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LIABILITY OF AIR TRAFFIC SERVICES PROVIDERS: THE IMPACT OF NEW SYSTEMS AND COMMERCIALIZATION

by

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A thesis submitted to the Faculty of Graduate Studies and Research,
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the degree of Master of Laws.

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ABSTRACT

The liability regime to which air traffic services (ATS) providers are subject is being significantly changed with the implementation of satellite-based technologies as exemplified by the ICAO Communications, Navigation, Surveillance/Air Traffic Management (CNS/ATM) systems, and by the movement from state to corporate provision of services.

These new systems will result in less individual state control than currently exists. With multiple service providers crossing sovereign airspace boundaries, a space-based component and a greater role for pilots in selection of flight profiles, these new systems will create an increasingly complex ATS liability environment.

Statutes governing and limiting the liability of state ATS providers will thus have less relevance than in the past with the withdrawal of the state as provider of ATS and its replacement by corporate service providers. Liability insurance and contractual liability limitation thus assume greater importance.

This thesis examines the impact of these important technological and organizational changes on the legal regime governing ATS provider liability.

Résumé

Le régime de responsabilité auquel sont assujetties les agences de services de la circulation aérienne (SCA) subit de grands changements via la mise-en-service de technologies basées sur l'usage des satellites, tel qu'exemplifié par le système de communication, navigation et surveillance/gestion de trafic aérien (CNS/ATM) de l'OACI, et par le déplacement vers la livraison des SCA par des sociétés commerciales plutôt que des états.

Ces nouveaux systèmes résulteront en une réduction du contrôle étatique. Avec de multiples fournisseurs des services traversant des frontières d'espace aérien souverain, un élément spatial, et aussi un rôle augmenté pour les pilotes en sélectionnant leurs propres profils de vol, ces nouveaux systèmes vont créer un environnement de responsabilité d'une complexité croissante.

Les lois gouvernant et limitant la responsabilité des fournisseurs étatiques des SCA auront moins de pertinence qu'auparavant avec le retrait de l'état comme fournisseur des SCA et son remplacement par des fournisseurs commerciaux. Les assurances-responsabilité et les restrictions contractuelles visant à limiter la responsabilité deviendront donc plus importantes.

Cette thèse examine l'impact de ces changements technologiques et des modifications organisationnelles sur le régime gouvernant la responsabilité des agences de SCA.

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Rare is the academic work that is not founded to a large part in the contributions of others. This thesis is no exception, and without the assistance and support of the following people, it would not have been written at all.

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ABBREVIATIONS

AAC	Aeronautical Administrative Communications
ACAS	Airborne Collision Avoidance Systems
ACNZ	Airways Corporation of New Zealand
ADS	Automatic Dependent Surveillance
AFTN	Aeronautical Fixed Telecommunications Network
AMSS	Aeronautical Mobile Satellite Service
AOC	Aeronautical Operational Control
APC	Aeronautical Passenger Communications
ARINC	Aeronautical Radio Inc.
ASECNA	Agence pour la Sécurité de la Navigation Aérienne en Afrique et à Madagascar
ATC	Air Traffic Control
ATCPM	Air Traffic Control Procedures Manual
ATN	Aeronautical Telecommunications Network
ATS	Air Traffic Services
CAA	Civil Aeronautics Authority
CNS/ATM	Communications Navigation Surveillance/ Air Traffic Management
COCESNA	Corporacion Centroamericana de Servicios de Navigacion Aerea
COPUOS	United Nations Committee on the Peaceful Uses of Outer Space
DFS	Deutsche Flugsicherung GmbH

EUROCONTROL	European Organization for the Safety of Air Navigation
FAA	Federal Aviation Administration
FANS	Future Air Navigation Systems
FIR	Flight Information Region
FTCA	Federal Tort Claims Act
GLONASS	Global Orbiting Navigation Satellite System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HF	High Frequency (radio)
IATA	International Air Transport Association
ICAN	International Commission for Air Navigation
ICAO	International Civil Aviation Organization
IFATCA	International Federation of Air Traffic Controllers' Associations
IFR	Instrument Flight Rules
INMARSAT	International Maritime Satellite Organization
INS	Inertial Navigation System
LADGPS	Local-area Differential Global Positioning System
MANOPS	Air Traffic Control Manual of Operations
PFI	Private Finance Initiative
SITA	Société Internationale des Télécommunications Aéronautiques

SSR	Secondary Surveillance Radar
UK NATS	United Kingdom National Air Traffic Services
VFR	Visual Flight Rules
VHF	Very High Frequency (radio)
WAAS	Wide-area Augmentation Systems
WADGPS	Wide-area Differential Global Positioning System

Introduction

Within the next decade, two forces will act to greatly change the liability regime to which providers of air traffic services are subject. These forces are (i) the implementation of satellite-based global aeronautical communications, navigation, and surveillance systems as exemplified by the International Civil Aviation Organization's Communications Navigation Surveillance /Air Traffic Management systems and (ii) the movement away from state provided air traffic services to provision of such services by non-governmental corporations. Both of these developments herald significant changes in the current regime of national public law which governs the liability of providers of air traffic services. One of the principal changes will be a new focus on the private law aspects of liability of providers of air traffic services.

While a great deal has been written about the institutional and administrative law aspects of the new satellite communications, navigation and surveillance systems, the question of liability with regard to this new international cooperative endeavour has not been dealt with in any great detail. Many functions which were previously the responsibility of individual states will now be provided by an overlapping system involving multiple providers of various services.

The focus of this thesis is the impact of new technology and commercialization on the liability of providers of air traffic services. Much of what has been written in the past has been in relation to the liability of air traffic control agencies. Air traffic control is functionally more narrow than air traffic services, the latter including air traffic control, air traffic flow management, flight information service, alerting service, and air traffic advisory service. Air traffic control service by contrast is concerned with preventing collisions between (i) aircraft in flight and (ii) between aircraft on the ground, as well as "expediting and

maintaining an orderly flow of air traffic."[1]

Due to the functionally more inclusive nature of air traffic services, the new CNS/ATM systems which have an impact on more than air traffic control, and the fact that many providers of air traffic control are also providers of broader air traffic services, this thesis focuses on this broader category of services.

The technologies to be employed in the eventual global CNS/ATM systems present a number of aspects which could have an impact upon issues of liability. Navigation satellite systems may be state owned military satellites, as at present, whose signals are augmented in an airport terminal control area by a government or private corporation. In future, such signals may also be provided by private service providers such as the INMARSAT consortium. Communications between aircraft and the ground will occur via privately owned aeronautical mobile satellite systems, with the current widely used system of state-provided high frequency radio (HF) facilities being gradually withdrawn in many areas. Liability questions arise with regard to issues such as equipment failure and signal integrity.

The role of individual pilots in selecting the operating profile of their aircraft will be greatly enhanced by such systems, redefining the relationship between pilot and air traffic controller. This changed relationship will in turn have an impact on the outcome of air traffic services liability litigation.

The driving force behind the move to satellite-based aeronautical communications, navigation and surveillance systems has been that of efficiency, increased efficiency in the management of air traffic and efficiency gains to air carriers and general aviation. While the International Civil Aviation Organization[2] has found no substantive legal impediments to the implementation of these new

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1 International Civil Aviation Organization, *International Standards and recommended Practices: Air Traffic Services: Annex 11 to the International Convention on Civil Aviation*, 10th edition (Montreal, International Civil Aviation Organization, July 1994), at 2.

2 Hereinafter, ICAO.

systems, it has not made any detailed study of its liability implications.[3]

At present, air traffic services are provided in most states by government agencies. The number of states which have established independent corporations to provide such services is, however, growing.[4] As service providers have traditionally been governments, liability for negligence of air traffic controllers and providers of air traffic services has been governed by statutes covering state liability.

These statutes have either prohibited action on the basis of sovereign immunity or placed limitations upon negligence actions. Examples of the latter are the *Federal Tort Claims Act*[5] (FTCA) in the United States and the *Crown Liability Act* in Canada. The effect of corporatization would be to remove air traffic services from the ambit of such statutes and the protection to the service provider which they provide. In the case of the United States, the FTCA prohibits jury trials and provides certain exceptions from liability which do not exist in private law.

The effect of such a change would be to subject such providers to the greater tort liability that exists under private law. Issues of private liability insurance and regulatory standards would assume greater importance, both for service providers and potential plaintiffs.

Exploration began in 1962 in the Legal Committee of ICAO with regard to

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3 The issue of liability of service providers and of ATC agencies is mentioned in passing by Dr. Werner Guldimann in his Report to the Legal Committee of ICAO, "The Legal and Institutional Aspects of Futrure Air Navigation Systems (FANS)" of October 1991. Dr. Guldimann notes a multiplicity of issues such as applicable law, limitation of liability, parties liable and the role of insurance. He also notes the considerable difficulty of covering any of these issues in a multilateral convention, concluding that national law will govern this area for some time to come and that the best route to uniformity may lie in model ATC liability legislation. For the full text of the Report, see: Werner Guldimann and Stefan Kaiser. Future Air Navigation Systems: Legal and Institutional Aspects. (Dordrecht, The Netherlands: Martinus Nijhoff, 1993).

4 Among those countries which have already established independent corporations to provide such services are: Australia, Austria, Germany, Ireland, Latvia, New Zealand, Portugal, South Africa, Switzerland,Thailand, and Ukraine. Corporatization is to occur in the United States, Canada, the United Kingdom, and the Czech and Slovak Republics.

5 Federal Tort Claims Act, 28 U.S.C.S. par. 2674 (1990)

an international convention concerning the liability of air traffic control agencies. This proposal has languished in the Legal Committee ever since. Dissatisfaction with the experience of the Warsaw Convention, and a perception on the part of states that a convention regarding liability and its limitation is not a pressing matter, have led to this inaction. However, it remains as part of the Legal Committee's Work Programme. Most recently, at the 29th session of the Legal Committee (July 4-15, 1994) it was recommended that an examination be made of integrating the CNS/ATM systems within the framework of an international convention on air traffic control liability.[6]

It is understandable that concerns regarding transnational and complex systems such as CNS/ATM would lead to a desire to include it within the ambit of any international ATC liability convention. The complexity of the communications, navigation and surveillance systems, coupled with national and regional air traffic services providers makes liability, as noted earlier, an important question. A myriad of potential defendants exists in an air traffic services negligence action, in which issues of private and public law would be intermingled. This very complexity, however, should provide a warning to the international aviation community that any attempt at an all encompassing liability convention would be bound to fail in light of past experience in attempting to unify the law in a more simple liability environment. Attempts at creating model national laws or regional unification of law regarding liability of providers of air traffic services would only be half implementations of a flawed concept. Attention should rather be directed to contractual provisions and insurance.

This thesis will present these issues in four chapters. The first will be an overview of the nature of air traffic services and the law relating to the liability of providers of air traffic services. The second chapter will discuss the ICAO CNS/ATM systems and their specific liability issues. The third chapter will examine the trend toward corporatized air traffic services and its impact upon the

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[6] ICAO Legal Committee, Report of 29th Session of the Legal Committee, (4-15 July 1994) at 7-2. ICAO Doc. 9630-LC/189

manner in which liability of such service providers has been governed in the past. The fourth and concluding chapter will synthesize the liability issues raised in the preceding chapters and will examine the movement away from public law to private law treatment of air traffic services provider liability. This chapter will also argue in favour of abandonment of attempts to unify the law by means of an international convention and will advocate that, in light of the increasingly complex relationships between service providers, the regulation of liability should be left to contract and that the role of private insurers should be increased.

1. Liability of Air Traffic Services Providers

1.1 The Development of Air Traffic Control/Air Traffic Services

In far less than a century, mankind has seen a progression from the under sixty second flight of the Wright brothers' heavier than air aircraft to the supersonic Anglo-French Concorde. Non-stop transoceanic flight is no more an adventure or feat but is merely a fact of life for the shipper or traveller. The history of aviation has been the history of technologies and applications which have advanced both steadily and by quantitative leaps. The utilization of air transport has increased exponentially as well, to the point where 1.02 billion passengers used scheduled air carriers in 1994.[7] It is a given that air travel is now the safest mode of transport in existence. Much of this high level of safety has been due to the increase in sophistication and design of the aircraft themselves. A substantial part, however, has been due to the development of safety related procedures, most specifically among them that of air traffic control.

In the same way that civil air transport as we know it developed over time, so has air traffic control. Today's system of controlled airspace; terminal, en-route, and oceanic did not emerge, like the mythical Apollo, as a mature and fully formed adult. Rather, it progressed from the use of bonfires and lighted beacons at aerodromes, to a system employing radio contact between pilots and those on the ground directing the movement of aircraft in the aerodrome's vicinity, and after the Second World War, to a system employing both radar and direct radio communications between controller and pilot.

While air traffic control as it is currently understood has its roots in the late 1920s, and the development of national systems from the 1930s, the basis for air

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[7] This figure excludes those passengers carried by charter air carriers, which would in turn add several million additional passengers. At any given moment the world's airspace may see as many as 10,000 aircraft in flight from any of up to 40,000 civil airports. Source: International Civil Aviation Organization, International Civil Aviation Organization: 50 Years Global Celebrations 1944-1994. (London:International Systems and Communications Ltd., 1994) at 15.

traffic control has been posited to go back as far as the rules promulgated by the International Commission for Air Navigation (ICAN or, "CINA" in its French form) in its "General Rules for Air Traffic".[8] While the Convention focused primarily on European States, it was in the United States where the most significant developments would take place with regard to air traffic control, from which most other countries would take their inspiration[9].

Gilbert notes that the United States, while not an ICAN Convention signatory, generally followed ICAN rules when it began to establish a "Federal Airways System" in 1926-27 with "a network of radio beacons and later a similar network of four-course low frequency radio ranges were laid out to connect principal cities in the United States".[10]

He further notes that two-way radio communication between aircraft and the ground was essentially non-existent prior to 1930, but had become common by 1932. In the period 1930 to 1935, the United States went from having one radio-equipped control tower to twenty.[11] Airways, essentially fixed routes or "aerial highways", were becoming more tightly controlled, subject to greater involvement by ground-based controllers during the late 1930s. These airways were established using radio beacons for navigation. By 1936 the United States government began to assume the operation of existing airway traffic control centres, but actual control at aerodromes remained in the hands of local authorities.[12] Uniformity was thus lacking. This situation was soon to be remedied with the U.S. *Civil Aeronautics*

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8 Glen A. Gilbert. Air Traffic Control: The Uncrowded Sky (Smithsonian Institute Press: Washington, D.C., 1973) at 8.

9 It should also be noted that the United States has also been the jurisdiction with the most developed jurisprudence relating to the liability of air traffic control/air traffic services agencies. This is due largely to the immense general aviation sector in the United States as well as its more litigious culture.

10 Ibid. at 8.

11 Ibid. at 8.

12 Ibid. at 9.

Act of 1938 which established a regulatory code, the Civil Air Regulations (CARs), and which also established a new federal supervisory agency, "the Civil Aeronautics Authority (CAA) which included the Airway Traffic Control Service".[13] This agency was succeeded by the Federal Aviation Agency (FAA) created by the Federal Aeronautics Act of 1958.[14] While federal licensing applied to local tower controllers, they were not federal employees. This would change during the Second World War, when in an attempt to rationalize the system for wartime needs, the CAA created "a coordinated system operation including both airway traffic centers and airport control towers, and the United States' "Air Traffic Control [ATC] Service" came into being."[15] This process of consolidation of air traffic control from a local service to a national one, provided by a national organization, followed on similar lines in all countries.[16]

The Second World War would have a tremendous impact upon the development of civil aviation, with its primary impact in the domain of technology. The development of radar provided an independent means of determining aircraft position which enabled navigation to be made more precise and possible in all weather conditions. Radar was introduced in the United States for en-route control in 1946 and in 1958 in Canada.[17] Today, radar is also used in terminal area control.

The jet engine, developed late in the war, and first used in military aircraft, was to enter service in civilian passenger aircraft with the introduction of

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13 Ibid. at 10.

14 Ibid. at 10. The current Federal Aviation Administration was created in 1967, maintaining the same responsibilities as its predecessor.

15 Ibid. at 11.

16 Even in a federal state such as Australia where constitutional authority for aviation would lie with the individual component subnational governments, administrative arrangements are frequently made to delegate such authority to the central government. The operational requirements of ATS would effectively dictate that this be done.

17 Hélène Sasseville. The Liability of Air Traffic Control Agencies. (LL.M. Thesis, McGill University, 1985) [unpublished] at 3.

the de Havilland Comet and later the Boeing 707 in the late 1950s. This major change, from slower propeller-driven aircraft to faster jet aircraft, and the tremendous expansion of the world's civil air fleet in the years following their introduction, created further complexities and challenges for air traffic control. The simpler early era of relatively slow propeller driven aircraft following visual flight rules (VFR) ended with the increased speed and sophistication of these aircraft themselves, as well as jet aircraft, following instrument flight rules (IFR)[18]. The separation of aircraft, which could be dealt with by pilots on the basis of the "see and avoid rule" when aircraft were slower and propeller-driven, took on a much greater importance with jets. Due to the speed at which these aircraft moved separation minima on airways became a matter of several miles.

Thus, the importance of the air traffic controller grew with the now dominant IFR aircraft, the increased speed of aircraft, and the increased number of aircraft (to the extent where the number of aircraft movements in the U.S. alone is measured annually in the tens of millions).

The other great legacy of the Second World War in the field of civil aviation was the drafting of the Chicago Convention[19] in December of 1944. The Chicago Convention created the International Civil Aviation Organization (ICAO) and established the framework for the governance of international civil aviation. Article 1 recognizes state supremacy in international law by stating that "every State has complete and exclusive sovereignty over the airspace above its territory".

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[18] See Seti K. Hammalian. "Liability of the United States Government in Cases of Air Traffic Controller Negligence." (1985) 11 Annals of Air and Space Law, 55 at 58, who notes that VFR are safety rules which require that pilots may only fly within certain weather conditions that allow them to be able to see other air traffic, hence the concept of "see and be seen". He states that IFR differ in that they:

> ...allow planes to fly at practically any altitude and under practically all types of weather conditions, including times when visibility is nil. Aviators need controllers most when flying under IFR, because only a controller's directives, gathered from radar, will prevent two planes from unknowingly flying into each other in cloudy weather.

[19] Convention on International Civil Aviation Signed at Chicago, on 7 December 1944. ICAO Doc. 7300/6 (1980). Hereinafter, Chicago Convention.

Under Article 28 of the Chicago Convention, Contracting States undertake to provide in their territories the necessary services and facilities to facilitate international air transport in accordance with standards and practices recommended under the Convention. They also undertake to adopt and use standard systems of communication and signals. The adoption of international standards and procedures flows from Article 37 of the Convention which states that each contracting State undertakes to collaborate in securing "the highest practicable degree of uniformity" in regulations, standards, and procedures relating to air navigation. Article 37 further states that "[T]o this end the International Civil Aviation Organization shall adopt and amend from time to time, as may be necessary, international standards and recommended practices..." These Standards and Recommended Practices, known as "SARPS" are found within various Annexes to the Chicago Convention.

Those SARPS concerning Air Traffic Services are found within Annex 11 and are largely incorporated in whole in national regulations and procedures manuals used by air traffic services providers. Such procedural manuals, (in the United States the Air Traffic Control Procedures Manual [ATCPM] and in Canada, the Air Traffic Control Manual of Operations [MANOPS]) are often relied upon by courts in establishing the appropriate standard of care in negligence cases.[20]

In the introduction to this thesis, a distinction was made between air traffic control (ATC) and air traffic services (ATS). Annex 11 defines "air traffic control service" as follows:

> A service provided for the purpose of:
>
> (a) preventing collisions:
>
> (1) between aircraft, and
> (2) on the manoeuvring area between aircraft and obstructions; and
>
> (b) expediting and maintaining an orderly flow of traffic.

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[20] For a full discussion of this use of procedural manuals and their role in negligence litigation, see Kevin N. Courtois, ""Standards and Practices": The Judiciary's Role in Promoting Safety in the Air Traffic Control System", (1990) 55 J. of Air Law and Com., 1117.

"Air traffic service" is defined in the following manner:

> A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).

Those services described in the second definition are almost invariably provided by the same agency that provides air traffic control services.[21] It is thus more accurate to speak of the liability of air traffic services providers than of air traffic control agencies. This is of note, in that negligence can occur in the provision of meteorological and other information by those tasked with providing flight information service.

The technology used in the provision of ATS is about to take a quantum leap into an era of satellite-based systems. In order to understand the move to such systems, it is necessary to be aware of the technology that is presently in use and its limitations.

1.2.1 Current ATM Technologies and Their Limitations

Currently the functions of communications, navigation and surveillance are based on radio communications between pilots and controllers on the ground, as well as the use of radar for determining the location of aircraft and the use of radio beacons for navigation. At present the systems in use, outside of specific experimental trials, are all ground-based. Presently, Very High Frequency (VHF) is used for communications between ground and aircraft, but VHF signals are limited to line-of-sight coverage, thus signals are not available over large expanses of oceanic airspace. When VHF is unavailable, High Frequency (HF) radio signals are used. HF, however, does not offer the signal clarity of VHF and is frequently

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[21] ATS can be seen as having four objectives: (i) Prevention of collisions between aircraft both in the air and on the ground, (ii) the maintenance of an "orderly and expeditious" flow of traffic, (iii) provision of advice and information necessary for safe flight, (iv) notification of search and rescue agencies re: need for services and re: aircraft in distress (alerting service). International Air Transport Association. "The Present Air Navigation System" in FANS CNS/ATM Starter Kit: Section 2: Manual, (IATA: Montreal, 1995) at 3..

subject to interruption by atmospheric electromagnetic interference.

Navigation is largely dependant on radio beacons which are not available over all landmasses and which are absent over the oceans. These are supplemented by other long range navigation systems, such as OMEGA, LORAN C or Inertial Navigation Systems (INS).[22] With regard to the surveillance aspect, "primary and secondary radar coverage is provided in continental and coastal areas, and procedural voice reporting is used in oceanic and remote areas."[23] One of the weaknesses of procedural voice reporting is that it is lacking in accuracy, and this lack in accuracy requires wide horizontal separation between aircraft.[24] As oceanic airspace is generally characterized by fixed tracks which aircraft must follow, this large horizontal separation results in an inefficient use of the available airspace, limiting capacity and accentuating congestion penalties. It is this inefficiency in use of airspace, and the need for aircraft to remain on less than optimally efficient fixed routes in oceanic airspace, that created the impetus for the ICAO CNS/ATM concept, with its use of navigation satellites and position reporting via automatic dependent surveillance (ADS).[25]

As noted, the technology currently employed faces serious limitations, the most important of which is the so-called "line of sight problem". Current radar and VHF communications are disrupted by natural barriers such as mountain ranges and the curvature of the earth. Unless the aircraft is directly within the line of sight, ie. with an unobstructed access to radio and radar signals, communication and surveillance is absent. It is this problem which leads to the need for HF radio

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22 Ibid. at 3.

23 Ibid. at 3.

24 In North Atlantic airspace, separation minima for aircraft are 60 nautical miles between tracks laterally and 10 minutes longitudinal separation between aircraft, these minima being established under the Minimum Navigation Performance Specifications..

25 As defined in Annex 11 to the Chicago Convention, ADS is "[A]surveillance technique in which aircraft automatically provide, via a data link, data derived from on-board navigation and position-fixing systems, including aircraft identification, four-dimensional position and additional data as appropriate."Annex 11, Air Traffic Services, 10th ed., July 1994 at 3.

communication, particularly over oceanic airspace and over certain continental airspace, eg. mountainous areas of South America.

Another problem faced with present CNS systems is the fact that they are not implemented on a uniform basis world wide due to their expense. A further limitation is "the lack of digital air-ground data interchange systems in the air and on the ground".[26] The system envisaged by the CNS/ATM concept addresses all of these limitations of the current system. While the second chapter will set out the system components of the CNS/ATM systems, it will be useful at this point to present a brief description of the system.

1.2.2 The New CNS/ATM Systems Concept

In 1983, ICAO formed its first Future Air Navigation System Committee (FANS I), charged with the task of addressing the need for change in the systems used for CNS functions.[27] It was the FANS I committee which developed the satellite-based concept. It issued its report in 1988, showing the concept to be technologically feasible. A second Committee (FANS II) was created to deal with issues of implementation. The concept was approved at ICAO's 10th Air Navigation Conference, held in September of 1991. The overall goal is improved air traffic management, so as to increase utilization of airspace, as well as increasing safety, to meet the increases in air traffic anticipated in the period to 2010.

Satellites will be used for the communications aspect through an aeronautical mobile satellite system, which will be used for both data and voice communications. Aircraft will thus communicate with providers of air traffic services via means of these telecommunications satellites, linked to ground earth

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[26] ICAO. Report of the Tenth Air Navigation Conference, (ICAO: Montreal, 1991) Doc. 9583,AN-Conf/10, at p. 2A-1.

[27] International Civil Aviation Organization. ICAO CNS/ATM Systems Implementation Task Force (CASITAF): Information paper No. 1. (Montreal: ICAO, 1994) at 7.

stations, thus solving the line of sight problem and other propagation problems. This system, using specifically reserved portions of the radio spectrum, would allow continuous updating via data and voice link for "air traffic services, aeronautical control, airline administrative communications and aeronautical passenger communications".[28] It will create a technical uniformity in the air-ground communications system which is currently lacking. The main benefit will be over oceans and remote continental airspace. High density regions will continue to rely on VHF which has served well in such areas.

The Global Navigation Satellite System (GNSS) as envisaged in the CNS/ATM concept involves the use of the U.S. Global Positioning System (GPS) navigational satellites and the Russian GLONASS navigational satellite system. The American system consists of a constellation of twenty-four (twenty-one plus three spares) satellites in a six orbit pattern at an altitude of approximately 20,183 kilometres.[29] The system operates on the concept of "ranging" whereby users on the surface of the earth measures their distance to three of the satellites and thus can calculate their exact position.[30] The Russian GLONASS system, using a constellation of twenty-one satellites (plus three spares) in eleven orbits, at an altitude of 19,100 kilometres operates on the same principle. The accuracy of GPS as available to civil aviation is within 100 metres horizontally with 95% accuracy. GLONASS has similar accuracy.[31] At present, these two military systems are the only two available navigational satellite systems. They have been made available to civil aviation free of charge by their government owners for periods of ten and fifteen years respectively. Signal accuracy and continuous availability of service are both issues which have significant safety and liability aspects.

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28 Ibid. at 15.

29 FANS CNS/ATM Starter Kit: Manual at 22. see also Thompson, Steven D. Everyman's Guide to Satellite Navigation (A GPS Primer). (Interstate Electronics Corporation: Anaheim California, 1994).

30 Ibid. at 28.

31 Op. Cit. at 23.

The importance of these systems lies in their navigation and surveillance capabilities. The navigation information provided by the satellite systems, is of such precision that it will enable pilots on oceanic routes to engage in free flight, ie. establishing a flight profile that does not use the currently mandated fixed tracks through the airspace. It is anticipated by IATA that the fuel savings alone to its member carriers via the efficiencies of the new system would be on the order of 5.2 to 6 billion dollars (U.S.) per annum.[32] The increased accuracy of positioning would allow more aircraft to occupy the airspace through utilization of reduced horizontal separation minima.

This is possible by virtue of the surveillance aspect of the system. Aircraft would automatically transmit their position via Automatic Dependent Surveillance (ADS) whereby the aircraft would relay data to air traffic control centres from on-board navigational equipment, which would be reliant primarily on the GNSS. The AMSS would allow for two-way data communication between aircraft and ATS. Surveillance would also occur via secondary surveillance radar (SSR) in high density areas.

The CNS/ATM systems, constitute a fundamental change in the technologies applied to air traffic management. It brings into play new service providers, with new interrelationships between them and it raises new questions in terms of liability.

It is a given that in aviation the law follows technological developments. In order to understand the potential liability implications of this new system on air traffic services providers, and on new corporate forms of providers, it is first necessary to have an understanding of how the law relating to the liability of ATS providers developed and where it now stands.

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[32] R.I.R. Abeyratne, "The Evolution from FANS to CNS/ATM and Products Liability of Technology Providers in the United States" (1994) 43:2 Zeitschrift fur Luft und Weltraumrecht 157 at 170, note 66.

1.3 Principles of ATC/ATS Liability: An Overview

In the same way that the technology and systems applied to air traffic services evolved over time, so has the law relating to the liability of providers of these services. Historically, as these service providers have been largely states, the law relating to their liability is that of public law relating to claims against the state by its citizens. The regime which applies in both common law and civil law jurisdictions, with regard to claims of negligence on the part of ATS providers, is that of *fault (ie. negligence)*. In a common law negligence action, it is thus necessary for the successful plaintiff to establish that (i) there existed a duty of care owed to them by the service provider, (ii) that there was a breach of that duty of care, and that (iii) the breach of the duty of care was the proximate cause of the damage suffered by the plaintiff. A claim in a civil law jurisdiction, while using slightly different terminology, would nonetheless require that essentially the same elements be present.[33]

The suggestion has been made that, in fact, a regime of strict liability would be more appropriate for services such as ATC due to the increased automation and complexity of the processes, the potentially disastrous impact upon potential plaintiffs, and that strict liability would in fact have a more positive impact upon safety.[34] Due to its relevance to the use of highly automated computerized equipment and with regard to ATS agency use of both the GNSS and the AMSS, this question will be looked at later in this chapter.

As noted, until very recently, the provision of air traffic services was almost exclusively a state function and thus liability was a question of state liability. The

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[33] While the terminology may be different, "delict" as opposed to "tort", the same elements are present in a civil law delictual action as a in a common law tort action in the necessity of (i) wrongdoing, (ii) fault, (iii) causation, and (iv) damage. Wrongdoing generally consists of injuring or damaging the physical integrity of property or persons. The unlawfulness of the action is presumed when such harm results.

[34] Hélène Sasseville. "Air Traffic Control Agencies: Fault Liability vs. Strict Liability" (1985) 10 Ann. Air & Sp. L. 239 at 247.

majority of the world's states still provide ATS as a function of government, however, the increasing creation of free-standing corporate ATS providers shows a change of this view.

The question of ATC/ATS liability as a subject of international law dates back beyond the studies of the Legal Committee of ICAO. In fact, the Comité international technique d'experts juridiques aériens (CITEJA) had in 1928 suggested rules, relating to what would now be considered ATC, in discussions relating "to damage to third parties on the surface and at airports."[35] However the issue was deferred due to limited technical knowledge at the time.[36] It was to be revived as a question of international law worthy of study in the 1960s.

The United States has the most extensive jurisprudence regarding liability of ATC/ATS service providers. U.S. caselaw sets out many of the principles and standards with regard to duty of care and subjects of that duty, which are relied upon in the decisions of foreign courts. As a result, it will be a discussion of American caselaw that will begin our examination of the principles of liability of ATS providers.

1.3.1 United States: Principles, Caselaw and Discussion

Suits Against the U.S. Government: Guiding Principles

The United States, as a common law jurisdiction, inherited the English concept of sovereign immunity, which held that the government is immune from otherwise meritorious suits brought by its citizens. Historically, this immunity from civil liability comes from the maxim that "the king can do no wrong". In order for a citizen to proceed with a civil claim in most common law jurisdictions, it was necessary for the claimant to seek special dispensation or permission from

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35 H.A.Perucchi, International Civil Aviation Organization: Legal Committee, "Report on the Liability of Air Traffic Control Agencies",Buenos Aires, 1985, reprinted in ICAO Legal Committee Working paper LC/29-WP/7-3, 15/3/94 at 2.

36 Ibid. at 2.

the government to proceed with such a claim. In the U.S. a petition to Congress was required.[37] This situation caused severe inequity among claimants.[38]

With the increase of government involvement in the economy in the twentieth century, such immunity from civil claims on the part of government became an impediment to commerce and was seen as an inequity requiring resolution. In the United States, this situation was remedied with the passage by Congress of the Federal Tort Claims Act (FTCA) in 1946.[39] As noted by Prosser and Keaton "[T]his statute gave a general consent of the government to be sued in tort, though it was a consent subject to several particular restrictions".[40] The FTCA does not create new causes of action beyond existing tort law. What it does, however, is hold that in suits against the government, if a tort has occurred, the government shall be liable "...in the same manner and the same extent as a private individual under like circumstances."[41] The applicable law is state law, but the court in which actions are to be brought is the Federal Court, before a judge, *without a jury*.[42]

The FTCA applies to torts caused by acts of the employees of the U.S. government. The FTCA states that an "employee" is "employee of the government

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37 Desbiens at 17.

38 See Indian Towing Co. v. United States 350 U.S. 61 (1955) (U.S.S.C.) at 68, where the United States Supreme Court states:

> The broad and just purpose which the statute was designed to effect was to compensate the victims of negligence in the conduct of governmental activities in circumstances like unto those in which a private person would be liable and not to leave just treatment to caprice and legislative burden of private law.

39 Federal Tort Claims Act, 28 U.S.C.S. Section 1346 and Sections 2671-2680 (1977). By contrast, The British parliament passed the similar Crown Proceedings Act in 1947. Canada's Crown Liability Act dates from 1953.

40 W.L. Prosser, D.B. Dobbs, R.E. Keeton, and G. Gowen. Prosser and Keaton on Torts. 5th ed. (Minnesota: West Publishing, 1984), at 1034.

41 28 U.S.C.S par 2674. (1990).

42 Op. Cit. at 1035.

includes officers and employees of any federal agency... and persons acting on behalf of a federal agency".[43] Those providing air traffic services on behalf of the FAA are clearly "employees" under the FTCA. The employees must be acting within the scope of their employment in order that the government be held liable under the doctrine of *respondeat superior*.[44]

The provision of the FTCA withdrawing immunity states:

> The district courts... shall have exclusive jurisdiction of civil actions on claims against the United States for money damages...for injury or loss of property, or personal injury or death caused by the negligent or wrongful act or omission of any employee of the government while acting within the scope of his office or employment, under circumstances where the United States, if a private person, would be liable to the claimant in accordance with the law of the place where the act or omission occurred.[45]

This provision is noteworthy with regard to the points it raises concerning the operation of the FTCA. It notes the exclusive jurisdiction of the federal district courts, the requirement that the federal employee be acting within the scope of his or her employment, and that it is the law of the place of occurrence of the act or omission, not the place where the damage is suffered, that governs. The phrasing that sets out liability "...under circumstances where the United States, if a private person, would be liable to the claimant..."[46] had, at one point, led the U.S. government to claim that if a service was provided uniquely by government and no comparable services were supplied by private individuals, then the FTCA would not apply to the allegedly negligent act committed by a federal employee providing such a service.

Such a line of defence was readily disposed of by the court in the landmark

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43 Para 2671.

44 W. Turley. Aviation Litigation. (Colorado Springs, Co.: Shepard's/McGraw-Hill, 1986) at 89.

45 28 U.S.C.S. (1990) as cited in Desbiens at 17 note 39.

46 28 U.S.C.S. para 1446(b).

decision of Eastern Airlines v. Union Trust Co. ,[47] in which the court held that air traffic control services, even though exclusively provided by government employees, were indeed an activity in which, if provided privately, liability could accrue. This position was also supported in the ruling of the United States Supreme Court in Indian Towing v. United States .[48] Indian Towing is notable for its elaboration of the "Good Samaritan Doctrine" in stating that it is not absolutely necessary for there to exist a privately provided service identical to the government activity in order for liability to accrue to the U.S government.[49] Briefly, the doctrine can be said to be:

> ...a rule of tort liability that holds that whenever one voluntarily comes to the aid of another and the latter relies upon such an undertaking, there is imposed upon the former a duty of care. There is also liability on a person who negligently renders a service to another when it is clear that the person acting in reliance is in a more disadvantageous position than he was prior to the voluntary undertaking since the undertaking.[50]

The Good Samaritan Doctrine has thus become the basis for actions against the FAA with regard to ATS and other safety-related services it provides to the public.[51] The Good Samaritan Doctrine takes on a particular relevance with regard to the provision of GPS navigational signals to civil aviation users by the United States.

Actions under the FTCA are subject to federal, not state procedural rules and time limitations.[52] The most important aspect of this is that trials are conducted by judge alone. In light of the fact that jury awards in negligence cases tend to be greater than those awards made by judge alone, the removal of ATC/ATS negligence actions

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47 221 F. 2d. 62 (D.C. 1955)

48 350 U.S. 61 (1955).

49 Sasseville at 22.

50 Ibid. at 22.

51 Ibid. at 23.

52 Prosser and Keaton at 1035-36.

from the ambit of the FTCA, by virtue of a corporatization of the FAA 's air traffic services could lead to significantly increased damage awards. The applicability of the law of the state where the negligent behaviour occurred, as opposed to that where the damage occurred has led to judgments that vary according to the locus of the negligent act. This runs counter to the traditional approach to conflict of laws where it is the law of the place of harmful impact that governs.[53] The complexity of ATS operations, in which services are provided in one state and relied upon by pilots overflying a different state, and the existence of differing state laws can lead to considerably varied results. This is particularly of note with regard to the presence or absence of state wrongful death statutes, which impact upon "[P]ersons entitled to bring the action, the extent of recovery, the effect of contributory negligence, admissible heads of damages..."[54] This, in a way, underscores the similar problems which will exist under the CNS/ATM systems, but on a global scale.

The elements of negligence, while they may vary slightly from state to state are essentially as set out in the Restatement (Second) of Torts.[55] There must be a duty of care owed to the plaintiff, a breach of that duty of care, a causal link between that breach of duty and the damages suffered by the plaintiff. The specific content of that duty of care as owed by providers of air traffic services has created an extensive jurisprudence, the scope of which is too vast to be covered in this chapter. However, a review of the most salient points will follow.

The FTCA is as notable for what aspects of governmental activity are exempt from actions as for its removal of broad sovereign immunity. The FTCA establishes several grounds which bar suit.[56] Among them, two are relevant to provision of ATS: (i) the discretionary function exemption, and (ii) misrepresentation. The FTCA in

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53 Sasseville, supra, at 18.

54 Ibid. at 19.

55 Restatement (Second) of Torts, American Law Institute Publishers, section 281 (1965). See Desbiens, note 50 at 20.

56 In total the FTCA sets out (13) such exceptions. See 28 USCS para. 2680 (1990).

paragraph 2680 (a) states that liability shall not be:

> ....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.[57]

One of the most important decisions in terms of its clarification of the scope of this exemption is Dalehite v. United States[58]. The decision holds that the discretionary function exemption goes beyond mere initiation of programs but includes the setting of standards and criteria. It distinguishes between the planning and the operational levels of government activity. Suits for negligence may only arise from negligence at the operational and not the planning level. In the field of air traffic services liability, the decision of Eastern Airlines v. Union Trust Co.[59], is notable. In this case, the United States government attempted to argue that it could not be held liable for an accident resulting from an air traffic controller clearing two aircraft to land at the same time, claiming that the air traffic controller's duties are discretionary in nature. The circuit court of the District of Columbia held that discretion came into play in the decision to build the control tower, as it was a policy decision, "but that tower personnel had no discretion to operate it negligently."[60] This was reaffirmed in Ingham v. Eastern Airlines[61] where the United States Court of Appeals, Second Circuit stated:

> When the government decided to establish and operate an

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57 28 U.S.C.S. para. 2674 (a) (1990).

58 346 U.S. 15 (1953) Dalehite concerned an action brought for damages against the U.S. government resulting from a massive explosion of ammonium nitrate fertilizer that was being loaded onto ships in Texas City, Texas as part of a U.S. government relief program to increase food production in Europe immediately after the second world war. Suits for damages in excess of $200 million were brought against the government, alleging that the government had been negligent regarding the specifications and procedures it established for labelling, handling and shipping this chemically unstable substance.

59 221 F.2d 62.

60 Ibid. at 77.

61 10 Avi. 17,122.

> air traffic control system, that policy decision was an exercise of "discretion" at the planning level, and could not serve as the basis of liability...But once having made that decision, the government's employees were required thereafter to act in a reasonable manner. A failure to do so rendered the government liable for the omission or commission.[62]

Thus, the discretionary exemption will not apply to the duties of an air traffic controller and the defence is only available to the government in a "big picture" sense, i.e. on the level of deciding to build a control tower or to install specific equipment.

The second exemption from applicability of the FTCA with a relevance to ATS is that of misrepresentation. Misrepresentation is understood to be the giving of inaccurate information, either deliberately or negligently. In the context of ATS, this may be either the relaying of inaccurate information regarding weather, or regarding other aircraft in controlled airspace. Misrepresentation can also be present when information is not provided at all.[63]

However, this defence has not been successful with regard to ATS. In Ingham, the court held that:

> Where the gravamen of the complaint is the negligent performance of operational tasks, rather than misrepresentation, the government may not rely upon s. 2680 (h) to absolve itself of liability.[64]

The question when information is omitted or inaccurate information is provided is not merely one of whether there has been misrepresentation but also a question of whether a duty to warn has been negligently performed.[65] The importance of the FTCA in terms of its impact upon ATS negligence litigation, lies in procedural matters. Its

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62 10 Avi. 17,130. As cited in Hamalian at 61.

63 Sasseville. The Liability of Air Traffic Control Agencies, at 29.

64 10 Avi. 17,123 at 17,131.

65 Sasseville at 29. United Air Lines v. Wiener, 335 F.2d. 379 (1964).

impact is considerable, in terms of choice of applicable law in interstate accidents and in its removing such litigation from the state courts.

1.3.2 American Caselaw on Air Traffic Control/Air Traffic Services Liability

The duty of care: to whom is it owed?

In light of the myriad potential victims of an aircraft accident resulting from negligence on the part of a provider of ATS, the duty of care owed by such a provider is not owed to any one particular group. Schubert notes that there can be several classes of potential accident victims and that these would include the actual users of ATC (ie. operators of aircraft) and third parties.[66]It can be seen to be owed to several classes of third parties, such as: (i) aircrew, (ii) passengers, (iii) shippers, (iv) owners of the aircraft, (v) third parties on the ground, and (vi) other victims such as airport authorities and those who suffer economic injury as a result of such accidents.[67]

In the decision in Marino v. United States[68], the Federal Court of the Eastern district of New York found a duty of care to exist on the part of tower controllers, in this case the duty to signal a maintenance worker near a runway of a taxiing aircraft was not met. Both Eastern Airlines v. Union Trust Co. and Ingham v. Eastern Air Lines, Inc.[69] establish that there exists a duty to flight crew and passengers. The existence of such a duty, as noted earlier, is grounded in the so-called "good samaritan" doctrine, which is effectively a doctrine of reliance.[70] If a safety service is provided gratuitously, the operator of such a service has a duty not to place at risk of harm those relying upon such a service, by virtue of their reliance.

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66 Francis Schubert. La responsabilité des agences du controle de la circulation aérienne, (Lenticularis: Opfikon (Switzerland), 1994) at 28-30.

67 Ibid. at 29-32.

68 84 F. Supp 721 (1949)

69 10 Avi. 17,122 (1967)

70 Supra. note 48.

This existence of a duty of care, exists of course during all phases of flight to which an aircraft is subject to air traffic control or information provided by air traffic services, however, the extent of this duty varies, as responsibility is shared between pilots and controllers on the ground. As Hamalian notes, "[T]he relationship between the pilot and crew of an aircraft and air traffic controllers has been labelled "the continuum of dependence".[71] The degree of dependence upon ATC/ATS of a pilot flying IFR is much greater than that of a pilot flying under the "see and be seen" rule of VFR.[72] While the Chicago Convention, in Annex 6 states that "[T]he pilot in command shall be responsible for the operation and safety of the aeroplane and for the safety of all persons on board during flight time", and some states may base their domestic air law upon such a presumption, the reality is that there is no clear distinction between the responsibility of the pilot and the controller. It is in fact a concurrent responsibility.[73]

Extent of duty of care: the nature and content of the duty of care of providers of air traffic services

The air traffic controller is expected to act as would a reasonable person in similar circumstances. This would extend to instructions and advice upon which the person receiving them would be required to act as well as to advice and instructions which the recipient is not obliged to follow.[74] In setting out the extent of the duty of care, what role is ascribed to government procedural manuals such as the FAA's Air Traffic Control Procedures Manual (ATCPM) and Transport Canada's Air Traffic

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71 Hamalian at 62.

72 Ibid. at 62.

73 Henk Geut. "The Law: The Pilot and the Air Traffic Controller - Division of Responsibilities", *Air Law* at 267. The concept of a division of responsibility has gradually emerged in the United States via the following decisions: Maryland ex. rel. Meyer v. United States 257 F. Supp. 468 (DDC 1966), United States v. Furimizo 381 F. 2d 1965 (9th Circ. 1967), In re Air Crash at Dallas/Fort Worth F.2d 23 Avi. 17,292.

74 Sasseville. The Liability of Air Traffic Control Services. at 35, note 49.

Control Manual of Operations (MANOPS)? For a number of years, this issue was a subject of some debate as to whether the procedures and rules set out in the ATCPM constituted a series of regulations having the force of law, deviation from which would constitute *prima facie* proof of negligence on the part of air traffic controllers, or whether they merely established the scope of duty. The courts have strongly leaned toward the latter view.

The court in Baker v. United States[75] rejected the view of the ATCPM as having the force of law. The most influential case in this regard is that of Hartz v. United States[76] where the court stated "[W]e disapprove of the view that the duty of a FAA controller is circumscribed within the narrow limits of an operations manual and nothing more." In Rudelson v. United States[77] and in Ross v. United States[78] the duty of an air traffic controller was held to go beyond that set in the ATCPM. When circumstances are such that they require steps to be taken beyond those set out in the manual, in order to ensure safety, merely following the manual would likely constitute negligence.

Kreindler states that there exists a superior duty on the part of controllers, above and beyond that found in the ATCPM, to warn of hazards in the following specific instances:

> (1) When the danger to aircraft is immediate and extreme;
>
> (2) When the danger is apparent only to the air traffic controller;
>
> (3) Where the controller is better qualified than the pilot to evalutae the danger;

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75 417 F. Supp. 471 (D. Wash. 1975) at 485.

76 387 F. 2d 870 (5th Circ. 1968) at 873.

77 602 F. 2d 1326 (9th Circ. 1979).

78 640 F. 2d 511 (5th Circ. 1981).

(4) When the pilot declares an emergency or indicates distress;

(5) When misinformation has previously been given;

(6) When the controller is aware of a danger reasonably apparent to him; and

(7) When the pilots have placed reliance on the controllers for certain information.[79]

It would only seem reasonable that personnel of agencies tasked with maintaining the safety of flight would be under a duty to go beyond set procedures in emergency situations if circumstances demanded so. The greater reliance of pilots upon ATS while in IFR flight will also lead to a greater standard of care being applied to ATS staff.

Causality and contributory negligence

The issue of contemporaneous responsibility between the pilot and ATC/ATS is of particular relevance to matters of causality and contributory negligence, particularly in a federal system such as the United States, where, under the FTCA, the *lex loci delicti* is applied to the facts. Depending on the state in which the negligent act was committed, contributory negligence may very well serve to bar recovery from the FAA in ATS negligence actions.[80]

The questions that are to be asked in any ATS negligence liability are (i) was the allegedly negligent act the cause in fact of the accident? and (ii) was the accident foreseeable? It is necessary for the negligent act to be the proximate cause of the injury or damages. What exactly is proximate cause? In one American decision, proximate cause was defined as, "a cause which in natural and continuous sequence unbroken by any new independent causes produces an event and without which the

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79 Kreindler as cited in Desbiens at 85-86.

80 Desbiens notes that there remain only a very few states that adhere to the contributory negligence principle, in 1987 these included Alabama, Delaware, Indiana, Maryland and New Mexico. Desbiens, note 316.

injury would not have occured."[81] Intervening or superceding causes of an accident will result in the dismissal of an action against ATC/ATS.[82]

Thus, ATS may be negligent in failing to warn a pilot of deteriorating weather conditions while in flight, but a pilot's negligent actions may nonetheless be solely responsible for an accident. Questions of apportionment of damages due to contributory negligence of an operator of an aircraft will be determined on the basis of the facts of each specific case.

1.3.3 ATS Agency Liability in Canada

Authority over the regulation of aviation in Canada is conferred upon the federal government via means of the Aeronautics Act[83]. Canada's federal system had led to some question as to whether aeronautics was solely and indivisibly a subject of federal power. The Supreme Court of Canada confirmed that aeronautics was indeed a subject of exclusive federal jurisdiction in Johannesson v. Rural Municipality of West St. Paul[84]. Under the enumerated duties of the Minister found in section 4 of the Aeronautics Act is the duty "to supervise all matters connected with aeronautics". Further, under article 8, the Minister "may make regulations to control and regulate air navigation over Canada" with respect to, among fifteen enumerated fields, "aerial routes, their use and control."

The provision of air traffic services in Canada is the responsibility of the

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81 Blanton v. Curry, (1942) 20 Cal. 2d 793 as cited in Schubert at 86.

82 Ibid. at 87. Desbiens cites the cases of Pierce v. United States , 718 F.2d 825 (6th Circ) rehearing denied , 722 F. 2d 289 (1983) in support of this proposition as well as the case of Wallace v. United States, 17 Avi. 18,066 (S.D. GA. 1982).

83 Aeronautics Act, R.S.C, 1985, c. A-3.

84 3 Avi 17,729

Minister of Transport, through the federal department, Transport Canada.[85] As a department of the federal government, Transport Canada is governed by the provisions of the Crown Liability Act with regard to negligence claims brought against it. Like the FTCA, the Crown Liability Act constitutes a general waiver of immunity to civil suit, while also retaining certain specified exceptions. The general waiver is found in Article 3, which states:

> 3. The Crown is liable in tort for the damages for which, if it were a private person of full age and capacity, it would be liable
>
> (a) in respect of a tort committed by a servant of the Crown; or
>
> (b) in respect of a breach of duty attaching to the ownership, occupation, possession or control of property.

Article 3(a) establishes the rule of *respondeat superior*, making the Crown liable for the torts committed by its employees, in the same manner as the FTCA. Thus air traffic controllers, flight service specialists and others providing air traffic services fall under the ambit of the act, being employees of Transport Canada. Canada has a relatively small body of case law relating to the ATC negligence, derived largely from American jurisprudence. Article 3(b) is notable in that it deals with ownership and occupation of property, imposing a direct liability on the Crown, beyond what would be found in the FTCA.[86] As noted by one author:

> This provision could become relevant to a situation which is likely to happen in a near future, that is the failure of computerized equipment of the air traffic control services causing an accident. Although there would be no negligence of the controller, the government could be found liable for a failure of such computerized equipment since the Canadian government occupies every control

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[85] Transport Canada operates 7 area control centres, 55 control towers, 105 flight service stations and employs 6,000 people in its air navigation system. It handles in excess of 6 million aircraft movements annually. Canada, Transport Canada - Aviation, "The Study of the Commercialization of the Air Navigation System in Canada" (1995) TP. Doc 12207.

[86] R.S.C. 1985, c. C-38, s. 3(b). See Sasseville at 51.

tower in Canada and owns all the equipment therein.[87]

Such a consideration is an important one, as the potential does exist for "crashes" of computerized equipment to create serious hazards to aviation.[88] Due to the increasing reliance upon automated systems, it has been suggested that a strict liability regime would be more appropriate for air traffic control agencies than would a fault based regime.[89] This becomes of particular relevance to the CNS/ATM systems where ATS agencies may find themselves relying upon highly complex aeronautical mobile satellite communications systems and GNSS for signals used for wide-area augmentation over which they have no control.

It is the provincial law of negligence of the place where the tortious act is alleged to have been committed that governs. The federal and provincial courts have concurrent jurisdiction.[90] As with the United States, tort law in the common law provinces is essentially the same, thus case law regarding the duty of care of providers of air traffic services is relevant in all courts. What is described as a tort in

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87 Sasseville. The Liability of Air Traffic Control Agencies. at 51. Since 1994, the exception to government operation of air traffic control towers in Canada has been that of the tower at Portage la Prarie which is operated by Serco, a private company.

88 Notable in this regard are two separate incidents, one affecting airspace controlled by Sweden, the other, airspace controlled by Canada. On June 11, 1990 Stockholm Area Control Centre suffered a short-circuit in its computer system leading to a two hour period without computers and a one hour period without radar, leaving only radio communication with aircraft in flight. While no accidents arose, the event led to serious disruption of air traffic over all of Scandinavia. On January 20, 1994, the failure of the Anik2 satellite resulted in a loss of air-ground communication links, ground communication links and radar information links at the Montreal, Moncton and Gander area control centres, affecting a significant portion of Canadian and North Atlantic airspace. HF radio communication was used as the primary back-up means of communication and no accidents resulted. Should accidents arise in such situations, under the Crown Liability Act, recovery could possibly exist in the absence of negligence. See Elsberg, Roger. "System Failure, Total Darkness", The Controller, June 1991 at 24 and The Controller, June 1995 at 4, 32.

89 Hélène Sasseville. "Air Traffic Control Agencies: Fault Liability vs. Strict Liability" (1985)10 Ann. of Air and Sp. Law 239 at 247.

90 Prior to the amendment of the Federal Court Act in 1990, plaintiffs were faced with a situation of having to bring two separate court actions where there were defendants other than the Crown or its servants, as they would not fall within the jurisdiction of the Federal Court. In 1990 the Federal Court Act was amended to allow for concurrent jurisdiction with the provincial courts. See Desbiens at 55.

a common law province would be in the civil law jurisdiction of Quebec, either a "delict" or a "quasi-delict".[91]

Canada has a relatively limited jurisprudence regarding ATC/ATS liability, taking its inspiration largely from the U.S. jurisprudence. The earliest decision making any reference to air traffic control is that of Grossman v. The King [92]. In Grossman, the plaintiff damaged his aircraft when attempting to make a landing at the Saskatoon airport. The undercarriage of the aircraft caught the far end of a ditch at the end of a runway while the pilot was attempting to roll toward a hangar. The plaintiff pilot claimed that he had not been aware of the ditch and that warning flags did not provide adequate notice. The pilot's case was dismissed, the court holding that the pilot did not exercise reasonable care by informing himself of the nature of the ground upon which he was trying to land. It is notable that there was a control tower with which it was possible to make radio contact. The case obliquely makes reference to warnings by the radio operator, and has been interpreted by one author as implying a duty on the part of a ground radio operator to warn of obstructions and the possibility of a negligence action in the absence of such a warning.[93]

Following Grossman, there was a hiatus of twenty-two years before the next decision, Sexton v. Boak[94], regarding the liability of tower controllers for failure to notify of wake turbulence. In this case the court held that there was no responsibility on the part of ATC to inform the pilot of a small aircraft, flying VFR, of the danger of wake turbulence caused by a larger departing aircraft. The responsibility for adequate separation in this VFR context lay with the pilot. What is left unsaid is the responsibility of ATC in an IFR context. Presumably it becomes a question of the concurrent responsibilities of the pilot and the controller.

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91 Sasseville, "The Liability of Air Traffic Control Agencies" at 89.

92 3 Avi. 17,472 (Exch. Ct. of Can., 1950).

93 Sasseville. The Liability of Air Traffic Control Agencies. at 107.

94 12 Avi. 17,851 (B.C.S.C., 1972).

A notable later IFR case is that of Churchill Falls Corp. v. The Queen[95]. In Churchill Falls, an IFR executive jet crashed in Wabush, Labrador after following an approach procedure cleared by ATC personnel using a nondirectional beacon whose use for approach had been phased out several months previously. The result of this was the aircraft flying into the side of an open pit mine instead of landing on the runway. The facts of the case indicated that the pilots accepted the approach clearance despite having navigational charts and approach plates showing that the approach based on the selected non-directional beacon was no longer the proper procedure. The aircraft had informed ATC that it was flying at 4100 feet which was in fact below the minimum necessary altitude. ATC did not inform the pilots that they were flying below the minimum necessary altitude for an approach. The court found that the air traffic controller at the Moncton Area Control Centre had been negligent in instructing an approach based on a an obsolete procedure, but could not establish that this had been the proximate cause of the accident. Further, the court also found that the air traffic controller was not under a duty to monitor the aircraft's descent after the pilots had accepted clearance to land, "other than for purposes of providing separation between airplanes".[96]

With regard to the role to be played by procedural manuals, the court stated:

> The Regulations and Manuals are not a code governing civil liability in the event of an airplane accident, but, in my opinion, they represent a reasonable standard of care to be observed by air traffic control units and pilots in the carrying out of the activities they have undertaken.[97]

Churchill Falls has led to criticism on the part of some commentators, for not considering U.S. jurisprudence and for reverting to the early concept of ATC merely having the obligation to ensure adequate separation of aircraft.[98]

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95 13 Avi. 18,443 (F.C.T.D., 1974).

96 13 Avi. 18,442 at 18,453.

97 13 Avi. 18,442 at 18,452.

98 Sasseville, supra note 168 at 111; Desbiens, supra note 430 at 117.

The most recent Canadian decision relating to liability for ATC negligence is that of Trottier v. Canada[99]. In this case, the plaintiff made a VFR flight, taking off in worsening weather conditions, lost his way and contacted the wrong ATC unit which could not render assistance unless the plaintiff as pilot declared that he was in an emergency situation. The pilot refused to do so and ATC personnel instructed him to change frequencies in order to contact Montreal Tower and not Montreal Mirabel Tower as he had done. Shortly thereafter, the aircraft crashed into a mountain.

The court found that the pilot 's actions were reckless, and found that the air traffic controllers had acted properly and responsibly. This case emphasized the VFR aspect of the flight and thus placed greater emphasis upon the responsibilities of the pilot.

A reading of the Canadian cases leads to the conclusion that the liability of Transport Canada as a provider of ATC/ATS is not as extensive as that of the FAA in the United States, placing a greater emphasis upon the responsibility of the pilot for safe operation of the aircraft.[100] The "pilot in command" principle is thus alive and well in Canada.

The argument has been made that Canadian jurisprudence in this field, as in others will eventually follow that of the U.S., thus increasing the liability of Transport Canada as the provider of ATS.[101] The converse could just as easily be argued as the Federal Court had over twenty years of jurisprudence in the U.S., which increased air traffic control liability, upon which it could have relied. It chose not to. Given the rarity of negligence litigation in Canada over ATS, and the decision not to follow the American jurisprudence of expanded liability, the liability of Transport Canada (or any corporate successor) will likely remain less extensive than that of the FAA.

Thus while there exist fundamental similarities between the Canadian and American law that applies to ATS providers, such as the FTCA and the Crown

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99 (1986), [1987] 9 F.T.R. 94 (F.C.T.D.)

100 Desbiens at 119.

101 Ibid. at 119.

Liability Act, and similar tort concepts, important differences remain.

1.3.4 The European Law of ATS Liability

To speak of a "European law of ATS liability" is something of a misnomer. "Civil law" is not uniform among the so-called "civil law jurisidictions." It should be noted that Europe contains two common law jurisdictions, the United Kingdom and Ireland. As du Perron notes, "[A]lthough the Napoleonic codes may originally have set the example for the major codes of most "civil law" countries, the further development of the various national law systems has been independent and to a large extent isolated."[102] The intent here will be to examine some of the approaches taken in European States to the question of ATS agency liability. A full survey would be well beyond the scope of this thesis. Unlike the United States, there is a minimal body of caselaw relating to ATS liability in Europe. As a result, it becomes next to impossible to speak of judicially determined duties on the part of ATS personnel to users of the air transport system and third parties.

As noted earlier, ATS liability is almost universally based on fault. It does not fall under contractual liability due to the fact that "ATC is performing a task which has been attributed to it by law and the essential elements of a contract are lacking."[103] As ATS in Europe was, until recently, essentially a state provided activity, the law governing such liability, in the absence of special legislation devoted to ATS liability, was the general law of state liability.[104]

The approach to state liability varies from state to state. In some countries

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102 A.E. du Perron, "Liability of air traffic control agencies and airport operators in civil law jurisdictions", (1985)10:4-5 Air Law 203 at 203.

103 Ibid. at 205.

104 du Perron wrote his article dealing with European law in 1985, where the only arm's length agency providing ATS in Europe was Radio Suisse, S.A., with the government accepting liability. Thus, at the time, he concluded that the appropriate law was that of state liability. However, with the move to independent corporate agencies as providers, the role of private law assumes a new importance.

such as France, criminal prosecution may also come into play in cases of ATC/ATS negligence.[105] There is some question as to whether state liability applies to all negligent acts of the state's servants or only those which are seriously negligent (i.e. *faute lourde*), as has been the case in France.[106]

In France, as noted, liability only incurs where there has been serious negligence on the part of the ATS agency or its servants. This, notes Schubert, is due to the highly sensitive nature of ATC/ATS.[107] He also notes that other authors have argued that due to the potentially disastrous impact of any negligence, whether it be slight or serious, the French Conseil d'Etat should do away with this requirement of serious negligence (faute grave) for there to be liability on the part of the state agency providing the service. This, however, has not yet been adopted by the Conseil d'Etat as policy.[108] There is no monetary limit upon recovery in France.

The most notable French court decision is that of the Conseil d'Etat de Nantes (26 July 1980) of Société Spantax et Compagnie La Equitava c. Ministre de la Défense et Ministre des Transports.[109] This case arose from an accident which occured during a 1973 air traffic controllers strike in France, during which time ATS was provided by the French military. On March 5, 1973, a collision occurred between an Iberia DC-9 and a Convair Coronado belonging to Spantax. In this case, both aircraft were placed by military ATC at the same altitude although both pilots had informed ATC that they would be passing over a particular beacon at Nantes at the same time. While the ATC centre at Mont-Marsant could have instructed one of the aircraft to change altitude it instead requested the Convair to reduce its speed. The longitudinal separation between the aircraft was 8 minutes as opposed to the required 10 minutes. A further misuse of

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105 du Perron at 209.

106 Kim Doo Hwan. "Some considerations on the liability of air traffic control agencies". (1988) 13:6 Air Law 268 at 269.

107 Schubert at 139.

108 In light of the rarity of ATS accident litigation, this may not occur for some time, if ever.

109 (1982) 36 RFDA 495.

an English command given by a military controller to the Convair and an ATS broadcast antenna malfunction all contributed to the accident.

The court found that:

> Ainsi, nous estimons qu'une série d'erreurs ou d'insuffisances, humaines ou matérielles, imputables au contrôle aérien militaire, et spécialement le fait d'avoir créé le risque de collision, sont, au cas présent, constitutives d'une faute lourde.[110]

State liability was set at 85%, effectively limiting recovery to less than the full amount claimed on the basis of what would be in common law contributory negligence, based on alleged fault on the part of the Spantax pilot. The State requested that the findings be overturned. The Conseil d'Etat upheld the judgment but modified the judgment to declare the state 100% responsible for the accident. Other than this decision, French case law regarding ATS negligence does not exist.

Switzerland, by contrast, applies a regime of strict liability for actions against Swisscontrol, making it an exception among European states.[111] Swisscontrol is organized as a corporation with the controlling share interest owned by the government. Its employees are not considered to be public servants.[112] The linkage between this corporation and government liability lies in the public function performed by Swisscontrol.[113] Under Swiss law, the procedure to be followed by the plaintiff is one of presenting a claim to Swisscontrol and should no settlement be made .between the parties an administrative law action may be commenced in the Federal Tribunal.[114] Swisscontrol is indemnified by the state for awards made against it and an action against the state itself would appear possible in the event that insolvency of

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110 (1982) 36 RFDA 495 at 501.

111 Schubert at 141.

112 Ibid. at 143.

113 Ibid. at 143.

114 Ibid. at 143.

Swisscontrol might arise.[115] The Swiss approach favours the plaintiff with its strict liability regime and absence of limits on damages.[116] To this point there has been only one civil action in Switzerland relating to ATC/ATS liability, dating from 1992, which was still pending in 1994.[117]

Germany does not have a specific statute dealing with ATC liability, however with the "operational privatization" of the DFS, the newly corporatized German ATS agency, liability will be governed by the contract between the agency and the state. The terms of this contract relieve the DFS of payment of awards by state indemnification of the DFS.[118] German courts have only seen suits relating to damages resulting from ATS creating delays of flights, usually in the context of controller strike or "go slow" actions. As of March 1994, there had not been any suits based on negligence of German ATS.[119]

This relative absence of European ATC/ATS negligence cases, due to a smaller general aviation sector than exists in the U.S. and, possibly, an extraordinary run of good luck, makes it difficult to predict what approach might be taken by European courts with regard to an accident involving an ATS provider, the GNSS and AMSS.

1.4 Fault Liability or Strict Liability?

It was noted earlier in this chapter that the increasing reliance upon automated systems might make the application of strict liability more appropriate than fault liability in the event of failure of such equipment. Liability of ATS providers is near-universally based on fault. The only exception would appear to be Switzerland, which applies a

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115 Ibid. at 144.

116 Ibid. at 144.

117 Ibid. at 137.

118 Ibid. at 25-26.

119 Ibid. at 137.

system of strict liability to all public services.[120] Thus, this approach is not strictly limited to air traffic services. The impact of increased automation was largely behind the German decision to apply strict liability to automated equipment failure when controllers could have been used instead. As Schubert notes:

> En Allemagne, par exemple, il a été considéré qu'une panne technique constitue une violation d'un devoir public, si les autorités se servent d'équipments techniques plutôt que des personnes pour assumer certaines tâches, et si, dans l'hypothèse où ces fonctions auraient été dévolues à des personnes, un manquement de leur part eût constitué une violation d'un devoir public.[121]

However, while legislation to this effect was passed in Germany, it never came into force on constitutional grounds.[122] A comparable system applies in Norway, however.[123] Schubert refers to unnamed certain states that are considering applying strict liability to accidents arising from automated systems.[124] Whether such an approach would be applicable in the United States is effectively a dead issue, as Schubert notes, in light of the Dalehite decision.[125] The decision to use such automated equipment would clearly fall under the "discretionary function" exemption to the FTCA as defined in that decision.

This of course poses a problem for the contention put forward by Sasseville that the Crown Liability Act effectively creates such a situation through section 3(b) regarding Crown liability resulting from its occupation or control of any property. For while a form of strict liability for damages resulting from the malfunction of Crown

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120 Schubert at 93.

121 Ibid. at 94.

122 Ibid. at 95.

123 Ibid. at 95.

124 Ibid. at 93.

125 Ibid. at 95.

owned automated ATC/ATS equipment could be said to result from 3(b), at the same time, it is also possible to read the equivalent of a discretionary function exemption into the Act. The decision to use such equipment would fall under the rubric of policy as opposed to operations.[126]

The idea of strict liability applying to highly automated systems is nonetheless attractive. With regard to air carrier operations, it has been adopted in the Guatemala City Protocol (as of yet unratified). However, the Guatemala City Protocol also limits liability, something which does not apply to actions against providers of ATS in a substantial number of countries.[127]

Sasseville, citing Fleming, notes that "strict liability is better suited to compensate harm associated with a dangerous activity that is not only legal, but so desirable that its utility alone justifies incurring the risk".[128] She lists several criteria supplied by Fleming for determining whether an activity fits the description, among them: (1) magnitude of possible damage, (2) lack of assurance of complete safety, (3) inability of potential victims to protect themselves.[129] She then states that all of these criteria apply to ATC services:

> The first goes without saying when one thinks that a controller's error can make hundreds of victims. The second becomes more relevant as ATC technology becomes more complex: basic defects in design or engineering and failure of computerized equipment render obsolete the appreciation of conduct on a fault basis only. The third is even more evident: if airlines can improve their own safety measures, they are powerless to enforce stricter ones on ATCA [air traffic control agencies]. The

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126 Desbiens at 56-57 .

127 In fact, it is those states with the most highly developed domestic civil aviation infrastructure that do not limit such damages. To claim a cause and effect relationship between unlimited liability and increased aviation safety and development would, however, be to go beyond the scope of this chapter.

128 Sasseville. "Air Traffic Control Agencies: Fault Liability vs. Strict Liability" at 247.

129 Ibid. at 246-247.

> travelling public is even more remote and none of the two has any real bargaining power since ATC services are after all a government monopoly.[130]

A.E. du Perron makes the argument that applying strict liability to the actions of air traffic controllers themselves does not make sense as the very activities that they undertake reduce the chances of accidents, thus fault liability is perfectly acceptable.[131] However, he holds that strict liability would be the appropriate regime with regard to accidents caused by failure of automated equipment. Without such liability, in a fault-based regime, failure of such a system would lead to a serious *lacuna* in the law:

> There is one region, though, where strict adherence to the negligence concept might lead to an unjust situation and that is the failure of automated systems. Nowadays, ATC, in handling air traffic in high density areas, is to a large extent relying on information generated by fully automated systems. If it were not, it would not even be able to cope with such traffic, as automation has been instrumental in reducing the separation and visibility standards to their present levels. Although one can always assert that a failure of the automated system is attributable in the end to some hardware or software deficiency or "bug", it will not always be possible to translate such failure into negligence of ATC. From the ICAO study [it] appears that in a number of countries no liability would attach to ATC in such cases.
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> Consequently, it seems appropriate that a means be found to either construe the failure of automated procedures as negligence of ATC or by explicitly broadening the scope of ATC liability to being strict in respect of such failure.[132]

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130 Ibid. at 247.

131 A.E. du Perron, "Liability of air traffic control agencies and operators in civil law jurisdictions" (1985) 10:2 Air Law 203.

132 Ibid. at 206.

There has been little perceived need on the part of states for a convention unifying the law with regard to the liability of air traffic control agencies, and the fault approach appears to rule supreme with regard to the liability regime governing providers of air traffic services. However, the arguments for applying strict liability in the case of failure of automated systems are strong. The ATS provider will in most instances have a recourse action against the manufacturer of the equipment.[133] It is quite possible that at a future date strict liability will govern in cases of equipment failure. The merits of a strict liability approach with regard to the CNS/ATM systems will be discussed in the second chapter.

1.5 A System of Liability with Government Providers

As noted in the introduction, the majority of the world's providers of ATS, despite historical anomalies such as providers in Switzerland and Thailand, are governments.[134] Within the last five years, however, there has been a movement towards commercialization or the occurrence of full commercialization in a number of states.[135] It is worth noting however, that in the case of Radio Suisse, the state assumed any liabilities that might arise.[136]

The fact that most providers of ATS are governments leaves the plaintiff facing either sovereign immunity, thus precluding a negligence action, or a statute specifically

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133 Kim, Doo Hwan, "Some considerations on the liability of Air Traffic Control agencies" (1988)13:6 Air Law 268 at 271.

134 ATS in Switzerland had been provided by a private company, Radio Suisse, S.A. until 1988 and performed such services for the government under contract. In 1988 it was succeeded by Swisscontrol. The majority of shares in Swisscontrol are owned by the government, with the two Swiss airlines, airports and employee groups holding the minority position. In Thailand, from 1948 to 1963, a private company established by the airlines, Aerothai, performed area ATC. In 1963 it became a State enterprise with a 10% airline shareholding interest. For further information see Canada, Transport Canada -Aviation, "The Study of the Commercialization of the Air Navigation System in Canada - International Experience of ANS Commercialization (Discussion Paper No. 4)", Ottawa: 1995.

135 See note 4 supra.

136 du Perron at 205.

governing state liability, examples of the latter being the aforementioned FTCA and the Crown Liability Act. The law varies from state to state. As du Perron notes, "...each jurisdiction had developed its own road from the starting point that the State can do no wrong to the modern concept that citizens do need an elaborate network of protection from an ever mightier and increasingly meddling government."[137]

With regard to the civil law states he concludes that "...for practical purposes it seems safe to say that in most civil law jurisdictions the State will be held liable for negligent actions (or omissions) of its air traffic controllers, once the State has (in its discretionary power) decided to assume the task of providing ATC services".[138] In France and Spain, actions for ATC/ATS negligence have to be tried before a special administrative court, precluding, as du Perron notes, suits with multiple public and private defendants. Further, in some jurisdictions, suits against the state are subject to more stringent limitation periods than those against private defendants.[139]

Du Perron also notes that at the international level "...most States will not be prepared to accept the jurisdiction of a foreign court" or the foreign courts will adhere to the "act of state doctrine", thus recognizing the defendant state's sovereign immunity. Further, there may be problems for foreign litigants when a suit is brought against a state ATS provider in that state's own courts.[140]

Exclusive governance of this field by public law will be less the case as proposed corporatizations and possible full privatizations take place. More will be said on the liability and insurance aspects of corporatized entities in the third chapter.

1.6 ASECNA and COCESNA Treatment of Liability

For every rule, there is an exception. While it is the general rule that states

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137 Ibid. at 206.

138 Ibid. at 207.

139 For example, the Netherlands, where suits against the government have a five year limitation period as compared to tort claims having a thirty year limitation period for non-governmental defendants. see du Perron at 207.

140 Ibid. at 209.

organize and manage their own air traffic services, the exception to this rule lies in three joint-operation ATC/ATS agencies whose responsibilities cross national boundaries. These are: ASECNA, COCESNA and EUROCONTROL.[141] ASECNA (Agence pour la Sécurité de la Navigation Aérienne en Afrique et à Madagascar) dates from 1959 and was created in the period of French decolonization in Africa. It is responsible for managing and providing ATC services for its member states.[142] ASECNA cannot claim any immunity from civil actions, as Schubert notes:

> L'article 13 du Cahier des charges réserve explicitement la possibilité d'une action judiciare en responsabilité engagée contre elle. Dans l'éventualité d'une telle procédure, "l'Agence est soumise aux lois et règlements généraux et de la police applicables sur le territoire des Etats où s'étend sa compétence.[143]

ASECNA is also required to carry insurance coverage for third party liability that could arise from the use of its services.[144] The governing system of liability is one that is fault-based with no limitation of liability on the part of the agency.[145] ASECNA can also call upon member states for indemnification .[146]

COCESNA (Corporacion Centroamericana de Servicios de Navigacion Aerea) has a membership of five states: Costa-Rica, El Salvador, Guatemala, Honduras,

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141 While ASECNA and COCESNA both provide actual air traffic services for their member states, EUROCONTROL has moved away from provision of ATC services which was its mandate at the time of its formation in 1960 and has become primarily a planning and centralized fee collection agency for the ATS agencies of its member states.

142 The ASECNA member states are: Burkina Faso, Cameroun, the Central Africa Republic, the Congo, Cote d'Ivoire, Dahomey, Gabon, Madagascar, Mali, Mauritania, Niger, Senegal, Sudan, Chad and Togo. Schubert at 155, note 470.

143 Ibid. at 155.

144 Ibid. at 155, note 475.

145 Ibid. at 156.

146 Ibid. at 155.

Nicaragua and was created in 1960 by Tegucigalpa Convention.[147] With regard to the organization's approach to liability, the Convention says nothing directly, however as Schubert notes, Article 5 "...rend obligatoire la souscription des assurances necessaires pour couvrir les dommages qui pourraient être provoqués en cours d'exploitation."[148]

The European Organization for the Safety of Air Navigation (EUROCONTROL) was also formed in 1960 via the International Convention relating to Cooperation for the Safety of Air Navigation.[149] EUROCONTROL currently has 19 member states. Unlike the other two organizations, EUROCONTROL does not concern itself with the provision of ATC in the airspace as a whole, but only in the upper regions.[150] With regard to liability, Schubert observes that EUROCONTROL's liability can either be tortious or contractual. With regard to tortious liability, it is necessary for there to be negligence on the part of an agent or employee.[151]

Thus while different, all three organizations base liability on fault and allow for the indemnification of those who have proven their losses and the existence of negligence. It is worth noting that with the exception of Swisscontrol, Germany's DAF, and Austria's ATS agency, all of these organizations' member agencies, are state ATS providers. EUROCONTROL member Britain is at this stage preparing to create a separate private share capital corporate entity that will provide ATS, as a successor to its current independent agency, UK NATS.

1.7 Attempts at Drafting a Multilateral ATC Liability Convention

The history of attempts within ICAO at drafting a multilateral instrument governing the liability of ATC agencies is a lengthy one. It was at the 13th ICAO

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147 Ibid. at 156.

148 Ibid. at 156.

149 Sasseville. " The Liability of Air Traffic Control Agencies" at 162.

150 Schubert at 158.

151 Ibid. at 158.

Legal Committee meeting that a multilateral convention on ATC liability was first discussed and it was at this time that it became an element on the Legal Committee's Work Programme. It still remains on the Work Programme of the Legal Committee.[152]

In 1962 the Legal Commission recommended study of the ATC liability issue by a subcommittee.[153] In 1963 a questionnaire was sent to member states by the subcommittee in order to determine the legal regime governing air traffic control provider agencies in member states. Twenty-seven states replied, providing a partial picture of the legal regime which governed. What was most striking among the replies to the 1963 questionnaire was that none of the respondent states had enacted specific legislation dealing with ATC liability.[154] In 1964, the subcommittee made its report, concluding that international rules regarding liability would be useful.[155] The subcommittee's report was considered by the Legal Committe which held that along with a broad concept as to what services were to be included, "the Convention should have a system of liability based on fault" and "it should provide for a limitation of liability in a reasonably high amount."[156]

A further Questionnaire was formulated and distributed to members. The response to this second questionnaire was more extensive. At its 16th Session, the Legal Committee held that a Convention should be drawn up and requested that there be further study by the subcommittee.[157] The Final Report of the Subcommittee, concluding that "the international rules (relating to ATC) should be comprised in a

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152 See ICAO, Legal Committee, Report: 29th Session, 4-15 July, 1994. The Legal Committee at that session opted to update the Rapporteur's report on ATC agency liability to cover aspects arising out of the CNS/ATM concept. Report at 7-2, para. 7-11.

153 Sasseville at 117.

154 Sasseville at 119.

155 Ibid. at 120.

156 Sasseville at 122.

157 Sasseville at 124.

particular convention", was submitted to the Legal Committee in 1967.[158] This matter was then ignored throughout the 1970s by the Legal Committee.[159]

In 1980 a new, more detailed questionnaire was sent to member states. Again, a limited number of states responded. Sasseville notes that:

> In its report, submitted to the 104th session of the Council in August 1981, the Panel of Experts pointed out that a great majority of States, according to what they wrote, had not yet encountered any practical problems in this field.[160]

The Legal Committee again decided to give the matter further study at its 25th Session in 1983. In 1987 the Report on the Liability of Air Traffic Control Agencies authored by Professor H. Perucchi of Argentina was considered by the Legal Committee at its 26th Session.[161] Professor Perucchi recommended a regime of fault liability with monetary limits and recommended that a presumption of liability apply in cases of breakdown of electronic equipment or computers.[162] He also concluded that work should be done on a "model statute" on ATC liability that states could implement

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158 H.A. Perucchi. Report on the Liability of Air Traffic Control Agencies, as reprinted in LC/29 -WP/7-3 at 4.

159 du Perron at 209.

160 Sasseville at 126.

161 Professor Perucchi opted for a definition of air traffic control agency that effectively constituted the broader definition of ATS provider, stating:

> In my opinion the "instrument" must also state what the concept of "air traffic control agency" is. This is very important, as it means unifying the concept of the services, concerning which different opinions are apparent in the reports of the States. These services must provide for flight management and protection, and the services covered must include air traffic control, area control, approach control, aerodrome control, air traffic advisory service, aeronautical information and alert services. Cooperation in search and rescue can also be added and, in the opinion of a few States, the instrument should also cover meteorological services, airport facilities, aeronautical charts and other facilities for the safety of air navigation.
> LC/29-WP/7-3 at 14.

162 Ibid. at 16.

as a partial measure on the route to a multilateral Convention.[163]

In his report to the Legal Committee, Professor Perucchi included a draft Convention prepared by Argentina, containing most of the Convention content recommended by the rapporteur. However, due to time constraints, the Rapporteur's report was not dealt with at the 26th Session and was effectively ignored at the 27th Session, attention being devoted rather to the matters such as legal aspects of global air-ground communications and institutional and legal aspects of future air navigation systems. The matter of a Convention subsequently languished in the Legal Committee until the 29th Session in 1994, at which time it was decided that Prof. Perucchi's Report would need to be updated in light of the CNS/ATM systems. While the Legal Committee awaits this updated report, the question remains as to the real need for such a convention.

Among the "pros" is a perceived need to address the international aspects of ATC/ATS with regard to liability. Advocates for a Convention argue that there is a need for unification of private air law in this field. But experience has shown, particularly with the unification under the Warsaw System, that such uniformity is often achieved at a particularly high price, namely the limitation of liability at levels which wind up satisfying very few. Admittedly, plaintiffs could benefit by having uniformity with regard to actions against government. As one author notes:

> At the present time, suits against the State often involve compliance with a series of preliminary steps which often delay compensation and might even cause the loss of the right of action.[164]

At the same time, this very aspect of unification renders it unlikely that governments would have a particular incentive to ratify such a Convention.

The International Federation of Air Traffic Controllers' Associations (IFATCA) has been vociferously advocating a Convention for a number of years, emphasizing the

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163 Ibid. at 22.

164 Sasseville at 136.

number of Flight Information Regions (FIRs) that covered two or more different legal systems.[165] In fact, IFATCA had prepared its own draft Convention on the liability of ATC. However, while IFATCA may consider the drafting of a Convention to be of the utmost importance, this should be weighed against the fact that IFATCA is an association of air traffic controller labour unions. The benefits to society at large may not necessarily be first and foremost among the concerns of such an organization.

Thirty years have passed and still a multilateral Convention on ATC/ATS liability is no closer on the horizon. There has been a lack of interest on the part of ICAO's members. In fact, under the current international regime, where liability is essentially unlimited and governments almost all provide for suits against their ATC agencies, there is no incentive for movement. In 1981, the United States expressed its view that:

> ... the experience of the United States has been that, with respect to the liability of air traffic control agencies, the presence of a foreign element in the circumstances of an aircraft accident does not present legal problems which cannot be resolved under established principles of domestic law.[166]

There just does not appear to be any adequate incentive for the drafting of such a Convention. As Schubert concludes:

> Les conditions matérielles de la responsabilité des agences de contrôle aérien présentent ainsi un caractère suffisamment homogène et satisfaisant, de telle sorte qu'une intervention sur le plan international en vue d'en uniformiser encore la substance ne semble pas indispensable.[167]

The final word has, of course, not been said, and the Legal Committee still

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165 Ibid. at 140 et seq.

166 ICAO Doc. PE/PLC - WD/6-30, 2/6/81 at 3 cited in Schubert at 165, note 508.

167 Schubert at 164.

awaits an update of Prof. Perucchi's Report that will encompass the elements raised by the implementation of CNS/ATM systems. However, if the past is any indication of the future, CNS/ATM is highly unlikely to spur States on to the drafting and adoption of a multilateral ATC/ATS liability Convention.

Having conducted this overview of the current regime governing the liability of ATS providers, it is to an examination of the liability issues that arise from the ICAO CNS/ATM systems to which we now turn.

2. CNS/ATM Systems: An Overview of Elements and Liability Issues

2.1 Elements

The previous chapter has provided some background concerning the elements of CNS/ATM, particularly with regard to the GNSS. However, in order to fully understand the liability implications raised by the CNS/ATM systems, it is necessary to have a fuller understanding of the elements, their operation, operators and users. As noted earlier, the systems have two space-based elements: (i) the GNSS, which at this point comprises the GPS and GLONASS systems and , (ii) the AMSS, with several aeronautical mobile communications systems provided by different operators such as ARINC, SITA and INMARSAT. An integrated system, CNS/ATM has moved from the drawing board to the functional stage and has been undergoing trials in Pacific oceanic airspace since April of 1995.[168] Thus, as more of the systems enter into use, questions of liability and the regime which shall govern it move from the realm of abstractions to legitimate legal questions with important commercial ramifications for users, service providers and equipment manufacturers.

Communications

The concept of a global network for aeronautical communications is one of the underpinnings of CNS/ATM. The concept of large scale use of satellites for aeronautical communications certainly predates the formation of the first FANS Committee. ICAO first investigated the concept in 1966.[169] In 1975 a joint study programme was undertaken by the U.S., Canada and the precursor to the European Space Agency, with regard to the creation and operation of a satellite-based

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168 G. Norris, "Watching the Clock", (1994) Flight International, 16-22 November, 30.

169 B. Verhaegen, Aspects légaux des communications aéronautiques mobiles par satellite.(LL.M. Thesis, McGill University, 1993) [unpublished] at 11.

aeronautical communications system. The organization created for this study, AEROSAT, abandoned the project due to cost. [170] However, in 1978 ICAO formed its Aviation Review Committee, which in 1982 came out in favour of the use of satellites for aeronautical communications, recommending that the INMARSAT system be used.[171]

INMARSAT was formed in 1978 via the Convention on the International Maritime Satellite Organization. Its principal objective was the creation of a system of satellite communications for maritime shipping that would be used for both safety and non-safety communications. In 1985, the Convention and the Operating Agreement were amended to permit INMARSAT to provide an aeronautical mobile satellite service.[172] Such communications services have been available on INMARSAT's second generation of satellites since 1990.[173] Thus, the

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170 Ibid. at 15.

171 Ibid. at 16-17.

172 This expanded role is found in the amended Article 3 of the Convention, which reads as follows:

> (1) The purpose of the Organization is to make provision for the space segment necessary for improving maritime communications and, as practicable, aeronautical communications, thereby assisting in improving communications for distress and safety of life, communications for air traffic services, the efficiency and management of ships and aircraft, maritime and aeronautical public correspondence services and radio detection capabilities.
>
> (2) The organization shall seek to serve all areas where there is a need for maritime and aeronautical communications.

Amendments to the Convention on the International Maritime satellite Organization (INMARSAT) and Amendments to the Operating Agreement, Done at London, October 16, 1985. DDV CA 1 EA10 89T48.

173 INMARSAT's aeronautical mobile satellite service became operational in November of 1990, providing ATS, AOC, AAC and APC services. INMARSAT operates 11 satellites of which four are second generation satellites and seven are first generation satellites used as backup in the event of primary satellite failure. The majority of the surface of the globe is covered by the system. The INMARSAT 3 satellite series will increase area spot coverage and will include a navigational payload which will complement GPS/GLONASS. The third generation will enable mobile to mobile communications links (ie. aircraft to aircraft). INMARSAT estimates that by the end of 1997, half of the world's long-haul airline fleet will be outfitted with satellite avionics. See: R.B. Thompson, "Implementation Watch: INMARSAT's Global Aeronautical Satellite Service",

AMSS is not a new concept suddenly unleashed on international aviation by CNS/ATM, rather the ICAO concept takes usage of aeronautical communications satellites one step beyond that which exists at present.

The CNS/ATM systems, as planned, will use the following communications systems:

> (1) Gatelink: Two-way high speed data link for aircraft on the ground and ground communications system;
>
> (2) High Frequency (HF) radio: While this system is intended to be phased out over large areas of the earth's surface, it will be used in areas where geo-stationary satellites do not provide communications coverage (ie. polar regions). HF will be used for data link communications in future;
>
> (3) AMSS: The Aeronautical Mobile Satellite System will be the focal point of the communications aspect of the new system. It will be used for both low and high speed data link and voice communication;
>
> (4) SSR Mode S: Secondary surveillance radar, in its Mode S configuration can be used for air ground data communication and may eventually figure in the implementation of CNS/ATM;
>
> (5) Very High Frequency (VHF) radio: This will continue to be used for voice communications in particularly high density airspace, but will also be used for data link.[174]

The movement to greater use of digital data interchange as opposed to voice communication is anticipated to yield greater efficiencies and to increase safety. A seamless aeronautical telecommunications network (ATN) is the ultimate communications objective within the CNS/ATM systems. Users can be categorized into different groups, such as: (i) ATS, (ii) aeronautical operational control (AOC),

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Proceedings: Global Navcom 1994 (IATA:1994)55.

[174] FANS CNS /ATM Starter Kit at 19.

(iii) aeronautical administrative communications (AAC) and (iv) aeronautical passenger communications (APC).[175]

These communications will be routed from the aircraft through one of three networks: (i) a ground network based on the Aeronautical Fixed Telecommunications Network (AFTN), (ii) an air-ground network based on AMSS, VHF, HF, Gatelink and Mode S and (iii) an airborne network of onboard systems for managing communications.[176]

AFTN links ATS providers by means of terrestrial message relay. ARINC, a private aeronautical communications company, also provides its ARINC Data Network Service (ADNS) as a communications link between air carriers, ATS and weather services.[177] It should also be noted that ARINC uses INMARSAT satellites for its AOC, AAC and APC services. SITA (Société Internationale des Télécommunications Aéronautiques) provides similar type services as well.

Within the AMSS, there is thus a mixture of private service providers and an international satellite consortium, which is itself a service provider and owner which leases out satellite capacity to ARINC and SITA. ARINC and SITA both deal with liability issues by means of contract, whereas INMARSAT addresses liability within the Convention and Operating Agreement.[178]

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175 AOC communications are operational communications between the aircrew and the aircraft owner/operator, ie. airline. AAC are non-safety communications between the aircraft and the airline with regard to matters such as passenger seating, ticket sales and so forth. APC, is perhaps the aspect most familiar to the air travelling public, namely radio-telephone air-ground communications such as the Airphone system.

176 Op. Cit. at 16.

177 FANS CNS/ATM Starter Kit at 18.

178 Article XII of the Operating Agreement bears the title "Exoneration from Liability arising from the Provision of Telecommunications Services" and states in full:

> Neither the Organization, nor any Signatory in its capacity as such, nor any officer or employee of any of them, nor any member of the board of directors of any Signatory, nor any representative to any organ of the Organization acting in the performance of their functions, shall be liable to any Signatory of the Organization for losss or damage sustained by reason of any unavailability, delay or faultiness of telecommunications services

Navigation and Surveillance

In the preceding chapter a brief description was provided of the GLONASS and GPS systems which form the basis of the GNSS. Both provide similar levels of accuracy and operate on the same principles. Each constellation consists of 21 satellites (excluding spares), although GLONASS operates in lower orbits than does GPS. Both systems provide velocity, position and time information on a continuous basis. As noted in the preceding chapter, the systems work on the basis of ranging based on time signals.[179] The preference of the international aeronautical community would appear to be toward GPS, although avionics have been developed that use both GPS and GLONASS signals.[180]

One of the key aspects of the GNSS is that of differential GNSS, most often discussed in terms of differential GPS. Differential GNSS is a method of increasing

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provided or to be provided pursuant to the Convention or this Agreement.

With regard to apportioning the financial burden of liability: Article X(1) of the Operating Agreement sets out that signatories shall bear the responsibility of paying any deficiency beyond any insurance coverage in the event of a binding decision rendered by a competent tribunal or agreed settlement, and that such responsibility shall be based on the signatories' respective investment shares on the date that the liability arose.

179 The manner of operation of the GNSS has been described as follows:

> Given a knowledge of a satellite's position and velocity at any time, the user then ranges to a satellite by measuring the arrival time of a marker (epoch). Should the user's clock be synchronised to the satellite clock, independent measurement to three satellites suffices to establish position. Since in practice users do not possess synchronised clocks, measurements are made to four satellites (pseudo-ranges) and position and clock offset determined as the four unknowns.

P. Daly GPS & GLONASS - progress towards GNSS, Proceedings: Global Navcom 1994 101 at 102.

180 Plans were made for development of specifications for such a receiver to be made in 1991 for using GPS (ARINC 743) and GPS/GLONASS (ARINC 743A). The U.K. Civil Aeronautics Authority has through its Institute of Satellite Navigation at the University of Leeds developed 10 and 20 channel GNSS receivers using both GPS and GLONASS signals. P. Daly, "GPS & GLONASS - progress towards GNSS" in Proceedings: Global Navcom 1994 101 at 107.

the accuracy of GNSS so as to correct for ionospheric bending, satellite clock and receiver inaccuracy. It has been defined as follows:

> Differential GNSS is an augmentation to GNSS, the purpose of which is to determine position errors at one or more known locations and subsequently transmit derived information to other GNSS receivers in order to enhance the accuracy of the position estimate.[181]

The process involved in differential GNSS for correction of these errors can be briefly described as follows:

> A ground station determines the errors in the received signal by virtue of the fact that its actual position is fixed and known. It then broadcasts corrected information to all parties in the vicinity. An airborne system, receiving and applying the differential and correction data, can refine its position to an even higher level of accuracy.[182]

Local-area differential GPS (LADGPS) is a GPS enhancement system whereby the master and slave stations are within line of sight range.[183] Using line of sight radio links, the master station may send corrected and enhanced GPS signals to aircraft. LADGPS is envisioned for use in the vicinity of airports and at a future point may provide a sufficient degree of accuracy to permit precision (Category 2 and 3) landings.[184]

Wide-area differential GPS (WADGPS) is a similar concept using a number of monitoring stations and a broadcast station which would broadcast enhanced positioning information to users over a large area of territory by means of a geostationary satellite.[185]

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181 ICAO, Fans Manual at 23.

182 Ibid. at 23.

183 Daly at 106.

184 Daly at 106.

185 Daly at 106.

Wide area augmentation systems (WAAS) are systems which use GPS frequencies and provide an additional ranging signal for greater accuracy. Broadcasting integrity information and differential corrections, these systems are intended to cover large expanses of continental airspace through the use of multiple monitoring stations. This system, once operational, will be supported by INMARSAT 3 series satellites, introducing an additional civil aspect into the GNSS. The United States plans for domestic implementation of WAAS in 1997.[186]

All of these augmentation systems pose interesting legal questions with regard to the interrelationship between GNSS signal providers (GPS, GLONASS and INMARSAT) and ATS agencies which would have the responsibility for signal augmentation. Further, in continental Europe, due to the proximity of states, augmented signals may be provided by an ATS agency in one state, eg. Germany and relied upon by an ATS agency in another state such as France, with different legal systems, and different arrangements for indemnification of damages assessed against their ATS agency. Thus not only is there a question of air law, but also a basic question of state responsibility and conflict of laws.

CNS/ATM , once fully implemented, will likely result in most commercial passenger aircraft relying upon automatic dependent surveillance (ADS) as their means of communicating their position to ATS.[187] Position information on board aircraft would be transmitted to ATS via means of air to ground data link. This information would be transmitted upon occurrence of certain events, such as altitude changes or waypoint crossings or at specific intervals. As discussed in the preceding chapter, secondary surveillance radar (SSR) may also be used as a means of surveillance. Aircraft may also use airborne collision avoidance systems (ACAS). ACAS is an independent airborne system using SSR transponder data, analyzing it to determine if there is the potential of collision with other aircraft in

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186 Daly at 106.

187 ICAO RNP criteria will not mandate the use of ADS, however the commercial adavantages airlines will derive from ADS will result in it becoming the standard method of surveillance for air traffic management.

the vicinity. Such systems are not designed for use as surveillance systems for ATS but can be used as an aid for ensuring aircraft separation.

2.2 Possible Sources of Liability

One of the primary concerns that has been voiced since the adoption of the acceptance of CNS/ATM at the Tenth Air Navigation Conference has been over the availability of GNSS, specifically GPS, signals in the event of intentional degradation or withdrawal of service by the United States in the event of military hostilities. Cessation of the civil selective availability (SA) service could leave civil users, both aircraft operators and ATS agencies, effectively "blind", which could result in a possible aerial disaster.[188]

Such a scenario has been at the forefront of European concerns and calls for an all-civil GNSS.[189] Whether such a concern is legitimate, or rather motivated more by politics, national prestige or industrial policy as opposed to safety, is debatable.[190] In fact, during the Gulf War, the one occasion where one would

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188 Guldimann & Kaiser at 240.

189 See for example W. Leopold, "Transition to GNSS Sole Means of Navigation - The German/European Requirements and Transition Plan", Proceedings: Global Navcom 1994 (IATA: 1994) 329 at 335-6. While stating valid concerns about the service of GPS being switched off or downgraded, its adoption as a sole source means of navigation, and the introduction of the INMARSAT 3 segment, both weigh very heavily against this likelihood. The introduction of civil GNSS via INMARSAT 3 and future systems would greatly lessen the military benefits of shutting off the SA mode of GPS as such signals would nonetheless still be available to a potential adversary via these alternative sources.

190 The political/industrial development game is perhaps given away in the statement made by ECAC states at their June 10, 1994 conference in Copenhagen in which Transport Ministers invited the European ATS agencies and the ESA:

> to develop and pursue jointly proposals for a European component of an initial global satellite system for navigation and;
>
> to take appropriate action to place Europe in a position to contribute to the next generation of global civil satellite navigation systems.

See Leopold at 338.

expect such a deliberate degradation or withdrawal of signals to have taken place, it did not occur.[191] It is noteworthy that the bulk of concerns regarding GPS, and to a lesser extent, GLONASS, availability come from Europe, whereas, by contrast, very few complaints to this effect have come from Asian states.[192]

Nonetheless, a malfunction of the system could diminish its precision. Such a malfunction could possibly arise in the satellite constellations or ground based augmentation equipment. What is known as integrity monitoring and health warning becomes of paramount importance with regard to maintaining system safety, and also with regard to operator liability. As Kaiser notes, "[U]nder liability

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In an interview discussing European concerns regarding satellite navigation and the reliance on GPS, Eurocontrol Director General Yves Lambert, in stating his support of the INMARSAT 3 navigational package, stated:

> Europe has every interest in joining the space club, which is for now the exclusive preserve of the U.S.A. and Russia. A good way to do this would be to lease two of the four Inmarsat transponders. This would give us control of the space segment. We would then have to look at the ground segment.

See F. Jassogne, "Eurocontrol's "slowly but surely" strategy", Interavia, May (1994) 45 at 46.

191 Kaiser notes that in the period of spring to September of 1990, the U.S. degraded the accuracy of the (civil) "selective availability" mode from approximately 100 to 300 feet, with a negligible impact on horizontal separation, but rendering vertical separation by means of GPS alone unacceptable. ***However, he further notes that this degradation was terminated in the fall of 1990 in order for U.S. and allied ground forces to use commercially available civil GPS receivers.*** [Guldimann and Kaiser at 242]. Leopold does note that such signals were downgraded over the former Yugoslavia. However, such a signal degradation could be argued to be in accordance with U.N. Security Council resolutions to which a civilian provider would be equally subject. Leopold also notes that the U.S. radio navigation plan provides for all U.S. electronic navigational aids to be shut down on orders of the U.S. government should it so decide, and that this would be unacceptable for a satellite navigation system intended for global use.[See Leopold at 334.] Should the U.S. (or the Russian Federation) ever find itself in a position of shutting down all satellite-based electronic navaids (upon which U.S. domestic traffic would be dependent in a sole-source scenario), EUROCONTROL might be better advised to see whether it has a fallout shelter in its headquarters basement, as a possible nuclear exchange would be about the only credible scenario for such an occurrence.

192 In light of the vast expanses of ocean that fall within Pacific airspace, the benefits of CNS/ATM for air carriers operating in Asia becomes clear. Moreover, the argument that European concerns over sole source provision of navigational signals are driven by industrial policy considerations can be seen to have had a precedent in the sparring that took place in ICAO over adoption of a European or an American standard for microwave landing systems (MLS).

considerations it can become a central issue, since navigation service providers will likely be required to give warnings of any accuracy degradation or disruption of services."[193]

The new INMARSAT 3 series of satellites will have the capacity to broadcast such warnings. However, integrity monitoring at present has to be done by the operator of the navigation system, leaving liability for failure to monitor and provide warning of system inaccuracy in the hands of the system operators.[194]

The space segment which forms the backbone of CNS/ATM is itself relatively delicate and the satellites themselves are vulnerable to impacts with micrometeors and other matter, such as man-made debris.[195] From a liability standpoint, however, this would have little importance in terms of duty of care on the part of satellite builders and system operators, except with regard to system provisions regarding redundancy and integrity monitoring as it is impossible to predict the time, place or consequences of an impact.

Telecommunications satellite failures are not unknown, as shown by the January 20, 1994 failure of the Canadian Anik 2 satellite used in Northern Canadian airspace. Thus dangers are posed in both the GNSS and the AMSS portions of the CNS/ATM systems. All such potential problems with the GNSS have an impact upon those ATS agencies which would rely upon the GNSS, either in terms of the

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193 Op. Cit. at 243.

194 There exists the possibility that on-board systems may come into use which would allow pilots to detect signal degradation or malfunction,using Receiver Autonomous Integrity Monitoring (RAIM). Such a system requires there to be six satellites in line of sight of the aircraft. At present, GPS and GLONASS do not provide sufficient numbers of satellites in their constellations for this to be done separately with each system. Kaiser notes that "[A] combined GPS/GLONASS receiver for civil users could solve all RAIM problems" and that "[I]t could use the signals of the INMARSAT 3 series, which will be like GPS". This would likely remove some of the liability burden for service providers with regard to integrity monitoring. See Guldimann and Kaiser at 244.

195 For example it is anticipated that in late 1998 or early 1999 the anticipated Leonids meteor storm in which debris from the comet Tempel-Tuttle will pass through the earth's atmosphere will present in a single hour the number of microparticles that would normally be present over three years. These fragments have the potential to damage satellites through impact and through discharge of electrical charges. It is anticipated that during the Leonids storm that some of the approximately 240 operational satellites in orbit around the Earth will be lost. See T. Spears, "Space Industry Fears Attack of the Leonids", Ottawa Citizen, July 20, 1995, p. A1.

data supplied by aircraft ADS or through their use of GNSS signals for LADGPS, WADGPS and WAAS. There will undoubtedly be a reticence on the part of states to take on the additional liability implicit in providing integrity monitoring and health warning, when a failure in such an area would likely result in strict liability for the ATS provider due to system complexity. [196]

2.3 The CNS/ATM Liability Regime: A World Without Maps

2.3.1 The ICAO Perspective

At its 29th Session, the Legal Committee of ICAO concluded "that there is no fundamental legal obstacle to the implementation and achievement of the CNS/ATM concept".[197] The Legal Committee did not reach any express conclusion with regard to issues of liability arising from the concept. This is not to imply that there was an absence of discussion of the question. The Report of the Legal Committee would indicate that such discussions certainly occurred.

The report contains two Annexes which both note the question of liability. The first Annex, entitled "Guidelines for Acceptable Institutional Arrangements Relative to the Implementation of Aeronautical Mobile Satellite Services (AMSS) and Global Navigation Satellite System (GNSS) for Civil Aviation" is intended to aid states and regional planning groups in assessing proposed AMSS and GNSS. Guideline I-7 states that "Arrangements should provide for the determination of liabilities, while Guideline I-8 states that "Adequate arrangements should be made for recovery in the event of a significant malfunction or catastrophic failure of the satellite system."[198]

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196 Just such a regime of strict liability for ATS using CNS/ATM has been recommended in I. Lagarrigue, "ATC Liability and the Perspectives of the Global GNSS (Is an International Convention Viable?)"(LL.M. Thesis, McGill University, 1994) [unpublished] at 72.

197 ICAO Legal Committee, Report of the 29th Session of the Legal Committee, (4-15 July 1994) at 3-9. ICAO Doc. 9588-LC/188.

198 Such arrangements would presumably include insurance coverage. What extent of coverage would be appropriate? It is worth noting that at present the draft legislation for the Canadian ATS non-profit corporation envisages the need to obtain insurance coverage of approximately 1 billion dollars (Cdn.) per occurrence. Similar coverage for any non-state GNSS provider or for AMSS service providers would seem reasonable.

The Second Annex deals with contracts between ATS and service providers. Entitled "Checklist of Items to be Contained in Contracts for ATS Services with Service Providers" it is a guide for those contracting for AMSS services. Item 2.6 of the checklist sets out general terms and conditions which should be found in such contracts, with regard to such matters as (i) insurance, (ii) limitations of liability, (iii) settlement of disputes, and (iv) applicable law.

Both of these annexes are proof that the issue of liability did not escape the notice of the Legal Committee. However, the relatively minimal attention devoted to liability issues would appear to indicate that the Legal Committee was not troubled by such questions.

The Report to the Legal Committee of Dr. Werner Guldimann with regard to the institutional and legal aspects of FANS states in its draft recommendations that:

> ...Member States adopt in their respective national laws a rule expressly determining the applicable laws in respect of the liability of service providers, preferably the lex loci actus of the law of the agency's residence...
>
> ....the Legal Committee be charged to consider the liability rules which might be applicable to ATS providers and other potentially liable parties.
>
> Action on these Recommendations, however, should not in any way delay implementation of the FANS concept.[199]

The final point acknowledges the harsh reality that ICAO has had an unsuccessful history in its attempt to unify the law of ATC/ATS liability by means of an international convention, and that the best that ICAO can do at present is to use its moral suasion to encourage member states to commit to use of a model law. The liability issue is not deemed to be of sufficient importance to merit delaying the

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199 W. Guldimann and S. Kaiser. Future Air Navigation Systems: Legal and Institutional Aspects (Dordrecht, the Netherlands: Martinus Nijhoff, 1993) at 36-37. Due to budgetary restraints, the Legal Committee was not presented with the full text of Dr. Guldimann's Report. The full text of the report, along with various Annexes and Appendices, appears in the Guldimann and Kaiser text.

implementation of the technology.[200] The Report of the Tenth Air Navigation Conference in its report on Agenda Item No. 4, "Consideration of institutional aspects of the future air navigation system" had little to say with regard to liability, noting that:

> The conference was apprised of the experience of a number of States in contracting communication services (including satellite services) for air traffic control (ATC) and where questions of liability had been addressed and no particular problems had arisen. In addition, many States also had successful long-standing intergovernmental arrangements for the provision and sharing of air traffic services.[201]

2.4 A Space or Aeronautical Liability Issue?

To pose this question is not to engage in a meaningless discourse. The CNS/ATM systems are a complex interlinkage of space-based communications and navigation equipment, and terrestrial-based ATS systems, the latter of which have been governed by national fault-based regimes, whereas activities in outer space are governed by the liability provisions of the 1967 Outer Space Treaty[202] and the 1972 Convention on International Liability for Damage Caused by Space Objects.[203] The legal regime which applies to liability for damages arising from space objects and space activities is considerably different from that which applies to activities on the

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200 In fact, Dr. Guldimann in the concluding remarks to his Report stated: "The Committee was unable to agree on recommendation No. 1, concerning an express rule of national laws determining the applicable law in respect of the liability of service providers. I do not consider this matter to be of great consequence..." Future Air Navigation Systems at 137.

201 ICAO. Report of the Tenth Air Navigation Conference. (ICAO: Montreal, 1991) ICAO Doc. No. 9583, AN-CONF/10.

202 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, January 27, 1967, 610 U.N.T.S. 204, 18 UST 2410, T.I.A.S. No. 6347 [Hereinafter "Outer Space Treaty"].

203 Convention on International Liability for Damage Caused by Space Objects, March 29, 1972, 961 U.N.T.S. 187, 24 U.S.T. 2389, T.I.A.S. No. 7762.

earth. As one author notes with regard to the liability aspect of navigation satellite operation:

> There is a tension between the legal regimes governing outer space, where navigation systems are located, and those regimes governing sovereign air space, sovereign surface territory, and the high seas, where the airplanes, ships and surface vehicles being navigated are located. At issue is whether it is possible and desirable to include the operation of navigation satellite systems within one legal regime.[204]

The characterization of the question as one of a choice between two mutually exclusive legal regimes may be somewhat artificial. There would appear to be a functional overlap of the two regimes, one international, the other defined by national law via Article 1 of the Chicago Convention.[205]

The Outer Space Treaty's provision concerning liability is found in Articles VI and VII. Article VI states, in part:

> 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.[206]

Article VI states that:

> 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

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204 P.B. Larsen, Legal Liability for Global Navigation satellite Systems (1993) 1 I.I.S.L. 69 at 74.

205 Hong-Kyun Shin and Soon-Kil Hong, "Legal Aspects of Space Activities of ICAO in Implementing FANS", (1993) 36 Colloquium of the American Institute of Aeronautics and Astronautics 98 at 99.

206 Outer Space Treaty, Art. VI.

> 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 or in outer space, including the moon and other celestial bodies.[207]

The Liability Convention goes further by setting out claims procedures. It also states unequivocally in Article II that "[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 in flight." Article VII proscribes nationals of a launching state or states participating in a launch from making claims under the Convention. Thus claims in such instances would have to be made in the courts of the launching state and sovereign immunity may apply in cases of state space activities.[208] Compensation claims procedure is set out in Articles VIII-XIX, where claims are to be presented by States through either diplomatic channels or through the courts of a launching State.

The idea behind these liability provisions is compensation for the "innocent bystander" affected directly through such hazardous space activities. A question arises with regard to how "damage" is defined and the willingness of jurists to extend it. "Damage" would appear to be of a direct and largely physical character as defined in Article I, where it is defined as "...loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or judicial or property of international intergovernmental

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207 Outer Space Treaty, Article VII.

208 Of course this does not provide a complete answer to the question of liability in the case of privately operated satellites. As one author notes:

> Since AMSS are offered also by private entities the question becomes very urgent [as to] who will actually be held liable if a space segment is operated by a private services provider. A safe starting point is to say that the state under whose name a satellite operating AMSS is registered in accordance with the Registration Convention will be liable.

W. Stoffel, "Legal Aspects of Aeronautical Mobile satellite Services - The ICAO FANS Concept", (1993) 36 Colloquium of the American Institute of Aeronautics and Astronautics 116 at 118.

organizations."[209] Thus, re-entry of a space object such as Skylab or Cosmos 954 would be covered in terms of any direct damage to persons or property resulting from their re-entry, however the issue of inapplicability of the Liability Convention to indirect damage from an object still in space remains.[210]

Kenneth Spradling argues that damage caused indirectly, such as a ship running aground due to faulty GPS signals, would likely not be covered under the Liability Convention.[211] The rationale for this being that from the beginning of United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) deliberations in 1958, the idea of damages being caused by objects remaining in space did not appear to be present. He further notes that this issue was raised in Congressional ratification hearings and that:

> The documents point out that the Senate had previously indicated that liability in space did not include recovery for "nonphysical damages" and that the U.S. position that indirect damages were *not* covered by the Convention had been stated to the United Nations in 1971.[212]

By contrast, the Space Station Agreement specifically includes indirect damages, leading to the conclusion that by virtue of the Liability Convention being silent as to indirect damages, they are not included in it.[213]

Wilhelm Stoffel, in an article published by the American Institute of Aeronautics and Astronautics draws the same conclusion as Spradling, noting that the Liability Convention in defining damages, "...makes it clear that it refers

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209 For a fuller discussion of the likely interpretation of this article and its applicability to the U.S. GPS navigation system, see K.K. Spradling, "The International Liability Ramifications of the U.S.' NAVSTAR Global Positioning System", (1990) 36 Colloquium of the American Institute of Aeronautics and Astronautics 93. at 97.

210 Ibid. at 97.

211 Ibid. at 97.

212 Ibid. at 97.

213 Ibid. at 98.

exclusively to physical damage and excludes pecuniary damages."[214] He further notes that the Liability Convention only concerns itself with the space segment, thus with regard to the AMSS:

> The typical damage arising from telecommunications activities, namely pecuniary loss due to transmission failure, incorrect, unclear, retarded or otherwise faulty transmission is not covered. Applied to AMSS, a major disaster caused by transmission failure would not fall under the scope of the LC [Liability Convention].[215]

As noted on the preceding page, the Liability Convention sets out a diplomatic process for making claims against a State for its space activities as defined under the Convention.[216] Under Article VIII, claims may be made by States on behalf of their nationals. Article IX states that "A claim for compensation for damage shall be presented to a launching State through diplomatic channels". The use of the national courts of the launching state is not precluded. However, the conclusion which can be drawn from reading the Liability Convention is that the diplomatic processes would be applied first. The process for determining claims set out in the Liability Convention is, to say the least, cumbersome. The possibility arises of waiting several years for a decision of an ad hoc claims commission, the formation of which is provided for in Articles XIV through XX.

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214 W. Stoffel, "Legal Aspects of Aeronautical Mobile satellite Services - The ICAO FANS Concept", (1993) 36 Colloquium of the American Institute of Aeronautics and Astronautics 116.

215 Ibid. at 118.

216 Under the definition of "launching state" found within Article I of the Liability Convention, namely "a State which launches or procures the launching of a space object" and "A State from whose territory or facility a space object is launched", a state would be liable for damage resulting from a privately-owned satellite launched from its territory. Thus, Canada could be held liable for any damages resulting from its ANIK series of satellites or the U.S. for damages resulting from Western Union satellites. Again, "damage" would have to be considered physical damage, essentially that arising from re-entry.

Addressing this very issue, Spradling writes that:

> ...a claimant could conceivably wait for several years for his claim to be processed and considered with favourable results by a claims commission, only to find that he will not be compensated simply because the country involved refuses to be bound by the commission's recommendations. Compared to the relative certainty of a domestic claims process -- where available -- the Convention fares poorly. As a result, asserting a GPS-related claim under the Liability Convention should be considered a last resort at best.[217]

Both GLONASS and GPS, as government owned and operated systems, present claimants in suits with the option of proceeding under the Liability Convention's diplomatic channels and non-binding claims commission process or by means of proceeding under national tort law. The case of a future navigational service operated by an international organization other than INMARSAT leads to the question of whether its members would be willing to be bound under the Liability Convention under Art. XXII. Article XXII makes application of the Liability Convention to such international organizations dependent on the organization filing its consent to be bound.[218] However, in the event that such an organization is unwilling to be bound, there could still be joint and several liability on the part of its state members under Art. XXII (3).

As noted earlier, the question of liability is already dealt with in the INMARSAT Convention. With regard to GPS, with its U.S. government

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217 Ibid. at 98.

218 The full text of Article XXII(1) states as follows:

> In this Convention, with the exception of Articles XXIV to XXVII, references to the States shall be deemed to apply to any international intergovernmental organization which conducts space activities if the organization declares its acceptance of the rights and obligations provided for in this Convention and if a majority of the States members of the organization are States Parties to this Convention and to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.

provision, in the event of damages caused by signal failure or inaccuracy, either through the signals themselves or WAAS using such signals, the route of choice would be to proceed with a claim under U.S. law, by means of the FTCA or other statutes.

With regard to GPS, claimants would not be limited solely to proceeding by means of an action under the FTCA. As GPS signals are navigational signals and ATS is provided over water as well as over land, it is possible, in very specific circumstances, to bring action against the U.S. government under the Suits in Admiralty Act.[219] Nonetheless, a claim under this statute confers no benefit above that which exists via initiating an action under the FTCA. The opportunity also exists to present claims under the Military Claims Act,[220] or the Foreign Claims Act[221] for foreign claimants. Both allow for what is essentially an *ex gratia* settling of claims resulting from the actions of the U.S. armed forces. Provision of navigational signals clearly would fall under the ambit of both statutes. In light of the precedent setting nature of any claim for damages resulting from usage of GPS,[222] and the involvement of the U.S. FAA in terms of domestic augmentation and also notification of signal degradation, the focus would likely be on the FTCA as opposed to these two statutes dealing directly with the liability of the U.S. armed forces.. Epstein also notes that with regard to these two statutes :

> While the United States has been very liberal in paying claims, the government has no legal obligation to do so. The Military Claims Act provides similar relief for those U.S. citizens and others that do not fall under the Foreign Claims Act; however, agencies have typically required that the

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219 46 U.S.C. s. 741-752 (1988) . For further details see J.M. Epstein, "Global Positioning System (GPS): Defining the Legal Issues of its Expanding Use", (1991) 61 Journal of Air Law and Commerce 242 at 266-7.

220 10 U.S.C.A. 2734 et seq. as cited in Spradling at 97.

221 10 U.S.C.A. 2733 as cited in Spradling at 96.

222 Epstein notes that "[T]hus far, the government has avoided suits based on navigation errors caused by GPS", there having been only one case dealing with the issue of GPS accuracy, and then only in terms of its accuracy as a mapping tool. Epstein at 262.

> military member causing the injury: (1) was acting in an official capacity, (2) acted negligently, (3) that the act was not a discretionary function.[223]

A discussion of the FTCA and its applicability to ATS liability appeared in the preceding chapter. Of particular note is the standard of care that would be expected to apply and the availability of the discretionary function defence.

Larsen observes that:

> It is uncertain whether negligence would cause the government to be liable under the Federal Tort Claims Act because navigational satellite service is a more passive function of the government than is air traffic control.[224]

Such an argument, based on "passivity" in all likelihood goes too far. The "passive" nature of maritime navigational aids did not prevent an action on the grounds of negligence in Indian Towing. In fact, both Larsen and Spradling note that the Indian Towing decision is relevant. Indian Towing is notable for establishing that for a gratuitously provided service, while there exists a duty of care to users of the service, the applicable standard of care is lower than would otherwise be the case if the service were not gratuitously provided. Nonetheless, a duty of care does clearly exist. Also of importance is the issue of what constitutes discretion at the policy vs. the operational level. The fact that the level of accuracy in the GPS civil Selective Availability mode is less than is available to military users is clearly a policy decision at the discretionary level. The distinction between policy level decisions and operational level actions is important, particularly in relation to claims under the FTCA and similar legislation in other countries.

The discussion thus far has concerned itself primarily with the GNSS aspect of CNS/ATM. However, with regard to the AMSS aspect, conclusions are drawn

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223 Epstein at 268.

224 Larsen at 73.

largely on the same basis. Both SITA and ARINC, in providing their AAC, AOC and ATS communications services use leased transponders on satellites owned by other entities. Thus, there exists the possibility of an interruption in communications resulting from a problem with the service provider's ground facilities, or the leased satellite transponder. It is also possible that the satellite owner/operator may have entered into a contract with the aeronautical communications service provider which deals in detail with the issue of liability.

The provisions of the Outer Space Treaty and the Liability Convention apply to the launching state. By not being the owners of the satellites, SITA and ARINC's activities would not come under these instruments, although the utility of these two international instruments is dubious in light of their possible lack of applicability to anything other than direct damage physically caused by the satellites themselves. By contrast, an organization that owned its own satellites, along the lines of INMARSAT would be subject to these instruments. However, as noted, INMARSAT addresses liability in its own Convention and in its contracts with its airline customers. The end result is that liability in such a situation most likely would be the subject of a contractual waiver between the service provider and the user.

2.4.1 An Aeronautical Liability Issue

Having examined the application of the liability provisions of the major conventions on the law of outer space and having found them wanting from the perspective of the plaintiff, and their applicability questionable, we again return to consideration of liability for damages incurred through usage of CNS/ATM systems as a "traditional" aeronautical law question.

The "traditional" approach to aeronautical liability has been that of the application of national laws, within the framework of international instruments such as the Chicago and Warsaw Conventions. With regard to civil passenger air transport, the liability limits inherent in carriage covered by the Warsaw Convention have led historically to a search for a "deep pocket" defendant not

subject to the liability limits, namely the aircraft manufacturer or an ATS provider.

The use of CNS/ATM within national air navigation systems does not necessarily move liability outside the historical experience. It can be classed as merely another sophisticated technology embraced by ATS authorities. Thus, much of the case law relating to the liability of ATS agencies would still be applicable.

The ATS provider may wish to cover the issue of liability via contract with the space segment provider. This would not remove actual ATS liability from the realm of delictual liability, but would rather be in the nature of assurance of indemnification. As noted by Hong-Kyun Shin and Soon-Kil Hong:

> Legal arrangements between States and other participants should include the determination of the extent to which liability is to be assumed in connection with the provision of facility/service. [225]

2.5 Choice of Governing Legal Regime and Choice of Law: Fault Liability vs. Strict Liability

In a world of sophisticated litigants and "forum shopping", it is difficult to argue against the conclusion drawn by Spradling, that use of the Liability Convention would be a claimant's last resort compared to national courts. Assuming an action for direct damage is brought against an ATS agency and navigational signal provider as a result of a GNSS failure, the question that must be asked is whether the regime which would apply is one of fault or of strict liability. As was apparent in the first chapter, both regimes can be said to be applicable to liability of ATS agencies, albeit in relation to different factual scenarios, ie. human error vs. equipment malfunction. Kaiser notes that in future there may be "...a distinction between liability for the integrity of the communications pipeline and for the information transmitted through it."[226]

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225 Hong-Kyun Shin and Soon-Kil Hong at 109.

226 Kaiser at 215. This is an interesting proposal, insofar as it would suggest a "product" to which a fault-based negligence regime would apply being carried via a "product" to which a regime

The regime which governs ATS liability is essentially one of fault, however strict liability has made inroads in legal commentaries.[227] This is particularly true in relation to failure of computerized equipment, and its eventual application is probably a matter of time more than anything else.

With regard to CNS/ATM, reliance upon a strict liability regime is certainly conceivable, due to the sophisticated nature of the technology involved. The practical difficulties of proving negligence, particularly in relation to such complex systems as CNS/ATM has led to the call for application of principles of strict liability.[228] Kaiser adopts an approach of examining CNS/ATM in terms of its two elements: the AMSS and the GNSS, when determining whether strict or fault liability should apply.[229]

Kaiser notes firstly that there should be a distinction between the liability rules which would apply to ATS communications which are safety related and AOC, AAC and APC which are commercial.[230] Because of the degree of reliance of the aircraft upon ATS communications and the difficulty in establishing fault, Kaiser holds that "[I]f a separate liability regime for ATS communications is established in addition to the "general" ATC liability, it should be independent of fault."[231] AOC, AAC and APC communications should they fail would not result in an aircraft accident, whereas:

> If an ATS communication link fails, an aircraft accident is likely to result, causing damage to or loss of life, health, aircraft and perhaps even third parties in the air and on the ground. Damages which may

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of strict liability could apply.

227 H. Sasseville, "Air Traffic Control Agencies: Fault Liability vs. Strict Liability" 10 Annals 239 (1985).

228 Lagarrigue at 72.

229 Kaiser at pp. 215-219 and pp. 242-243.

230 Ibid. at 215.

231 Ibid. at 216.

> occur due to failure of AOC, AAC, and APC are less catastrophic. Typically, they will be limited to financial disadvantages (affecting the coordination of the airline administration, the computerized reservation system, or the private data and voice passenger communication). Without underestimating the damages resulting from the disruption of a non-safety communication link, it is questionable whether a strict liability regime can be justified for these kind[s] of services. From a safety point of view, the establishment of a fault liability regime for the disruption and disturbances of AOC, AAC, and APC services is sufficient.[232]

Moreover, Kaiser sees liability for these services as being governed by contract between service provider and user.[233] Kaiser also frames his discussion in terms of the existence of what he describes as an Air Traffic Management Operating Organization (ATM-OO), an international regional body, existing between the level of states and the aeronautical communications service providers. This he argues would create a situation where the ATM-OO provide ATS services and "would also take over liability for ATS communication outages."[234] The communications service provider would in turn, by means of contract, indemnify the ATM-OO for damages it has caused.[235] Whether such an organization is likely to exist on any large scale is questionable, the only example at present being ASECNA, as EUROCONTROL has over time shifted from being a provider of services to being largely a planning organization and a user fee collection agency and clearinghouse and can no longer be said to truly fit this model. Nevertheless, Kaiser's discussion reinforces the importance of the issue of contractual indemnification by the comunications service provider.

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232 Ibid. at 216-7.

233 Ibid. at 217.

234 Ibid. at 218.

235 Ibid. at 218.

With regard to the GNSS portion of CNS/ATM, Kaiser holds that the (at present) free provision of navigational signals and the lack of a contractual relationship between the provider of the signals, be it the U.S. Department of Defense, FAA, or the Russian Federation, results in a situation where strict liability would be inapplicable.[236] He notes that:

> With the unilateral free provision, the lack of user charges are traded in for a lower level of liability and a lower standard of care. Under these circumstances the provider cannot be held liable for accidental degrading and damages."[237]

Fault liability would thus govern, but with the reduced standard of care that would apply to a gratuitously provided service. [238] Liability for gross negligence would still, however, exist.[239] The key for an effective fault-based regime to apply is the existence of a capability on the part of the navigation signal service provider to notify users of signal degradation or inaccuracy:

> This standard of care would oblige the navigation service provider to give warnings of foreseeable degrading and outages. It would also require him to take all measures to establish the navigation system so that it gives warnings automatically, should it fail or be unable to comply with prescribed standards.[240]

The conclusion that a fault-based negligence regime would apply to the GNSS is also at the core of Spradling's understanding of the liability issue, and he

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236 Eventual provision of navigational signals by INMARSAT or another entity with navigational pacakges on its low earth orbit satellites on a fee for service basis, would change this conclusion.

237 Op. Cit. at 242.

238 As Kaiser phrases it, the applicable standard would be found in the latin maxim *diligentia quam in suis*. Kaiser at 242.

239 Ibid. at 243.

240 Ibid. at 243.

notes the obligation on the part of the U.S. towards users of GPS to provide warning of signal degradation.[241] This requirement of notice would be tempered by a consideration of "reasonableness", ie. a balancing of benefits of measures such as development of real time warning capability with costs of so doing.[242] The applicable standard of care, at least in regard to American litigation, for a gratuitously provided service, would be that found in Indian Towing. Of note is the fact that GPS has only been made available on a gratuitous basis to international civil aviation for a period of ten years.[243] What may transpire afterwards in terms of fees for the service and the resulting impact upon liability becomes an unknown.

Thus we arrive at a bifurcated, and perhaps unsatisfactory approach; one regime of liability for the safety-related aspects of the AMSS and another for the GNSS. Is it correct to establish such a split between the regime that would apply to ATS safety communications and to the GNSS? After all, if we are to apply strict liability to aeronautical safety communications service providers, why not extend it to the providers of navigational signals? Surely the rationale that complex electronic systems over whose failure operators may have no control, and for which accident victims could not establish negligence, thus necessitating strict liability (as has been argued for current ATS, reliant upon complex electronic equipment) also applies to a complex satellite-based navigation system.

At the same time, however, it is not necessary for there to be an identical liability regime applying to the two elements of CNS/ATM systems. Accident investigation techniques are sufficiently sophisticated to be able to usually determine the cause of an accident, even in the event of the complete loss of the aircraft, thus allowing application of a fault-based approach.

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241 Spradling at 94.

242 Ibid. at 92.

243 The U.S. pledge of GPS on a gratuitous basis for civil air navigation for a period of ten years was made by FAA Administrator J. Busey at the Xth Air Navigation Conference in 1991.

Lagarrigue, as noted earlier, favours the application of strict liability to CNS/ATM across the board. Whether this is necessary is less than fully clear. While the benefits of strict liability for a plaintiff are clear, in matters of such sophisticated technology, the long run effect of strict liability might be to discourage technological innovation. Lagarrigue, noting industry opposition to the application of strict liability, particularly in relation to AMSS service providers, suggests a combination of strict liability with liability limitations as a possible option.[244] She also notes, however, that some states, such as the U.S., and organizations such as INMARSAT, would have the capability to bear unlimited liability.[245] She thus proposes a system of strict liability applicable to accidents arising out of CNS/ATM systems usage that would combine limited and unlimited damages depending on the law of the victim's state of residence.[246]

In so arguing, she attempts to address the tension that exists between limited and unlimited liability, due largely to the fact that the monetary value ascribed to human life and wellbeing varies across societies. While this is an inescapable fact, and has been for years at the heart of the debate over limitation of liability under the Warsaw Convention, her prescription of compensating accident victims based on the law of the state of residence is politically unacceptable. To enshrine a lower value in law to residents of lesser developed states would strike so many as repugnant that it would be politically unacceptable. Such an approach is by its very nature a non-starter.

To determine the form of liability on the basis of the relative wealth of the service provider would not be appropriate. This serves to create two classes of service provider: those which are "rich" that would be subject to unlimited liability, and those which are "poor", that would benefit from liability limits. As an extreme example, both the U.S. and the Russian Federation, as providers of navigational

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244 Lagarrigue at pp. 75-80.

245 Ibid. at 78-80.

246 Ibid. at 78-80.

signals would be subject to strict liability, but the Russian Federation could plead poverty and thus gain the benefit of limited liability, which the wealthy United States could not. Such an approach, to an accident victim, would be justice stood on its head, arbitrarily creating a windfall or deprivation.

Should we opt to accept Kaiser's approach of applying a strict liability regime to safety related ATS communications and a fault-based regime applying to the GNSS, there still remains the issue of the applicable standard of care.

As noted earlier, the appropriate standard of care for the gratuitous provision of GNSS signals, at least insofar as suits in the United States are concerned, would lie in the "Good Samaritan Doctrine" that is adopted in the decisions of the United States Supreme Court in Dalehite and Indian Towing. In these decisions it was stated that once the government provides a service upon which it knows others will rely for their safety, there exists a duty to take reasonable care to ensure its continued operation.[247] In view of the fact that this doctrine has found its application in air traffic control negligence cases, it is only fitting that it would apply to the provision of GPS signals for aeronautical use. The question resides in what is the content of reasonable care.

The space segment is expensive, out of reach for most repair, and extremely sophisticated. Reasonable care would likely be defined in terms of provision of integrity and health monitoring that would be available to users to let them know on a real-time basis of the existence of signal error, the provision of corrected data from WAAS where available, and the ability to restore signal integrity. It would also entail the maintenace of so-called hot spares in orbit so that satellite equipment that fails may be replaced quickly and the system made fully operational. Other than this, the content of the standard and duty of care remains an unknown.

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247 Sasseville at 25.

2.6 Liability of Manufacturers

The CNS/ATM systems are based on mixed systems of civilian and military equipment produced by a multiplicity of manufacturers. The systems involve the GNSS and AMSS, on-board avionics, and terrestrial ATS equipment including GPS Wide Area Augmentation Systems (WAAS) and LADGPS in the vicinity of airports. This results in a question of applicable law with regard to the various manufacturers and potential plaintiffs.

At present, with the exception of those involved in the Russian GLONASS enterprise, the vast majority of manufacturers of satellite navigational equipment, ie. satellites and avionics, are American, thus, liability of technology providers becomes largely a matter of American products liability law.[248] Moreover, American jurisprudence in the domain of products liability, and the emphasis on juries in U.S. civil trials, favours the plaintiff to a greater degree than that of other states. Lord Denning's seemingly flippant remark that "As moths are drawn to a flame, so litigants are drawn to the state of California", illustrates the natural tendency of the litigant to seek out the most favourable jurisdiction for their action.

The question becomes one of whether the liability regime which would be applicable is that of strict liability or fault. As has been discussed in the preceding chapter, the trend in academic writing has been to treat failure of automated systems used in providing ATS as being subject to a strict liability regime. To do otherwise would be to place an undue burden upon plaintiffs. This of course, is in the context of the difficulty in proving negligence on the part of an ATS provider when such systems fail. The same can be said with regard to the technologies used in CNS/ATM systems, both the GNSS and AMSS.
However, the question of the applicable regime for CNS/ATM technology manufacturer liability has nowhere near been answered.

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248 R.I.R. Abeyratne, "The Evolution from FANS to CNS/ATM and Products Liability of Technology Providers in the United States" (1994) 43:2 Zeitscrift fur Luft und Weltraumrecht, 155 at 157.

Fault-based liability

In order to establish negligence on the part of a technology manufacturer it is first necessary to establish the existence of : (i) duty on the part of the manufacturer, (ii) breach of that duty, (iii) cause in fact, (iv) proximate cause, and (v) damage.[249] The determination of the existence of a duty on the part of a manufacturer of such technology depends on the following factors:

1) the probability that the product would prove to be defective;

2) the gravity of the resulting injury if it does; and,

3) the burden of taking adequate precautions to avoid the injury.[250]

With regard to the manufacturer of the equipment (satellites and avionics) and producers of the software used in GPS navigation, it is plainly clear that the gravity of resulting injury to users in the event of failure could be catastrophic. A defective aircraft endangers those aboard and third parties on the ground. A defective navigation satellite has the potential to endanger all aircraft relying upon it, in addition to third parties on the ground. However, in determining the probability that a product could prove defective or determining the burden of taking "adequate" precautions, it becomes much harder to make an appropriate determination. This is particularly so in that GPS is, and remains, a military system which has been made available to civil users by the U.S. government. The lawyer attempting to make these determinations runs directly into the 'brick wall" of the so-called government contractor or military contractor defence.

This defence to a negligence claim is based on the fact that the defect in a product that causes damage results from a government-specified design element. This defence to a design negligence claim was adopted by the United States

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249 Ibid. at 182.

250 Ibid. at 182.

Supreme Court in Boyle v. United Technologies Corp..[251] In Boyle it was held that the lack of a suitable crew escape system for at sea crashes of the helicopters manufactured by the defendant could not be held to be negligence on the part of the defendant, as it had manufactured the aircraft to a design specified by the government. There would be a lack of fairness in holding the manufacturer responsible to do something it was specifically told not to do through precise, client-imposed design specifications.

As Larsen notes:

> Under case law, the government contractor's defense is particularly strong if the satellite is manufactured for the military. If the satellite is built exactly to government specifications it appears to be unfair to hold the contractor liable for the government's negligent design if the manufacturer conformed to those design specifications.[252]

This defense can be seen as being an extension of the discretionary function exemption of government to the manufacturer operating from government-imposed specifications.[253] Kreindler notes, however, that the defence is limited, citing the words of the majority in Boyle:

> Liability for design defects in military equipment cannot be imposed, pursuant to state law, when (1) the United States approved reasonably precise specifications; (2) the equipment conformed to those specifications; and (3) the supplier warned the United States about the dangers in the use of the equipment that were known to the supplier but not the United States. The first two of these conditions assure that the suit is within the area where the policy of "discretionary function" would be frustrated -- ie. they assure that the design feature in question was *considered by a government officer, and not merely by the contractor itself. The third condition is*

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251 108 S. Ct. 2510 (1988)

252 Larsen at 74.

253 Ibid. at 73-74.

> *necessary because in its absence, the displacement of state tort law would create some incentive for the manufacturer to withhold knowledge of risks*, since conveying that knowledge might disrupt the contract but withholding it would produce no liability. [emphasis added in Kreindler][254]

It is this third criterion that makes the defence less than a complete immunization from liability. Nonetheless, in the case of GPS, manufacturers dealing with a new cutting edge technology with a limited budget for redundant components would likely have little trouble in meeting the third criterion.

The conclusion is somewhat different regarding the navigation avionics that will be used by civil aircraft. Producers of such equipment will not be producing such equipment according to government specifications. Their equipment must meet ICAO's minimum required navigational performance criteria[255], however, design of equipment is left to the manufacturers themselves.[256] This equipment is designed for a civilian aviation application. The fact that satellite navigation began as a military system should not have any impact upon liability of avionics manufacturers producing "FANS packages". LORAN, and inertial navigation systems (INS) both began as military technologies and systems as well, however, manufacturers of the necessary avionics for these systems in civil aircraft could no longer rely on a "government contractor"-type defence once transfer of such technology to the civil sector had occurred.

Liability of manufacturers of equipment used in WAAS would, in the U.S., with the FAA establishing specifications in its contracts, come under the

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254 L.S. Kreindler. Aviation Accident Law Matthew Bender at 7-91 - 7-92.

255 ICAO has not specifically endorsed GPS over GLONASS as a navigational system. It has instead established certain minimum performance criteria that can be met by both GPS and GLONASS signals and receivers calibrated for either or both. RNP defines the performance required in particular airspace or a particular phase of flight, thus allowing a variety of navigational equipment to be used.

256 There exists a variety of manufacturers of equipment. Major airframe manufacturers such as Boeing and Airbus Industrie have produced CNS/ATM "packages" of avionics for aircraft, consisting of "bundles" of equipment.

government contractor defence under the FTCA in relation to design. Liability of such manufacturers to the FAA would be governed by state law, and in most instances would probably be dealt with via contract, by means of the cross-waivers of liability often used in the space launch industry.

Strict liability

The argument for the application of strict liability to the manufacturers of the technology used in CNS/ATM systems has had its strongest academic voice thus far in R.I.R. Abeyratne's article on the liability issue.[257] Relying upon American products liability jurisprudence, in particular the law which has followed the seminal decision of Greenman v. Yuba Power Products 377 P. 2d. 897, he notes that strict liability would apply upon the proof of a defect in the product and a linkage between the defect and the injury suffered.[258] He also draws upon the few cases relating to defective aeronautical charts,[259] to conclude that:

> The foregoing instances of judicial interpretation draws a significant inference that the strict products liability regime as applicable in the United States would apply to the technology providers under CNS/ATM systems whether they provide "advice", "services" or "goods" related to the technology they provide, if such providers make themselves out to the world at large that they are providing such services on commercial scale or goods as a business.

As a conclusion, this is somewhat tenuous, insofar as the technologies involved in CNS/ATM systems are custom built for the space segment as is the

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257 R.I.R. Abeyratne, "The Evolution from FANS to CNS/ATM and Products Liability of Technology Providers in the United States", Zeitschrift fur Luft und Weltraumrecht, vol. 43 no. 2 1(1994) 156.

258 Ibid. at 183-184.

259 In particular, Halstead v. United States 535 F. Supp. 782 (1982).

equipment used to propagate signals for WAAS from ground stations. However, in the case of the commercial avionics, of the "FANS Package" sort required for CNS/ATM usage, he is likely correct.

Abeyratne describes liability for CNS/ATM systems technologies as being "the last frontier". The legal frontier imagery is appropriate as these present a vast uncharted legal territory, characterized by a lack of applicable case law.

2.6.1 The Role of Insurance

The role of insurance in the context of CNS/ATM is not yet fully apparent. At this stage in time, the providers of navigational signals are governmental, and government in almost all enterprises acts as a "self-insurer" insofar as it pays claims out of its own consolidated revenues. With regard to the AMSS, commercial communications service providers maintain liability coverage purchased in the insurance market, while INMARSAT settlement payouts are based on contributions assessed from its members.

The standard texts on aviation insurance have little to say with regard to insurance coverage for ATC, let alone ATS, operations using satellite-based technologies. Margo notes that ATC-directed terminal area ground movements would be covered under the standard airport operator's (ARIEL) policy.[260] Thus, an accident in the nature of the 1975 Teneriffe disaster would probably be covered. Otherwise, ATS operations would require that custom coverage be arranged by the ATS provider. A more extensive discussion of insurance issues follows in the next chapter.

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[260] R.D. Margo, Aviation Insurance. 2nd ed. (London: Butterworth & Co. (Publishers) Ltd., 1989) at 194-195.

3. The Movement Toward Corporatized ATS: A Break with the Past

3. 1 A New Form of Service Provider

As noted in the first chapter of this thesis, the early development of rudimentary ATC/ATS was initially private, or at the level of municipally operated aerodromes. Gradually, as the economic importance of air transport increased, and the need for more elaborate and capital intensive systems of ATC arose, these services began to be performed by national governments. State provision of these services had become the norm by the time of the Second World War, with very few exceptions.[261]

The dominance of the model of the state provider of air traffic services has been implicit in the discussions since 1962 relating to the drafting of an international convention concerning ATC liability. While the ICAO questionnaires that were administered in 1963 and 1980 asked whether the agencies providing ATC services were of a state, private or mixed enterprise nature, the vast majority of the responses received fell into the first category. Further, the operative assumption in the 1972 Argentinean Draft Convention on the Liability of Air Traffic Control Agencies, which was submitted to ICAO at the 25th Session of the Legal Committee in 1980, is that such services are provided by the state, despite the reference in Article 1 to agencies "authorized by them to provide services".[262]

The Chicago Convention and Annex 11 to the Convention, however, do not specifically require that services be provided by an organ of the state.

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261 The exceptions would be RadioSuisse SA, Aerothai, and certain smaller municipal airfields in the United States where services were provided by private organizations such as Serco IAL, or as in Chicago in the mid 1930s, ARINC. Aerothai, a joint venture of airlines and private capital in Thailand was nationalized by the Thai government in the early 1960s, with a minority shareholding remaining in private hands.

262 Draft Convention, Article 1.

Article 28 states that:

> 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.

Further, Annex 11 in paragraphs 2.1.1 and 2.1.2 refer to the obligation of a State to "arrange" for the establishment and provision of air traffic services. There is no express obligation on the part of the state to operate, build or maintain such a service.[263] Further, paragraph 2.1.3 relating to air space over the high seas states that:

> When it has been determined that air traffic services will be provided, the States concerned shall designate the authority responsible for providing such services.

Note 1 to this paragraph states that "The authority responsible for establishing the service may be a State or a suitable agency." Thus, the clear conclusion that can be drawn is that "[T]he Annex, and the ICAO documentation is clear that the State may designate another agency to provide air traffic control services in its airspace."[264] Having seen that no legal impediment exists to the establishment of a non-state provider of ATS, insofar as the Chicago Convention is concerned, it next falls to be seen how and why non-state or commercialized ATS began to emerge.

The movement toward commercialization or corporatizing of ATS should be seen as being more a product of harsh economic reality than of ideology.[265] The

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263 See Privatization study at 3. Paper No. 4.

264 Privatization study, vol. no. 4 at 3.

265 While some such as IFATCA see this as an outgrowth of Reaganomics, it is worth noting that Portugal corporatized in 1979, and that the U.S., the home of the "Reagan Revolution", still retains at present an FAA state-provider model ATS system.

central issue has been funding for new systems, equipment maintenance and controller training. Under a state provider model, the ATS agency is merely a branch of the civil service and must fight for funding for programmes and modernization with other government agencies and organizations. For almost all government ATS providers, the same problems exist as were faced in Germany, prior to the creation of the corporatized DFS: namely hierarchical civil service structures with multiple layers of management, personnel recruitment and rigid procurement systems.[266] Further, ATS agencies such as the FAA often have found their operations to have become highly politicized.[267]

In the case of New Zealand, the fiscal crisis faced by the state in the 1980s, forced a wholesale reshaping of government activities and a greatly reduced role for the state as provider of all services. In 1987, the government created a corporate body, the Airways Corporation of New Zealand (ACNZ), with a 100% government share ownership, to operate the New Zealand ATS system. The corporation, now in its seventh year of operation, is financed by user fees, and uses this revenue stream for funding system modernization and operations.[268]

It is the ability to raise funds through user fees and to engage in equipment and systems procurement without having to follow cumbersome, lengthy, and often politicized procurement processes that perhaps has the most attraction for ATS agencies contemplating taking the corporate route. In the case of New Zealand,

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266 E. Hazelwood, "Global Support Grows for Private ATC Companies", A.W. & S.T. May 16, 1994 at 45.

267 For example: In the United States, Congress is concerned over its loss of oversight over the largest portion of the FAA's operations in the event of corporatization. The lobbying efforts of a vocal general aviation sector, through groups such as the Aircraft Owners and Pilots Association (AOPA) and the National Business Aircraft Association (NBAA), further politicize any major changes to the FAA. See A. Vise, "ATC's Future Hostage to Turf-Sensitive Congress, AWST, May 16, 1994 at 37.

268 ACNZ through the use of user fee revenue completed a $90 million capital investment in computerized ATC systems including radar and communications. As noted by the CEO of ACNZ, this system, discussed as a project but never implemented during the days of government operation, came in on specification, under budget and on time, once it became a corporate procurement. P. Proulx, "Corporatising Aviation Infrastructure: Can Institutional Change Enhance Performance?", Journal of ATC, January - March 1994 19. at 22.

the removal of funding from political processes has led to greater predictability in funding for ACNZ. In the United States, one of the conclusions of the Department of Transportation's ATC Corporatization Study was that corporatization would reduce the blockages and impediments to modernizing the U.S. ATC system.[269] In the case of the United States, such systems modernization is a priority due to the age of much of the equipment currently in use. As one FAA official has noted, the funding problems have served to delay introduction of new technology which the commercial air transport industry deems vital, thus leading to industry support of corporatization in the United States. The industry "[I]s clearly upset with the FAA's inability to field new technology and the FAA's apparent inability to meet its need for capacity efficiency."[270]

Canada's creation of a corporatized ATS agency is based on the same considerations, particularly the need for stable funding in an era of government cutbacks and the need for large-scale modernization of capital equipment. [271] The source of revenue will be from user service charges, namely en-route charges for domestic users and overflight charges for foreign aircraft crossing Canadian airspace, with additional debt financing where needed.[272]

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269 B.D. Norwall, "Privatization May Speed ATC Systems Acquisitions", AWST, May 16, 1994 at 49.

270 C.B. Schellenberg, Regional Administrator, Western-Pacific Region - FAA, "Corporatizing the U.S. ATC System", Journal of ATC, July - September 1994 at 79.

271 In Canada, the majority of system modernization work is approaching completion, however the funding has been governmental. Major aspects of this modernization program include radar systems, at a cost of approximately $810 million, and automation of ATC systems (Canadian Automated Air Traffic System [CAATS] estimated to cost approximately $805 million upon completion in 1997. While this equipment modernization occurred while Canadian ATS was operated as a state-provided service, procurement would likely have occurred more rapidly with a corporatized agency, as has been the case with Airways Corporation of New Zealand. See Globe and Mail, Report on Business, May 13, 1995 at B1. As of February 1996, the target date for completion and delivery of CAATS has been changed to 1998.

272 At present, funding is derived from an air transport tax, levied on all commercial passenger traffic using Canadian airports, and from an additional annual subsidy of approximately $200 million.

3.2 Varying Forms and Models

The process of the devolution of the operation of ATS from government has yielded several terms to express the new forms of operation and organization, among them: commercialization, privatization, and corporatization. Further, there exist several different approaches to organizational structure. As noted earlier, there exist certain subtle differences among commercialization, privatization and corporatization as concepts.

Commercialization is defined at its core as the operation of an enterprise along commercial lines with fees and charges for services providing the revenue, or the bulk of revenues, for the operation of the service. The structure of the ATS provider may remain that of a government department or it may be that of a corporate entity which receives some government funding. Transport Canada has, in its literature, used the term "commercialization".[273] However, the option that has been adopted in Canada and most other states that have done so is "corporatization", the creation of a free-standing corporate entity to provide such services. This is not a trivial distinction, for a commercialized agency may remain a part of a state ministry, with the implications that this would have for liability.

Corporatization is the creation of a corporate entity, usually with government share capital ownership, for the provision of a service, with revenues derived from charges (in the case of ATS, overflight and en-route charges) for services provided. As will be observed in the following section, such corporations may take several different forms.

Privatization, is by contrast, the creation of an enterprise with private capital to provide services which have been previously provided by either the state or a state corporation. An example of privatization would be the transfer of ownership of British Airways from the Crown to private sector investors, through the issuance of shares. At present, the government of the United Kingdom has declared its intention to move from the current independent commercialized joint civil/military

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[273] Canada. Transport Canada. Study of the Commercialization of the Canadian Air Navigation System. 1995

ATS agency (National Air Traffic Services or NATS), responsible to the Civil Aviation Authority (CAA), to a fully private corporation that would contract its services to the CAA.[274] The corporatization option is only being pursued in the United Kingdom as an intermediate step to full privatization. The U.K. is thus the first state to declare its intention to proceed to a fully privately owned and operated ATS system. At present, "there are no known examples of fully privatized ANS [air navigation services] in any state".[275]

3.2.1 Corporate Models

There exist four models of corporate organization: (i) a corporation with the state as sole shareholder, with operations either subsidized or operated on a commercial basis; (ii) a fully private corporation; (iii) a mixed state - private ownership corporation; and (iv) a user-owned non-profit corporation. Due to the absence of any fully private corporations providing such services, these will not be the subject of discussion, save for the following conclusions: Such corporations would provide such services by means of contract to the state, they would be responsible for obtaining their own liability insurance coverage and they would be subject to the liability regime applicable to private enterprise.

State owned corporations

As noted, a fully private corporation does not yet exist, but may very well exist in the United Kingdom in the near future.[276] The vast majority of

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274 United Kingdom, House of Commons, Transport Committee. "Privatisation of National Air Traffic Services", Vol. II, Minutes of Evidence. 8 December 1994. at 1-2.

275 Transport Canada. "The Study of the Commercialization of the Air Navigation System in Canada: Principles and Options for Commercialization", Discussion Paper No. 1 at 24.

276 Testimony of H.B. Wenban-Smith, Head of Civil Aviation Directorate, Department of Transport. United Kingdom. House of Commons. Transportation Committee Second report "Privatisation of National Air Traffic Services" Minutes of Evidence. (8 February, 1995) at 4 paras. 14-17.

corporatized ATS agencies[277] fall within the first model, what is known in Canada as the "crown corporation" or "state owned enterprise" model, examples of which would be the Canadian passenger rail service - VIA Rail - or Air France. These two examples also illustrate the two types of crown or state corporation that can exist (i) subsidized, such as VIA Rail which greatly subsidizes passenger ticket tariffs as opposed to (ii) enterprises such as Air France which operate on commercial principles with fares being the source of operating revenues.

The ANS corporations in both New Zealand and Australia fall under this model as do those in Germany[278] and Austria. In Australia, however, the corporation also provides aviation safety services such as inspection and certification of aircraft.[279] The newest such corporation is the Irish Aviation Authority, a limited company, which was established by statute in 1993. All shares are held by two Ministries: (i) the Ministry of Transport and (ii) the Ministry of Energy and Communications. [280] On January 1, 1994, the corporation took over all facilities and operations of the state Air Navigation Services Office. Like the Australian agency, the Irish Aviation Authority also oversees such matters as airworthiness and pilot regulation. The principle source of funding (84%) is derived from overflight fees.[281]

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277 The following countries have ATS agencies operated along the lines of this model: Australia, Austria, Germany, Ireland, Latvia, New Zealand, Portugal, South Africa, Switzerland and Thailand.

278 Germany's Deutsche Flugsicherung GmbH (DFS) is a wholly state-owned corporation with a mandate for 100% cost recovery. It is a non-profit corporation which derives its revenues from charges for overflight of German airspace, en route charges for domestic users and landing charges at airports. See Vol. 4 of the Transport Canada Commercialization Study at 24.

279 Movement is now underway to eventually take the safety oversight outside of the corporate Civil Aviation Authority. See Vol. No. 4 at 16. It should also be noted that the CAA in the United Kingdom also has a safety oversight role, which will be spun off with the creation of a privately operated ATS. Vol. No. 4 at 19.

280 Irish Aviation Authority, Annual report, 1995 at 3.

281 Ibid. at 7.

Mixed Enterprises

Mixed state - private enterprises in a corporate form are a relative rarity. Austria, Switzerland and Thailand can be seen as following this model, although the proportion of private shareholding varies greatly among them. In all cases, the majority shareholder is the state. The ownership structure of Swisscontrol, is 71% governmental, 7% owned by the two Swiss airlines, 12% by the three principal Swiss airports and 10% by employee and user groups.[282] Austria's corporatized ATS organization, Austro Control, is permitted to have up to 49% ownership by local airport authorities.[283] Admittedly, this is not the same as private sector involvement, however, this user involvement differs considerably from the old regime of complete state ownership of the ATS system.

Thailand's Aerothai, as noted earlier had started life as a wholly private enterprise which was nationalized in the 1960s. However, a 10% minority shareholding was set aside for the air carriers using Bangkok International Airport, with carriers operating out of the airport required to obtain specific numbers of shares in proportion to their usage of the airport.[284] At present 52 carriers are shareholders and there is carrier representation on the Board of Directors of Aerothai.[285]

The user-owned nonprofit corporation: the North American route

This option has not been used in any state for ATS but is proposed for the United States and is to be applied in Canada with the creation of NAV Canada, a federally incorporated nonprofit corporation. This corporation will be controlled by

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282 Canadian Study Vol.4 at 25. The potential exists under the legislation establishing Swiss Control for the reduction of state shareholding to 51%.

283 Canadian Study, Vol. 4 at 25.

284 Canadian study. Vol. 4 Page 29.

285 Ibid. at 29.

the major stakeholders in the Canadian air navigation system: air carriers, the unions involved in operating the Canadian air navigation system, general aviation and the federal government.[286]

This corporation will, through the issuance of debt, make a one time purchase of the air navigation system.[287] The operating costs would then be financed through en-route and overflight charges. At present the operating costs are met through an air transport tax (ATT) applied to all flights that use a Canadian airport. Overflight charges, a major source of revenue in Europe, had been ignored, but were finally instituted on November 1, 1995. The underlying assumption is that user charges will remove the need for state subsidy.

A brief discussion of U.S. plans for corporatizing the FAA's ATS operations will follow later in this chapter.

With the removal of ANS/ATS from the operations of government, a departure from the traditional model of service provision arises, which also brings into play the issue of liability regimes governing such corporatized entities and their approaches to catastrophic risk.

3.3 Differing liability regimes: Impact upon the traditional model

As discussed in the first chapter of this thesis, when ATS are provided by the state either sovereign immunity or specific legislation regarding state liability applies. Thus in Canada, the Crown Liability Act applies, whereas in the United States, the FTCA governs. European examples of this traditional approach include France and Italy.

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286 Globe and Mail, Report on Business, at B3 Aug. 5, 1995. As of September 8, 1995 the Board of Directors consisted of eleven members, with four representing air carriers, two representing labour, three representing government, an independent chair, a CEO and four independent members.

287 A memorandum of understanding was entered into between the corporation and the federal government on December 8, 1995 transferring the Canadian ANS system to NAV Canada, for $1.5 billion, effective April 1, 1996, subject to Parliamentary approval of implementing legislation.

It is on the level of corporatized ATS agencies where this changes. Once separate from government, such agencies fall under the ambit of private law. The benefits that would accrue to a state defendant, such as the FTCA discretionary function exemption (limited though they may be) no longer apply. The response of states varies regarding the problems this poses for their ATS agencies. Some states cover potential liability of such agencies, taking on responsibility for damages resulting from negligence or system failure, while other states structure their ATS organizations such that they must take out private catastrophic loss insurance.

3.3.1 State indemnification for torts of ATS corporations

Clearly, where the provider of ATS is an organ of the state, state liability applies and issues of solvency do not arise. As Schubert observes:

> La question de la garantie de solvabilité d'une agence du contrôle de la circulation aérienne se pose en des termes différents de celle concernant la couverture de la responsabilité du transporteur aérien ou de l'exploitant d'aéronef. En effet, dans la quasi-totalité des cas, les agences de la circulation aérienne sont des entités gouvernementales, et il y a identité entre le sujet de la responsabilité et son garant. De plus, dans ces circonstances le problème de la solvabilité des agences du contrôle de la circulation aérienne a fort peu de chance de se poser, étant donné les moyens financiers dont dispose généralement l'Etat.[288]

But what of the case of the corporatized ATS agency with a contract with the state? Schubert notes that questions of solvency of an agency do arise when the question of catastrophic loss is brought up. He notes that the Argentinean draft convention on ATC liability makes note of various means of ensuring adequacy of resources for payment of claims such as indemnification based on the agency's own assets, by a guarantee on the part of the contracting state or through purchase of a

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288 Schubert at 241-2.

policy(ies) of insurance.[289]

Nonetheless, the question of provision of a guarantee of sufficient funds to cover catastrophic negligence claims almost invariably flows back to the state that contracts out its ATS obligations. As Schubert observes:

> Pour certains Etats, la consécration formelle d'une obligation de garantie de leur part, même subsidiaire, en raison des dommages susceptibles de découler des activités de leurs services de la circulation aérienne, ne constitue en rien une innovation. Les Etats qui entrevoient dans l'article 28 de la Convention de Chicago un devoir à leur charge de fournir ces services, y distingue même coup qu'un corollaire selon lequel ils acceptent de couvrir financièrement les conséquences d'une défaillance de ces services. Quelle que soit la portée effective de l'article 28 de la Convention de Chicago, on constate effectivement que dans la pratique, les Etats s'assurent que les agences non-gouvernemnetales disposent d'une couverture financière suffisante ou d'une assurance adéquate, pour faire aux obligations qui pourraient leur être imposées par un tribunal en cas de dommage provoqué par leur faute.[290]

In the case of Germany, the state will pay damages for the torts of the DFS, yet reserves for itself the right to pursue the DFS for an indemnification.[291] However, the effect of such an arrangement is that the state is the ultimate guarantor, as the agency may find itself insolvent in the face of catastrophic loss, or its insurer may not be solvent.[292] Nonetheless, despite the state being the ultimate guarantor,

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289 Ibid. at 242.

290 Ibid. at 242-3.

291 Ibid. at 241.

292 The odds of the insurer being insolvent are quite slim. Air carriers have had liability insurance arrangements for decades that cover substantial potential losses and for which their insurers have been able to make payment. Total losses from a catastrophic accident involving a wide-bodied passenger aircraft would be no greater if caused by ATC/ATS negligence than by negligence on the flight deck. Insurers have been able to cope with the payouts on the latter type of accident and the rarity of accidents of such magnitude attributable to ATS negligence or equipment failure would render insolvency of the insurer less of a concern, due to the lesser frequency of

private insurance arrangements merit a closer look, for when an agency is required to obtain private insurance, it should be assumed that the insurer will be sufficiently solvent that there will be no need to resort to a state pay-out. The effect of moving to market determined, risk based insurance coverage and premiums will reflect itself in the user charges which an ATS agency would levy on airspace users, based as they would be upon true costs of operation, with no hidden subsidy in the form of state indemnification.

3.4 Insurance and Self-Insurance

3.4.1 Commercially available coverage

As noted earlier in the first chapter, ASECNA is required to carry liability insurance. As Schubert notes, this insurance is required to cover "les risques de recours que les tiers pourraient intenter à l'exploitation des services dont elle a la responsabilité."[293] COCESNA is also required to provide for insurance coverage for any negligent acts.[294]

The purchase of liability insurance in the commercial market characterizes the current UK NATS agency, as well as the Irish Aviation Authority, ACNZ, the Czech Air Traffic Control Administration (ATCA) and the newly-incorporated NAV Canada. Such coverage is for all intents relatively new in the realm of air law and has received no attention from the established writers in the field.

In a 1989 article on ATC privatization in the American context, David Duncan discusses the impact that privatization would have upon liability and

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insurance payouts. The shift to CNS/ATM, however, presents new challenges insofar as the potential impact of a catastrophic accident becomes greater than would be the case with current systems, as multiple aircraft will be relying upon a sole-source space-based navigational system. The possibility of accidents involving several aircraft, resulting from the fault of one particular insured leads to the possibility of payouts of such a magnitude, that premiums may very well be set at an extremely high level so as to prevent insolvency of an insurer.

293 ASECNA. Cahier des charges, Article 13 as cited in Schubert at 155.

294 Schubert at 156 refers to Article 5 of the Tegucigalpa Convention.

insurance issues. He notes the obvious effect of a removal from the FTCA's protections in terms of the introduction of hitherto absent jury trials[295] and argues that liability insurance would be a major cost of provision of private ATC and would thus figure in setting the price for the service:

> Liability insurance is sometimes the largest item of cost in the manufacture of a new aircraft. By analogy it is reasonable to assume that liability insurance would be a major cost of private air traffic control. Under the theory of privatization, efficiency demands that the users of the system bear that cost as directly as possible. Proponents of privatization maintain that the costs will be there no matter how the system operates. The real question, they say, is whether the costs should be borne by the taxpayers as a whole or, through explicit, visible insurance policies by those who use aviation.[296]

Again, one of the arguments used to make corporatization more palatable is that of "user pay" and the inequity which results from cross-subsidization. Corporatized ATS providers may attempt to limit these costs through express liability limitations in their service provision contracts with users. More will be said of this at a later point in this chapter. Duncan, is clearly right in noting that insurance costs would likely be high. He steps out on a limb however, when he attempts to argue that because of potentially astronomical payouts that insurers would become de facto regulators of ATS safety.[297] This ignores the role of ICAO in setting SARPS relating to ATS, the ultimate role of the state in assuring that ATS services are provided and its oversight role under the Chicago Convention. Further, the applicable standards for ATS safety have been reached through intergovernmental, air carrier and user input over decades. It is noteworthy that insurers have not to this point achieved this quasi-regulatory role in relation to such

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295 D.Duncan "Privatization of Air Traffic Control Systems", (1989) 59 J. of Air Law and Com. at 818.

296 Ibid. at 820.

297 Ibid. at 823.

states as the United Kingdom, Ireland or New Zealand.

R.D. Margo in his leading text Aviation Insurance, refers to liability insurance for air traffic control only briefly, noting that "[U]nless previously agreed to by insurers, the [Lloyd's standard] Ariel airport form does not cover the operations of an airport control tower."[298] However, it could be said that the actions of the air traffic controller in directing the aircraft to and from the runway would be covered under the Ariel airport form. The Ariel form in section 2 excludes "loss or damage to the aircraft while in flight as defined." "Flight" is defined thusly, "the term "in flight" means the time commencing with the actual take off run of the aircraft and continuing thereafter until it has completed its landing run." Thus, by virtue of not constituting "flight", ground movements to and from the runway directed by the tower would not be excluded from liability coverage. Whether a catastrophe such as the 1974 Teneriffe air disaster would be covered under such a policy is a matter for argument.

Coverage can be structured to suit the needs of a particular ATS provider and can cover any possible occurrence that would arise via occupiers liability, or vicarious liability for the acts of its employees performing non-ATS tasks. However, the principal coverage will be in the area of liability for accidents resulting from negligence of ATS personnel in performance of the ATS function, or for damage to life and property via ATS systems (hardware and software) failure. Coverage for economic loss of air carriers for delay arising from industrial action by ATS personnel or failure of equipment is a somewhat different issue.

While it is possible to contract for such liability coverage, the effect of doing so would be to substantially increase premiums by virtue of the fact that delays due to strikes and equipment failure are far more common than catastrophic loss. It is entirely possible that a corporatized ATS provider could find itself being the subject of an action for damages due to delay resulting from industrial action by its personnel, yet find its insurer is also the insurer of the claimant air carrier.

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[298] Aviation Insurance, 2nd ed., (Butterworth & Co. (Publishers) Ltd.: London, 1989) at 197, note 35.

In the small and specialized world of aviation insurance, such conflicts are not unexpected. In the event of a catastrophic loss claim resulting from ATS negligence, such a conflict could have far more serious implications, both for insurer and insured.

Taking as an example two service providers in different hemispheres, we can examine the similarities and differences which exist in terms of liability insurance coverage. Airways Corporation of New Zealand (ACNZ) is a corporation created by Act of Parliament in 1987. It is not compelled by legislation to carry insurance from private underwriters, which it nonetheless does.[299] Coverage of claims relating to economic loss to users due to industrial action against ACNZ is not covered under its insurance arrangements, but liability limitation clauses in the standard services agreement of ACNZ are drafted so as to exclude such claims.[300] Liability is limited to damages arising from loss or damage to the hull of any aircraft up to the replacement value. Liability for death or injury is limited to the amounts set out in the 1975 Montreal Protocol to the Warsaw Convention, i.e. a maximum of 100,000 Special Drawing Rights. Damages for loss of cargo or baggage are limited to the New Zealand Dollar equivalent of 250 French Gold Francs. [301]

By introducing these liability limits, ACNZ has also effectively imported the U.S. and Commonwealth jurisprudence relating to the applicability of the Warsaw system limits. In the event of a major accident attributable to ATS, the possibility arises of an air carrier attempting to break these liability limits so as to claim fuller damages from ACNZ while at the same time, attempting to shelter itself from passenger/survivor claims by means of these very same terms as found in the contract of carriage. While a discussion of the Warsaw system exceeds the

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299 Letter to author from Ezequiel Trumper, General Counsel of Airways Corporation of New Zealand, January 29, 1996.

300 Ibid.

301 Paragraph 10 Standard Terms, ACNZ 1995.

scope of this chapter, it is sufficient to say that given the tendency of the courts to seek to break these limits in actions against air carriers, these limits would likely be challenged in any ATS negligence action against a service provider which attempted to rely upon them. Ultimately, the existence of such limitation of liability terms will likely have little impact upon the liability insurance premiums that an ATS provider would have to pay.

The U.K. CAA, which comprises the UK NATS as an ATS provider among its various branches,[302] by contrast to ACNZ has been required since its formation to purchase insurance in the commercial markets. The rationale being that the Crown should not bear the risk of claims.[303] Current insurance coverage is in excess of £800 million for any one incident.[304] Liability for commercial damages due to industrial action or system failure resulting in delay is an untested issue in terms of actions against UK NATS or the extent of its insurance coverage. To this point, UK NATS has never ben successfully sued for loss of revenue.[305]

One aspect of the operations of UK NATS which presents interesting questions for the future of all corporatized ATS providers lies in the government Private Finance Initiative (PFI) in the United Kingdom. The PFI is a government policy whereby formerly state-funded infrastructure is through various arrangements funded via the private sector, as a means of reducing government borrowing requirements. In the case of provision of ATS, the UK NATS could find itself using facilities owned by a private entity which it in turns leases to UK NATS. The private entity, possibly a project company which builds facilities or a systems manufacturer which equips the facility on a turn-key basis, lease the

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302 UK NATS will become a wholly owned corporate subsidiary of the CAA on April 1, 1996. This step will be a prelude to its eventual privatization, barring any change of government policy.

303 Letter to the author from David C. Avann, Insurance Manager, Civil Aviation Authority, January 29, 1996.

304 Ibid.

305 Ibid.

facilities to the ATS provider. An example of such a project would be the planned new Scottish Air Traffic Control/Oceanic Control Centre. The end result of such arrangements is an insurance environment of increasing complexity.[306] In a period of ever increasing global fiscal constraints such projects may very well become the wave of the future. Leaving an indelible change upon approaches to insuring of ATS provider liability.

3.4.2 Self-Insurance

The jurisprudence relating to negligence actions involving large scale damages attributable to ATS negligence is essentially limited. By and large, the case law which exists is mostly American and related to general aviation, as opposed to accidents involving large aircraft of scheduled or charter carriers. The conclusion that can be drawn is that the latter type of accident attributable to ATS negligence is a relative rarity amongst aviation accidents. For those states in which the ATS provider has moved away from being a state organ to being a free standing corporate entity, this provides a considerable degree of comfort. Some such service providers may decide to act as self insurers, creating a pool of funds for settlement of claims.[307]

Self-insurance, however, does not lend itself to this enterprise in the manner of other activities. Potential liabilities are huge. It is one thing for a government-run ATS agency, or the armed forces of a state, to be self insurers, these constitute so-called "deep pockets" in regard to negligence liability. Certain commercial enterprises, such as manufacturers of consumer products, with sufficient reserves of cash may also be acceptable candidates for self insurance. However, most corporatized ATS agencies are, or will be, operated on a non-profit basis. Their

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306 Ibid.

307 Black's Law Dictionary, 5th ed., defines self insurance as:

> The practice of setting aside a fund to meet losses instead of insuring against such through insurance. A common practice of business is to self insure up to a certain amount, and then to cover any excess with insurance.

sources of revenues, while sufficient for operating purposes, are limited. Overflight and en-route charges are levied as a means of funding operating and capital expenses, not the creation of a claims settlement fund. The presence of user group representatives on the boards of such agencies, as in Canada, mitigates against any increase in fees beyond that necessary to fund the foregoing expenses. This results in little surplus revenue that can be set aside for major catastrophic loss. This being the case, the likelihood is increased of a self-insuring ATS agency finding itself unable to meet claims from a major accident for which it has been found liable. When faced with such an insolvency, the issue of a state's guarantee, discussed earlier, again becomes relevant.

3.5 The USA: Land of the Free and Corporatized?

As noted earlier in this chapter, the movement towards ATS corporatization, contrary to the natural perception in such matters, did not originate in the United States. While recommendations for spinning off ATS from the FAA have been around since the 1970s,[308] discussion of the corporatization option, has really occurred in the United States largely since the second term of the Reagan administration. It is worth noting, however, that the March 1988, Report of the President's Commission on Privatization did not envisage the creation of a single corporate entity providing all ATS, but rather focused on contracting out of various ATC functions,with the maintenance of en-route ATC in the hands of the FAA.[309]

The Clinton administration's support for the creation of an air traffic services corporation as evidenced in Vice-President Gore's National Performance Review has run into Congressional opposition.[310] Surprisingly much of this

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308 L. Blattner, "ATC: Privatize or Corporatize", Air Line Pilot, April 1995, 32 at 34-35.

309 United States. Privatization -Toward More Effective Government: Report of the President's Commission on Privatization. March 1988 at 79-81.

310 A. Vise, "ATC's Future Hostage to Turf-Sensitive Congress" A.W.S.T May 16, 1994 at 37.

opposition came from a Democrat-controlled House of representatives. With the arrival of a Republican majority in both the House of Representatives and the Senate, it might appear that the corporatization route would be enhanced. Nonetheless, a system operated on a true cost-recovery basis is not popular with a sizeable, and vocal, general aviation sector, thus the Republican reaction should be no different than that of Congressional Democrats.

Thus debate in the United States spins on, with any progress hampered by uncertainty over the appropriateness of private capital involvement, user concerns over fees, and legislative concern over a loss of oversight and power. Little can be expected in the foreseeable future in terms of results.

However, in the event that the future does yield a corporatized ATS provider in the United States, the entire jurisprudence regarding ATS liability will be stood on its head. The introduction of jury trials in an activity no longer covered by the FTCA, the reliance upon GPS via CNS/ATM, the linkage to the government as provider of navigational signals, and the role of FAA mandated procedures in setting out appropriate standards of care, will all serve to create an area of law that is uncharted.

4. Converging Tracks: The Impact of New Technology and New Organizational Structures on Liability of ATS Providers

4.1 A Flight Plan: Some Ideas Regarding the Future Direction of ATS Liability

To this point, this thesis has traced the development of air traffic services from its relatively primitive beginnings, examined the law relating to air traffic services liability at a national and international level, and examined the liability implications of the new ICAO CNS/ATM systems and the trend toward corporatization of ATS providers. All of these subjects are interlinked in the study of the liability regime that will apply to ATS providers in the future, a future which is already beginning to take form with operational trials embodying CNS functionality together with changing ATM systems and current ATS corporatization programs in various states.

As this paper states in its initial chapter, the technologies and procedures supporting ATS today did not suddenly arrive fully formed, but evolved over a period of decades. The same is true of the governing liability regime, which is still focused on national law. Just as it has taken years for this body of statute and jurisprudence to emerge, so it will also take a considerable number of years for the law applicable to the newly emerging ATS environment to develop. The preceding chapters, however, do provide the sources from which certain conclusions may be drawn. Among those conclusions, which will be discussed in this chapter, are the following:

> (1) The interrelationships among service providers subject to different national regimes, and service users (in eventual free-flight operations) will become increasingly convoluted, leading to a multiplicity of potential defendants;
>
> (2) New technologies have emerged which fall outside the framework of any draft convention on ATC liability thus far discussed;

(3) ATS is no longer solely a state provided service with ATS agencies benefitting from sovereign immunity or special privileges as defendants, thus increasing the role of private law;

(4) All encompassing "solutions" such as an international convention on ATS liability will not prove practicable and the "sweeteners" to such a convention such as limitations on liability will be unacceptable; and, finally,

(5) The net effect of all these changes and difficulties will be to give greater prominence to regulation of ATS liability by means of contract and insurance.

4.1.1 Services and Their Providers: Increased Complexity and Decreased Legal Uniformity

In the not too distant future, a Boeing 747 will takeoff from London's Heathrow on a flight to New York's John F. Kennedy airport. This aircraft will rely upon the services of a privately-owned UK ATS agency whilst in U.K. airspace, the services of the Irish Aviation Authority whilst transiting Irish airspace, thence to the Shanwick Oceanic Control Area where services are provided jointly by the UK and Ireland, through to the Gander Oceanic Control Area and Canadian domestic airspace where services are provided by NAV Canada and thence rely on ATS provided by the FAA from the Canada U.S. border to New York. During this roughly six-hour journey it will have used the services of four different forms of service provider, each subject to a different liability regime.

On the flightdeck, there will not be a restriction to the use of fixed oceanic tracks but rather, using navigational signals provided by the US GPS system or the INMARSAT 3 constellation,[311] it will set its own route, providing positional

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311 Despite the availability of GLONASS navigational signals, the choice of commercial air carriers would appear to be GPS as a signal source. This has less to do with signal accuracy (GPS selective availability is nearly identical to GLONASS) but more to do with cost considerations in that avionics and airframe manufacturers favour GPS. The proposed INMARSAT navigational package recognizes this in that it is designed to complement GPS, using a signal that could be

information to the ATC centres via ADS, complemented by direct controller/pilot data link communications (CPDLC). In part, the responsibility for the assurance of separation and conflict resolution will be transferred from the ground ATC infrastructure to the aircraft.[312] The avionics used will be based upon technologies originally designed for military applications.[313] Upon leaving Heathrow and upon approaching New York, it will receive augmented navigational signal information from a ground station via means of WAAS. During this flight the passengers will be blissfully ignorant of the complexities of the air navigation system, concerned only with their schedule upon arrival and whether or not their luggage has been routed mistakenly to Beijing. Presumably, even less thought will be given to liability aspects of a catastrophic accident attributable to ATS.

However, in the event that such an accident were to occur in the environment which has just been described, the convoluted issue of appropriate defendants and governing legal regime must be addressed.

Some Questions

If the accident is attributable to navigational signal integrity (ie. accuracy) is the signal provider alone liable? What about the ATS agency which accepted the information and relied upon it or the air carrier whose crew programmed their route using this information? What happens with regard to WAAS or LDGPS if proper "health monitoring" of the navigational signal was not provided or if this complex ground-based equipment fails? In the event of the latter scenario, defendants could include the ATS agency, the signal provider, the air carrier and

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received on GPS receivers. For more detail see Proceedings: Global NAVCOM '95 at 191-197 re: INMARSAT 3 navigational package.

312 RTCA Inc. Final report of the RTCA Task Force 3: Free Flight Implementation , (Washington, D.C: 1995)

313 This leads to questions of whether standards which would be acceptable under a government contractor defence would be acceptable in a negligence suit when the avionics are used by a commercial air carrier.

the equipment manufacturer. Would strict liability govern, or fault liability?

With regard to the aeronautical communications necessary for the safety of this flight, what would be the result of a degradation in the performance and capability of the satellite communications link? Is this considered to fall under the law relating to liability for activities in outer space?

Liability considerations

The answers to some of these questions are not easy to determine. With regard to the air carrier, its liability is governed by the Warsaw Convention with its attendant limits. As this flight would be destined to the United States, the greater limits found in the Montreal Protocol would govern.[314] Of course, any passenger plaintiff, or survivor plaintiff, would seek to avoid liability limits by acting against other defendants such as the ATS agency or the navigational and communications signal providers.

As noted, the ATS agency in the U.S. is the FAA, thus leaving the U.S. government as defendant with the benefits that it derives from the FTCA, notably the absence of a jury at trial and the availability of the discretionary function exemption. The Irish Aviation Authority in our scenario, as a state-owned corporation, and NAV Canada, as a non-governmental not for profit corporation, could not shelter behind the benefits of such legislation. A private successor to UK NATS would be treated as would any private defendant before the courts. These three corporations would all have commercially obtained insurance coverage for liability, while the FAA would be indemnified by the U.S. government.

If reliance is made on GPS navigational signals, liability would be governed by the FTCA, whereas if the signals provided via INMARSAT were used, liability becomes a more contentious issue. If issues of liability are dealt with by contract between the air carrier user and the signal provider, which could arise once GPS is

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314 Under the Montreal Protocol, the limitation of liability per passenger is set at a global limit of 100,000 Special Drawing Rights (SDR).

no longer provided free of charge, privity of contract would not extend to the passenger, shipper or third party. There also exists the uncertainty, already discussed in the second chapter of this thesis, as to whether the liability of the space segment signal provider is governed by the liability regime applying to space activities or is in fact a matter of air law. However, as noted in chapter two, the applicability of the space law conventions is doubtful.

To further complicate matters, this discussion has largely been with regard to the navigational and surveillance aspects of CNS/ATM systems. Aeronautical telecommunications form a vital part of these. The role played by space-segment service providers such as SITA, ARINC and INMARSAT also leads to questions of tortious liability, strict liability and damages limitation by means of contract.

Thus the future bears far more difficulty in sorting out potential defendants than did an old system based on state ATS using a ground-based system for communications with aircraft using specific fixed tracks. For a considerable period, especially due to the rarity of catastrophic accidents attributable to ATS, any case involving use of the new technologies will be a test case. What is certain, however, is that if a multilateral ATS liability convention was thwarted in an era of simpler systems that were fewer and state-owned, the mere drafting, let alone ratification, of such an agreement would now appear to be an impossibility.

4.1.2 The Futility of a Multilateral ATS Liability Convention

Progress on a multilateral ATS liability convention through ICAO has effectively been nil since this first became part of the Work Program of the Legal Committee in 1962. In all fairness, other, more pressing matters have arisen over the years to occupy its attention. However, the Legal Committee is unwilling to drop this as an objective. Most recently at its 29th Session in July of 1994, it recommended that the report of Dr. Perucchi on an ATC liability convention be

updated to cover aspects arising out of CNS/ATM.[315] If, as noted in the first chapter of this thesis, there has been no incentive for states to push for such an international convention,[316] the changes that have occurred in the field of ATS during the past decade, most notably the arrival of CNS/ATM and the movement to ATS provider corporatization, have made a multilateral ATS liability convention all the more unlikely. The draft conventions of Argentina and IFATCA simply do not offer the kind of flexibility to deal with the complexities presented in the flight scenario which introduced this chapter. The legal committee will no doubt not opt to abandon this project, but the technologies now being applied to ATS have essentially relegated such a project to the sidelines.

This leads, of course, to the question of whether unification of the law is possible. It is the view of this author that it is not. Two other options which exist are adherence by states to a model statute or regional unification.[317] Once again, the complexities of ATS liability involving new forms of service provider, a new relationship with aircrew, new technologies, and conflict between strict and fault based liability resulting from the introduction of these technologies, mitigate against any sort of comprehensive unification of the law.

One of the arguments that might be used to create state and ATS provider support for such a multilateral liability convention would be limitation of liability as in the Argentinean draft convention. However, if the Warsaw system is seen as an example, little can be said to recommend limitation of liability. Limitation of liability for air carrier accidents has fallen into disfavour from almost all academic commentators, most notably Drion and Cheng,[318] as well as practitioners.

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315 Note 152 supra.

316 Notes 166 and 167 supra.

317 Lagarrigue provides an extensive discussion of both of these options as alternatives to a multilateral ATS convention. Her ultimate conclusion is that liability relating to ATC and CNS/ATM is best dealt with at the state level. Lagarrigue at 88-89.

318 Drion in his text Limitation of Liability in International Air Law in 1952 found the traditional arguments in favour of limitation of liability to be unconvincing.

Some might argue that the sheer magnitude and novelty of the technology inherent in CNS/ATM systems would lead to a need for liability limitation, however "infant industry" type arguments have been found to no longer have an application to carriage by air - if they ever did. Moreover, air transport is increasingly being treated as a commercial undertaking like any other. Aviation as a whole is losing the "special status" that it held for almost all the postwar period. However, with the air transport annex to the GATS, it is clear that air transport is being treated, albeit at a glacial pace, more like any other "normal" industry. Air carriers are being privatized, the E.U. is attempting to stop further state aid to flag carriers. Airport facilities are being privatized, eg. Heathrow. It is not surprising that ATS would be treated any differently. Thus, ATS becomes one element of a "normal" industry, and normal industries are not characterized by such things as liability limits.

The potential for catastrophic accident exists in the operation of the aircraft due to negligence on the part of flight crew, the airframe, avionics or engine manufacturer. All of these are subject to private law, albeit with the benefit of possible liability limitations for air carriers under the Warsaw Convention. An activity of guiding an aircraft through airspace, which has been in the past, and is, the function of some private providers, does not by its very nature render itself incapable of being governed by the legal regime governing the carrier or the manufacturer.

On a separate note, if a catastrophic loss occurs due to crew negligence on an international flight, liability limits will apply, whereas if a loss occurs due to a negligently designed airframe the sky, so to speak, is the limit for potential recovery. Victims of aviation accidents caused by third party negligence should not have to find themselves hoping that the cause of their misfortune was one party instead of another, so as to avoid the application of limitations.

The issue of a multilateral ATS liability convention is one which is for all

intents and purposes, glacial pace efforts of the Legal Committee notwithstanding, .. dead. As a result, discussion of liability limits, much as they may please some service providers, is dead as well, for limitation on liability only makes sense in the context of a unified system of law with specific advantages or benefits directed at plaintiffs, such as presumptive fault.

4.2 Charting a Course

Future treatment of the liability of ATS agencies will not be a matter of grand schemes of unification of law. Rather, if we look about us, we can see that the future is being written now. It is a future that will be more complex in terms of ATS user-provider relations, one in which the legal privileges bestowed upon ATS agencies as creatures of the state begin to fade. An older simpler era in terms of ATS liability has passed as the systems employed have evolved. Picking up on a theme which has emerged in the third chapter, ATS is being gradually removed from the field of state liability and into the domain of private legal relationships, complex as they may be. The net effect of these changes will be entry into a new territory in which private law and insurance gain prominence, a territory that is to a large extent one without maps.

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