the alert messages received from distress emitting beacons. MANZINI, MASUTTI, *An International Civil Liability regime for the Galileo Service: A Proposal*, air and Space Law, Vol. XXXIII/2, 2008, p. 114.

⁵³ KAUL, *supra* note 11, p. 431.

⁵⁴ CARBONE, DE MAESTRI, *The Rationale for an International Navigation Convention on TPL in Satellite Navigation*, in ESPI Report 19, July 2009, "Policy Aspects of Third Party Liability in Satellite Navigation", p. 21-22.

⁵⁵ VON DER DUNK, *The European Equation: GNSS = Multimodality + Liability*, *Haftungsrecht Im Dritten Millennium – Liability in the Third Millennium*, 2009, p. 232.

⁵⁶ For a comprehensive overview of the issues related with the adoption of an international convention, see CARBONE, DE MAESTRI, *supra* note 54, p. 24-29.

nature. As highlighted above, the need for a legal framework is much stronger in this case, as the potential users would choose Galileo costly services only upon condition of legal certainty for compensation in case of damages.

The actual framework is constituted by Regulation (EC) No. 683/2008 “On the further implementation of the European satellite navigation programmes (EGNOS and Galileo)”. Whereas it provides the basic principles for the governance of the system, no explicit provision regarding civil liability is established; a further regulation is therefore necessary in order to make the Galileo services commercially viable for future potential users.⁵⁷

Bearing in mind the differentiated kinds of future Galileo services, it is possible to make some consideration about the instrument to be used.⁵⁸

The users relying on the CS (Commercial Service) would be bound to the signal provider by a contract. Therefore, liability would be regulated by contractual provisions, ensuring an adequate level of flexibility according to the case-by-case specific legal and economical needs. To guarantee a minimal level of uniformity, reference can be made to the “Contractual Framework” developed by ECAC-Eurocontrol and presented to ICAO General Assembly in 2004.⁵⁹ It provides a non-binding model contractual chain, with the aim to cover the relationships among different players in various stages of GNSS services, channelling the final liability upon the system operator through a system of contractual recourses.⁶⁰

The necessity of a binding legal instrument arises mainly for non-contractual liability, which would involve two categories of subjects: the users exploiting the OS (Open Service), whose position may be compared with GPS and GLONASS current users, and the innocent third parties.⁶¹ The nature of this instrument is still unclear, although the EU is putting this subject on the agenda. In the absence of a concrete chance to stipulate a multilateral convention, the most reliable tool seems to be a EU Regulation. In case of GNSS-caused accident, it should be made applicable in a subsidiary way in respect to the existing international conventions, with the aim not to overlap, but to fulfil the gaps in their liability provisions and channel the final burden of the damages upon the legally liable entity.⁶² In this way the victims, staring at the high complexity of Galileo organisational framework, would be able to find immediately the suable body, which should coincide with the system operator.⁶³ The limited territorial scope

⁵⁷MASUTTI, *GNSS: The Basic Principles for a European Legal Framework on TPL*, supra note 36, p. 32.

⁵⁸ See supra, note 52.

⁵⁹ Although recognised by ICAO in Assembly Resolution A35-3 “A Practical Way Forward on legal and Institutional Aspects of Communication, navigation, Surveillance/Air Traffic Management (CSM/ATM) Systems” in 2004 (see ICAO docs. A35-WP/75; A35-WP/125), the “Contractual Framework” has been later considered by the General Assembly an exclusive responsibility of ECAC States and no more a task of ICAO. The downgrading of its priority from 1 to 3 means that ICAO has substantially given up this project. BOLLWEG, *GNSS Liability by International or European Union Law?*, *Zeitschrift für Luft und Weltraumrecht – German Journal of Air and Space Law*, 2010, p. 551-552.

⁶⁰ For a critical view of the Framework Agreement, and for its feasibility as a mere “ad interim solution”, see CARBONE, DE MAESTRI, supra note 54, p. 23-24.

⁶¹ The treatment of these two categories should be differentiated, as OS users would benefit from Galileo application, while third parties would be regarded as “innocent victims”.

⁶² BOLLWEG, supra note 59, p. 557.

⁶³ There are already international instruments dealing with potentially catastrophic incidents, such as the 1963 Convention on Civil Liability for Nuclear Damage, the 1971 International

of a EU Regulation, finally, may be enhanced by the stipulation of bilateral agreements with single States interested in exploiting Galileo services and in implementing its own legal framework, instead of relying on national tort laws.⁶⁴

Conclusions

In dealing with GNSS liability, it is pointless to limit the scope of the analysis to one single economical – and legal – field of application, such as international air transport, especially with reference to the perspectives for the future. The intrinsic multimodality of this technology forces the commentator to enlarge his view, and take in account that any upcoming regime shall adopt a harmonised approach towards a large number of factors and applications.

Despite this, it is possible to make some concluding remarks maintaining a special attention to aviation.

The current GNSS legal framework is clearly inadequate. A private entity, in our case an airline, wishing to seek compensation from a provider, would find a situation of a fundamental legal uncertainty, and would be discouraged by the likely perspective of seeing its claim barred by the sovereign immunity defence. Despite this, the system on the whole works all the same, and this legal uncertainty at the present time does not seem to threaten the spread of GNSS applications.

In the near future, the global scene is probably doomed to an enduring legal fragmentation. While the US and Russia are interested in maintaining a substantial legal vacuum in order to avoid to deal directly and openly with the issue of liability, the EU is expected to enforce a legal framework for Galileo and its commercial and non-commercial services, in the most likely shape of a combination of non-binding contractual framework, Regulation and bilateral agreements. ICAO's role, for the moment, seems irremediable set aside.

On the long run, a comprehensive international convention is surely desirable, but its achievement strongly depends on the US and Russia political will. As long as their State duopoly is in force, a significant change of the actual conditions can be hardly imagined. The forthcoming competition of Galileo and further GNSS systems like the Chinese Beidou-2/Compass, and even more the introduction of a business-related logic, could potentially unblock the situation, and bring to a general trend of commercialisation and a subsequent need for a harmonised global regulation. The trigger of this phenomenon will be largely influenced by the success of Galileo, whose extent, in the actual conditions, is very hard to predict.

Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage and the 1967 Convention on Supplementary Compensation for Nuclear Damage, that could serve as a model for the principles to be encompassed in the new instrument. Those principles should include but be not limited to: the definition of the eligible damages; a channelling liability system; a strict liability regime accompanied with compensation limits; a compulsory insurance for the third party-risk; a supplementary compensation mechanism; a provision for the right of recourse. For a detailed analysis, see MASUTTI, *supra* note 36, p. 34-40.

⁶⁴ BOLLWEG, *supra* note 59, p. 554.

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