Legal Aspects of Aeronautical Mobile Satellite Services

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Abstract

This thesis deals with the technical and legal aspects arising out of the envisaged implementation of Aeronautical Mobile Satellite Services-AMSS- for civil aviation purposes, such as communication, navigation and surveillance.

After a short introduction to the subject, Part A of this thesis will deal with the technical side of the subject and will introduce the reader to the current CNS/ATM-concept and its deficiencies (Chapter 1), and to the future CNS/ATM-concept and its benefits (Chapter 2).

Part B will discuss the legal aspects of the implementation of AMSS for civil aviation purposes. Starting from the legal aspects of AMSS with respect to the law of outer space (Chapter 3), it will explain the current régime of telecommunications developed by the International Telecommunication Union -ITU- and its impact on AMSS (Chapter 4). Then, the legal aspects of AMSS with respect to international public air law (Chapter 5) will be examined and some predominant issues with respect to the appropriate institutional framework to implement AMSS will be discussed (Chapter 6). Finally, the findings will be summarized in a conclusion.

Résumé

Cette thèse discutera des problèmes juridiques resultants de l'introduction de services aeronautiques mobiles par satéllites-AMSS- dans l'aviation civile, notamment pour la communication, la navigation et la surveillance.

Après une brève introduction, la Partie A de cette thèse discutera des aspects techniques et présentera le CNS/ATM-concept actuel (Chapitre 1) et ses inconvénients, et le CNS/ATM-concept future et ses avantages (Chapitre 2).

La Partie B traitera des aspects juridiques de l' introduction des AMSS pour l'aviation civile. On étudiera d'abord les aspects juridiques des AMSS en ce qui concerne le droit de 'espace (Chapitre 3). Ensuite, on présentera le régime actuel de la télécommunication internationale établi par l'Union Internationale de la Télécommunication-ITU- et ses conséquences sur les AMSS (Chapitre 4). Puis, les aspects juridiques quant au droit international aeronautique seront examinés (Chapitre 5), de même que les aspects les plus importants visant les modèles appropriés pour l'organisation de l'introduction des AMSS (Chapitre 6). Finalement, les résultats seront présentés dans une conclusion.

Table of Contents

Legal Aspects of Aeronautical Mobile Satellite Services

-Introduction-

Since the birth of modern civil aviation, aircraft have relied upon ground based systems for communication and navigation[1]. Whereas advanced technology is used with regard to the aircraft as such, communication, navigation, and surveillance (CNS) is still based upon technology basically developed before and during World War II. The then introduced VHF-radio communication and navigation was sufficient until the mid-fifties. Since 1947, the number of passengers transported by scheduled airlines grew from approximately 6,0 million per year to over 1,0 billion in 1991. In 1989, the International Civil Aviation Organization[2] developed long-term-forecasts of scheduled passenger and freight traffic which indicate a doubling of traffic worldwide by the year 2000[3]. Increasing congestion problems, especially in continental airspace over Europe and North America, make it absolutely necessary to reduce the spacing distances between aircrafts using the same air route. But this cannot be done with today's tools. The present systems have essentially the following major shortcomings[4]:

-line-of-sight constraints;

-implementation problems;

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[1]D. Fisher, "Satellite promise benefits for all" [No.1, 1992] *IATA Review* 13 at 13.

[2]hereinafter ICAO.

[3]"The Economic Situation of Air Transport, Review and Outlook-1978 to the Year 2000", ICAO Doc.222-AT/90.

[4]See: ICAO Doc.9583, AN-CONF/10 at 2A-1.

-lack of air/ground data interchange systems; and

-lack of route flexibility and harmonized system development.

Most of the above limitations are intrinsic to the systems themselves. Although their effects are not the same for every part of the world, it is evident that one or more of these factors inhibit the further development of air navigation almost everywhere[5]. There is agreement within the aviation community that only one technology already available today is able to overcome the described shortcomings, namely the use of satellite based communication, navigation, and surveillance systems. This was also recognized by ICAO which, in 1983, established, by a decision of the ICAO Council, the so called Special Committee on Future Air Navigation Systems-FANS-[6] with the following terms of reference:

> "[t]o study technical, operational, institutional, and economic questions, including cost/benefit effects, relating to future potential air navigation systems; to identify and assess new concepts and new technology, including satellite technology, which may have future benefits for the development of international civil aviation including the likely implications they would have for users and providers of such systems; and to make recommendations thereof for an over-all long-term projection for the co-ordinate evolutionary development of air navigation for international

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[5] *ibid.*

[6] Whereas the committee concerned with the future CNS/ATM systems continues to be known as the FANS Committee, ICAO recently adopted the term "ICAO CNS/ATM concept" in place of future air navigation systems, or FANS.

civil aviation over a period of the order of twenty-five years. The committee should avoid duplication of effort and its works should be co-ordinate with that of existing groups in the Organization"[7].

So far, the FANS-Committee held four meetings during the initial phase[8] and three meetings during PhaseII[9]. Additionally the 10th Air Navigation Conference was entirely dedicated to the subject[10]. In May 1992, the ICAO Legal Committee in its 28th Session examined the institutional and legal aspects of the future air navigation systems, and legal aspects of global air-ground communications[11]. Recently, the International Maritime Satellite Organizations-INMARSAT- organized a conference on "World Wide Aeronautical Satellite Communications". In fall, the 29th Assembly of ICAO will have the issue on the agenda[12].

The above shows clearly that the aviation community has recognized the importance of implementing the new systems for the benefit of civil aviation. The boundaries between outer space and aviation activities may gradually loose their significance. Hypersonic craft crossing outer space are no longer a dream of very few engineers. Such craft are already on the drawing board of many aerospace

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[7]ICAO Doc. FANS/1, at I-1

[8]1st meeting July 9-13, 1984, FANS/1-Report, 1984; 2nd meeting April 10-26, 1985, ICAO Doc.9458 FANS/2-Report, 1985; 3rd meeting November 3-21, 1986, ICAO Doc.9503 FANS/3, 1986; 4th meeting May 2-20, 1988, ICAO Doc.9524 FANS/4, 1988.

[9]1st meeting May 22-June 8, 1990, FANS (II)/1, 1990; 2nd meeting April 29-May 17, 1991, FANS (II)/2, 1991; 3rd meeting March 30-April 15, 1992, FANS (II)/3, 1992.

[10]10th Air Navigation Conference, September 5-20, 1991, ICAO Doc.9583, ANF-CONF/10.

[11]Legal Committee 28th Session, ICAO Doc.9588-LC/188, item 3 and item 4, 1992.

[12]See for details: ICAO Doc.A29-WP/42.

manufacturers. The use of satellites for aviation purposes is a further step towards the merging of air and space law. Whereas one has reason to be optimistic about the final achievement of this task, one should not underestimate the difficulties, as to quote *O'Keeffe*, "[t]o rid ourselves of the shackles that have constrained us for too long"[13]. These difficulties are of technical, political, economic, and legal nature.

The new systems are technically very complex and sophisticated. Although different providers might offer different systems as to avoid monopolies, it is absolutely mandatory that the systems remain compatible. Therefore, measures must be taken to interconnect the individual systems. The choice of the basic technology to be used depends on the standards set in advance by ICAO.

One of the most important rules of international public law is the principle that the states retain the complete and exclusive sovereignty over their domestic air-space embodied in Art.1 of the *Chicago Convention*[14]. Additionally, the states have exclusive jurisdiction with regard to aviation and are free to regulate technical matters. However, civil aviation has changed its face over the years and has become international. The consequence of this development is that isolated domestic regulation of aviation shall increasingly be replaced by uniform international regulations in order to facilitate the cross-border movement. This means however, that states must be ready to transfer regulative power to a supranational international organisation. The quasi-legislative powers of ICAO in Chapter VI of the *Chicago*

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[13]**B.O'Keeffe**, "Flight Path to the Future" [No.12, December 1991] 46 *ICAO Journal* 6.

[14]*Convention on International Civil Aviation, signed at Chicago on 7 December 1944*, ICAO Doc.7300/6 [hereinafter *Chicago Convention*].

Convention have been a first step in this direction but might not be sufficient to face the coming challenges of civil aviation. It is basically a political question whether states are willing and ready to transfer regulative powers. In any case, "the introduction of Future Air Navigation Systems w[ill] depend not only on the development and availability of new technology but, to a large extent, on the level of co-operative effort of states and their consensus to put the new systems into practical use under specified legal conditions"[15].

The implementation of the CNS/ATM-concept will be very costly. The cost, including amortized capital costs, should be in the region of US$ 1 billion per year[16]. Although the savings will be equal by saving maintenance costs of the existing systems, a lot of developing countries will rely on financial support by developed countries. The new concept can only be achieved if governments are ready to enter into a global partnership.

There are a couple of very difficult legal question related to the implementation of CNS/ATM-concept. Those will be discussed in this thesis. However, because of the actuality of the subject and the ongoing discussion in the aviation community, this thesis cannot pretend to be comprehensive and to cover all aspects of the new CNS/ATM systems.

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[15]ICAO Doc.9556-LC/187 at 7-1.

[16]D. Fisher, *supra*, note 1 at 1.

Part A:

The Current and Future CNS/ATM-Concepts

Chapter 1
-The Current CNS/ATM-Concept and Its Deficiencies-

In order to understand the advantages of space bound aeronautical systems, it is necessary to examine briefly the currently used CNS-technology and its deficiencies. The same is true with regard to the law. Since law deals with social relationships it can only be useful if it is able to respond to new factors influencing our daily lives. Technic has a considerable impact on our lives especially in a field such as aviation. It is therefore absolutely crucial to understand the current developments in the field of aeronautical satellite services in order to identify the special legal issues related thereto.

I. The Current CNS-Technology

1. Communication

Communication systems (voice and data) cover air-ground and ground-ground communications for air traffic services (ATS), meteorology (MET), aeronautical information (AIS), search and rescue (SAR) and operational control (OPC); and air-air communications for the collision avoidance system (CAS), traffic information

broadcast by aircraft (TIBA) and exchange of operational information[17]. In order to have reliable communication all commercial aircraft and most of the private aircraft are equipped with two independent VHF-radio-telephone systems. Each of the systems consists of a VHF-transmitter, a VHF-receiver, an antenna, and control panel to choose the right frequency[18]. The communication between aircraft and air traffic control is usually carried out in the VHF-band. It has a quasi-optical range of about 450 km[19].

2. Navigation

When, in 1851, Henri Griffard achieved, for the first time ever, to make a balloon manoeuvrable and to direct it in all directions he certainly did not worry about his exact position or exact flight direction. Even the Wright brothers, or the French flight pioneers Blériot, Ader and Vedrines, did not need sophisticated navigation tools because they remained more or less in the vicinity of their starting point. However, all the early pilots used a manner of navigation, namely the orientation by geographical points such as church towers, castles, railway lines, rivers, roads, bridges. One can call this terrestrial navigation. And indeed, this method of navigation is still used until today in general aviation by small aircraft not equipped with navigation tools allowing flights in poor weather conditions. These

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[17]**M.Milde**, "Legal Aspects of Future Air Navigation Systems" [1987] XII *Annals of Air and Space Law* 87 at 89.

[18]See for details: **H.W.Riedel**, *Die Kontrolle des Luftverkehrs* (Frankfurt/M.: Suhrkamp, 1973) at 119ff..

[19]*ibid.*

"visual flights" still rely upon geographical points and are subject to the so called Visual Flight Rules -VFR- in Annex 2, Chapter 4 of the Chicago Convention[20].

Today, the most frequently used method of navigation is radio navigation which can only be done with the help of ground-based radio stations. The most important radio navigation tools are, inter alia, the Non-directional Beacon -NDB-, the Very High Frequency Omnidirectional Radio Range-VOR-, and the Distance Measuring Equipment-DME-[21]. Additionally, Instrument Landing Systems-ILS- are available in the vicinity of, at least, all international airports to facilitate the final landing approach. ILS shall subsequently be replaced by Microwave Landing Systems-MLS-.

On board an aircraft NDBs are received by the Automatic Direct Finder -ADF- which indicates permanently the location of the radio station with regard to the axis of the aircraft. By using two ADF, each orientated to different NDB, the aircraft can be located by the point of intersection of the two NDB. NDB operate in the medium wave band and have a range of about 200 km.

Because VOR allow more accurate navigation they replace more and more the NDB. Unlike ADF, the use of VOR on-board equipment permits direct identification of the flight path of an aircraft. This equipment consists of an Off-course Indicator, the so called To/from-Indicator, and the Azimuth-Selector. The Off-course Indicator serves the exact navigation. VOR do have a quasi-optical range and can be received

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[20] *International Standards -Rules of the Air-, Annex 2 to the Convention on International Civil Aviation*, 9th edition, July 1990.

[21] **H.W.Riedel**, *supra*, note 18 at 48f.

up to a distance of about 450 km.

DME determine the distance between aircraft and radio station. An impulse emitted from the aircraft is received by a ground station and is reflected to the aircraft. The time needed indicates the distance between radio station and aircraft. Very often DME are integrated in the VOR-equipment.

ILS allows landing approaches even under very poor weather conditions such as fog, driving snow, heavy rain showers, or a low cloud cover. The system consists of a Localizer, a Glide Path Transmitter, and two Marker Beacons, Outer Marker and Middle Marker. The Localizer emits a pencil of rays, of which one side is modulated with 90 hertz and the other side with 150 hertz, towards the approaching aircraft. On the flight base line the rays form a radio-range beam of which the difference in modulation is equal zero. The Glide Path Transmitter uses the same system but in a vertical manner and determines the correct altitude of the landing approach and the correct descend angle. When an aircraft passes the Outer Marker it is still about 7 km away from the end of the runway, when it passes the middle marker about 1 km. Aircraft have to "queue" on the radio-range beam and have to fly a straight line (so called final centre-line segment-FCLS-) for more than 10 km towards the runway regardless of existing populated areas. That is the reason why ILS will increasingly be replaced by MLS because the latter does allow curved approaches and the minimum length of the FCLS for a Category-C aircraft, such as a B-727 or DC-9, is only about one-half the

distance required for an ILS approach[22]. Thus, populated areas can better be avoided and noise pollution be reduced.

3. Surveillance

Until today, the key technology for the identification of aircraft is radar (radio detection and ranging). Developed in World War II the so-called primary radar emits a large amount of energy in the form of radio-magnetic waves with its rotating dish antenna. With the same antenna it receives the echo reflected by the surface of any aircraft and thus indicates range and bearing. The accuracy and sensibility of this instrument decreases noticeably at larger distances from the antenna[23].

The more sophisticated Secondary Surveillance Radar-SSR- commonly used today for Air Traffic Control-ATC- relies on the active response of the aircraft to be detected. Aircraft and ATC cooperate electronically. The active reply of the aircraft transponders helps to enhance the radar image of the aircraft, which is important especially for small aircraft and at larger distances from the ground-based radio antenna. An additional advantage of SSR is that the transponder response-pulses can be used to carry information on the identification and altitude of the aircraft. For the purpose of identification 4096 different codes can be selected by the operator of the transponder and be transmitted to the interrogator allowing the allocation of the same

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[22]**R.P.Arnold**, "Introduction of MLS -Effects on Air Space and Airport Capacity-" [No.1, January 1989] 44 *ICAO Bulletin* 30 at 31.

[23]**St.Kaiser**, "A New Aspect of Future Air Navigation Systems: How Secondary Surveillance Radar Mode S Could Protect Civil Aviation" [1992] 41 *ZLW* 154 at 154.

number of aircraft identification codes[24].

In the near future, SSR Mode S will be introduced. Though its functions will remain that of a surveillance radar, namely to detect aircraft identity, range, bearing and altitude, the novelty is the extended data-link capacity between interrogator and transponder[25]. Its data capacity will be 16 million aircraft identification codes, rather than 4096 under the presently used SSR.

II. The Limitations of the Current CNS-Technology

As already mentioned earlier, the currently used CNS technology has three major limitations:

-line-of-sight constraints;

-implementation problems;

-lack of air/ground data interchange systems.

Additionally, it lacks of route flexibility and harmonized system developments[26].

1. Line-of-sight Constraints

The basic limitation of the current CNS technology consists of line-of-sight-constraints. None of the systems meets the requirement of future aircraft to allow coverage up to 70.000ft. altitude on a global basis[27]. The frequencies used are

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[24]*ibid.*

[25]*ibid.*

[26]ICAO Doc.9458, FANS/2, at 1-1.

[27]St.Kaiser, *Legal Implications of Satellite Based Communication, Navigation, and Surveillance Systems for Civil Aviation* (Faculty of Law, McGill University, 1990) [unpublished], at 13.

subject to both range and propagation limitations. As pointed out earlier, short distance communication and navigation systems operate in the VHF-frequency band. Because of the curvature of the earth surface their range is limited to about 450km. To have overall coverage a whole network of VHF-radio stations would be necessary. But this is not feasible because of political, economic, technical and geographical reasons. As further consequence of line-of-sight constraints, the flexibility to airspace users is limited, and the optimum utilization of available airspace is inhibited or overly fragmented[28]. A further limitation on flexibility and utilization is imposed by the fact that some systems have reached or are reaching their limits on accuracy and/or capacity improvement.

2. Implementation Problems

In large parts of the world, the different national plans for communication, navigation, and surveillance are not at all or not sufficiently operated in a coordinated manner. Since its foundation ICAO has developed regional air navigation plans, which are implemented by regional agreements. However, many countries over large regions of the world have been unable to do so. There is a variety of reasons such as lack of financing and trained technical personnel, the lack of clearly justified and accepted needs, and the lack of adequate air traffic to support the necessary capital investment[29].

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[28]ICAO Doc.9458, FANS/2, at 1-2.

[29]*ibid.*

3. Lack of Air-ground Data Interchange Systems

Today, communication between ground and aircraft is still limited to voice-only communication. It has been necessary to develop a common language and pronunciations. But even with these, ambiguity and misunderstandings are common[30]. 70 to 80 per cent of all potentially hazardous incidents that were reported in the United States aviation safety reporting system (ASRS) implicated ineffective verbal information transfer and the majority of these involved air-ground radio communication. Communication problems included, inter alia, acoustic confusion, pilot readback errors, controller "hearback" error, misinterpretation caused by poor pronunciation and failure to use standard terminology[31]. A further major difficulty with voice systems is the complicated procedures required to interface with other elements of the system.

4. Lack of Route Flexibility and Harmonized System Developments

Since aircraft today rely entirely upon a network of ground radio stations which are, in the case of VHF-communication, limited in range or which have, in the case of HF-communication, poor transmission quality and increasing congestion problems the network of air routes is very inflexible. Large parts of the world lack reliable coverage by CNS systems[32]. Although modern CNS-technologies are

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[30]*ibid*, at 1-4.

[31]ICAO Doc.9583, AN-CONF/10, at 3-8.

[32]See for details: "Shortcomings of the Present Air Navigation System", ICAO Doc.9524, FANS/4, at 2A-1.

already able to determine the optimum flight path for an aircraft depending on, inter alia, weather conditions and volume of traffic, with the benefit of saving fuel and using the given airspace more efficiently, these technologies are not available to all the countries because of, inter alia, lack of need, financing, or technical skill. Furthermore, even if an aircraft is equipped with the modern technology, its use is often inhibited because of limitations of ATC facilities and services on the ground. Some areas of the world, e.g. Europe, suffer under the variety of CNS systems used. In 1990, the European Civil Aviation Conference (ECAC) adopted the strategy for Air Traffic Control in the 1990s, thereby providing political commitment to a strategy for harmonizing and progressively integrating the patchwork of different ATC systems across Europe[33]. It is not very difficult to imagine the diversity of technology used between the 28 ECAC-member States. It has been said that there are between two or three generations of difference among States' ATC systems[34]. Therefore, a harmonized development of the future CNS technology is more than desirable to insure at least common standards and interfaces.

5. Airport Ground Navigation and Surveillance

Even with good visibility, navigation to and from a runway is sometimes difficult and often slower than desirable. In some cases, taxiways, turn-offs, etc. are not adequately marked; also visibility from the cockpit and/or control tower and pilot

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[33]**G.A.Paulson**, "Transition to Cooperative ATM System Requires Commitment" [No.1, 1992] *IATA Review* 10 at 10.

[34]*ibid.*

familiarity vary for individual situations. Coupled with reduced ground visibility caused by weather phenomena these factors increase ground collision risk, increase chances of taxiing off paved surfaces and decrease arrival/departure rates[35]. Therefore there is a need to improve aircraft ground navigation capability and also airport ground surveillance and detection.

The above shows that the current CNS technology reached its outer limits. However there is some development potential for the existing air navigation systems. These possible interim developments might improve the existing aeronautical navigation, communications and surveillance systems for the next decade, especially to long range aircraft operations in the non-radar surveillance environment of oceanic and remote land areas. They consist of, inter alia, reduction of vertical separation standard at and above flight level (FL) 290, automatic dependent surveillance, improved quality and presentation to controllers of traffic information on aircraft position and intent, airborne collision avoidance systems (ACAS)[36]. But there is agreement within the aviation community that these measures are not able to respond to the needs of future aviation demands. The limited prospects of substantial future global improvements if aviation has to rely on present systems led to the conclusion that exploitation of satellite technology complementary to certain terrestrial systems was the only viable solution to fulfil the future requirements of civil aviation[37].

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[35]ICAO Doc.9458, FANS/2, at 1-5.

[36]See for details: ICAO Doc.9458, FANS/2, at 1-5ff.

[37]N.J.G.Ostiguy, "Potential Impact of FANS Far-Reaching and Positive" [No.12, December 1991] 46 *ICAO Journal* at 7.

Chapter 2

-The Future CNS/ATM-Concept and Its Benefits-

In the following, the new communication, navigation, and surveillance system concept currently under discussion within the aviation community will be presented. Thereby especially its benefits will be discussed.

I. The History and Components of the Future CNS/ATM-Concept

1. Historical Outline

The potential use of space bound aeronautical installations has been envisaged since the benefits of satellite applications, especially in communication had been recognized[38]. In the early 1960's, NASA and Pan American Airlines conducted experiments to demonstrate the feasibility of satellite telecommunications for aircraft[39]. In 1968, ICAO established a panel of experts to examine the "Application of Space Technology Relating to Aviation" usually called -ASTRA-. It met between 1970 and 1972. The results of the deliberations of ASTRA were reviewed by the 7th Air Navigation Conference of ICAO which recommended that interested States and international organisations should begin an international programme in order to develop and evaluate aeronautical satellite systems[40]. Pursuing this recommendation

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[38]See for instance: **M.S.McDougal, H.D.Lasswell & I.A.Vlasic**, *Law and Public Order in Space* (New Haven: Yale University Press, 1963) at 74.

[39]**W.D.von Noorden**, "Space Communication to Aircraft: A New Development in International Space Law (Part I)" [1987] 15 *J.Space L.* 25 at 30.

[40]See for details: ICAO Doc.9004, AN-CONF/7 at 2-1ff..

NASA and ESRO[41], and several States such as Canada, Australia and Japan formed an international consortium called AEROSAT. It was composed initially of an Integrated Programme referring to the establishment of an aeronautical satellite segment over the Atlantic and Pacific Oceans, and the so called Co-ordinated Programme, including the establishment of ground facilities, the development and evaluation of necessary aircraft avionics and the establishment of a co-ordinated demonstration programme by using the aeronautical space segment capability[42]. The launch of an AEROSAT experimental satellite was scheduled for the mid 1980s. Unfortunately, ASTRA issued its recommendations at a time when airlines were suffering a decrease of business due to the first oil crisis and were unwilling to invest in an expensive satellite system[43]. The satellite was never launched and the AEROSAT project was abandoned in 1980[44].

However the idea of AMSS remained alive and very soon serious thoughts about alternatives had been undertaken. Especially sharing satellite capabilities with other uses were favourable particularly with maritime mobile satellite services. This was actually a reconsideration of common ideas of the International Telecommunication Union -ITU-, the Intergovernmental Maritime Consultative Organisation-IMCO-[45] and ICAO dating back to the early 1970s focusing on shared

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[41]European Space Research Organisation, later ESA.

[42]**H.Kaltenecker**, "European Understandings in the Application Satellites Fields and their Legal Implications" [1973] 1 *J. Space Law* 105 at 110.

[43]**W.D.von Noorden**, *supra*, note 39 at 31.

[44]**W.-H. Park**, "Satellite Application for Aviation Requirements" [1989] XIV *Air Law* 17 at 19.

[45]IMCO became subsequently the International Maritime Organisation -IMO-.

radio frequencies for aeronautical and maritime services. The need of shared use of radio frequencies was recognized, in 1971, by the ITU Conference, which decided that certain frequency bands should be allocated exclusively for maritime and aeronautical mobile satellite services for communications[46]. However, even if it has been discussed between the two organisations quiet extensively, both INMARSAT and ICAO have basically been very cautious on the question of sharing[47].

After the cancellation of AEROSAT the serious discussions on aeronautical mobile satellite services had virtually completely ceased at least within the interested international organisations and this silence lasted until the early 1980's which have seen a "come back" of the idea to use satellite technology for civil aviation purposes. INMARSAT and ICAO concurrently reconsidered the issue. As already said earlier, ICAO established in 1983 the Special Committee on the Future Air Navigation Systems -FANS- which held his first session in 1984. The possible timetable[48] for the new CNS/ATM-concept is as such that between 1993 and 2000, the system will be gradually implemented and partially utilized by some aircraft and aviation authorities, and between 2000 and 2005, the new services will be running parallel with the existing navigation systems. Between 2005 and 2015, the systems not required for the new CNS/ATM operations will be dismantled, and finally, by 2015 these operations will be performed exclusively by using the space bound CNS/ATM

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[46]See, *infra*, Chapter 4.

[47]See, *infra*, Chapter 5.

[48]See for details: ICAO Doc. FANS(II)/3, at 5D-4ff..

systems[49].

2. The Components of the Future CNS/ATM-Concept

a) Satellite data and voice communication services will be available for at least the larger part of the world[50]. Because the polar regions are out of the coverage of today's satellite orbits, HF-communication will still remain in operation until such time as satellite technic is available, able to cover polar regions as well. In high density airspace within coverage of terrestrial-based communication systems VHF and secondary surveillance radar Mode-S data links will continue to be used for air traffic services[51]. Of special importance will be the inter-operability of the different systems used which will be facilitated by the so called "open system interconnection model -OSI-". The aeronautical telecommunication network -ATN- concept, through the use of an agreed communication protocol structure, will provide for the interchange of digital data packets between end-users of dissimilar air-ground and ground-ground communication sub-networks[52]. Beside that, OSI allows flexible design of the system to be able to react to changing needs in the future.

The FANS Committee drew a distinction between two types of communication, namely safety communication requiring high system reliability and

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[49]**N.J.G.Ostiguy**, *supra*, note 37 at 9.

[50]ICAO Doc.9583, AN-CONF/10, at 1-1.

[51]**N.J.G.Ostiguy**, *supra*, note 37 at 7.

[52]ICAO Doc.9583, AN-CONF/10, at 2A-3.

fast information processing, and non-safety related communications[53]. ATS communication and Aeronautical Operational Control -AOC- belong to the first group, whereas Aeronautical Administrative Communication -AAC- and Aeronautical Passenger Communication -APC- belong to the other[54]. The distinction is of special importance. The 1987 World Radio Administrative Conference of ITU -ITU, WARC'87- reduced frequency bands open for aeronautical mobile-satellite services on one hand, but decided on the other hand that the national administrations be authorized to allow the use of the reduced frequencies also for non-safety purposes which has not been the case before. But in any case public non-safety communication has to cease immediately if necessary in order not to interfere with safety related communication[55]. It is open how message priority can be prevailed in a fully automated system and in a multi-provider and multi-user environment[56]. There has been growing concern about a sharing of allocated frequencies for AMSS with other terrestrial mobile satellite users such as trucks and trains[57]. This attempt has been rejected by ITU, WARC-92[58]. Thus the remaining frequencies allocated for mobile

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[53]ICAO Doc.9524, FANS/4, at 2-6.

[54]*ibid*, at 2-7.

[55]See for details: **M.Goddard**, "Mobile WARC '87: Implications for satellite services" in *Proceedings of the European Conference on Satellite Broadcasting and Satellite Communications 1987, Satellite Communications & Broadcasting 87* (London: Online Publications, 1987) at 1ff.

[56]**M.Milde**, "Legal Aspects of Global Air-Ground Communication" in G.R.Baccelli, ed., *Liber Amicorum Honouring Nicolas Mateesco Matte -Beyond Boundaries-* (Paris: Éditions A.Pedone, 1989) 215 at 225.

[57]See: **St.Kaiser**, "Will the WARC-92 threaten ICAO's Future Air Navigation Systems? [1992] XVII *Air and Space Law* 17ff.; **P.Poskett & P.McDougal**, "WARC-92-The Case for Mobile Satellites" 1990 *Telecommunications Policy* 355ff..

[58]See: **P.J.Klass**, "WARC-92 Approves Satellites for Small Cellular Telephones" [March 9, 1992, No.10] 136 *AW&ST* 31.

satellite services in particular AMSS respond to the needs of the aviation community[59].

b) With regard to satellite navigation two concepts have basically been in discussion:

-independent navigation, where the user performs on-board position determination from information received from broadcast transmissions by a number of satellites; and

-dependent navigation, using systems that provide radio-determination satellite services (RDSS) in which position, determined on the ground by multiple ranging measurements, are transmitted to the aircraft.[60]

The FANS Committee considered the former concept as preferable, because the latter lacks of frequency spectrum protection for safety services and RDSS are also saturable, variable in their accuracy, and dependent on several communication path, short they have comparable weaknesses as the existing services[61]. The present radio navigation will coexist with the present systems but will be progressively withdrawn and eventually be completely replaced.

c) The introduction of air-ground data links, together with sufficiently accurate and reliable aircraft navigation systems will provide surveillance services in areas which lack such services in the present, in particular oceanic areas and other areas where the current systems prove difficult, uneconomic, or even impossible to

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[59]See also ICAO Doc.FANS(II)/3, at 1-10f..

[60]*ibid*, at 2-10.

[61]*ibid*.

implement.

The FANS-Committee identified in particular Automatic Dependent Surveillance -ADS- as the most suitable system to transmit continuously data related to the actual position of the aircraft[62]. It will contain, as a minimum, aircraft identification and three-dimensional position. Emergency location beacons -ELBA- which start operating after an accident, allow a rapid detection of the emergency and an actual detection of the grounded aircraft.

II. Benefits of the Future CNS/ATM-Concept

The benefits can be divided in two different categories[63]:

-safety, technical and operational benefits; and

-economic benefits.

1. Safety, Technical and Operational Benefits

The new CNS/ATM concept will enhance aviation safety. For instance, the improved reliability of the aeronautical mobile satellite communication system would result in fewer interruptions in ATS communication. The new system will operate independently of line-of-sight constraints and will cover almost the entire globe. A further aspect is the introduction of aeronautical passenger communication increasingly demanded by business travellers. Aircraft operation will become more

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[62]*ibid*, at 2-11.

[63]See for details: ICAO Doc.9583, AN-CONF/10, at 6-1ff.

efficient since the new system will allow more direct routing. Additionally, incidents like the shot down of KAL 007 will be avoided by alerting the cockpit about the route deviation at the time. The new systems can also be used for non-precision approach to almost any airfield in the world. Finally, the new communication and navigation systems together will improve aviation surveillance. It will allow more efficient handling of an aircraft in all phases of ATC operations, such as separation, cruise-climb clearances, and aircraft routing, particularly in areas where no surveillance capability is available at present[64]. The inter-operability of different systems will be maintained through the concept of required navigation performance capability -RNPC-[65] leaving the airlines the choice of which system will be operated on board of their aircraft as long as it responds to the above requirements. Furthermore, the new systems will be able to accommodate the traffic growth expected for the near future but which can hardly be handled by the current systems.

2. Economic Benefits

The FANS Committee examined the economic benefits of the new CNS/ATM concept during its fourth meeting in 1988[66]. The annual cost is estimated about $1.0 billion whereas the annual economic benefits range from $5.2 billion to $6.6 billion. They consist of, inter alia, effective reduction in air miles and fuel consumption

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[64]See for details: **International Federation of Air Traffic Controllers' Associations**, "Controllers Look Forward to Technology Enhancements" [No.12, December 1991] 46 *ICAO Journal* at 20ff..

[65]See for details: ICAO Doc.9524, FANS/4, at 3.2A-1ff..

[66]See for details: *ibid*, at 4-12ff..

through access to optimum flight profiles. The airline industry has recently estimated that the cost of air traffic control system delays to the airlines and commercial aviation users is probably about $10 billion per year. A reduction of congestion and ATC-related costs of delay of just 10 per cent would offset the cost of implementing the new concept world-wide[67]. Land-based CNS systems might be less expensive in some areas, such as Europe, however, this gradual disadvantage will be overweighed by the overall benefits described above.

The future passenger communication services, including telephone, telex and telefax, will be of special economic importance for the airlines. Cathay Pacific estimates satcom costs and revenue yields as follows[68]. Installing the airborne equipment would cost between $350.000 (for a 747-400) and $540.000 (retrofitted on an older-type 747), plus $600.000 one-time system design cost and $2.0 million certification cost per aircraft/ avionics type combination. Increased fuel burn caused by antenna drag will equal about $4.000 to $5.000 per year per aircraft. Total annual costs per aircraft would be $57.300 for a 747-400, $85.800 for an older 747 and raising to as much as $132.600 for an L-1011 TriStar. Cathay Pacific assumes a marginal revenue (the portion of the caller charge retained by the carrier after deduction of the telecoms carrier and space segment traffic charges) of $3.30 per minute. On this basis, a satcoms-equipped 747-400 would generate $99.800 per year for the airline if only 6% of passengers made one three-minute call per flight, raising

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[67]**International Coordinating Council of Aerospace Industries Association**, "Aerospace Industry Ready to Help Implement Global Solution" [No.12, December 1991] 46 *ICAO Journal* at 14f.

[68]Quoted from **C.Bulloch**, "Aeronautical Satcoms Arrive" [1990] 6 *Space Markets* 275 at 280.

to $266.100 if 16% of passengers used the facility. After deducting the annualized costs, each satcoms-equipped 747-400 would generate a net return to the airline of $42.500 per year at the low 6% use estimate and as much as $208.800 for the 16% use estimate. Even if these figures are rather conservative[9], not including possible traffic growth and increases in passenger load factors secured by airlines that install satcoms, taking passengers away from competitors not offering these services, the economic benefits for airlines are striking.

III. The Existing AMSS

Even if AMSS are still under discussion, a couple of space systems are set up, either in an early operational or an experimental stage. However, there is no system covering all aspects of the future CNS/ATM concept, but focusing on, e.g., either communication, navigation or surveillance.

1. Communication

a) Today, the prime carrier for international satellite communications traffic for mobile users is the International Maritime Satellite Organization -INMARSAT-. It has progressively broadened its mandate from initially providing communication services between ships, shipowner and their customers, and services for personal communications of crew members and passengers. INMARSAT awarded

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[9]An IATA survey conducted in March 1990 concluded that at a median cost of $10 per minute, about 70% of passengers in segment frequent First and Business Travellers in Europe might make one or more calls averaging three minutes each in duration during a long-haul trip (over three hours) and 50% would do so on shorter trips.

itself, with the consent of its signatories, the right to provide commercial services on behalf of every kind of mobile user, including AMSS[70].

b) Two privately organized satcom service providers play a considerable role on the emerging aeronautical market, the US based "Aeronautical Radio Inc.-ARINC-" and the "Société Internationale de la Télécommunication Aéronautique-SITA-" based in France. Owned by large American carriers, ARINC provides aeronautical communications in the oceanic flight information regions adjacent to the US and aeronautical operational communication in the USA, parts of Canada and Mexico. SITA was founded in 1949 as a cooperative and has presently 300 airlines as members. It offers telecommunication services to its members on a cost basis. Both ARINC and SITA do not have their own space hardware but lease capabilities from INMARSAT and other hardware providers.

2. Navigation

a) Two navigation systems are already operational although not yet fully installed, namely the US-American Global Positioning System -GPS-[71] and the Russian Global Orbiting Navigation Satellite System -GLONASS-[72].

Both systems have been originally designed for military purposes but the Governments of the United States and the Soviet Union have offered to make these

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[70]See, *infra*, Chapter 5.

[71]Sometimes referred to as GPS/NAVSTAR. NAVSTAR is the name of the type of satellite used for GPS.

[72]Although created under the former Soviet Union, GLONASS will be continued by the Russian Republic.

systems also accessible for civil uses free of charge for the first ten years of operations.

Both systems have global coverage and are independent of weather conditions[73]. The space segment of each system includes 24 navigation satellites, including 3 spares, which are uniformly placed in circular medium-altitude orbits[74].

GPS and GLONASS systems have very high accuracy. For instance, GPS provides a standard positioning service which will be available to civil, commercial and other users with a level of accuracy set at about 100m horizontal and 157m vertical. The precise positioning service only available to military users has an even higher accuracy[75]. GLONASS will have an accuracy of 100m horizontal and 150m vertical[76].

Very soon it has been considered desirable to make both systems compatible in order to increase the benefits in terms of civil aviation navigation system integrity, coverage, accuracy and redundancy[77]. Moreover, this compatibility would practically insure that regional or global failures of part of a system would not threaten either the safety or the reliability of civil aviation[78]. In 1989 the USA and the (former) Soviet Union agreed upon the joint development of user equipment

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[73]**D.Fisher**, *supra*, note 1 at 14.

[74]See for details: **T.G.Anodina, J.E.Turner**, "USSR-USA accord reached on satellite navigation" [No.5, May 1989] 44 *ICAO Bulletin* at 12.

[75]ICAO Doc.9583, AN-CONF/10, at 4F-1.

[76]*ibid*, at 4G-3.

[77]ICAO Doc.9524, FANS/4, at 3.3-18.

[78]**T.G.Anodina, J.E.Turner**, *supra*, note 74 at 12.

compatible with GPS and GLONASS[79].

It is expected that GPS will be fully operational by the year 1992[80]. One can only considerably doubt whether GLONASS will be operational by 1995 because of the incertitude with regard to the Russian space programmes.

b) The PRODAT/PROSAT ATS experiment project is carried out by ESA, Spain, the United Kingdom and EUROCONTROL[81]. The objective of this cooperative effort is to implement the recommendations of the FANS Committee in relation to communication and navigation satellite-based data links. It successfully achieved for the first time ever, in 1988, to control a flight of a civil aircraft entirely by satellite-based data links. Voice communication was not used at all in any direction and positional data were displayed on a radar screen together with the corresponding map.

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[79]See for details: *ibid*, at 13.

[80]A recent incident by which one NAVSTAR satellite had been heavily damaged by two individuals who entered the room in which the satellite had been stored before launch will probably slightly delate the programme.

[81]See for details: **D.Diez & E.Esteban**, "PRODAT/PROSAT data links successful in controlling jet flight" [No.2, February 1989] 44 *ICAO Bulletin* at 30ff..

3. Surveillance

The COSPAS/SARSAT project[82] is a cooperative effort of the member states of SARSAT[83], Canada, France and the USA, and the COSPAS-project[84] of the (former) Soviet Union. Initially meant to be an experimental project, COSPAS/ SARSAT has been established, in 1988, by a long-term agreement as a non-commercial service open to participation by all countries interested. In 1988, a ICAO paper stated that until then 1.126 persons had been rescued by using COSPAS/SARSAT services; 590 in aeronautical incidents, 480 in maritime and 47 in terrestrial incidents[85]. It has world-wide coverage although this coverage is not continuous thus detection of an emergency transmission is not instantaneous. However, the maximum time to detection is about three hours and the average less than one hour[86].

Several other mobile satellite service providers should be mentioned such as the GEOSTAR-corporation providing services for trucking companies in the USA. GEOSTAR intends to expand into the aviation and maritime area. Japan began in 1987 satellite navigation systems tests using its ETS-5 spacecraft allowing position

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[82]See for details: **R.Hafer**, "COSPAS/SARSAT demonstration to begin mid-year" [No.3, March 1982] 37 *ICAO Bulletin* at 16ff.; **C.D. LaFond**, "First results of COSPAS-derived accident-location data are encouraging" [No.12, December 1982] 37 *ICAO Bulletin* at 15ff..

[83]Search and Rescue Satellite-Aided System.

[84]Kosmicheskaya Sistyema Poiska Avariynych Sudov (KOSPAS), meaning Space System for Search of Vessels in Distress.

[85]ICAO Doc.AN-WP/6218, 13/6/88, at 2.

[86]**R.Hafer**, *supra*, note 82 at 18.

information with 1-km accuracy. Australia is looking forward to making use of satellites for CNS purposes using the geostationary AUSSAT system[87].

The above shows clearly that the introduction of world-wide satellite-based CNS/ATM systems is on its way. The needs of modern aviation will speed up this process. However the adoption of the new concept must be evolutionary, as mentioned earlier, and at a pace appropriate to the State and different regions in question[88].

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[87]See for details: **H.-W.Park**, *supra*, note 44 at 25.

[88]**N.J.G.Ostiguy**, *supra*, note 37 at 9.

Part B:

AMSS and the Law

Chapter 3
-AMSS and the Law of Outer Space-

AMSS is only one particular application of telecommunications via satellite. Its very nature implies that its activities extend beyond the borders of any one state[89]. This is evident in the case of international transmissions, but it is equally true in domestic cases where the sending and receiving stations are located within the same territory and the satellite is necessarily stationed in outer space, and thus beyond national borders[90]. Activities in outer space are subject to international outer space law[91], particularly the *Outer Space Treaty of 1967*[92]. This chapter will only deal with legal aspects of AMSS with regard to general rules of outer space law[93].

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[89]**N.M.Matte**, "Aerospace Law: Telecommunication Satellites" [1980, I] 166 *Recueil des Cours* 123 at 137.

[90]*ibid.*

[91]International outer space law must be distinguished from national regulations of outer space activities, to which can refer as to "*National Law of Outer Space Activities*". See for details: **K.H.Böckstiegel**, "Grundlagen des Weltraumrechts" in **K.H.Böckstiegel(Ed.)** *Handbuch des Weltraumrechts* (Köln: Carl Heymanns Verlag KG, 1991) at 5.

[92]*Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, of 27 January 1967*, **K.H.Böckstiegel & M.Benkö(Eds.)**, *Space Law Basic Documents* (Dodrecht: Martinus Nijhoff Publishers, 1989) Vol.I Part A.I [hereinafter *Outer Space Treaty*].

[93]With regard to the special field of telecommunications see, *infra*, Chapter 6.

I. The Applicability of the *Outer Space Treaty* to AMSS

Because AMSS will eventually be offered, inter alia, by private entities, the basic question arises whether the provisions of the *Outer Space Treaty* do apply also in this case. Article III of the *Outer Space Treaty* provides that

> "[s]tates Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the Moon and other celestial bodies, in accordance with international law, including the *Charter of the United Nations*, in the interest of maintaining international peace and security and promoting international cooperation and understanding."

The utilization of outer space for aeronautical satellite services implies a "use of outer space" and thus fall within the scope of international law. Even if the wording of article III suggests that its application is restricted to state activities, nowadays, there is general agreement that private enterprise may launch or/and operate satellite systems[94]. It does not matter whether these activities are carried out by private entities as long as the respective states authorize and supervise such activities. However, private activities in outer space are subject of the same limitations imposed by the *Outer Space Treaty* to state activities and furthermore the special conditions in articles VI, IX *Outer Space Treaty*[95]. Therefore, the *Outer Space Treaty* and its principles apply to all outer space activities, including AMSS, irrespective whether

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[94]This has been disputed in the past. See for details: **K.H.Böckstiegel**, "Transport to Outer Space by Private Enterprises: Aspects of Air and Space Law" [1976] 25 *ZLW* 285 at 304.

[95]**K.H.Böckstiegel**, "Die Nutzung des Weltraums-Allgemeine Grundsätze-" in **K.H.Böckstiegel(Ed.)**, *supra*, note 91 265 at 267.

carried out by private entities, state entities or international organisations[96].

II. Basic Principles of the *Outer Space Treaty* and AMSS

The *Outer Space Treaty* contains the basic principles governing all activities in outer space. In the following these basic principles shall be examined whether they pose any significant legal problem regarding AMSS.

1. The "Common Interest-Clause"

Article I, para 1 contains the so called "Common Interest-Clause". It provides that

> "[t]he exploration and use of outer space,..., shall be carried out for the benefit and in the interest of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind."

The exact meaning of this clause is disputed. Some consider it as an "illusive concept[97]", a mere expression of intention not having real legal substance. Others see in it a binding rule of public international law eventually causing a change away from the traditional concept of state individualism and state sovereignty to a new

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[96]See article XIII *Outer Space Treaty*.

[97]See for instance: C.Q.Christol, "The Legal Common Heritage of Mankind: Capturing an Illusive Concept and Applying It to World Needs" in *Proceedings of the XVIIIth Colloquium on the Law of Outer Space*, Lisbon 1976 (Davis: International Institute of Space Law of the International Astronautical Federation, 1976), pp.42ff.

concept of solidarity amongst states[98]. This is not the place to discuss the exact meaning of this clause. But it is fair enough to say that there is a basic call upon states carrying out space activities to be in some way responsive to the interests of developing countries, and to provide distribution of benefits derived from such activities. Therefore article I, para 1 of the *Outer Space Treaty* can be regarded as "at best a joint expression of intention, conferring no legal rights and imposing no real obligations[99]".The ways and means by which to achieve such cooperation is a matter of agreement between the states concerned[100]. This has to be done on a non-discriminatory basis.

It is interesting to note that ICAO itself is guided by the principle of non-discrimination. The so-called "*Guidelines For Acceptable Institutional Arrangements Relative to the Implementation of Aeronautical Satellite Services (AMSS) and Global Navigation Satellite Services (GNSS) for Civil Aviation*"[101] contain General Guideline I-1 which reads as follows:

> "[U]niversal accessibility to air navigation safety services must be available without discrimination".[102]

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[98]See for details: **M.A.Dauses**, "Das Weltraumrecht im Rechtsgefüge" in **M.Bodenschatz, K.-H.Böckstiegel & P.Weides(Eds.)** *Beiträge zum Luft- und Weltraumrecht -Festschrift Alex Meyer-* (Köln: Carl Heymanns Verlag KG, 1975) 283ff.

[99]**B.Cheng**, "Outer Space: The International Legal Framework" in Institute of International Public Law and International Relations *Thesaurus Acroasium Vol.X -Air and Outer Space Law-* (Thessaloniki 1981) 51 at 81.

[100]**N.M.Matte**, *supra*, note 89 at 147.

[101]ICAO Doc.FANS(II)/3, at 5A-1.

[102]One has to underline that the principle of non-discrimination in Guideline I-1 does only apply to access to air navigation safety services. The accessibility to necessary equipment is not ensured. The

(continued...)

The space segment will be part of the air navigation safety hardware. Therefore once a user disposes of the necessary on-board equipment allowing him to use AMSS the access to the space segment should not be prevented.

2. The Principle of Freedom of Outer Space

Article I, para 2 states that

"[O]uter Space,..., shall be free for exploration and use by all states without discrimination of any kind, on a basis of equality and in accordance with international law,...".

This article is the base of all space activities acknowledging that the exploration and use of outer space is basically free. However there are limitations to the freedom. Their content is largely unclear and disputed. Obviously, outer space activities do have their limitations in general rules of international public, particular the *Charter of the United Nations*. Additionally the *Outer Space Treaty* itself contains certain limitations such as the prohibition of placing certain types of weapons in outer space (article IV, para 1), the duty to use outer space exclusively for peaceful purposes (article IV, para 2), the duty to protect the outer space environment (article IX), and the prohibition of national appropriation or occupation (article II). It might be enough to state that the future AMSS are in perfect conformity with the above principle of freedom of outer space as long as the limitations are respected. The author has no

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[102](...continued)
10th AN-CONF only recognized "the convenience of equipment accessibility without discrimination" (ICAO Doc.9583, AN-CONF/10 at 4-10).

doubt that this will be the case.

3. The Principle of State Responsibility and Liability

Articles VI and VII of the *Outer Space Treaty* establish a rather unique régime of responsibility and liability which is elaborated in detail in the *Liability Convention of 1972*[103]. Article VI of the *Outer Space Treaty* states in general terms,

> "[S]tates ...shall bear international responsibility for national activities in outer space".

Article VII states that

> "[e]ach State Party to the Treaty that launches or procures in launching of an object into outer space,..., and each State Party from whose territory or facility an object is launched, is internationally liable for damage...".

Since all the major space faring nations and almost all international organisations involved in space are parties to both agreements or have submitted declarations of acceptance of the obligations under these agreements[104] it is worthwhile to explain briefly the mechanism of liability[105] established by the two international agreements and its possible impacts on AMSS.

a) As already stated the liability régime established under the *Outer Space Treaty* and the *Liability Convention* is rather unique. The above-mentioned articles VI

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[103]*Convention on International Liability for Damage Caused by Space Objects*, 29 March 1972, **K.H.Böckstiegel & M.Benkö(Eds.)**, *supra*, note 92 Vol.I Part A.II [hereinafter *Liability Convention*].

[104]See article XIII *Outer Space Treaty* and article XXII *Liability Convention*.

[105]See for details: **W.Stoffel**, "Das Haftungssystem des Internationalen Weltraumrechts" [1991] *Neue Juristische Wochenschrift-NJW-* at 2181ff.

and VII of the *Outer Space Treaty* only establish the general principle of state liability. They do neither define the general circumstances causing liability nor do they deal with the question whether a system of absolute liability or a system of liability based on fault is in place.

The *Liability Convention* establishes a twofold system of liability depending on where a damage occurs. Strict liability applies when damage is caused by an space object on the surface of the earth or to aircraft in flight (article II), whereas liability based on fault applies for damage caused elsewhere than on the surface of the earth (article III).

The term "space object" is not defined by the agreement itself and details are heavily disputed[106]. It seams to be accepted in the current practice that "[s]pace object is the generic term used to cover spacecraft, satellites, and, in fact anything that human beings launched or attempt to launch into space, including their component parts thereof...It embraces satellites, space vehicles, equipment, facilities, stations, installations and other constructions, as well as their launch vehicles and parts thereof[107]".

The Convention defines however the term "Damage". Under article I(a) of the Convention "Damage"

"[m]eans any loss of life, personal injury or other impairment of health; or

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[106]See for details: **M.Hintz**, "Weltraumgegenstände" in **K.H.Böckstiegel (Ed.)**, *supra*, note 91 at 157ff..

[107]**B.Cheng**, "Spacecraft, Satellites and Space Objects" in **R.Bernhardt (Ed.)** *Encyclopedia of Public International Law, Law of the Sea Air and Space, Vol.11*(Amsterdam: North Holland 1989) 309 at 311.

loss of or damage to property of States or persons, natural or juridical, or property of international intergovernmental organizations".

The wording of this article already makes it clear that it refers exclusively to physical damage and excludes pecuniary damages[108].

The Convention establishes liability of the "launching state[109]". Which state must be considered as "launching state" is defined in article I(c) of the Convention[110]. One can distinguish four categories of launching states:

-a state which launches a space object;

-a state which procures the launching;

-a state from whose territory has been launched; and

-a state from whose facilities has been launched.

If states launch jointly a space object, they all are liable jointly and severally for any damage caused (article V(1)). Participants of such a joint launch are allowed to conclude agreements regarding the apportioning among themselves of the recompensation to be paid. Such an agreement does not however effect the right of the claimant state to seek the damage from any or all states involved in the joint launch (article V(2)).

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[108]**N.M.Matte**, *supra*, note 89 at 149. See also, *infra*, Chapter 6.

[109]It is important to note that under the *Liability Convention* only States are liable for space activities. International organisation are liable under conditions set up by article XXII. The *Liability Convention* does not establish liability of individuals as such but of their respective national state.

[110]See for details: **K.H.Böckstiegel**, "The Terms 'Appropriate State' and 'Launching State' in the Space Treaties -Indicators of State Responsibility and Liability for State and Private Space Activities" in *Proceedings of the XXIV Colloquium on the Law of Outer Space, Montreal 1991* IISL-91-021 (Washington: American Institute of Aeronautics and Astronautics, 1992), 13ff.

b) After having very briefly described the basic mechanism of the *Liability Convention* its possible impacts on AMSS will be examined.

The liability régime of the outer space law will only be applicable with regard to damages caused by the space segment itself. The space segment of AMSS is a space object under the *Liability Convention*. The typical damage arising from telecommunication activities, namely pecuniary loss due to transmission failure, incorrect, unclear, retarded or otherwise faulty transmission is not covered[111].

A much more complex problem could be which state will actually be held liable. One has to recall that the *Outer Space Treaty* states in article VI that states are liable regardless whether the activities in outer space are carried on by governmental agencies or non-governmental entities. Thus there is no doubt that the liability provisions are applicable both for launchings by states and state institutions as well as by non-governmental institutions, especially private enterprises[112].

The activities of non-governmental entities shall require authorization and continuing supervision by the appropriate state. Since AMSS are offered by non-governmental, private entities as shown earlier, the question becomes very urgent who will be liable if a space segment is operated by a private provider. For instance, the US-based Motorola is currently setting up a low earth orbit satellite system allowing voice communication by small cellular phone type user terminals[113]. It will use its own satellites. Even if this system is not dedicated to AMSS the parallels to

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[111]See, *infra*, Chapter 6.

[112]**K.H.Böckstiegel**, *supra*, note 110 at 15.

[113]See for details: **P.J.Klass**, *supra*, note 58, *ibid.*

aeronautical satcom services are obvious.

A safe starting point is to say that the state under whose name a satellite operating AMSS is registered in accordance with the provisions of the *Registration Convention*[114] will be liable[115]. The basic problem of the liability régime established is the question whether the term "state which...procures the launching" under article I(c)(i) *Liability Convention* shall be interpreted narrowly in the sense that the launch has been carried out because of the respective state's initiative or under its supervision. A broad interpretation would impose liability already in cases where a state does not intervene and thus does in fact tolerate launching activities by its own nationals. It seems to be that because of both the drafting history and the rationale behind this provisions, the term has to be interpreted in a broad sense. Articles VI, VII of the *Outer Space Treaty* together with the *Liability Convention* make a state generally liable for all outer space activities for which he should give authorization and exercise supervision[116].

However it seems doubtful whether a state will be liable in any case for space activities by its nationals. A couple of years ago a private company registered in Germany called Orbital Transport- und Raketen Aktiengesellschaft -OTRAG- planned to offer launch services abroad in Lybia and Zaire[117]. The only

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[114]*Convention on Registration of Objects Launched into Outer Space of 1975*, **K.H.Böckstiegel & M.Benkö(Eds.)**, *supra*, note 92 Vol.I Part A.IV. [hereinafter *Registration Convention*].

[115]**M.Hintz**, *supra*, note 106 at 180.

[116]**K.H.Böckstiegel**, 'Die Nutzung des Weltraums-Allgemeine Grundsätze' in **K.H.Böckstiegel(Ed.)**, *supra*, note 91 265 at 294.

[117]See for details: **W.Stoffel**, *supra*, note 105 at 2184f.

link between Germany and OTRAG was the registry in Stuttgart. The German government had no interest in and in fact discouraged the activities of OTRAG. Some authors are indeed of the opinion that a state is always liable for outer space activities of entities which have to be considered as its nationals[118].

First of all, it appears to be very difficult to determine, for instance, the nationality of an multinational legal person[119]. Secondly, article VI of the *Outer Space Treaty* provides that activities of non-governmental entities in outer space shall require authorization and continuing supervision by "the appropriate state". Without entering a deep discussion on the meaning of this expression[120] it is fair enough to say that one must not necessarily identify the "appropriate state" with the "launching state" or the "national state". In the author's mind, there must be some factual link between state and private entity, and the practical possibility of an effective control exercised by a state.

One can therefore conclude that nationality as such is not sufficient to make a state liable for outer space activities of individuals. Additional aspects, such as, inter alia, licensing and subsidies by the government, headquarters and main place of business, effectiveness of supervision and control may play a role to determine the state which is actually liable under the *Liability Convention.*

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[118]**H.Bittlinger**, *Hoheitsgewalt und Kontrolle im Weltraum* (Köln: Carl Heymanns Verlag KG, 1988) at 39f.; **N.M.Matte**, *supra*, note 89 at 148.

[119]See for instance: *The Barcelona Traction, Light and Power Company* [1970] *ICJ Reports*, pp.3ff..

[120]See for details: **K.H.Böckstiegel**, *supra*, note 110 at 14.

III. Conclusions

The introduction AMSS as envisaged by the FANS Committee is in conformity with the basic principles of outer space law.

AMSS are subject to the liability régime established by the *Outer Space Treaty* and the *Liability Convention*, and therefore the principles of state responsibility and liability apply. However, in a particular case it might be difficult to determine the state which is internationally liable.

Chapter 4
-AMSS and the Régime of International Telecommunication-

The term "telecommunication" is defined in Annex 2 of the *International Telecommunication Convention*[121] as:

> "[A]ny transmission, emission or reception of signs, signals, writing, images and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems."

All forms of telecommunication, including AMSS, depend on the availability of frequencies for transmission of messages. Allocation, allotment, and assignments of frequencies on a global basis are being agreed upon within the framework of the International Telecommunication Union -ITU-[122]. Furthermore, the availability of appropriate orbital positions for the satellites is a prerequisite for all MSS. After having described the general framework of outer space law applicable on AMSS, in the following the specific régime of international telecommunication and its impacts on AMSS will be examined.

I. The Basic Principles of Telecommunication

The two major principles in the field of telecommunication are, on a national level, the "Principle of States' Jurisdiction" and, on an international level, the "Principle of States' Responsibility". Additionally, the above general principles of the

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[121] *International Telecommunication Convention with Annexes I and II of 1982*, **K.H.Böckstiegel & M.Benkö(Eds.)**, *supra*, note 92 Vol.II Part C.IV.1 [hereinafter *ITU-Convention*].

[122] **W.-H.Park**, *supra*, note 44 at 30.

law of outer space are of course applicable[123].

1. The Principle of States' Sovereignty and Jurisdiction

Under international law, governmental regulation and control of national telecommunications systems are considered to be an internal matter, the domaine réservé, of the respective state. Thus under the principles of sovereignty and territorial jurisdiction, general international law recognizes the jurisdiction of states to regulate and control their internal telecommunications system[124]. The right to regulate and control internal telecommunications covers, for instance, the right to license radio stations and to authorize the use of certain radio frequencies. Thus, there is no freedom in the field of telecommunication which would automatically permit anybody, within the sovereign territory of a state, to operate a wireless transmitter or any other means of telecommunication[125]. This principle will have considerable impact on AMSS as will be shown later.

2. The Principle of States' Responsibility

On the international level, the "Principle of States' Responsibility" is the correlate to the "Principle of States' Jurisdiction"[126]. Under this principle, states are

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[123]**N.M.Matte**, *supra*, note 89 at 138ff.

[124]**F.W.Hondius**, "International Control of Broadcasting Programs in Western Europe" in E.McWhinney(Ed.) *The International Law of Communications* (Leyden: A.W.Sijthoff, 1971) 69 at 76f.

[125]**M.Milde**, *supra*, note 56 at 218.

[126]**N.M.Matte**, *supra*, note 89 at 142.

internationally responsible if the assigned frequencies cause harmful interference to foreign radio stations and thus violate the licensing state's international obligations under the rules established by ITU. However, it should be underlined that the above principle does only apply with regard to other states and not to private users of the telecommunication systems[127].

II. The Regulatory Régime of the International Telecommunication Union -ITU- and its Impact on AMSS

As stated above, international regulations on telecommunications are established by the International Telecommunication Union -ITU-. ITU is the United Nations Organizations specialised agency dealing with this subject matter[128]. In the following the purposes and structure as well as the regulatory régime of ITU shall be described, and its impact on AMSS be examined.

1. The Purposes and Structure of ITU

ITU is tracing its origins back to 1865 when the *International Telegraph Convention* was signed creating the International Telegraph Union[129]. Since then, its constitutional conventions have been continuously revised. ITU is based upon two different international instruments. The basic document is the *ITU-Convention* identifying ITU as an international legal entity, determining its structure, defining its

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[127]With regard to private law responsibility see, *infra*, Chapter 6.

[128]**M.Goddard**, *supra*, note 55 at 1.

[129]For the history of ITU see: **J.M.Smits**, *Legal Aspects of Implementing International Telecommunication Links* (Dodrecht: Martinus Nijhoff Publishers 1992) 31ff.

purposes and membership, establishing its relationship with the United Nations Organization and other international organisations, and setting forth certain general provisions relating to telecommunications[130]. The second international instrument are the *Radio Regulations* containing very detailed provisions regarding technicalities. Both instruments are international treaties thus binding the governments which have agreed on them[131]. The presently applicable *ITU Convention* was adopted in 1982 in Nairobi replacing the *ITU-Convention of 1973*[132] adopted in Malaga-Torremolinos[133].

a) Under article 4(1) of the *ITU-Convention*, the general purposes of ITU are:

-to maintain and extend international cooperation...for the improvement and rational use of telecommunications of all kinds, as well as to promote and to offer technical assistance to developing countries in the field of telecommunications;

-to promote the development of technical facilities and their most efficient operation with a view to improving the efficiency of telecommunications

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[130]**M.L.Smith,** *International Regulation of Radiocommunication* (Dodrecht: Martinus Nijhoff Publishers, 1990) at 24.

[131]**M.Mili,** "International Jurisdiction in Telecommunication Affairs" [1973] 40 *Telecommunication J.* 122

[132]*International Telecommunication Convention*, Malaga-Torremolinos 1973, in **N.Jasentuliyana (ed.) & R.S.K.Lee (ed.),** *Manual on Space Law* (Dobbs Ferry/NY: Oceana Publications 1979) Vol.II, pp29ff.

[133]In 1989, the Nice Plenipotentiary Conference decided to separate the *1982 ITU-Convention* into two basic legal documents, i.e., the *International Telecommunication Constitution* and the *International Telecommunication Convention*. Constitution, Convention and Radio Regulations shall enter into force the 30th day after the deposit of the 55th instrument of ratification or accession. This is not yet the case. When referring in the following to the ITU-Convention or Radio Regulations those of 1982 are meant. See for details: **R.S.Jakhu,** "Plenipot Decisions on Key Legal Issues" [August/September 1989] XII *Transnational Data and Communications Report*, pp.15ff.

services, increasing their usefulness and making them, so far as possible, generally available for the public; and

-to harmonize the actions of nations in the attainment of those ends.

To accomplish the above purposes, ITU is assigned certain duties which are of special importance with regard to AMSS. These duties are:

-to effect allocation of the radio frequency spectrum and registration of radio frequency assignments in order to avoid harmful interference between radio stations of different countries;

-to coordinate efforts to eliminate harmful interference between radio stations of different countries and to improve the use made of the radio frequency spectrum; and

-to foster international cooperation in the delivery of technical assistance to the developing countries and the creation, development and improvement of telecommunication equipment and networks in developing countries by every means at its disposal, including through its participation in the relevant programmes of the United Nations and the use of its own resources, as appropriate[134].

b) With regard to the organisational structure of ITU[135] one must distinguish between so called permanent organs and temporary organs. The former consist of General Secretariat, the International Frequency Registration Board -IFRB-, the

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[134]*ibid*, article 4(2).

[135]See for details: **J.M.Smits**, *supra*, note 129 at 38ff.

International Radio Consultative Committee

-CCIR-, the International Telegraph and Telephone Consultative Committee -CCITT-, whereas the latter consist of the Plenipotentiary Conference as supreme organ of ITU, the Administrative Conferences[136], and the Administrative Council. In the context of this thesis, the Administrative Conferences in general, but particularly the World Administrative Radio Conferences -WARC- dealing with frequency allocation to AMSS are of special interest.

2. The Regulatory Régime of Telecommunication Established by ITU

In the following the regulatory régime of ITU and the nature of the acquired rights shall be described.

a) The fundamental purpose of Radio Administrative Conferences, regional or worldwide, is the allocation of radio frequencies to the various services. Article 1, No.17 of the *Radio Regulations* defines "allocation" as

> "[e]ntry in the Table of Frequency Allocations of a given frequency for the purpose of its use by one or more terrestrial or radiocommunication services...".

Therefore, allocations are made to services and not to countries. Following allocation, countries may enter into agreements for further distribution of frequencies. Two or more members of ITU may conclude special agreements, so called "plans", which must conform to the general allocation scheme, for sub-allocation to particular

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[136]One has to distinguish between World Radio Administrative Conferences -WARC- and Regional Administrative Radio Conferences -RARC-.

countries of a combination of frequency bands and services[137]. This process is called "allotment" and has significantly different legal consequences since it consists of a designation of frequencies in an agreed plan for use by one or more countries, as opposed to services, particularly their administrations for radiocommunication purposes. The third step is the "assignment" which means the authorization given by a national administration for one of its radio stations to use frequencies under specific conditions. Although this procedure has to follow rules established by ITU, it is purely internal.

b) In order to be protected against harmful interference by other users, ITU-member states have to follow a special procedure[138] set up in the *ITU-Convention*, leading to the registration of allocated frequencies in the so-called Master International Frequency Register. Time of registration is of the essence because rights are not obtained until registration, when formal international recognition is granted[139]. Therefore, the system consists basically of a "first-come, first-served" rule. The first station to be registered by the IFRB will be protected against harmful interference. This system has very often been criticised because later users have to make sure that their assignments will not interfere with the earlier. However, until today the system has been able to accommodate all demands of assignments and has also been referred to as "last-come, always-served" rule[140].

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[137]*Radio Regulations* article 7.

[138]See for details: **M.L.Smith**, *supra*, note 129 at 47ff.

[139]*ibid*, at 47.

[140]*ibid*.

c) The right to use a properly registered assignment is not tantamount to possessing title or property. It is neither ownership[141]. Furthermore, the right to use a registered assignment is only protected when its use is in accordance with the characteristics recorded in the Master Register. Once an assignment is registered, an administration can only proceed with changes after having repeated the procedure leading to the registration of new assignments[142]. Services not operated in accordance with the registration can be cancelled by the IFRB. However it may only do so after consultations with the respective administration and only with its agreement[143]. Finally, after a suspension for 18 months or the permanent discontinuation of the use of the registered assignment, the IFRB may make a mark against the entry in the Master Register. The assignment will no longer be considered in the procedure leading to the registration of new assignments and it is no longer protected against harmful interference from subsequently registered assignments[144].

III. ITU-Regulations of AMSS

1. Frequency Allocations to AMSS

One has to distinguish between frequency allocation for aeronautical radionavigation services and allocations for AMSS. The former were subject of deliberations within ITU since the use of radio stations for aeronautical purposes was

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[141]See for details: **E.N.Valters**, *International Law of Communications Satellites: Scarce Resources in a New Environment* (An Arbor: University Microfilms 1971) at 153ff.

[142]article 13, No.1548 *Radio Regulations*.

[143]article 13, No.1574 *Radio Regulations*.

[144]article 13, No.1572 *Radio Regulations*.

recognized whereas the latter emerged on the 1971 WARC-ST[145]. Most of the radio frequency spectrum allocated to space services such as MSS was shared with terrestrial services. Whereas previously only space services as such has been recognized, numerous different space telecommunication services have then been identified. One is the so called "Mobile Satellite Services-MSS-", consisting of "Maritime Mobile Satellite Services-MMSS-" and "Aeronautical Mobile Satellite Services-AMSS-"[146]. Although, for the first time ever frequency bands have been allocated exclusively for aeronautical mobile-satellite(R) services[147], the total frequency bands for aeronautical radionavigation services have been curtailed. Since the frequencies for AMSS have not been used, ITU subsequently further reduced these bands on the 1979 ITU General WARC and on the 1987 WARC-MSS[148], in favour of other mobile satellite services, particularly land mobile satellite services-LMSS-[149]. However, the remaining allocation have been considered as to maintain a sufficient spectrum on a world-wide basis for AMSS[150]. With regard to the 1992 WARC there has been some concern about the maintaining of the above frequency bands[151]. Proposals for further cut-backs of frequencies exclusively allocated for

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[145]World Radio Administrative Conference-Space Telecommunications

[146]**M.Goddard**, *supra*, note 55 at 7.

[147](R) means for safety and regularity of flight use only, excluding the use for the public.

[148]World Administrative Radio Conference-Mobile Satellite Services.

[149]See for details: **M.Goddard**, *supra*, note 55 at 8.

[150]*ibid.*

[151]See **St.Kaiser**, *supra*, note 57 at 17.

AMSS in favour of other MSS, particular LMSS, have been rejected[152].

2. Aeronautical Safety and Non-Safety Communications

As said above, frequency bands allocated for AMSS were reserved for safety and regularity of flight use only, thus excluding essentially Aeronautical Passenger Communication-APC-. But APC was a major issue during the 1987 WARC-MSS. Some states realized its enormous economic potential and developed APC-systems. They strongly opposed further curtailing of AMSS frequency allocations. Finally, a compromise was reached. The respective states agreed on the new allocation, but received, as quid-pro-quo, the authorization that public correspondence could take place within these bands, provided that full priority would be given to messages concerning safety and regularity of flight. According to the *Radio Regulations*, national administrations may authorize these frequencies to be used for public correspondence with aircraft earth stations, provided that such "such communications must cease immediately, if necessary, to permit transmissions with priority 1 to 6 in Article 51." Article 51 deals with the order of priority of communications in aeronautical mobile service and in AMSS[153]. The priorities are as follows:

1) Distress calls, distress messages and distress traffic;

2) Communications preceded by urgency signal;

3) Communications relating to radio direct-finding;

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[152]P.J.Klass, *supra*, note 58.

[153]M.Milde, *supra*, note 56 at 224.

4) Flight safety messages;

5) Meteorological messages; and

6) Flight regularity messages.

Some concern was expressed with regard to the practical implementation of the rule of message priority[154]. However, it seems technically to be feasible to interrupt communications in order to give priority to messages belonging to one of the above categories[155]. But this issue deserves special attention by the national authorities with regard to the assignments of AMSS including APC to national users such as airlines.

IV. Conclusions

AMSS are subject to the régime established by ITU. The current regulations allow the use of certain frequency bands for such services. APC services are allowed in so far as priority is given for messages under article 51 *Radio Regulations*. Member states of ITU are internationally responsible that the allocated frequencies are used in accordance with the registration in the Master Registry and do not cause harmful interference with other uses duly registered by ITU.

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[154]*ibid*, at 225.

[155]Personal communication from SITA engineers.

Chapter 5
-AMSS and Public International Air Law-

This chapter will deal with legal aspects of AMSS under public international air law. National implications of AMSS will remain outside the scope of this thesis.

I. The Basic Principles of Public International Air Law

In order to understand the specific aspects of AMSS with regard to the existing régime of public international air law it is necessary to repeat briefly the basic principles of international public air law setting the framework for all activities related to aviation.

1. State Sovereignty over Its Territorial Airspace

State sovereignty over its territorial airspace is the basic principle underlying the whole system of international air law[156]. Irrespective whether the airspace can be regarded as constituting part of the state's territory (though it is usually the case), it is generally recognized that every state enjoys sovereign rights over the airspace above its land areas and territorial waters[157]. This principle is codified in articles 1 and 2 of the *Chicago Convention* which reads as follows:

Article 1

"[T]he contracting States recognize that every State has complete and

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[156]M.Zylicz, *International Air Transport Law* (Dodrecht: Martinus Nijhoff Publishers 1992) at 58.

[157]*ibid.*

exclusive sovereignty over the airspace above its territory".

Article 2

"[F]or the purposes of this Convention the territory of a state shall be deemed to be the land areas and the territorial waters adjacent thereto under the sovereignty, ...of such state".

The wording of the articles already makes it clear that these treaty provisions do not create a new rule of international public air law, but confirms an already existing rule[158]. And indeed, the principle of states' sovereignty over their national air space was already well established in 1944 when the above Convention has been drafted, thus rejecting Fauchille's "Doctrine of Freedom of the Air"[159] stating that "[l]e principe que l'air n'est pas susceptible d'une occupation régulière demeure...dans son entier; on doit en conclure qu'il ne saurait être un objet de propriété"[160].

However the wording of this article gives rise to a number of problems connected with current changes in the Law of the Sea, especially regarding the attempts of some states to extend the territorial waters beyond the limits of 12 nautical miles[161]. It seems to be appropriate to interpret this provision in the sense that the actual limits of the territorial waters is delimitated by generally recognized

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[158]See for details: **B.Cheng**, *Law of International Air Transport* (London: Stevens & Sons Ltd., 1962) at 120ff.

[159]See for details: **P. Fauchille**, "Le domaine aérien et le régime juridique des aéerostats" [1901] VIII *Revue Générale de Droit International Public*, pp. 414ff.

[160]*ibid*, at 415.

[161]See for details: **M.Milde**, "United Nations Convention on the Law of the Sea-Possible Implications for International Air Law-" [1983] X *Annals of Air and Space Law* 87ff.

rules of customary international law[162]. With regard to the question of delimitation of territorial waters, the *1982 Convention on the Law of the Sea*[163] contains generally accepted (customary) rules limiting these waters to 12 nautical miles.

The legal consequences of states' sovereignty over their air space is such that the states have certain rights, namely:

-to authorize or refuse authorization of any flight into and above its territory;

-to impose such regulations, conditions and limitations for the exercise of such flights as it may deem appropriate; and

-to establish and, where practicable, enforce its jurisdiction and territorial application of its laws with respect to both national and foreign aircraft while within its territory, as well as to the persons and goods on board such aircraft, and to the offenses, torts or other acts committed on board, whenever territorial links are applicable according to its law[164].

Even if the above rights are exclusive, they cannot be regarded as absolute in the sense that they are not subject to restrictions. They find their limits in general recognized provisions of international law, whether codified, such as the *Charter of the United Nations Organization*, or uncodified such as general principles and customary international law under article 38 of the *Status of the International Court*

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[162]**N.M.Matte**, *Treatise on Air-Aeronautical Law* (Toronto: The Carswell Co.Ltd., 1981) at 134.

[163]*United Nations Convention on the Law of the Sea of 1982* UN Doc.A/CONF.62/122.

[164]**M.Zylicz**, *supra*, note 156 at 61.

of Justice[165].

One could think that aviation enjoys unlimited and uncontrolled freedom of the air in all areas not subject to any jurisdiction of any single state, particularly the air space above the high seas, the ice-covered areas of the Arctic Ocean, as well as the Antarctic land and sea areas within the boundaries established by the *Antarctic Treaty of 1959*[166]. In order to avoid an "aviation wild west" states agreed to give regulative power to ICAO with regard to the rules in force over those areas not subject to any (national) jurisdiction, Article 12(3) of the *Chicago Convention* reads as follows:

> "[O]ver the high seas, the rules in force shall be those established under this Convention."

Consequently, ICAO agreed on Annex 2 to the *Chicago Convention* called "Rules of the Air".

2. Nationality of Aircraft

The legal status of aircraft, particularly its nationality, is of special importance in international public air law. The *Chicago Convention* restates and confirms a well established rule of customary international law, providing in article 17, that

> "[a]ircraft shall have the nationality of the State in which there are

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[165] *Status of the International Court of Justice*, 4 *ICJ Acts and Documents*, pp.60ff..

[166] *Antarctic Treaty of 1959* [1960] 54 *AJIL* 477ff.

registered".

The legal importance of this provision is far reaching. It places the aircraft under the jurisdiction of the state of registry. As one of its consequences the state of registry is internationally responsible for the conduct of the aircraft and for the compliance with the regulations applicable on civil aviation with regard to, inter alia, licensing of crews, airworthiness, designation of airports and so on[167]. But one has to underline that aircraft should not be regarded as "an extension of [...] territory in any fictional way"[168]. In the case *R. v. Martin*, dealing with offenses against the *UK Dangerous Drugs Act of 1951* and the *Dangerous Drugs Regulations of 1953*[169], the Judge held that British aircraft are not an extension of British territory[170].

3. Principles Governing the Operation of Aircraft

The *Chicago Convention* imposes a number of conditions with which aircraft of contracting states engaged in international air navigation, as well as their operators, crews and passengers, especially when over the territory of other contracting states, must comply[171]. These conditions are imposed, inter alia, with regard to instruments of flight, type of operations, i.e. scheduled or non-scheduled services, entry and departure of aircraft, marks, documents, certificates and licenses,

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[167]See for details: **M.Zylicz**, *supra*, note 156 at 148.

[168]**C.H.Alexandrowicz**, *The Law of Global Communication* (New York: Columbia University Press, 1971) at 128.

[169]*Dangerous Drugs Act of 1951* and *Dangerous Drugs Regulations of 1953*, *S.I.* 1953, *No.*499.

[170]*R v. Martin*, [1956] 2 *Q.B.* 272 at 288.

[171]**B.Cheng**, *supra*, note 158 at 132.

and observance of aeronautical regulations[172].

4. International Cooperation and Facilitation

The fourth great principle accepted by the contracting parties to the *Chicago Convention* is that of mutual co-operation in the development and facilitation of international air transport[173]. This principle finds expression in various provisions of the Convention. One of the major issues in this context is the international standardisation of rules and regulations relating to civil aviation.

II. The International Civil Aviation Organization-ICAO-

In order to understand the principle legal problems to implement AMSS, one has to know the structure and regulative power confirmed to ICAO by the *Chicago Convention.*

1. Structure and Functioning

ICAO has been established by Part II of the *Chicago Convention.* It came into being on April 4, 1947, thirty days after the receipt on March 5 of the twenty-sixth ratification of the *Chicago Convention*[174]. ICAO is one of the specialised agencies of the United Nations Organization and enjoys full juridical personality[175].

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[172]For details see: *ibid*, at 133ff.

[173]*ibid*, at 145.

[174]See article 91(b). Until this date, ICAO was known as "Provisional International Civil Aviation Organization-PICAO-" under the *Interim Agreement on Civil Aviation, attached to the Convention on International Civil Aviation as Appendix I*, 7 December 1944, ICAO Doc.2187.

[175]See for details: **B.Cheng**, *supra*, note 158 at 37ff.

The structure of ICAO is such of a classical international organisation. It consists of the Assembly[176], the Council[177], the Air Navigation Commission[178], and the Air Transport Committee[179]. These organs are mentioned in the *Chicago Convention*. Later three additional permanent committees were created, namely the Committee on Joint Support of Air Navigation Services, the Legal Committee and the Finance Committee. In the context of this thesis these three are of minor importance.

The Assembly is the plenary organ of ICAO where all members are represented[180], meeting not less than once in three years. It is competent to deal with any matter covered by the *Chicago Convention* which has not been specifically assigned to the Council[181].

The Council is a permanent organ responsible to the Assembly, composed of thirty-six members, elected by the Assembly for a three-year term[182]. The most important function the Council shall carry out under article 54, is the adoption of international standards and recommended practices.

The actual formulation of SARPS is done by the Air Transport Commission[183] in close cooperation with the Air Navigation Committee and their

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[176]See Chapter VIII *Chicago Convention*, articles 48ff.

[177]See Chapter IX *Chicago Convention*, articles 50ff.

[178]See Chapter X *Chicago Convention*, articles 56ff.

[179]See article 54(d) *Chicago Convention*.

[180]**B.Cheng**, *supra*, note 158 at 42.

[181]See article 49 *Chicago Convention*.

[182]**B.Cheng**, *supra*, note 158 at 46.

[183]See article 57(a) *Chicago Convention*.

respective sub-divisions.

2. The "Quasi-legislative Power" of ICAO

The organisation's authority to adopt SARPS derives from article 37 of the *Chicago Convention* which reads as follows:

> "[E]ach Contracting State undertakes to collaborate insecuring the highest practicable degree of uniformity in regulations, standards, procedures, and organization in relation to aircraft, personnel, airways and auxiliary services in all matters in which such uniformity will facilitate and improve air navigation. To this end [ICAO] shall adopt and amend from time to time, as may be necessary, international standards and recommended practices...".

"For convenience" they are designated as Annexes to the *Chicago Convention*[184] thus indicating that they are actually not an integral part of the agreement itself[185]. 18 Annexes have been adopted so far.

a) The *Chicago Convention* itself does not define the term "International Standard" or "Recommended Practices". This has been done, in 1947, by Assembly Resolution A1-31[186] as describing standards[187] as:

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[184]See article 54(l) *Chicago Convention.*

[185]**T. Buergenthal**, *Law-Making in the International Civil Aviation Organization* (Buffalo: Syracuse University Press, 1969) at 100.

[186]See Assembly Res. A1-31, ICAO Doc.4411 (A1-P/45).

[187]The foregoing resolution does only apply to "air navigation matters". Therefore SARPS dealing with air transport are somehow different in wording, i.e., "non-compliance must be notified" with

(continued...)

"[a]ny specification for physical characteristics, configuration, materiel, performance, personnel, or procedure, the uniform application of which is recognized as *necessary* for the safety or regularity of international air navigation and to which Member States *will conform* in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38 of the Convention[188]".

Recommended practices are defined as:

"[a]ny specification for physical characteristics, configuration, materiel, performance, personnel, or procedure, the uniformity of which is recognized as *desirable* in the interest of safety, regularity or efficiency of international air navigation, and to which Member States *will endeavour to conform*[189] in accordance with the Convention".

b) The competence to adopt or amend Annexes is entrusted to the Council under article 54(l) of the *Chicago Convention*. However, all member states of ICAO are already involved in the stage of discussion on the adoption or amendment. The states are free to participate in the divisional meetings and conferences, where they have the opportunity to initiate and support proposals for SARPS[190]. Furthermore, SARPS, amended or new, must be submitted to the member states for their comments

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[187](...continued)
regard to standards, and "generally practicable and highly desirable" with regard to recommended practices.

[188]Emphasis added.

[189]Emphasis added.

[190]**T.Buergenthal**, *supra*, note 185 at 63.

after they have been reviewed by the Air Navigation Commission or the Air Transport Committee[191]. The final draft will then pass to the Council who adopts it by a two-thirds majority of its total membership, and will be submitted to the contracting states. It will become effective within three months after its submission unless in the meantime a majority of states register their disapproval with the Council[192]. Usually, Annexes become not applicable upon the date of the enactment but after a period of several month to be determined by the Council[193].

c) It is of particular importance which legal nature the Annexes have. It is fair to say, that, with some exceptions, the states have no legal obligation to implement or to comply with the provisions of a duly enacted annex, unless they find it practicable to do so. Article 38 of the *Chicago Convention* provides that

> "[a]ny *state which finds it impracticable to comply* with any such international standard...shall give immediate notification to [ICAO]..."[194].

Effectively, it is up to each state to decide whether to comply with or give effect to an international standard. Thus, the states are completely free to adhere to any regulation. The same is true with regard to recommended practices which are, as the name already indicates, of a non-obligatory nature. With regard to a subsequent inability to comply with the regulations in the Annexes,

the states have retained the right to depart from the provisions of an existing standard

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[191] *ibid.*

[192] See article 90(a) *Chicago Convention.*

[193] See article 90(b) *Chicago Convention.* For details on the interpretation of this article by the ICAO Council see **T. Buergenthal**, *supra*, note 185 at 69ff.

[194] Emphasis added.

any time they decide to do so, provided only that they notify ICAO accordingly[195]. However, as long as a state has notified ICAO by what date it will comply with an Annex, or when it expressly notifies that it has no differences to report, the state is under the international obligation to respect the standards and to act in accordance with them.

But there are certain exceptions to this rule, the most important of which is article 12 of the *Chicago Convention* "The Rules of the Air", governing flights over the high seas. The compliance with these rules is mandatory.

As to summarize the above, the essential characteristics of an ICAO standard are its recognition as being necessary and its binding nature, at least in the absence of a notification to the Council of a member state's inability, prior or subsequent to the enactment, to comply with it[196]. Recommended practices are of a non-mandatory nature and states can depart from them whether they have notified a difference with ICAO are not.

III. ICAO and AMSS

As already mentioned above[197], ICAO has dealt with AMSS since the early 1970's, but particularly since 1983 when the FANS Committee was established. There are a couple of air law related matters which have to be addressed such as,

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[195]**T.Buergenthal**, *supra*, note 185 at 78.

[196]**B.Cheng**, *supra*, note 158 at 70.

[197]See, *supra*, Chapter 2.

inter alia, the jurisdiction of ICAO on AMSS matters, Safety and Non-Safety Communications, and implementation problems related to Standards and Recommended Practices-SARPS-.

1. The ICAO Mandate

In 1989 ICAO and INMARSAT concluded an agreement which should put an end to a fierce fight on presumably conflicting jurisdictions between the two international organisations[198] with regard to AMSS. The question was simply who is the appropriate international organisation which should deal with AMSS. The outcome can be summarized as such that each organisation has different tasks in the implementation and provision of AMSS. The agreement states in its preamble that

> "...[I]CAO has the exclusive competence to establish International Standards, Recommended Practices and Procedures in the field of aeronautical communications as provided by the Convention on International Civil Aviation",

and that

> "[I]NMARSAT has confirmed that it has the technical competence and capability to offer aeronautical mobile-satellite communication services in support of air traffic services, aeronautical operational control, aeronautical administrative communications (...) and aeronautical

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[198] *Agreement of Cooperation between the International Civil Aviation Organization (ICAO) and the International Maritime Satellite Organization (INMARSAT)*, Montreal 27 June 1989, ICAO Reg.No.B467.

passenger communications (...)".

a) It is worthwhile to describe briefly the development in the mutual relationship between INMARSAT and ICAO on the subject matter.

ICAO and INMARSAT had quiete extensive discussions on a possible sharing of frequencies allocated to MSS by the 1971 WARC-ST. From the very beginning, ICAO has been very concerned about possible negative impacts of general sharing of frequency bands between aeronautical and maritime users and stated

> "[t]hat, since from an operational and frequency management viewpoint general sharing of frequency bands between the aeronautical mobile and the maritime mobile services is considered undesirable, any proposal to this effect should be opposed".

But the Council identified a shared Search and Rescue system -SAR- as a possible field of shared frequencies. The IMCO Panel of Experts on the Establishment of a Maritime Satellite System also considered this as suitable[199]. It is interesting to note, that, in the following years ICAO remained fairly inactive with regard to aeronautical satellite services, whereas INMARSAT had from the very beginning of its existence the ambition to offer aeronautical satellite services to interested users. This was already stated in a recommendation included in the Final Act of the International Conference on the Establishment of a Maritime Satellite System, namely

> "[t]hat arrangements should be made to undertake...the study,..., of the institutional, financial, technical and operating consequences of the use by

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[199]W.von Noorden, *supra*, note 39 (Part I.)at 33.

INMARSAT of multi-purpose satellites providing both maritime mobile and aeronautical mobile capabilities"[200].

And indeed, in 1985, the *INMARSAT Convention* has been amended, giving INMARSAT institutional competence to be involved in the provision of aeronautical communications services. The conflict of jurisdiction with ICAO was created.

b) The new article 3(1) of the *INMARSAT Convention* provides that the purpose of the Organization is as follows:

> "[t]o make provisions for the space segment necessary for improving..., as practicable, aeronautical communications, thereby assisting in improving communications for distress and 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-determination capabilities".

The wording already makes the possible conflict with ICAO quiete obvious and ICAO objected strongly to the amendments that it felt would encroach upon its exclusive jurisdiction in aeronautical communications[201]. And indeed, the relationship between ICAO and INMARSAT was later on not the best, as to be very cautious, especially since the above amendment was done at a time ICAO was just retaking the ideas of the 1970's regarding aeronautical satellite services by

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[200] *Final Act of the International Conference on the Establishment of an International Maritime Satellite System*, IMCO 69 (London 1976).

[201] **J.-L. Magdelénat**, "INMARSAT and the satellites for air navigation services" [1987] XII *Air Law* 266 at 277.

establishing, in 1983, the Special Committee on the Future Air Navigation Services - FANS- which held its first session in 1985[202]. As already stated, the basic problem consisted of conflicting and overlapping jurisdictions of INMARSAT on one hand and ICAO on the other.

Under article 44 of the *Chicago Convention*, ICAO has the objective, inter alia,

> "to encourage the development of airways, airports, and air navigation facilities for international civil aviation (art.44 (c));
>
> "to meet the needs of the people of the world for safe, regular, efficient and economical air transport (art.44 (d)); and
>
> "to promote safety of flight in international air navigation (art.44 (h))".

In order to achieve these objectives, ICAO has the competence to adopt international standards and recommended practices-SARPS- dealing with, inter alia, communications systems and air navigation aids, including ground marking, and such other matters concerned with the safety, regularity, and efficiency of air navigation as may from time to time appear appropriate (art.37).

Attempts had been made to adopt a common position of ICAO and INMARSAT on this issue, however it turned out that especially ICAO's view with regard to the binding force of international standards and the jurisdiction of the ICAO Council in the determination of aeronautical satellite communications was in total opposition to the amended article 15(a) of the *INMARSAT Convention* by which the

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[202]See Report FANS/1.

Council of INMARSAT has the right of

> "[d]etermination of...aeronautical...mobile satellite telecommunications requirements...".

With regard to this provision, the Council of ICAO was of the opinion that the determination of AMSS telecommunications requirements was the exclusive prerogative of ICAO under the *Chicago Convention*[203] as confirmed in the ICAO Assembly Resolution A22-20 of 1977 which reads as follows:

> "[I]CAO is responsible for developing the position of international civil aviation on all matters related to the study of questions involving the use of space technology for air navigation purposes, including the determination of international civil aviation's particular requirements in respect of the application of space technology[204]".

Under the amended article 27, INMARSAT

> "[s]hall take into account the relevant international standards, regulations, resolutions, procedures and recommendations of the International Maritime Organization and the International Civil Aviation Organization".

In other words, the position of ICAO, under this provision, is similar to that of IMO[205]. The reasoning behind such is because under the *IMO Convention*[206], the

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[203]See for details regarding the deliberations in the ICAO Council: **M.Milde**, "Amendments to the Convention on the International Maritime Satellite Organization" [1985] X *Air Law* at 306ff.

[204]Assembly Res.A22-20, ICAO Doc.9215 (A22-Res).

[205]**W.D.von Noorden**, "Space Communications to Aircraft: A New Development in International Space Law" (Part II), [1987] 15 *J. of Space Law* 147 at 153.

organisation has no competence to develop international standards and regulations and to impose these directly upon member states[207]. It was considered as inappropriate that INMARSAT should be obliged to respect ICAO standards, since in this case states would assume under the *INMARSAT Convention* a stricter obligation to comply with ICAO standards, than they had assumed under the *Chicago Convention*[208]. It is true that no member state of ICAO is obliged, in general, to comply with SARPS as shown; however, at this point, it is important to remind the reader of the above findings regarding the legal nature of the standards developed by ICAO, which are binding upon member states, depending on the circumstances. Accepting such, arguably, the equal treatment of standards developed by ICAO, and resolutions and recommendations of IMO seems to be somewhat inaccurate.

However, it would have been very difficult to find a formulation which could have encompassed the two slightly different concepts. Moreover, it is virtually impossible to draw a clear line between AMSS related matters purely being the prerogative of ICAO or the prerogative of INMARSAT. The latter has accepted ICAO's competence with regard to technical standards[209]. But INMARSAT remains responsible for the planning and providing of its space segment, and the adoption of criteria and procedures for approval of earth stations for access to the INMARSAT

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[206](...continued)

[206]As stated above, IMO is the successor of IMCO. The international instrument remained the same, only few article had to be renumbered. Therefore see *Convention on the Inter-governmental Maritime Consulatative Organization* 324 *U.N.T.S.* 553.

[207]**W.D.von Noorden**, *supra*, note 205 at 154.

[208]*ibid.*

[209]See Preamble *INMARSAT-ICAO Agreement*.

space segment. With regard to the interfaces, the remaining ambiguity seems to be cleared by INMARSAT and ICAO in the above agreement. It provides, under article 1, the obligation to

> "[..] establish and maintain close but non-exclusive consultation and cooperation in matters of common concern relating the planning and provision of aeronautical mobile-satellite communication services and, where appropriate, shall coordinate and ensure consistency, to the extend possible, between their activities".

To this end, information shall be regularly exchanged with respect to their activities on AMSS matters, meetings shall be convened, as necessary, between ICAO and INMARSAT, and due consideration shall be given by each organisation to comments and proposals received from the other. Furthermore, both organisations have the duty, under article 2, to inform each other of meetings convened relating to AMSS and are invited to be represented as observers, being entitled to propose the inclusion of items on the agenda, submit contributions to such meetings, and participate, without vote, in discussions.

Thus, the agreement shall ensure that communication amongst ICAO and INMARSAT will be maintained, and that each organisation is informed on the other's activities, whilst acknowledging the different competence of ICAO and INMARSAT. Interfaces and overlapping of both competencies shall be identified in an early stage and a common position shall be found. However, one should not forget that this agreement only regulates the relations between ICAO and INMARSAT, and does not

affect other services providers outside the two organisations.

2. Adoption of AMSS-related SARPS by ICAO

As explained above, the means to secure the highest practicable degree of uniformity in regulations, standards, procedures, and organisation with respect to civil aviation, are international standards and recommended practices-SARPS-adopted or amended by ICAO. The Rapporteur's Report on "Institutional and Legal Aspects of the Future Air Navigation Systems" presented to the Legal Committee summarizes the role of ICAO in the establishment of technical standards for AMSS as such that "*the FANS concept would be fully within the mandate of ICAO as the only constitutional regulatory body to adopt Standards and Recommended Practices which [are] relevant for the future systems*[210]".

One can only agree with his findings. However, the particular legal nature of SARPS give rise to some concern on whether the traditional concept of achieving uniformity by adopting SARPS will be effective with respect to AMSS. The *Chicago Convention* does not contain any sanction if a state does not comply with SARPS established thereunder. Standards on AMSS will most probably be included in Annex 10 to the *Chicago Convention* dealing with aeronautical telecommunications. The future CNS/ATM concept will depend entirely on the safety, regularity and efficiency of the system, which would be seriously undermined if the contracting states do not

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[210]**W. Guldimann**, "The Institutional and Legal Aspects of the Future Air Navigation Systems", ICAO Doc.LC/28-WP/3-1, at 5.

comply with the standards to be embodied in Annex 10[211]. In view of this, it can very well be argued that the introduction of new aeronautical CNS systems by satellite would not stand a chance in the existing international legal framework. The simple fact arises that there is no sufficient legal basis for ICAO in articles 37 and 44 of the *Chicago Convention* or in Annex 10 to the convention to force states to implement the new system and to comply with SARPS related thereto[212]. This seems to be one of the major dangers which could hamper the whole new CNS/ATM-concept. Appropriate institutional solutions have to be found in order to ensure the highest possible flexibility with regard to the respective states, but to ensure as well the highest level of compliance with the regulations set by ICAO with regard to AMSS[213].

3. Legal Aspects of Private Correspondence

As explained above[214], aeronautical communication can be divided in two groups, namely safety communication and non-safety communication. In the context of the future use of AMSS, the former does not pose any legal problem[215], when they are made in conformity with the relevant ICAO SARPS, especially those set

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[211]**A.H.Khan**, "Aeronautical Communication, Navigation and Surveillance by Satellite-Towards Global Framework for Civil Aviation?-" in **T.L.Masson-Zwaan & P.M.J.Mendes De Leon(Eds.)** *Air and Space Law: De Lege Ferenda -Essays in Honour of Henri A. Wassenbergh* (Dodrecht: Martinus Nijhoff Publishers, 1992), 43 at 47.

[212]*ibid.*

[213]See, *infra*, Chapter 6.

[214]See, *supra*, Chapter 4.

[215]**M.Milde**, *supra*, note 56 at 217.

forth in Annex 10 to the *Chicago Convention*[216]. But of special legal interest is non-safety related, Aeronautical Passenger Communication-APC- and Aeronautical Administrative Communications

-AAC-[217].

Acknowledging, inter alia, the particular economic impacts of this type of communication on airline operations, the FANS Committee passed, in 1988, the following Recommendation 6/1 "Enabling of non-safety air-ground communications on a global basis"[218]:

> "That ICAO, in the light of the planned implementation of aeronautical administrative communications and aeronautical passenger communications services, as a matter of urgency, study the implications of Article 30(a) and (b) of the [*Chicago Convention*], with the view to enabling, on a global basis, non-safety air-ground communications".

This topic has also been discussed by the Legal Committee during its 27th[219]and its 28th Session[220] and did get, by a Council decision of 1991, priority No.2 in the general work of the Legal Committee[221], thus highlighting the importance of this

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[216]*International Standards and Recommended Practices -Aeronautical Telecommunications- Annex 10 to the Convention on International Civil Aviation*, 4th edition, 1985.

[217]Hereinafter, non-safety air-ground communications originating from a civil aircraft in flight shall be referred to as "public correspondence".

[218]ICAO Doc.9503, FANS/3 at 6-4.

[219]ICAO Doc.9556-LC/187, Agenda Item 6: Legal aspects of the global air-ground communications.

[220]ICAO Doc.9588-LC/188, Agenda Item 4: Legal aspects of the global air-ground communications.

[221]*ibid*, at 4-1.

issue in the context of the future CNS/ATM concept.

The legal problems to implement public correspondence are twofold. First, the existing régime of telecommunications as established by ITU must be considered. Secondly, article 30 (a) and (b) of the *Chicago Convention* is applicable on the subject matter and might inhibit public correspondence. The two aspects of public correspondence will be examined in the following and possible solutions be will discussed.

a) As shown above[222], one of the basic principles of international telecommunications provides that every state has the complete and exclusive sovereign right to regulate its telecommunications. This principle is already embodied in the Preamble of the *ITU-Convention*. There is no freedom in this field which would allow anybody, within the sovereign territory of a state any means of telecommunications. Therefore, most of the states retain complete state monopoly on all forms of telecommunications. In the cases where telecommunications services are offered by private entities, these are often owned by the state, or at least object of strong regulatory supervision by state authorities[223]. The reasons for states to retain complete and exclusive sovereignty in the field of telecommunications are of financial and security nature. The economic benefits of telecommunication are enormous and

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[222]See, *supra*, Chapter 4.

[223]For instance, in Germany PTT used to be a government agency headed by the Ministry of Post and Telecommunications. This has been changed. The PTT consists now of three independent private companies, Post Bank, Post Services, and Post Transport, each 100% owned by the Federal Republic of Germany.

states are very interested to keep their hands on the money generated by these services. The security aspect might have diminished in the meantime because of the changing climate in world policy in recent years, however, states are still reluctant to liberalize the established national systems of telecommunication.

b) The legal problems arising out of article 30(a) and (b) of the *Chicago Convention* are strongly linked to the above considerations on telecommunications.

As mentioned above, state sovereignty over the airspace above its territory is also one of the fundamental principles of international public air law and any activity therein, including the operation of telecommunications means, is subject to the sovereign rights of that state. Article 1 of the *Chicago Convention* recognizes that "...every state has complete and exclusive sovereignty over the airspace above its territory...". One has to keep in mind this provision when dealing with article 30 of the *Chicago Convention*. Paragraph (a) of this article provides that:

> "[a]ircraft of each contracting State may, in or over the territory of other contracting States, carry radio transmitting apparatus only if a license to install and operate such apparatus has been issued by the appropriate authorities of the *State in which the aircraft is registered*. The use of radio transmitting apparatus in the territory of the contracting State whose territory is flown over shall be in accordance with the regulations by *that State*"[224].

The first sentence of this article deals only with certification of radio equipment. It is

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[224]Emphasis added.

up to the state of registry of the aircraft to certify that the radio transmitting apparatus is technically suitable, that it may be installed in the aircraft for practical operation and that the operator is qualified to operate the apparatus in accordance with the requirements of the licensing authority[225].

The license does not however authorise or even deal with the actual use of the radio transmitting apparatus in the airspace of a foreign State. This is covered by the second sentence of this article. The clear and absolute requirement that the actual use of the radio transmitting apparatus to be in accordance with the regulations prescribed by the State overflown, is in recognition of the sovereign rights of states and in compliance with the rules of general international law. It also presents a major obstacle to the global introduction of public correspondence[226].

Furthermore, article 30 (b) provides that:

> "[r]adio transmitting apparatus may be used *only by members of the flight crew* who are *provided with a special licence* for that purpose, issued by the appropriate authorities of the State in which the aircraft is registered[227]".

Literally interpreted, both provisions would actually forbid public correspondence from an aircraft in foreign sovereign airspace because it involves the "use" of a "radio transmitting apparatus" by a person who is not "member of the flight crew provided with a special licence". However, it is doubtful whether such a literal

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[225]V.Poonoosamy, "Report of the Rapporteur on the Legal Aspects of the Global Air-Ground Communications", ICAO Doc. LC/28-WP/4-1 at 3.

[226]*ibid*, at 4.

[227]Emphasis added.

interpretation is appropriate.

The *Vienna Convention on the Law of Treaties*[228] provides, under article 31, that treaty provisions should be interpreted in the light of their purposes and objectives. The purpose of the *Chicago Convention* in general is to secure that international air services are operated safely[229]. This has already been mentioned in the Preamble which provides

"...that civil aviation may be developed in a safe and orderly manner...". Before the background of this finding, one can conclude that the relevant provisions of the *Chicago Convention*, particularly article 30 with regard to aircraft radio equipment, intend to secure that international aviation operations are performed safely and they ought not therefore to be an obstacle to developments which do not threaten the safe operations of such services[230]. The proper use of the aircraft radio equipment is essential for maintaining the safety of operations and to avoid harmful interference with radio communications by other users, such as aircraft and ATC-services providers. There is no doubt that these operations must be done by trained personnel duly licensed. Thus, the expression "used" in this article must be interpreted as referring to the technical operation of the radio equipment involving specialized technical skill and training and requiring a licence confirming such skills[231]. In practice, passengers will use a fixed or wireless telephone similar to

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[228]*Vienna Convention on the Law of the Treaties of 1969* [1969] VIII *ILM* 679.

[229]**M.Zylicz**, *supra*, note 156 at 82.

[230]**V.Poonoosamy**, *supra*, note 225 at 5.

[231]**M.Milde**, *supra*, note 56 at 220.

those used on the ground[232]. But no one would ever argue that the simple use of a telephone does need a particular technical skill. Additionally, the telephone system itself will still remain under the control of a designated crew member or an automatic airborne controller unit.

With regard to public correspondence, article 30 of the *Chicago Convention* does not represent a legal obstacle to the implementation of such services. This finding is entirely supported by article 44 of the *ITU Radio Regulations* and *Radio Regulations* 3393 and 3394 which expressly permit the use of radio telephone equipment and aircraft earth stations by anybody, provided the station itself is controlled by a licensed operator[233]. It is therefore submitted that article 30(b) *Chicago Convention* does not preclude the use of the radio transmitting apparatus by unlicensed persons for purposes of public correspondence. Accordingly, the Legal Committee of ICAO recommended to the Council that it should invite the Assembly to resovle, in its next ordinary session, :

> "(1)that nothing in article 30 (b) of the Chicago Convention shall be taken to preclude the use by unlicensed persons of the radio transmitting apparatus installed upon an aircraft where that use is for non-safety related air-ground radio transmissions;
>
> (2)that all Member States shall secure that such use of such apparatus shall not be prohibited in their air space; and

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[232]See for details: **C.Bulloch**, *supra*, note 68 at 275.

[233]**V.Poonoosamy**, *supra*, note 225 at 5.

(3)that such use of such apparatus shall be subject to the conditions set out in the Annex hereto"[234].

c) Even if the findings with regard to article 30(b) of the *Chicago Convention* are positive, the basic legal obstacle to implement private correspondence services remains, namely the current legal régime of telecommunications and its principle of absolute and complete sovereignty of states to regulate their own telecommunications services.

Basically four solutions have been discussed:

-Amendment of the *Chicago Convention*;

-A new multilateral convention dealing with the subject matter;

-Bilateral agreements; and

-Unilateral action by states[235].

The process leading to an amendment of the *Chicago Convention* is set up in article 94 which provides that:

> "[a]ny proposed amendment to this Convention must be *approved by a two-thirds vote of the Assembly* and shall then *come into force in respect of States which have ratified such amendment* when ratified by the number of contracting States specified by the Assembly. The number so specified shall *not be less than two-thirds* of the total number of contracting states"[236].

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[234]See also ICAO Doc.9588-LC/188, at 4-5.

[235]See ICAO Doc.9588-LC/188, at 4-1f.

[236]Emphasis added.

Article 30(a) of the *Chicago Convention* could be amended to remove any existing obstacles to such type of communications or to specifically authorize such commu..cations. For several reasons, the system established under article 94 of the *Chicago Convention* makes an amendment of the convention a very difficult and rather uncertain procedure. First, the affirmative vote of the Assembly is very high. Secondly, the amendment comes only into force when ratified by at least two-thirds of the total number of contracting states. Thirdly, the amendment comes only into force between the states which have ratified them. Until now several amendments have not yet become effective due to the lack of ratification, such as, e.g., the amendment to the convention including the new article 3bis[237] and the amendment including the new article 83bis[238]. It seems to be totally unrealistic with the present membership of ICAO of 168 states, after the adherence of Slovenia in June, to reach the required ratification of 112 in a reasonable period of time. Therefore this solution has been dismissed by the majority of the delegations taking part at the deliberations of the recent session of the ICAO Legal Committee[239].

The second possible solution is the adoption of a new multilateral agreement dealing with the subject matter. ICAO has indeed a very impressive tradition regarding the drafting and adoption of international agreements dealing with all sorts of particular aspects of civil aviation. Sometimes agreements have been drafted and

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[237]See for details: **G.Richard** "KAL 007: The Legal Fallout" [1984] IX *Annals of Air and Space Law* 147.

[238]See for details: **F.Videla Escalada** "L'Article 83bis de la Convention de Chicago. Importance de sa ratification" [1990] XV *Annals of Air and Space Law* 221.

[239]ICAO Doc.9588-LC/188, at 4-3.

adopted in record time, such as the recent *Convention on the Marking of Plastics Explosives*[240]. However, even this solution does not seem to promise quick success. Faced with a similar problem with regard to use of Ship Earth Stations within the territorial sea and harbours of member states, an international agreement amongst the member states of INMARSAT was concluded in 1985[241]. It has not yet entered into force, since the required number of 25 ratification has not yet been reached as of spring 1992[242]. Therefore, this solution has also been dismissed by the Legal Committee as less preferable[243].

The third solution considered by ICAO would consist of a standard clause to be included or added to the respective bilateral air services agreements between member states of ICAO, or of separate bilateral agreements dealing specifically with the subject matter. One can refer to the ICAO model clause on aviation security developed in 1986 by the Council in consultation with the member states which has already been included in a number of bilateral agreements. The advantage of such an approach would be that it can be done much more rapidly because the time-consuming multilateral drafting and ratification process can be avoided. A model clause would be particularly attractive, because it would promote uniformity and expediency. The model clause should contain certain conditions taking into account

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[240]*Convention on the Marking of Plastics Explosives for the Purpose of Detection of 1991* ICAO Doc.9571. See for details: **M.Milde** "Draft Convention on the Marking of Explosives" [1990] XV *Annals of Air and Space Law* 155.

[241]*International Agreement on the Use on INMARSAT Ship Earth Stations within the Territorial Sea and Ports of 1985*

[242]See "Comments of the Director General of INMARSAT", ICAO Doc.LC/28-WP/4-3, at 3.

[243]ICAO Doc.9588-LC/188, at 4-2.

the requirements of article 30(a) and (b) of the *Chicago Convention*, and article 51 of the *ITU Radio Regulations*, and should, as far as relevant, be comparable to the conditions set forth in the above *INMARSAT Agreement of 1985*[244]. The Rapporteur on the Legal Aspects of the Global Air-Ground Communications suggested a model clause which reads as follows:

> "Whenever a Party to this Agreement is the State of Registry [...] of an aircraft, the earth station (AES) on board that aircraft may, while in or over the territory of the other Party, be used for non-safety air-ground radio transmissions, subject to the following conditions:
>
> (i) compliance with the conditions of the licence for the installation and operation of the AES issued by the Party which is the State of Registry [...] of the aircraft;
>
> (ii) Any person may use the AES for non-safety air-ground radio transmissions provided always that control of the AES shall be by an operator duly licensed by the Party which is the State of Registry [...] of the aircraft;
>
> (iii) compliance with the requirements of [ITU] Convention and Radio Regulations adopted thereunder, including the applicable radio frequencies, the avoidance of harmful interference with other services and priority for aeronautical communications relating to distress, safety and regularity of flight;

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[244]V.Poonoosamy, *supra*, note 225 at 9.

(iv) compliance with any operating conditions set forth in the applicable regulations of the Party in or over whose territory the aircraft is operating.[245]"

The last solution, considered as acceptable, is such that states could unilaterally authorise public correspondence under specified conditions either to aircraft of all states or on a basis of reciprocity. It would be preferable to use the model clause on public correspondence. This solution does have advantages with respect to achieving fast and effective results. However, arrangements based on reciprocity are not always conducive to clarity with respect to the specific right and obligations[246].

The Legal Committee did not want to prefer one of the two above solutions considered as feasible. It therefore gave the recommendation already mentioned above. However, an Annex to the recommendation has been formulated, setting the parameters and conditions under which the use of radio apparatus for public correspondence in the sovereign of other states should be permissible. These are quiete similar to those formulated by the Rapporteur mentioned above[247].

To conclude, the use of a model clause on public correspondence to be included in unilateral declarations of states, air services agreements or separate bilateral instruments, will enable the introduction of AES for public correspondence

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[245]*ibid*, at 11.

[246]**M.Milde**, *supra*, note 56 at 224.

[247]ICAO Doc.9588-LC/188, at 4-5.

purposes and accelerate global access to such services.

4. The Legal Régime of ATC under the Chicago Convention

Article 28 of the *Chicago Convention* provides that states undertake, *so far as it may find practicable*, to

> "(a)[p]rovide, in its territory, airports, radio services,...and other air navigation facilities to facilitate international air navigation in accordance with the standards and practices recommended or established from time to time, pursuant to this Convention;
>
> (b)[a]dopt and put into operation the appropriate standard systems of communications procedure,...and other operational practices and rules which may be recommended or established from time to time, pursuant to this Convention".

As the wording of this article already indicates, the obligations under it are not absolute, and at any rate, no state has the obligation to provide air navigation facilities beyond its own territory[248]. Additionally, with respect to ATC services, the above findings on the adoption of SARPS dealing with all aspects of AMSS are to be considered. The new CNS/ATM concept shall ensure world-wide coverage. It is questionable whether the current general practice of providing ATC services mostly on a national level is able to respond to the new concept. States might simply not need the new services because their current system is able to handle the air traffic,

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[248]A.H.Khan, *supra*, note 211 at 50.

even if, on a world-wide basis, the new systems are the only means to overcome the shortcomings of the present CNS/ATM concept. While very interested to implement the new systems, other states are not able to afford the funds needed to set up the necessary infrastructure. All these are factors which influence a state's decision whether it deems the implementation as practicable in the sense of article 28 of the *Chicago Convention.*

It is basically a question of developing the appropriate institutional framework able to respond to the needs of modern civil aviation on one hand, but, on the other hand, keeping in mind the sovereign rights of states in the subject matter and the role of ICAO in the uniformation of rules dealing with all aspects of AMSS.

IV. Conclusions

The adoption and implementation of the new CNS/ATM-concept has to bear in mind the principles of public international air law laid down in the *Chicago Convention.* Whereas ICAO has the jurisdiction with respect to the technical standards of AMSS, INMARSAT remains competent to decide on the space segment. Interfaces will be decided on together. Problems arising out of the legal nature of SARPS should be overcome by developing the appropriate institutional framework. However, a major legal obstacle with respect to public correspondence exists in article 30(a) of the *Chicago Convention.* The most appropriate and feasible solution would consist of a model clause to be developed within ICAO, and to be inserted either in bi-or multilateral agreements, or implemented unilaterally by the respective

member states. It is a question of developing the appropriate institutional framework to overcome the possible conflict between the needs of civil aviation with respect to ATC services and the sovereign rights of states in the subject matter.

Chapter 6
-Institutional Aspects of AMSS-

One of the major tasks of the FANS Committee is the study of the appropriate institutional framework for the implementation of the new CNS/ATM and the formulation of a recommendation thereof for the co-ordinated evolutionary development over a period of about 25 years[249].

This chapter will deal with the current framework of CNS and MSS. Then it will discuss selected legal issues to be borne in mind while establishing the future framework of AMSS.

I. The Elements Involved in Providing CNS/ATC-Services

It is very important to keep in mind the different elements which influence a state's decisions to provide CNS/ATC-services[250], the conditions under which such services will be provided, to whom it will offer the services, and how it will organize such services. These aspects also influence the states' decision whether they will implement AMSS for their domestic uses as well.

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[249]**M.Milde**, *supra*, note 17 at 89f.

[250]CNS and ATC are closely linked. Safety related CNS is the technical mean to carry out ATC. Sometimes CNS are referred to as ATC-services. In the following, the term "CNS/ATC-services" will be used to cover both.

1. The Policy Behind the Provision of CNS/ATC-Services

The decision to provide CNS/ATC-services to civil aviation is influenced by a variety of aspects. A couple of these aspects are linked to the principle of state sovereignty in general. A major concern of states is to keep their national airspace under their own ATC control. Since each state has the right to prohibit foreign aircraft to enter its airspace, or restrict foreign air traffic to certain air routes,states try to keep their hands on the tools which actually enable them to control their airspace. It is enough just to mention to reasons for doing so, namely national security and national safety. This is only one aspect of the principle of states' sovereignty. CNS/ATC-services are entitled to give binding orders to aircraft, a function which is typical for states.

Its geographical situation might be a very important aspect in the decision of a state how it will provide CNS/ATC-services. For instance, in Europe CNS/ATC-services are provided by 22 different ATC-systems with 44 ATC-Centres[251]. One can imagine the waste of financial resources this system implies. States like Canada[252], Australia, China or the USA with vast land areas can implement their own satellite CNS/ATC-system without necessarily being obliged to co-operate with their neighbouring states.

A further aspect is traffic density and air space capacity. Regions in the world

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[251]See for details: **M.Bothe, H.Hohmann & Ch.Schmidt**, "Möglichkeiten einer Reform der europäischen Flugsicherung?" [1990] 39 *ZLW* 40ff.

[252]See for details: **R.North**, "FANS Implementation Planning Under Way in Canada" [No.12, December 1991] 46 *ICAO Journal* 22f.

with very low traffic density and therefore very little air space congestion problems might be very satisfied with the current CNS/ATC-systems.

Finally, providing CNS/ATC-services is very costly and states might simply not be able to afford the considerable investments needed for the implementation of AMSS on a world-wide basis. Financial support from different sources such as World Bank and individual development projects is needed in such cases.

2. The Position of ICAO

Of course, ICAO always considered the above aspects with regard to the implementation of AMSS based CNS/ATC-services. Four different geographic areas have been identified by the FANS Committee, each with special demands with regard to CNS/ATC-system:

-oceanic/continental en-route airspace with low traffic density, including low-altitude, off-shore and remote areas;

-continental airspace with high density traffic;

-oceanic airspace with high density traffic; and

-terminal areas with high density traffic[253].

Technic and tools used in different geographic regions may considerably differ. Therefore, not only one single system will be used.

With regard to the financial constraints many states are faced with, the FANS Committee recalled the different programmes the state can dispose of. Especially the

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[253]See for details: ICAO Doc.9583, AN-CONF/10, at 2A-8.

United Nations Development Programme-UNDP- was considered as most appropriate to raise the funds for the implementation of the system and the necessary training[254].

Four scenarios as typical examples for developing institutional arrangements have been considered by the FANS Committee, depending on the degree of autonomy a state might wish to have and the degree of shared provision of aeronautical safety systems[255]. The main legal aspects of each scenario are the relationship with the services providers, unique contractual features, enforcement, relationship with the Chicago Convention and questions of liability[256].

Finally, with regard to the provision of the above services the 10th Air Navigation Conference of ICAO noted that at least four implementation options were available to states, namely:

-to contact recognized service providers;

-to contact existing multilateral state organisations to act on their behalf in dealing with service providers;

-to form an ad hoc group of states or a new international organisation with responsibilities for air traffic management which would negotiate for service; and

-to use a mechanism within ICAO (perhaps along the lines of the Denmark/Iceland agreements) to act on behalf of states concerned in

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[254]ICAO Doc.FANS(II)/3, at 5-6.

[255]See for details: ICAO Doc. FANS(II)/2 at 4B-1ff.

[256]See ICAO Doc.LC/28-WP/3-1, at 7.

dealing with service providers[257].

The above shows clearly that ICAO tries to accommodate, to the largest extend possible, the needs and preoccupations of states and to shape the new systems around them.

II. The Current Organisational Framework of CNS/ATC-Services

Today, basically three different types of organisational models to provide CNS/ATC-services are in existence:

-Services provided by a state;

-Services provided by one or several states on behalf of a group of states; and

-Services provided by international operating Organisations (intergovernmental, private and commercial)[258].

1. Services Provided by a State on a National Level

As already pointed out earlier[259], the provision of CNS/ATC-Services is largely the domaine réservée of states. They are not only free to decide whether and to which extend they provide such services on their territory, but also how such services are organised. The possible organisational frameworks rank from services entirely run and governed by armed forces, over government agency, to government

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[257]ICAO Doc.9583, AN-CONF/10 at 4-1f.

[258]ICAO Doc.9524, FANS/4, at 2-17.

[259]See, *supra*, Chapter 5.

owned private judicial entities under the control and supervision of the state. It would be worthwhile to examine this issue in depth but it is outside the scope of this thesis.

2. Services Provided by One or Several States on an International Level

Whereas the above sub-chapter deals with national provisions of CNS/ATC-services, the aim of this sub-chapter is to describe the provision of such services on an international level.

a) A state is free to provide CNS/ATC services on an international level. However, certain conditions must be fulfilled especially with respect to sovereign rights of other states. One aspect in this context is the principle of state sovereignty on matters of telecommunications. As far as the unilaterally provided services will have impacts on other states territory, it seems to be necessary to have at least the consent of the respective state, or have the activities based on agreements between the respective states. The GPS-system and GLONASS would belong in this category of provision. However, such unilateral systems do have considerable weaknesses. For instance, it must be ensured that access to the systems will be possible without discrimination. Service availability and reliability must be maintained continuously. Furthermore, a service which has been offered unilaterally can also be revoked unilaterally. It is true that contractual provisions might reduce the above risks but they cannot be totally excluded. Whereas the unilateral provision of CNS/ATC-services might be very helpful on short terms, particularly with regard to saving of funds, its weaknesses makes it less preferable.

A second type of unilateral service provision consists of two elements:

-the unilateral provision of services by states; and

-the regional coordination of service provision.

The regional coordination is usually done within Regional Air Navigation (RAN) Meetings by ICAO member states of the respective ICAO regions[260]. They develop Regional Supplementary Procedures-SUPPS- establishing therefore operating procedures designed for application in specific air navigation regions[261] and Regional Air Navigation Plans. The Chicago Convention does not mention neither SUPPS nor Regional Air Navigation Plans by name, nor does it contain any provisions regulating their enactment. Since SUPPS are subordinated to SARPS[262], ICAO's competence to agree on SUPPS is implied in the organisation's general power under article 37 to enact SARPS and from the Council's power under article 55(c) of the Chicago Convention[263]. However, since they are ICAO Council recommendations, SUPPS do not have any legally binding force[264].

The third type of unilateral service provision consists of three elements:

-the unilateral provision of services by states;

-regional coordination of service provision; and

-joint-financing of the service provision by several states.

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[260]The nine ICAO Regions are: African-Indian Ocean, Caribbean, European-Mediterranean, Middle East, North American, North Atlantic, Pacific, South-American and South East Asian.

[261]**T. Buergenthal**, *supra*, note 185 at 115.

[262]*ibid*, at 116.

[263]*ibid.*

[264]*ibid.*

This model has been used for over 45 years with regard to joint financing of certain air navigation services in the North Atlantic Area[265]. Basis for this is Chapter XV - Airports and other Air Navigation Facilities- of the Chicago Convention providing regulations for the joint financing of air navigation facilities. There are two projects which are still operational concerning air navigation facilities on Greenland and the Faroer Islands, and in Iceland. They are usually referred to as the Denmark/Iceland-Agreements. The unique construction of this system consists of the provider states Denmark and Iceland, the user states, and ICAO as carrying out administrative functions. Because the financial burdens for both states to maintain the aviation facilities set up during World War II would have been too high, ICAO invited the user states to establish contractual links between themselves and the providers[266] in order to set up and maintain a reliable system of air navigation facilities on one of the most busiest air routes on Earth[267]. The current agreements date back to 1982[268] when major changes have been undertaken with regard to, inter alia, the assessment of contracting governments, estimates of the costs of services, payments to provider

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[265]See for details: **G.F.FitzGerald**, "ICAO and the Joint Financing of Certain Air Navigation Services", [1986] XI *Annals of Air and Space Law* 17ff. (Part I), [1987] XII *Annals of Air and Space Law* 33ff. (Part II).

[266]See for historical details: *ibid*, (Part I) at 32ff.

[267]ICAO estimates that, in 1990, over 180.000 aircraft crossed the North Atlantic in one of the flight sector of the region.

[268]***Protocol for the amendment of the 1956 Agreement on the Joint Financing of Certain Air Navigation Services in Greenland and the Faroer Islands, done at Montreal on 3 November 1982, and Informal Consolidated Text of Articles I-XXVI of the 1956 Agreement on the Joint Financing of Certain Air Navigation Services in Greenland as amended by the Montreal Protocol of 1982***, ICAO Doc.9384-JS/679. ***Protocol for the amendment of the 1956 Agreement on the Joint Financing of Certain Air Navigation Services in Iceland, done at Montreal on 3 November 1982, and Informal Consolidated Text of Articles I-XXVI of the 1956 Agreement on the Joint Financing of Certain Air Navigation Services in Iceland as amended by the Montreal Protocol of 1982***, ICAO Doc.9384-JS/680.

states, establishment of user charges[269]. The parties to these agreements did not create a new international organisation, but combined the efforts of the provider states and the administrative skill of ICAO in order to have safe and reliable air navigation services affordable for both users and providers. The financing is done collectively by the users, based on assessments of the states' benefits from the provided facilities[270]. This assessment is done by the ICAO Council based on statistical material. The Council of ICAO can dispose of three financial sources, namely contribution of the providers Denmark and Iceland with 5%, and contributions of the contracting parties and other users with 95% of the allocable cost[271].

b) The above COSPAS/SARSAT cooperation belongs to a type of provider models whereby a group of states offer certain air traffic services, particularly Search and Rescue Satellite Aided Tracking. The basic characteristics of this project are that no user charges have to be paid, each partner remains responsible for its own space segment, and no provisions whatsoever have been agreed upon with respect to questions of liability. This cooperation is very informal and not based on an international agreement but on a Memorandum of Understanding, thus on a fairly weak legal basis. Since the partners realized that the existing contractual framework

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[269]See for details: **G.F.Fitzgerald**, *supra*, note 265 (Part II) at 51.

[270]The benefits consist of the use of air navigation services by aircraft being registered by the respective user or contracting party. In 1992, each North Atlantic crossing in the region covered by the agreements cost about 52,--$US.

[271]The North Atlantic air navigation services can be used by everybody. The contracting parties bear about 22% of the 95% overall cost.

might not be appropriate once the system will enter full operation, they are looking forward to entering in a much more formal relation[272].

3. Services Provided by International Operating Organisations

Services can be provided by an international operating organisation. One can distinguish three different types of international operating organisations, depending on their legal nature[273]:

-international intergovernmental organisations;

-private organisations; and

-mixed organisations.

a) The classical organisational model to set up international cooperation between states is the creation of an international intergovernmental organisation. These organisations have been created for different purposes and also for the provision of aeronautical services. In this field, three major examples exist today, ASECNA, COCESNA and EUROCONTROL.

Negotiations between France and the French speaking countries in Africa[274] resulted in a conference held at St.Louis, Senegal in 1959, and the signature of a

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[272]See for details: "COSPAS/SARSAT services agreement to continue to end of 1990 unless replaced by new international instrument", [No.2, February 1986] 41 *ICAO Bulletin* at 20f.

[273]One can choose other criteria to make a distinction between service providers, such as, e.g., the nature of services -communication and/or navigation-.

[274]Zaire (Congo-Brazzaville), Benin (Dahomey), Gabon, Ivory Coast, The Malagasy Republic, Mauritania, Nigeria, Senegal, Sudan, Tchad and Burkina Faso (Upper Volta). The Federal Republic of Germany also attended this conference.

convention[275] establishing the "Agence pour la sécurité de la navigation aérienne en Afrique et à Madagascar-ASECNA-". Despite the fact that the Agency's aims are generally those of the ICAO regional plan ICAO itself was not invited to take part in the preparatory studies[276]. The organisation has escaped the attentions of commentators over the last decade and its functions and processes therefore remain unknown.

The "Corporacion Centro-americana de Servicios de Navegacion Aerea-COCESNA-" was created in 1960 by an international multilateral agreement[277] between four central-american countries[278]. The purpose of this organisation is to facilitate air traffic services in Central America[279].

The "European Organization for the Safety of Air Navigation-EUROCONTROL-" was founded in 1960 by an intergovernmental agreement between Germany, Belgium, The Netherlands, Luxembourg, France, Great Britain and Ireland[280]. In 1986, Portugal became its 8th member state. Greece joined the organisation in 1989, together with Turkey and Malta. Cyprus joined in 1991, taking

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[275] *Convention relative à la création d'une agence chargée de gérer les installations et services destiné à assurer la navigation aérienne en Afrique et à Madagascar*, of 2 December 1959, N.M.Matte *Treatise on Air-Aeronautical Law* (Toronto: Carswell Co.Ltd., 1981) Appendix III.

[276] N.M.Matte, *supra*, note 275 at 265.

[277] *Convention for the Establishment of "Corporacion Centro-americana de Servicios de Navigacion Area" COCESNA, of 26 February 1960*, N.M.Matte, *supra*, note 275 Appendix IV.

[278] El Salvador, Guatemala, Honduras and Nicaragua. Costa Rica participated at the 1959 Tegucigalpa-Conference leading to the Convention but did not sign the final act.

[279] See for details: N.M.Matte, *supra*, note 275 at 265f.

[280] *International Convention Relating to Cooperation for the Safety of Air Navigation* of 1960, N.M.Matte, *supra*, note 275 Appendix II.

the number of full members to 12. Italy, Spain and Switzerland are expected to join formally soon[281]. Initially, EUROCONTROL should provide international ATC services in the upper airspace above the member states' territory. This ambitious plan was abandoned after some states expressed concern about the incompatibility of this task with their national interest. Consequently, new agreements[282] had to be concluded whereby the organisation was rendered very weak in its ability to provide ATC services under the amended treaty signed on 12 February 1981[283]. Now, member states are free to delegate their ATC operations to EUROCONTROL or to retain it in the hands of national agencies. The organisation has the functions of coordinating the ATC services with other regional and global bodies, formulation and collection of route charges for services supplied in the airspace of full and associated members, synchronizing the use of airspace by both civil and military aircraft and ensuring the cost-effectiveness and efficiency of air navigation services in Europe[284]. As a result of the amendments two out of three ATC service centres were transferred to the national administration of Germany and the Irish Republic, a fact which was commented on as "*Dark day for European integration*" and "*the death*

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[281]See for details: **A.A.Majid**, "Legal Capacity of EUROCONTROL to Ensure Smooth Aviation in Europe" [1991] XVI *Air Law* 267 at 272.

[282]The 1981 "package" consists of three instruments: *Protocol amending The EUROCONTROL International Convention relating to Cooperation for the Safety of Air Navigation of 13 December 1960, Multilateral Agreement relating to Route Charges*,and *Final Act of the Diplomatic Conference on the Protocol amending the EUROCONTROL International Convention relating to Cooperation for the Safety of Air Navigation of 13 December 1960* BGBl. 1984 II, 69ff.

[283]**A.A.Majid**, *supra*, note 281 at 273.

[284]*ibid.*

warrant of the twenty year old EUROCONTROL Dream"[285]. Nowadays, urgent calls have become louder and louder to provide EUROCONTROL with the necessary power to act as a supranational European Aviation Agency[286].

The organisation has a fairly simple structure[287]. The Commission is the principle organ setting the general policy guidelines and is composed of ministers. The second organ is the Agency which is supervised by the Commission. It is the executive body and is administered by the Committee of Management, composed of high ranking representatives of each member state, and the Director General. Whereas the former is in charge of the general policy implementation, the latter runs the day-to-day administration. Each member states has a weighted vote in the Commission, depending on the annual contributions.

b) The second model proposed entails providing CNS/ATC-services through a private entity. As already pointed out earlier[288], SITA and ARINC are now the two major private services providers with regard to aviation communication.

As a private corporation, Aeronautical Radio Inc.-ARINC- was formed in 1929 by members of the United States air transport industry to provide and coordinate air-ground and point-to-point telecommunications on a not-for-profit

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[285] *ibid.*

[286] See for details: **M.Bothe, H.Hohmann & Ch.Schmidt**, *supra*, note 251 at 45ff.

[287] See for details: **J.Mousée**, "Legal aspects of the new international régime for the operation of Air Navigation Services by EUROCONTROL. The Maastricht Area Control Centre" [1987] XII *Air Law* 187 at 194ff.

[288] See, *supra*, Chapter 2.

basis[289]. With its background ownership composed of airlines and foreseeing the potential of aeronautical satellite communication services, ARINC requested, in 1986, the U.S. Federal Communications Commission's approval for a global aviation communication satellite system providing air-ground services. For this purpose, ARINC established a new subsidiary called AvSat as the managing body of the envisaged service[290]. As an internationally owned and operated private system in partnership with airlines, it would have offered operational-control voice and international aeronautical mobil data services on a non-profit basis. Public correspondence would have been charged for allowing profits[291]. But AvSat did not last a very long time. After having failed to use INMARSAT satellite capabilities AvSat disappeared[292]. However, ARINC is still very much involved in providing satcom services to civil aviation and just recently successfully tested ATC satellite communications on transpacific routes in cooperation with United Airlines[293].

SITA is a global transmission system, providing a variety of services to airlines engaged in public civil air transport. It is a non-profit body which is owned by, and operated on behalf of its member airlines. Its Registered Office is in Brussels

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[289]**H.-W.Park**, *supra*, note 44 at 21.

[290]*ibid*, at 22.

[291]See for details: **W.J.Gribbin**, "Aeronautical Satellite Communication-A bold new capability" [No.12, December 1987] 42 *ICAO Bulletin* 19f.

[292]See for details: **Ch.Bulloch**, *supra*, note 68 at 276.

[293]See for details: **J.D.Nickum**, "Air Carrier Utilizes Satcom for ATC Communications" [No.1, January 1992] 47 *ICAO Journal* 10f.

and Administrative Head Office in Neuilly-sur-Seine, a suburb of Paris[294]. It was constituted in 1949 by a deed received by a notary in Brussels[295]. Almost 300 airlines are using SITA services, linking over 161 countries and territories in 1986[296]. The member airlines are the financiers of the organisation, whereby each member is obliged to pay membership fee and deposits, to pay the cost attributable to the services received by SITA, and to purchase SITA Investment Certificates[297]. The organisational structure of SITA consists of two representative organs, the Board of Directors and the General Assembly, and the Director General responsible for the day-to-day business. The General Assembly is the highest organ of SITA setting the general policy guidelines. However, the real power is with the Board of Directors. Each SITA member airline holding a minimum of 20 shares can nominate a director. Unlike in the General Assembly where members have a weighted vote according to their individual number of shares, the Board of Directors take its decision by the majority of directors present or duly represented[298].

The unique characteristic of ARINC and SITA is their very close and very successful collaboration with international civil aviation organisations, such as ICAO and IATA, and with the International Telecommunication Union. Both are required to cooperate with these international organisations in all matters having a bearing on

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[294]A.A.Majid, "SITA-Indispensable INGO to Transnational Aviation [1986] XI *Air Law*, 148 at 148.

[295]*SITA Articles of Association*, *Moniteur Belge* No.3551 (12 March 1949), Annex.

[296]A.A.Majiid, *supra*, note 294 at 149.

[297]See for details: *ibid*, at 153f.

[298]*ibid*, at 156.

telecommunications and data processing and transmission between air transport enterprises. SITA sends observers to meetings within ITU, IATA, and ICAO whenever possible, thus ensuring strong communications links between services providers, airlines and international organisations. This is very much appreciated by the international aviation community and ICAO and IATA have expressed their "highest praise for SITA for its efficient collaboration[299]". ARINC has been designated as the official registrar of so called Selective Calling Codes-SELCAL-.

c) As already pointed out earlier, today INMARSAT is the most important provider of satellite communications traffic for mobile users. It belongs to the third category, the mixed organisations, whereby elements of a classical international intergovernmental (non-profit) organisation are combined with elements of a private enterprise.

The first, and somehow "precursor", organisation having such a mixed composition has been the International Telecommunication Satellite Organization -INTELSAT- of 1971 based on an international intergovernmental agreement[300], and an operating agreement between Signatories[301], which can be the state itself or a telecommunication entity designated by the state having signed the

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[299]*SITA Annual Report 1981*, I., Report form the Board of Directors to the General Assembly.

[300]See: *Agreement Relating to the International Telecommunications Satellite Organization -INTELSAT-*, **K.H.Böckstiegel & M.Benkö(Eds.)**, *supra*, note 92 Vol.II Part C.V.1.

[301]See: *Operating Agreement Relating to the International Telecommunications Satellite Organization-INTELSAT- of 1971*, **K.H.Böckstiegel & M.Benkö(Eds.)**, *supra*, note 92 Vol.II Part C.V.3.

intergovernmental agreement[302]. INTELSAT is the most important provider of satellite services with 16 geostationary satellites, 8 control centres on the ground and 778 earth stations in 163 countries[303]. However, it does not specifically offer mobile satellite services[304] in general, or in particular AMSS. This is done by INMARSAT.

The same basic contractual construction has been chosen by the establishment of INMARSAT. It is based on the Convention[305] and the Operating Agreement[306], both of 1976. At present, it has 64 member states[307]. INMARSAT is a non-profit organisation. However, it shall "operate on a sound economic basis having regard to accepted commercial principles[308]" and its revenues shall be appropriate "to cover its operating and administrative costs[309]". Pursuant to a Council decision in 1986, INMARSAT reduced its space segment utilization charges because it started to generate a surplus of revenues[310].

The organisation has three organs: the Assembly of Parties, the Council and

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[302]See for details: **N.M.Matte**, *supra*, note 89 at 172.

[303]**K.Focke**, "Internationale Zusammenarbeit im Weltraum" in: **K.H.Böckstiegel(Ed.)**, *supra*, note 91 637 at 649.

[304]One has to note that other services providers lease INTELSAT space segments.

[305]*Convention on the International Maritime Satellite Organization-INMARSAT- of 1976*, **K.H.Böckstiegel & M.Benkö(Eds.)**, *supra*, note 92 Vol.II Part C.VI.1.

[306]*Operating Agreement on the International Maritime Satellite Organization-INMARSAT- of 1976*, **K.H.Böckstiegel & M.Benkö(Eds.)**, *supra*, note 92 Vol.II Part C.VI.2.

[307]List of member states as of April 1992 included in ICAO Doc.FANS(II)/3, at 5G-7.

[308]See article 5(3) *INMARSAT-Convention*.

[309]See article 19(1) *INMARSAT Convention*.

[310]**W.D.von Noorden**, *supra*, note 39 at 27.

the Directorate. The Assembly meets once every two years and is responsible for the general policy and long term objectives of the organisation[311]. The Council meets three times a year and is composed of representatives of those eighteen Signatories with the largest investment in INMARSAT and representatives of four elected Signatories to ensure an equal geographical representation. The real power within INMARSAT is with the Council being responsible for the detailed policy and the annual budget[312]. The day-to-day management of the organisation is done by the Directorate, headed by the Director General.

Navigation payloads have been included by INMARSAT in the new INMARSAT-3 generation in order to set up a system independent form GPS and GLONASS[313]. 106 aircraft are today equipped with aircraft earth stations for satcom purposes and are using the equipment daily. First voice installations are in operation mainly on the transatlantic and transpacific routes on long-range aircraft such as Boeing 747-400[314]. INMARSAT forecasts suggest that there will be 350 aircraft equipped for satcoms by the end of 1992 with about 1.800 by 1995[315].

The above shows that there exists a variety of organisational and institutional options with regard to mobile satellite services. This options have to be taken into account for the future AMSS implementation.

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[311] *ibid.*

[312] See for details: **N.Jasentuliyana**, " The Establishment of an International Maritime Satellite System" [1977] II *Annals of Air and Space Law*, pp.323ff.

[313] See for details ICAO Doc.FANS(II)/3, at 5G-3.

[314] *ibid.*

[315] *ibid.*

III. Selected Factual Aspects Affecting the Institutional Framework of AMSS

As already pointed out earlier, there are a number of factual aspects which have to be kept in mind by a state when deciding whether, under which conditions and in which organisational framework services for civil aviation shall be provided. These factual aspects play a important role also with respect to the future organisation and management of AMSS. It might be enough just to mention them: geographical situation of a state or a group of states, level of development, political system, market economy or planned economy, state's preoccupations with regard to national security and safety, traffic density and congestion problems, technical skill of personnel etc..

The institutional framework of AMSS must be able to cope with all the above aspects. It is fair to say, already in this early stage of examination of the appropriate institutional framework, that no single approach will be able to respond to all these aspects in a satisfactory manner.

IV. Selected Legal Aspects Affecting the Institutional Framework of AMSS

There is a variety of legal aspects which need to be discussed having a direct impact on the choice of the appropriate institutional framework. This does not pretend to be comprehensive but rather selective in the sense that only predominant issues can be discussed due to lack of space. However, in the author's mind, the following two topics are the major to be addressed[316].

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[316]For a list of other topics see ICAO Doc.LC/28-WP/3-1, at 14ff.

1. Liability of the Service Providers

As already pointed out earlier[317], the current régime of outer space law does not cover the typical damages arising out of telecommunications activities, namely pecuniary loss due to transmission failure, incorrect, retarded or otherwise faulty transmission.

Possible private litigations are subject to article 21 of the ITU Convention[318] which reads as follows:

"Members accept no responsibility towards users of the international telecommunication services, particularly as regards claims for damages".

This provision simply states that private claims arising out of the use of telecommunications services are not admissible under the ITU-Convention[319]. Furthermore, one can argue that the wording of this provision would even cover cases in which foreign states suffer damages as mere users of another state's telecommunications lines[320]. Furthermore, the COSPAR/SARSAT Agreement contains a provision to the effect that the parties will co-operate in order to protect themselves against any such claims[321]. However, one has to bear in mind that the

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[317]*Supra*, Chapter 3.

[318]Respectively article 25 of the *Nice ITU-Convention*.

[319]See for details: **P.-M. Martin**, "Distress Location Via Satellite: Legal Aspects" [1990] 57 *Telecommunication Journal* 545 at 548.

[320]**N.M.Matte**, *supra*, note 89 at 143.

[321]See *Memorandum of Understanding among the Ministry of Merchant Marine of the USSR, the National Oceanic and Atmospheric Administration of the USA, the Department of National Defense of Canada and CNES of France Concerning Cooperation in the COSPAS-SARSAT Search and Rescue Satellite System of 1981* **K.H.Böckstiegel & M.Benkö(Eds.)**, *supra*, Vol.II Part D.II.3.2..

ITU-Convention is not self-executing but needs the transformation in national law. It would fall outside the scope of this thesis to examine whether member states of the ITU did include similar waiver of liability in their national telecommunication regulations. If member states of ITU failed to do so, by adopting inconsistent provisions, a conflict of laws would exist. One principle of international law with regard to conflicts of law provides that international law prevails over domestic law in the clearest possible way. This principle is well established in international public law and was only recently confirmed by the International Court of Justice in the "*Advisory Opinion on the Applicabiltity of the Arbitration Obligation under Section 21 of the 1947 United Nations Headquarters Agreement*[322]". Therefore, the principle stands as long as it has not been changed. Several provisions of the ITU-Instruments will be reviewed in fall 1992. As far as it is known, article 21 ITU-Convention is not intended to be changed.

A very similar provision is contained in article 18(a) of the INTELSAT Operating Agreement which is even much more clear:

> "Neither INTELSAT nor any signatory,..., nor any director, officer or employee of any of them nor any representative to any organ of INTELSAT acting in the performance of their functions and within the scope of their authorities shall be liable to, nor shall any claim be made against any of them, by any signatory of INTELSAT, for loss or damage sustained by any reason of any unavailability, delay, or faultiness of

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[322]*Order and Advisory Opinion on the Applicability of the Obligation to Arbitrate under Section 21 of the United Nations Headquarters Agreement of 26 June 1947*, [1988] XXVII *ILM*, pp.800ff..

telecommunications services provided or to be provided...".

The above provision establishes a complete waiver of liability of INTELSAT, its signatories, directors and staff members as long as their act in carrying out their respective duties under the agreements. One can only speculate why these provisions have been included in the agreements. The organisations did not want to be confronted with claims of liability when the technic and systems used were still in their infancy and the financial risk unpredictable. Regarding the possible enormous damages due to system failures in today's telecommunications transaction this fear is understandable. However, it is questionable whether this principle is still acceptable today[323].

2. Competition Law Implications

From the very beginning, the FANS Committee underlined that AMSS shall "be provided by different suppliers (states, groups of states, organisations, private and commercial entities) and allow, where appropriate, for competition among a limited number of service providers, while meeting ICAO standards[324]". This automatically raises the question whether, and to which extent, competition law will have its impact on AMSS. Here as well, a selection has to be made due to the numerous jurisdictions involved in providing international civil aviation services. Thus, the author restricts himself to competition law aspects with regard to the

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[323]But see **P.-M.Martin**, *supra*, note 319 at 548.

[324]See for details: ICAO Doc.9524, FANS/4, at 2-17.

European Community and the USA. A further restriction has to be made with regard to the type of services[325]. In the following, only public correspondence will be subject to discussion.

a) In order to combine their respective access rights to INMARSAT space segments and to use them in a more efficient way, SITA and ARINC set up a joint venture[326] which will allow to make more efficient use of their respective ground earth stations. The elimination of duplications and maximisation of the use of existing SITA and ARINC resources will give the Joint Venture a considerable cost advantage. However, one has to keep in mind that both, SITA and ARINC, are owned and controlled by airlines which should be the actual costumers, thus creating a possible conflict of interests and creating the possibility of anti competitive behaviour of the Joint Venture by pricing in a predatory way below cost[327].

b) Competition issues in the USA are subject to the provisions of the so called *Sherman Act of 1890*[328]. Its section 1 declares illegal

"every contract, combination in the form of trust or otherwise, or conspiracy in restraint of trade [including that] with foreign nations".

This section has in recent years been held to extend to US import and export trades and other activities abroad, including delivering services, affecting US commerce

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[325]See for details with regard to ATS-Communications and Navigation, *ibid.*

[326]See for details: **P.J.Klass**, "Wider Use of Satellite Communications in Aircraft to Benefit Airlines, Passengers" [August 3, 1992, No.5] 137 *AW&ST* 70 at 71.

[327]See for details with respect to pricing by the Joint Venture, ICAO Doc. FANS(II)/3 at 5E-1ff.

[328]15 *USC.*

whether carried on by US citizens or by foreigners[329]. One could argue that antitrust law is not applicable since ARINC and SITA are owned by airlines and owners have the right to take decisions with respect to prices of the product they offer. And indeed, the US Supreme Court decided in the case *Copperweld Corp. vs. Independence Tube Corp.*[330] that a corporation and its wholly-owned subsidiary have to be considered as a single enterprise for antitrust purposes not being able to "conspire" in the sense of the *Sherman Act Section 1*. But no airline has even a majority share in either ARINC nor in SITA. The Joint Venture has to be regarded as supplier and the airlines as customers, thus being able to conspire in the above sense. Conspiracy may include price fixing, refusal to deal, other discriminatory practices, such as setting technical standards which are not objectively justifiable and so on. It is therefore advisable to look for transparency to the largest possible extent in the decision-making process in order to avoid charges of antitrust liability.

c) With regard to the EC regulations, article 85(1) of the *Treaty of Rome*[331], states that:

> "[t]he following shall be prohibited as incompatible with the Common Market:
>
> all agreements between undertakings, decisions by associations of undertakings and converted practices which may affect trade between

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[329]**M.J.Kerry**, "Extraterritorial Application of Competition Law" in **A.Kean(Ed.)** *Essays in Air Law* (The Hague: Martinus Nijhoff Publishers, 1982) 125 at 129.

[330]467 U.S. 752 (1984).

[331]See *Treaty Establishing the European Economic Community* 298 *U.N.T.S.* 11 [hereinafter *Treaty of Rome*].

Member States and which have as their object or effect the prevention restriction or distortion of competition...".

In the case *Centrafarm v. Sterling Drug*[332], the European Court of Justice held that the EC regulations on competition are not applicable in the relationship between a parent company and its wholly-owned subsidiary. Thus the same aspects as under US-antitrust law are applicable.

d) Pursuant to the so called "*Green Paper on Telecommunications of 1987*[333]" and the "*Green Paper on Satellite Communications of 1989*[334]", published by the European Commission[335], the access to the space segment of any telecommunications services provider shall be governed by three basic principles:

-free and efficient access, based on an objective, transparent and non-discriminatory procedure;

-separation of administrative and operational functions; and

-the full application of the provisions of the EC-Treaty, especially the competition rules[336].

The above principles apply to all suppliers of telecommunications satellite services

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[332][1974] *ECR* 1147.

[333]**Commission of the European Communities**, *Green Paper on a Common Approach in the Field of Telecommunications Services and Equipment in the European Community* Doc. COM (87) 290.

[334]**Commission of the European Communities**, *Green Paper on a Common Approach in the Field of Satellite Communications in the European Community* Doc. COM (90) 490.

[335]See for details: **H.-P.Gebhardt**, "Regulation of Satellite Communications in the EEC Member States" [1991] 58 *Telecommunication Journal* 223.

[336]*ibid*, at 110ff.

irrespective whether private company, public entity or international organisation[337]. The member states shall put all their effort in to ensure that the existing international agreements on the subject matter will be applied in a way consistent with the provisions of the *Treaty of Rome*. In the case of inconsistency, the member states are obliged to initiate the amendment of the respective provisions. Thus, international organisations providing telecommunications satellite services are subject to the same provisions as private entities. However, the application of competition law on these organisations might be not as important as in the case of private suppliers, because most of them do have provisions in their respective agreements which regulate the pricing and access to services in a way consistent with the above principles.

As to summarize the above, ownership of ARINC and SITA by airlines which are at the same time their customers, does not exempt the services provided from antitrust laws neither in the USA nor in the EC. Discussions between SITA and ARINC, and airlines shall focus on technical aspects which are objectively justifiable, and shall not include aspects of pricing, or shall lead to discriminatory practices with regard to other carriers. Within the EC, telecommunications satellite services providers are subject to the antitrust provisions of the *Treaty of Rome*, irrespective whether they act as a private entity or a international organisation.

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[337] *ibid*, at 113.

V. Some Thoughts about an Appropriate Institutional Solution

It is very difficult in such an early stage of the ongoing discussions within the aviation community to make a comprehensive proposal for an appropriate institutional framework. This proposal has to bear in mind all the aspects identified in the above Chapters. Therefore the author will restrict himself to some thoughts about possible institutional solutions.

A safe starting point is however, that the provision of the services shall be done by a variety of suppliers. Thus, a major issue is the question which organisational model shall be chosen with respect to the coordination of different services and services providers, setting of standards, financing etc., short of the establishment and management of the new systems. The issue becomes more complicated by the fact that the framework must be able to respond to the needs of states, international organisations, such as ICAO, ATC-authorities, services providers and users. Two basic problems exist. The first is, how to establish a coherent overall system without contradictions and tensions between its component subsystems, which may greatly differ in their equipment, their priorities and their financial possibilities[338]. The second question is, how to keep the system in every phase in agreement with the relevant provisions of the *Chicago Convention*, the ICAO SARPS, other applicable provisions of international law, and sufficiently flexible with regard to national laws[339].

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[338] W.Guldimann, *supra*, note 210 at 10.

[339] *ibid.*

The FANS-Committee identified three possible options available for states with respect to the implementation of AMSS:

-National Systems;

-Regional Systems;

-Global Systems[340].

However, the above solutions are not meant to be exclusive in the sense that only one of them should be chosen. There is the possibility of variations and combinations of more than one[341]. As mentioned, the discussion within the aviation community especially on this issue is still ongoing and therefore the outcome not yet predictable. However, the FANS Committee established "*Guiding Principles on Institutional and Legal Aspects of the Future Air Navigation Systems*[342]" and "*Guidelines to Assess the Adequacy of Provision of Aeronautical Mobile-Satellite Service (AMSS) for Air Navigation Services*[343]". The institutional framework must be shaped along these Guiding Principles and Guidelines.

In the author's mind, ICAO is the only international organisation which can fulfil the complex task to coordinate the implementation and establishment of the new systems. This does not mean that ICAO shall actually run the system on an overall basis. On the contrary, states, or group of states wherever appropriate, shall have the major task to set up the new systems. However, ICAO must exclusively establish the

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[340]*ibid*, at 3-1f.

[341]*ibid*, at 4-2.

[342]See, *ibid* at 4D-1.

[343]*ibid*, at 4E-1f.

standards to be fulfilled. Academically, it is questionable whether the existing system of SARPS is able to enforce these standards. The practice of civil aviation clearly shows that the work of ICAO in the unification and harmonization of aviation procedures and equipment has worked satisfactorily. It is therefore basically a question of the political will of the states involved whether they are ready to comply with the rules established by ICAO. Additionally, ICAO is a well-respected international organisation, which has worked now for almost 50 years to the great satisfaction of the member states. It is worthwhile to mention that it has very rarely been involved in political conflicts. Member states always considered the functioning of civil aviation as predominant. It is true that the procedures might not be such as to speed up the decision-making process within the organisation. But it is exactly the procedure which makes the states feel comfortable since they are involved in each stage of the process and can contribute to the deliberations. The outcome is therefore largely accepted by most of the member states. Additionally, ICAO has very successful relationships with other groups and organisations involved in civil aviation. For instance, IATA, as the representative of all major carriers, has an observer status within ICAO. One can only be optimistic that the relations to INMARSAT will improve on the basis of the agreement of 1989. The major private service providers, such as SITA, traditionally have very close relations to ICAO either directly or indirectly by IATA.

One should not forget that the states have acknowledged that the present system has reached its outer limits. It would be a contradiction to agree that only

AMSS are able to respond to the future needs of civil aviation, but not to take the necessary steps to implement the standards set up by ICAO. Of course, one should not underestimate the understandable preoccupations of states which have been already mentioned above. However, it should be possible to overcome them to a very high degree.

Below the level of implementation of technical standards and procedures to be respected, and the coordination and monitoring of the system establishment, reserved exclusively for ICAO, a variety of institutional models shall be possible.

With regard to the financial burdens, models similar to the Denmark/Iceland-Agreements are possible and even preferable. The unilateral provision of an essential service related to civil aviation, as envisaged by using GPS and GLONASS, always bears the danger of unilateral withdrawal for financial security or other reasons. Whilst acknowledging the historical changes in the geo-political environment, the author has strong doubts whether the provision of both systems for the next ten or fifteen years will be free of political considerations by the providers. An additional problem consists of the possible conflict of their military uses and civil uses. However, the use of the two systems shall help civil aviation to get the time needed to set up an independent international system.

Wherever feasible, states shall create interest groups, similar to the ICAO Regions, to discuss specific regional issues. This can even be done within the existing Regional Groups. A major issue in the discussion will be the interconnection of the national ATC-services. Today, cross-border exchange of air traffic control data is

still largely done by using telephone and telex links. The ultimate goal must be to establish a communication system which allows much more efficient air navigation management[344].

VI. Conclusions

International organisational arrangements for AMSS must allow that all the different elements, such as ATC- facilities, earth stations, space segments and airborne facilities, to be provided by different suppliers, and allow for competition among providers while meeting ICAO standards and the needs of ATS authorities. Institutional arrangements have to keep in mind that ICAO is the only appropriate body to establish technical standards for aeronautical CNS/ATC services, and for the coordination of the use of the frequencies allocated to AMSS. The compliance with ICAO regulations must be ensured.

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[344]See for details with regard to ATM: ICAO Doc. FANS(II)/3 at 3A-1ff.

Conclusions

The current CNS/ATM-concept is not able to respond to the needs of international civil aviation in most of the regions of Earth. The only technical means to overcome the shortcomings of today's systems is the use of space bound facilities, particularly Aeronautical Mobile Satellite Services-AMSS-.

The introduction AMSS as envisaged by the FANS Committee is in conformity with the basic principles of outer space law. AMSS are subject to the liability régime established by the Outer Space Treaty and the Liability Convention, and therefore the principles of state responsibility and liability apply. However, in a particular case it might be difficult to determine the state which is liable.

AMSS are subject to the régime established by ITU. The current regulations allow the use of certain frequency bands for such services. APC services are allowed in so far as priority is given for messages under article 51 Radio Regulations. Member states of ITU are internationally responsible so that the allocated frequencies are used in accordance with the registration in the Master Registry and do not cause harmful interference with other uses duly registered by ITU.

The adoption and implementation of the new CNS/ATM-concept has to bear in mind the principles of public international air law laid down in the Chicago Convention. Whereas ICAO has the jurisdiction with respect to the technical standards of AMSS, INMARSAT remains competent to decide on the space segment. Interfaces will be decided on together. Problems arising out of the legal nature of

SARPS should be overcome by developing the appropriate institutional framework. However, a major legal obstacle with respect to public correspondence exists in article 30(a) of the Chicago Convention. The most appropriate and feasible solution would consist of a model clause to be developed within ICAO, and to be inserted either in bi-or multilateral agreements, or implemented unilaterally by the respective member states. It is a question of developing the appropriate institutional framework to overcome the possible conflict between the needs of civil aviation with respect to ATC services and the sovereign rights of states in the subject matter.

International organisational arrangements for AMSS must allow that all the different elements, such as ATC- facilities, earth stations, space segment and airborne facilities, be provided by different suppliers, and allow for competition among providers while meeting ICAO standards and the needs of ATS authorities. Institutional arrangements have to keep in mind that ICAO is the only appropriate body to establish technical standards for aeronautical CNS services, and for the coordination of the use of of the frequencies allocated to AMSS. The compliance with ICAO regulations must be ensured.

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