

# The Never Ending Dispute: Legal Theories on the Spatial Demarcation Boundary Plane between Airspace and Outer Space

**Dr Gbenga Oduntan\***  
Lecturer, University of Kent

## Introduction

‘There is no universally agreed precise legal, technical or political definition of either the boundaries separating airspace from outer space or of the term outer space itself.’<sup>1</sup>

It is a trite observation that there are significant differences between the legal status of the airspace and that of outer space. In the former, states possess exclusive jurisdiction and in the latter there can be no exercise of sovereignty and territorial jurisdiction. The legal distinction between the airspace and outer space and the two bodies of law governing them is not only factual but ultimately very necessary. There is unanimity of opinion among scholars that the ‘airspace is that part of space subject to the sovereignty of a state’.<sup>2</sup> McNair notes that ‘sovereignty in the superincumbent airspace reigns supreme’.<sup>3</sup> Bin Cheng sees the principle as ‘a well-recognised rule of international customary law’.<sup>4</sup> For William J. Hughes the principle is now a fundamental tenet of international law.<sup>5</sup> This universal principle underlies other numerous bilateral and multilateral conventions particularly the Chicago Convention on International Civil Aviation (1944).<sup>6</sup>

The concept of sovereignty it would appear has not risen above the bounds of the earth’s airspace. Indeed it makes no sense in conventional terms to speak of sovereignty in outer space. This is because *ab initio* international legislation developed to govern outer space has been unequivocal on the prohibition of the application of state sovereignty in outer space. Of particular importance on this point are the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (1967)<sup>7</sup> and the Agreement Governing the Activities of States on the Moon and other Celestial Bodies (1979).<sup>8</sup>

---

\* Ph.D (Law); Lecturer, Kent Law School, University of Kent at Canterbury; Legal Adviser and Member, Nigerian/Cameroon Mixed Sub-Commission on the Demarcation of the Boundary between Nigeria and Cameroon. Address: Kent Law School, University of Kent at Canterbury, CT2 7NS (Tel.) 01227 827044 (Fax) 01227 827831. E-mail: O.T.Oduntan@ukc.ac.uk. This commentary sketches and reflects on the conclusions to the author’s Ph.D. thesis titled *Sovereignty & Jurisdiction in the Airspace & Outer Space: Legal Criteria for Spatial Delimitation*, submitted at the University of Kent (2002).

<sup>1</sup> The Minister of State, FCO, *Hansard*, H.C., Vol. 546 W.A. 66, July 23, 1993.

<sup>2</sup> Seara Vazquez, *Cosmic International Law* (1985) 27.

<sup>3</sup> McNair, *The Law of the Air* 3<sup>rd</sup> ed. (1964) 15.

<sup>4</sup> Bin Cheng, ‘From Air law to Space Law’, Vol. 13 *Current Legal Problems* (1960) 229; and Cheng, ‘Recent Developments in Air Law’, Vol. 9 *Current Legal Problems* (1956) 208.

<sup>5</sup> William J. Hughes, ‘Aerial Intrusions By Civil Airliner And The Use of Force’, *Journal of Air and Commerce* (1980) 595.

<sup>6</sup> 78.U.K.T.S. 8 1953 Cmd 8742; UNTS 295. Article 1 reads, ‘The contracting States recognize that every State has complete and exclusive sovereignty over the airspace above its territory’.

<sup>7</sup> Also known as the Space Treaty. 18 UST 2410, 610, U.N.T.S. 205.

<sup>8</sup> Also known as the Moon Treaty or Moon Agreement. G.A. Res. 34/68, U.N. GAOR, 34th Sess. Supp. No. 46 at 77, U.N. Doc. A/34/664 (1979).

However, the concept of jurisdiction (*ratione instrumenti and ratione personae*) on the other hand, applies to outer space and is recognised in the entire legal framework for regulation of man's activity wherever it occurs in the entire universe.<sup>9</sup> Most significantly the concepts of 'province of mankind' and 'Common heritage of Mankind' have been developed in space law to govern outer space, thereby establishing outer space as an international public utility.<sup>10</sup> Yet there is no clear guidance in any Treaty as to where outer space begins.

What remains to be achieved by international lawyers is to determine where exclusive sovereignty ends and where the province of all mankind begins. Patrick Del Duca<sup>11</sup> and Carl Q. Christol<sup>12</sup> rightly noted that the demarcation point is still an open question and an unsettled issue in Air and Space Law. This point arguably must exist somewhere in between the airspace, atmosphere and outer space. The determination of a demarcation line is primarily of legal significance. Scientific considerations are merely necessary to arrive at a suitable legal demarcation which would have a concrete and sensible basis, and around which the consensus of states can be built.

The core of the problem lies in the fact that air law (being the older body of law) has never come up with a definition of what the term 'airspace' actually denotes. Also left unanswered is the question of where precisely its boundary lies in relation to 'outer space'.<sup>13</sup> The matter of the delimitation has been discussed since the beginning of space flight in 1957 and some even say discussion on it existed before then.<sup>14</sup> Views and literature on the subject abound. However, most

---

<sup>9</sup> Examples of such provisions include, Article 8 of the Space Treaty (1967), which states that a state party on whose registry an object launched into outer space is carried shall retain jurisdiction and control over it. Article 12 (1) of the Moon Agreement confers jurisdiction and control over astronauts who are nationals of the sending state and Article VIII of the Space Treaty (1967) also confers jurisdiction on the state of registry irrespective of the nationality of all persons aboard the space vehicle. Further pertinent provisions on this issue are found in the Agreement on the Return of Objects launched in to Outer Space (1968) (Also known as the Astronaut Agreement or Rescue Agreement. U.K.T.S. 56 (1969), Cmnd. 3997; (1969) 63 A.J.I.L. 382. In force 1968. 86 parties, including the five permanent members of the Security Council); Convention on International Liability for Damage caused by space Objects (1972) (Also known as the Liability Convention. U.K.T.S. 16 (1974), Cmnd. 5551; 961 U.N.T.S. 187; 10 I.L.M. 965. In force 1973 76 parties, including the five permanent members of the Security Council); (g) Convention on Registration of Objects Launched into Outer Space (1975) (Also known as the Registration Convention. UNTS 187; 14 ILM 43; UKTS 70 (1978); In force 1976 39 parties including the five permanent members of the Security Council).

<sup>10</sup> Article 1 of the Space Treaty (1967) states that the exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind. Article 11 (1) of the Moon Agreement (1979) also provides that 'The moon and its natural resources are the common heritage of mankind'.

<sup>11</sup> Patrick Del Duca in a review of Gabriella Catalano Sgrosso's book: *La Responsibilita Staki per le attivita svolte nello spazio extra atmosferica* in 87 *American Journal of International Law* (1993) 355.

<sup>12</sup> Carl Q. Christol refers to it as 'the unsettled issue of formal boundary between sovereign airspace and non sovereign outer space'. See 87 *American Journal of International Law* (1993) 491.

<sup>13</sup> Diedericks-Verschuur, *An Introduction To Space Law*, (1999) 17.

<sup>14</sup> The views of Dr. Bess C.M. Reijnen in the preface to Robert F.A. Goedhart, *Forum For Air and Space Law: The Never Ending Dispute: Delimitation of Air Space And Outer Space* Vol. 4 Marietta Benko, Willem de Graaff (eds.) (1996). Other notable writers have stressed, that international lawyers have an interest in assisting towards the development of clearly defined boundaries and frontiers. Prescott wrote: 'Boundaries attract the interest of international lawyers because they mark the position ...where international rights are determined and obligations assumed'. Nicholas Grief more recently expressed similar views when he stated: 'To the international lawyer, in particular, the delimitation of national and international areas has vertical and horizontal aspects which require the application of legal principles and rules'. International Organisations that have consistently considered this problem to no avail include both scientific and Legal or Political Organisations. These include the International Law Association; the International Institute of Space Law and The International Astronautical Federation (IISL of IAF); the Committee of Space Research (COSPAR) of the International Council of Scientific Unions (ICSU); International Civil Aviation Organisation (ICAO). See J.R.V. Presscott, *Boundaries and Frontiers* (1978) 20; Nicholas Grief, *Public International Law in the Airspace of the High Seas* (1994) 7.

of these concentrate on scientific and political considerations.<sup>15</sup> It is from this medley of ideas that scholars must distil and formulate legal criteria for the resolution of the spatial delimitation dispute.

To arrive at this point it is possible to classify the existing theories into schools of thought. These theories range from the highly probable to the novel and the absurd.<sup>16</sup> The boundary problem involves a number of pertinent and distinct issues. Boundaries might be set in Space for many different purposes. For example, space-craft using nuclear fuels might be prohibited from operating below a certain altitude; launchers might be prohibited from discharging waste in certain layers of the atmosphere; space craft returning to earth or moving away from it might be required to control their flight in such a manner as may be dictated by the super-adjacent state. The right of self-defence over super-adjacent space might also be settled.

### 1. The No Present Need Theory

Most of the theories on the issue of a demarcation line presuppose that a demarcation line must be drawn somewhere in Space and the problem is to determine where. However, some authors like Jessup and Taubenfeld, simply assume that 'at some point there is a limit to the extension of territorial sovereignties'. It is only hoped that '...in due course practical international necessities will lead to its definition'.<sup>17</sup> Other authors belonging to this school like J. Morenoff believe that establishing a boundary altitude 'might fetter Space activities or needlessly interfere with the existing regime of international aviation'.<sup>18</sup> Hurwitz also thinks that while the need for such delimitation is fast growing '...it is not of crucial importance'.<sup>19</sup> Cheng would prefer that such exercise should be left to scientists to solve at a later date.<sup>20</sup>

The representatives of Canada, Great Britain, the United States and some other Western states also expressed such opinions in the early stages of legislative work at the United Nations Committee on the Peaceful Uses of Outer Space. At that stage even the representatives of the Soviet Union commented that, 'it is not possible at the present time to identify scientific or technical criteria, which would permit a definition of outer space'.<sup>21</sup>

The arguments of this school can be summarized thus:

- (a) That the absence of explicit agreement has not yet led to international tensions and does not appear likely to be able to do so.
- (b) That an attempt to reach explicit agreement on establishment of an altitude boundary would invite many states to make claims to sovereignty which in analogous cases such as the high seas, have led to immoderate claims. In other words, the Pandora's box might be harder to close than to

---

<sup>15</sup> Goedhart, *supra* note 5, see the preface.

<sup>16</sup> It must be noted that it is not all the existing theories that have been discussed here. Indeed it is difficult to ascertain just how many theories there are. The schools are in some cases not sharply defined and the ideas of one may flow into the other or be subsumed in them. Therefore, the way they are treated and the classifications made herein will necessarily be different from those of other writers on the topic. What has been attempted is a general treatment of the existing theories.

<sup>17</sup> Jessup and Taubenfeld, *Controls for Outer Space and The Antarctic Analogy* (1959) 207.

<sup>18</sup> Jerome Morenoff, *World Peace Through Space Law* (1967) 1.

<sup>19</sup> Bruce Hurwitz, *The Legality of International Air Transport*, (1986) 31.

<sup>20</sup> Cheng, *The Law of International Air Transport* (1962) 121. It is surprising to note that the same author two years earlier wrote in respect of '...the identification of upper limits of national sovereignty' and concluded that '[s]uch a definition while hitherto unimportant in air law, is one of the first and most important problems that have to be tackled in Space Law'. See Cheng, 'From Air law to Space Law', Vol. 13 *Current Legal Problems*, *supra* note 4, at 230.

<sup>21</sup> See UN Doc A/AC. 98/2 *passim*. See also A.S. Piradov (ed.), *International Space Law* (1986) 183-184.

open.

(c) That any boundary set might have to be set too high because fear of the unknown would lead states to claim as much as they could. On the other hand, that future activity at lower altitudes may be acceptable if there is no explicit agreement on the extent of airspace.

(d) That an agreement reached later is likely to fix a lower altitude than an agreement reached now.

(e) That an agreed altitude once achieved will be next to impossible to reduce.<sup>22</sup>

(f) That an arbitrarily chosen upper limit could easily become a bone of contention. This is in that disputes may arise from boundary violations, which are all the more likely because space objects are in fact difficult to track or identify.<sup>23</sup>

Indeed several authors have taken the position that the answer to the demarcation problem is primarily a political issue and that probably the answer lies in the political field with the law only rendering the possibility of assisting in the formulation of a solution.<sup>24</sup> This view is difficult to accept. Political resolution normally would have to take place before or at least contemporaneously with legal codification. Without things going in that order it is quite difficult to see how legal rules will be drawn up in the first place. It might, however, be suggested that the reason why the indecision over the issue of spatial demarcation has been allowed to fester so long is because the absence of a precise boundary is advantageous to the dominant interests in international space exploration.

Admittedly though, the fault of a lack of a demarcation regime cannot be said to rest with the industrialized powers alone. Complacency on this issue is fostered by the fact that prior to 1976 states have not protested at the passage of satellites over their territory.<sup>25</sup> Prior to the 1970s the call for a demarcation enjoyed much less popularity.<sup>26</sup> This is probably why the question was not dealt with in the seminal General Assembly resolutions and in the 1967 treaty. By the mid 1970s, the states that insisted on a demarcation spanned both the developing and developed state divide. Apart from the case of the erstwhile Soviet Union there was a common factor linking the states making a call for demarcation and that was the apparent lack of capabilities to engage in large-scale space activities. Thus, states like France, Belgium, Italy, the USSR, Poland Egypt, and a majority of other states were unified in a call for spatial delimitation. As time went by the more developed states could be perceived to have become relatively cool towards the idea probably as the possibilities of space exploration opened up to them as well. Sometimes this took the form of joint space exploratory activity through such structures as the European Space Agency. The immutable US position is that there is no real usefulness to the various proposals to establish a boundary. This is because the region is devoid of physically observable landmarks and most countries are not capable of accurately determining the altitude of space objects and, therefore, have no way to monitor any agreed altitude boundary.<sup>27</sup>

Presently, most states are agreed upon the necessity for establishing a demarcation boundary line between the two territories. It may, however, be noted that more stringent calls emanate from the ranks of the developing countries. This may be a reflection of the fact that the relative quiet that

---

<sup>22</sup> For these and other submissions see Houston Lay, and H Taubenfeld, *The Law Relating to Activities of Man in Space*, (1970) 46.

<sup>23</sup> Goedhart, *supra* note 5, at 7.

<sup>24</sup> *Ibid.*, preface.

<sup>25</sup> D.J. Harris, *Cases and Materials on International Law* (1998) 253.

<sup>26</sup> Diederiks-Verschoor, *supra* note 4, at 17.

<sup>27</sup> This was the reaction of the US to a working paper submitted by the USSR in 1987 to COPUOS suggesting the 110 km above sea level limit as the demarcation point See A/AC.105/C2/SR.316, paras. 1-7; see also A/AC.105/C.2/7/Add.1, para.42, p.15.

exists on the matter presently may have been calculated by the states active in space to be a much safer situation than to open the matter up for multilateral treaty consideration. This indeed may establish a solution, which will not be in the interest of the space faring states. On the other hand the need to resolve the question would appear to be assuming a crucial dimension for the developing states as a result of the increase in traffic between earth and outer space and as a result of the increasing stakes, economic and political of outer space activities. By 1990 the tide in international opinion at least in the developing states was to achieve a solution to this never-ending dispute. Nigeria lent its voice to the matter when in June 1990, in an address at the 33rd session of the UN Committee on Peaceful uses of Outer Space it called for 'a clear definition and delimitation of the airspace of various countries as distinct from outer space'.<sup>28</sup> This call reflected the swell of opinion among the non-space faring nations, which had no direct participation in outer space activities but are nonetheless rightly concerned about the questions of sovereignty and jurisdiction raised by contemporary developments in space.

As to the erstwhile absence of protest over the occurrence of space flights going through or flying above state territory this may be no more than evidence of a right of innocent passage.<sup>29</sup> One of the submissions by those who think there is no need to maintain a strict demarcation is that even in the event of an accident when the issue of liability is raised the defence of the state of registry will not depend on the place where the accident happened but will depend on the Outer Space Treaty (1967) and the Liability Convention (1972). It is also said that, at any rate the obligations that ensue from these treaties will not make it necessary for the contracting state to delimit airspace from outer space.<sup>30</sup> This of course is a fallacy, for as soon as the fact of a case borders upon uncertainties as to where in spatial terms an accident is caused or liability for damage or contamination arises, it can be expected with near certitude that lawyers for the defence will spring to attention and raise all possible doubts as to the regime that will govern the occasion.

Again, it should not be forgotten that two different registries exist for aircraft and space objects. This of course presupposes that different spheres of operation exist for them as well. Thus, the question really should not be whether there should be spatial demarcation but why it has not been achieved so far. Space objects particularly are a class of things, which are difficult to trace and identify. That is the more reason to insist that a demarcation will make it necessary for space faring nations to obey very strictly the laws on markings, registration and provision of flight paths as well as other information.

As to the fear that states may begin to unreasonably veto space flights that might have to pass through national territory on ascent or descent, it is more reasonable to presume that in view of the general tendency not to do so thus far, this fear may be more imaginary than real. Indeed it has become customary practice to allow the ingress and egress of space vehicles through national airspace.<sup>31</sup> Rather than the delimitation of airspace from outer space having the effect of making

---

<sup>28</sup> See A/AC. 105. 105/C.2/SR.417-435 Summary record of the Legal Sub-Committee forty fifth session April 4- May 1990. See also Nigerian Institute of International Affairs, 5 *Nigeria Bulletin On Foreign Affairs* (1990) 6. See also *New Nigerian* (June 14, 1990) 8. Note that in 1987 the Nigerian reaction to the Soviet proposal of 110 km suggestion by the US was to support the adoption of a linear delimitation. See A/AC.105/PV.234, p. 58.

<sup>29</sup> Cf. Harris, *supra* note 16, at 253. Harris thinks this view is highly unlikely but recognizes the possibility of this interpretation.

<sup>30</sup> Goedhart, *supra* note 5, at 6.

<sup>31</sup> Again this is an instance of the rules of international law being developed or tailored to take cognisance of the interest of the powerful nations. It is in some ways similar to the freedom of peaceful transit for private aircraft through national airspace. Although there are clear reciprocal benefits in an ideal scenario where all states have enough money and resources to run aircrafts, it is still necessary to consider the commonsense of the current situation where many states have neither succesful airlines of their own nor private aircraft yet accept the existing servitude for nothing in return.

space exploration operate under more difficult circumstances, it may well be that a well reasoned conclusion on the matter and a proper demarcation regime would in fact assure the development of space technology. Agreement reached now will buttress the settled nature of the main principles of space law. In any case leaving things in a state of flux will more likely than not create a lot of tension, the ground swelling of which we are beginning to see between states and which may in turn lead to the outbreak of war.<sup>32</sup>

Thus, it would appear that the only thing that the idea that there is no need to establish a spatial boundary demarcation plane has in its favour is that none has been established just yet. But of course, not only is that not a good reason at all but it is a tenuous justification soon liable to change in the light of the recurrent discussions over this matter in various UN fora. What better way to dismiss the 'no- present- need' theory than to adopt unequivocally the view of Maurice Andem that 'As a matter of fact, mankind cannot wait another 50 years in order to accumulate enough scientific and technical data before practical steps could be taken to select a specific altitude above sea level as a boundary between air space and outer space.'<sup>33</sup> For sure, if it was premature as at the time many of the 'no- present- need' theorists put their ideas to paper some years back, it is no longer premature now. There are lots of scientific and technical data, which have been accumulated during the past decades of practice of space flight. These data must, therefore, be sufficient to provide a very solid, reliable and objective basis for the establishment of a frontier between air space and outer space.<sup>34</sup>

As a fledging discipline and an increasingly important area of international law it is crucial that space law must develop in a manner as to put its subject matter in an appropriately delimited context. It indeed may be better not to grant sovereignty over the airspace at all than to grant it without specifying precisely where it ends. For as we know there can be no limit to which such latitude can be exploited by humans. The exact vertical and horizontal airspace appertaining to each state must always be known. The fact that demarcation has been done without thus far without any serious consequence is no reason why that position of things must continue. As Lord Denning once had occasion to say 'if you do not do a thing because it has not been done before then the world will stand still, Law should develop'.<sup>35</sup> The outer limit of the airspace must be fixed.

## 2. The Criteria of Space Activities or The Functional Approach

Some writers have developed the highly interesting theory that states should not worry as to the fixing of a demarcation boundary plane but rather should concentrate on the regulation of activities in space, regardless of the location of these activities.<sup>36</sup> That is to say, the concept of outer space has to be defined on the basis of a definition of the concept of space activities, or at any rate in close relation with that term. The approach, therefore, is functional. Reduced to its simplest basis outer space is to begin where space activities can be said to have begun. Subsumed in this school is the theory of a uniform legal regime, which insists that both air flights and space flights should be subject to the same rules of law.

---

<sup>32</sup> Witness the developments of the Bogota Declaration *infra*. Cf. Goedhart, *supra* note 5, at 7-9.

<sup>33</sup> Andem Maurice, *International Legal Problems in the Peaceful Exploratron and Use of Outer Space*, (1992) 153.

<sup>34</sup> *Ibid.* 143.

<sup>35</sup> *Parker v. Parker* 1954 A.C. 15 at 22.

<sup>36</sup> The possibility of such an approach was referred to as early as 1959. See Ad hoc Committee On The Peaceful Uses of Outer Space, U.N. Dec. A/AC, 198/2 General Assembly, June 1959, p. 8. See also McNair, *supra* note 3, at 16.

This school is populated with the likes of F. B. Schick, D. Goedhuis, Chaumont,<sup>37</sup> R. Quadri<sup>38</sup> and Seara Vazquez. Vazquez for instance claims that if we are seeking a point in Space to be governed by Space Law, 'we must consider our planet as part of the universe and an insignificant one at that'.<sup>39</sup> For theorists of this school the area surrounding the earth should not be thought of as a place legally speaking but as a focus for activities. Thus, an expression like 'international cosmic law' is preferred, as it is non-spatial and could include all manners of activities.<sup>40</sup> Maurice also appears to belong to this group though in a not committed manner because he recognised that the solution to the demarcation problem may not depend solely on this functional criterion. He wrote that it will 'require the political will of all states to find a political solution by establishing a boundary between air space and outer space either by adopting the *functional or spatial approach*' (emphasis supplied).<sup>41</sup>

Though the functional school may at face value appear to be *sui generis*, the school in actual fact attempts to discount the contributions of the spatial theories and take them into consideration. The implications of the central submissions of the functional school may be represented thus: (a) space law covers among others the area of transport through airspace; therefore, space law should be applicable to all transport from the earth to any point in space; (b) noting the definition of 'aircraft' that exists in Annex 7 of the Chicago Convention, all other vehicles passing through and beyond the atmosphere should be classified as 'spacecraft'; (c) airspace extends to the maximum altitude attainable for aircraft, while outer space starts at the lowest point where spacecraft can orbit the Earth. It is, therefore, postulated that in between these two points there exists a 'mesospace' for which authors like Wassenbergh have advanced a 'right of innocent passage' of space objects through foreign airspace.<sup>42</sup> (d) In the light of the above all space activities are best permitted at any level of altitude as long as the security of the underlying state is respected; (e) given the absence of a demarcation line in the Space Treaty (1967) and the lack of a definition of spacecraft in other space treaties, then the Space Treaty (1967) is by nature a functional treaty. Putting all these together Space law is seen as a functional body of laws and the definition of outer space must be a functional one.

The basic difference between the spatial approach and the functional approach is that while the former is based on the adoption of certain scientific and technical criteria; for example the gravitational pull of the earth, lowest perigee of satellite orbits etc. the latter is based on the definition of space objects and their functions or purposes and space activities.<sup>43</sup> The crux of the functional approach lies then in the nature of the activities displayed or to be displayed. Thus, there is no distinction between air flight and space flight as well as between aircraft and spacecraft.<sup>44</sup> By virtue of this reasoning wherever space objects may be found to be in operation, outer space laws apply.

The fatal error in this approach is the over enthusiastic attempt to put together in an untidy manner a jumble of considerations best treated alone and to hazard a single criteria from this. As will shortly be seen acceptable and precise definitions of 'aircraft' and 'spacecraft', are just as

---

<sup>37</sup> According to Chaumont 'splitting of the area above the earth would lead to a host of legal rules applicable to one and the same spacecraft in quick succession...wherefore it would be impossible to say clearly and exactly at any point of time which legal regime is relevant to the spacecraft concerned.' Chaumont, *Le Droit de l'espace* (1960) 37-61.

<sup>38</sup> R. Quadri, *Droit International Cosmique*, (1959) 509-524.

<sup>39</sup> J.E.S Fawcett, *International Law and The Uses of Outer Space*, (1968) 22.

<sup>40</sup> Quadri, *supra* note 29, at 521.

<sup>41</sup> Maurice, *supra* note 24, at 143.

<sup>42</sup> H.A. Wassenbergh, *Principles of Outer Space in Hindsight*, (1991) p. 18.

<sup>43</sup> Maurice, *supra* note 24, at 133.

<sup>44</sup> Goedhart, *supra* note 5, at 91.

elusive as similar definitions of air law and Space law.<sup>45</sup> Having sought to include too many considerations into the development of the functional theory the theory itself shares most of the criticism appertaining to those other theories it borrows heavily from.

What is more when the functional theorists say they are not interested in the adoption of scientific and legal criteria for a spatial demarcation decision and that therefore, they do not stand the chance of failing on that score, they are only correct to the extent that the little scientific considerations they do employ open that approach itself up to other cogent criticism. For instance it is submitted that every movement with less than circular velocity (i.e. the launching velocity of a spacecraft amounting to 9.4 km/s) has to be considered a flight through airspace regardless of its height. That is why such a flight is subject to the jurisdiction of all states that are in such manner overflown. On the other hand every movement with escape velocity or one exceeding that velocity (i.e. 11.2 km/s or faster) should be considered a space flight, which of course by definition (presumably as a result of acceptance under customary law of the right of ingress and egress of spacecraft) is free from all state interference, irrespective of the height at which it is carried out. In other words the speed of objects in itself is the distinguishing feature.<sup>46</sup> Note should be taken that the approach is supposed to take into account the security of the state from falling objects. While the security considerations are quite apt and necessary there is an apparent naivety in the functional theory argument because it fails to account for the following: (a) movements in outer space at less than circular velocity speed,<sup>47</sup> (b) launching manoeuvres slower than escape velocity which thereby endanger the underlying state, (c) the special problem of those aircraft which can also perform space flight (d) the possible harm that can be done by spacecraft on an ascent and descent trajectory through foreign airspace. This is because every flight with circular velocity or more will begin and end dangerously, at launch and at landing.

One shade of the functional theory is based on the assumption that since the largest part of the earth is covered by the sea-, which is not subject to state sovereignty-, there is no need to draw a boundary line between airspace and outer space. The one can be regarded as an extension of the other with a gradual transition for the purpose of conducting air and space activities.<sup>48</sup> This reasoning would have been more credible if most if not all launchings and re-entry of space objects take place solely at sea and outside state territory. The situation in practice, however, is that most space activities naturally emanate from national territory and involve the interests of other states. Therefore, justification of the functional approach on this ground fails. Also subsumed in this school of thought is the view that a uniform regime encompassing both air law and space law would in any case eliminate the need for demarcation all together.<sup>49</sup> Such a premise exposes the theorists of this school of thought to the accusation that their, 'thinking testifies to some naivety' and furthermore as Diederiks Verschoor put it, 'there are compelling reasons supporting the opposite view'.<sup>50</sup>

---

<sup>45</sup> Cf. Diedericks-Verschoor, *supra* note 4, at 8, 9, 20-21.

<sup>46</sup> Goedhart, *supra* note 5, at 82.

<sup>47</sup> Such movement s are still possible at an altitude of 1000 km or even higher. See Goedhart *ibid.*, p. 89

<sup>48</sup> Diedericks-Verschoor, *supra* note 4, at 20.

<sup>49</sup> This is the theory of a uniform legal regime. This theory makes both air flight and space flight subject to the same rules of law. Its cornerstone is the enactment of a single and uniform legal regime (i.e. a legal continuum) covering all space immediately surrounding the earth. The joining of air flight and space flight is chiefly inspired by the belief that air flight will be dwarfed by space flight as a result of technological progress. In that situation, the controversial concept of sovereignty as it exists today in state practice and under international law will become obsolete. See further H. T. Binet, 'Toward solving the Space Sovereignty Problem', in *Proc. 2<sup>nd</sup> Coll. I.I.S.L./I.A.F.* (1960). See also Goedhart, *supra* note 5, at 91.

<sup>50</sup> Diedericks-Verschoor, *supra* note 4, at 17.

Thus, despite its attractions, this view must be rejected in its entirety. Among the things it does not account for even though it is supposed to be an all encompassing view is whether or not that the term space activities in its legal sense applies also to activities still in the planning stage or partially performed on earth, but directed toward space. In any case the proposition that outer space law covers such activities happening on earth does not solve the spatial demarcation issue neither does it remove the need to solve it. To say that outer space is not a place but a focus of activities is only a half truth. It is both a place and a focus of activities. To insist that outer space factually or functionally begins from earth is a conception colossal in its mistaken value. There is no compelling reason to adopt the position that all spatial space should be subject to a single legal regime. This would run counter to the natural inclination of states to preserve and even expand their sovereignty. It would run against most existing international treaties on air law and on space law. It would make nonsense of the provision of the Chicago Convention (1944) that every state has complete and exclusive sovereignty over its airspace.<sup>51</sup> Furthermore it neglects the obvious value of developments in the law such as in Article II Outer Space Treaty (1967) which quite distinctly make outer space virtually a sovereignty free area.<sup>52</sup> The principle of free and equal utilisation of outer space can only mean that there is a limit at some point to national sovereignty. In sum the criteria of space activity is not of much help in determining the precise beginnings of outer space or a spatial demarcation line between airspace and outer space.

### 3. The Aerodynamic Lift Theory

The displacement of an aircraft through air space at a constant height meets a simple condition which can be expressed equation-wise: weight = aerodynamic lift + centrifugal force. With increasing altitude the density of air, as well as the upward pressure of air, decreases. Beyond an estimated elevation of 83 km the air buoyancy would altogether disappear and only the centrifugal force or Kepler force would remain, which could keep an aircraft in flight, if it can travel at a certain speed. To continue flight after the air lift has been reduced to zero, circular velocity (i.e. +/- 7,900 m/s) is required; in this way the aircraft would describe the demarcation line between two areas with legal regimes (i.e. air space and outer space).<sup>53</sup>

An aircraft is commonly described as a machine depending on the reactions of the air as its means of flight.<sup>54</sup> Therefore, a group of lawyers including Haley,<sup>55</sup> B. Potter, J.C. Hogan<sup>56</sup> (and at a time J.C. Cooper)<sup>57</sup> have concluded that airspace ends where an aircraft will no longer find sufficient aerodynamic lift to sustain a flight. This position exists in the stratosphere. It is held in scientific and legal circles that twenty-five miles above sea level is perhaps the maximum height for the practical use of aircraft requiring aerodynamic support to sustain flight and using breathing motive power. Fifty miles above sea level is perhaps the maximum height at which the atmosphere is sufficiently dense to provide any appreciable aerodynamic lift. At about 53 miles

---

<sup>51</sup> Chicago Convention on International Civil Aviation (1944) 78.U.K.T.S. 8 1953 Cmd 8742; UNTS 295. Article 1 reads, 'The contracting States recognize that every State has complete and exclusive sovereignty over the airspace above its territory'.

<sup>52</sup> 'Outer space including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by other means'.

<sup>53</sup> Goedhart, *supra* note 5, at 61.

<sup>54</sup> Fawcett, *supra* note 30, at 22.

<sup>55</sup> Pitman B. Potter, 'International Law of Outer Space', 52 *American Journal of International Law* (1958) 305. Potter also reiterated the persuasive belief that '...the functions of the physical scientist and the lawyer are inextricably intertwined'.

<sup>56</sup> Hogan, 'Legal Terminology for the Upper Regions of the Atmosphere and Space Beyond the Atmosphere,' 51 *American Journal of International Law* (1957) 362.

<sup>57</sup> J.C. Cooper, 'High Altitude Flight and National Sovereignty', in *Explorations in Aerospace Law: Selected Essays*, Vlassic (ed.) (1968) 368, 370.

an object travelling 25,000 feet per second loses its aerodynamic lift and centrifugal force takes over. This is the Karman primary jurisdiction line,<sup>58</sup> which represents the highest distance the theorists of this school will admit as the point where sovereignty can no longer be enforced.

The lure of this school lies in the knowledge that sovereignty of the air granted in air law relates to the regulation of aeroplanes and other aviation craft, which of course need aerodynamic lift. Thus, once a point is reached where a vacuum exists and all the aerodynamic features, which give a normal aircraft the needed 'lift', exist no more then claims to sovereignty and jurisdiction should cease. Demarcation here is based upon the aerodynamic features of flight instrumentalities.

The aerodynamic lift theory enjoys considerable support in scientific circles. This has translated into acceptance in legal academic opinion and very importantly in the position adopted by some states on the issue. According to the South African government airspace refers to the space above the surface of the earth and below the outer space. The country's Aviation Act, 1962 (Act No. 74 of 1962), defines an aircraft as a machine that can derive support in the atmosphere from the reactions of the air, other than the reaction of the air against the earth's surface. In terms of the Space Affairs Act, 1993 (Act No. 84 of 1993), outer airspace is defined as the space above the surface of the earth from a height at which it is in practice, possible to operate an object in an orbit around the earth. From these two definitions, the position is taken that for the purposes of South Africa the airspace is the space above the surface of the earth up to a height where an aircraft is no longer able to derive support from the atmosphere.<sup>59</sup>

The aerodynamic theory it has also been said has a natural relation to air law. Air law of course is the older body of law in comparison with space law. Thus, the aerodynamic yardstick is mentioned in so many words in Annex A of the Paris Convention (1919) and in Annex 7 of the Chicago Convention (1944).<sup>60</sup> Besides buoyancy in the air is a feature of the atmosphere that may well serve the purpose of distinguishing between aircraft and spacecraft. The argument of the aerodynamic school, therefore, is that in the context of air law as enshrined in Articles 1 of both air treaties, the aerodynamic yardstick determines the scope of 'the complete and exclusive sovereignty' a state possesses over its aerial territory. Sovereignty, therefore, does not exist beyond the uppermost height at which aircraft are capable of flying.<sup>61</sup>

Goedhart after comprehensively reviewing the various schools of thought would appear to lend more credence to the aerodynamic theorists. He commits himself on this point after reviewing the aerodynamic theory by stating:

'In summary, it might be said that a height between 80 km and 90 km is most appropriate for drawing a legal boundary line between airspace and outer space. The lower and denser part of the atmosphere is as good as homogeneous in its chemical composition, whereas the upper part of it is in more than one respect equivalent to cosmic space, thus differing essentially from the deeper air layers. Luckily enough, this intermediate area which presents itself as a matter of nature,

---

<sup>58</sup> Defined as the height at which aerodynamic lift ceases and centrifugal force takes over; a suggestion put forward by Von Karma at a speech delivered in 1957 at the University of California later modified by Haley who applied the diagrams of Mascon and Gazely. See A.G. Haley, *Space Law and Government*, (1963) 77, 97-107.

<sup>59</sup> Depending on weather and other conditions, this height is put at approximately 30,000 metres above sea level. See The South African Government White paper available at <http://www.transport.gov.za/docs/white-paper/airport-wp02.html>

<sup>60</sup> Entitled 'Aircraft Nationality and Registration Marks'.

<sup>61</sup> Goedhart, *supra* note 5, at 60.

happens to coincide with the numerous proposals done in Western literature on international law: most of them are directed at choosing a height between 80 km and 100 km above mean sea level.<sup>62</sup>

This theory, however, is not without obvious shortcomings, not the least of which is the advent of a new class of aircraft - the X-15 which is capable of flying to a height previously considered supra-atmospheric.<sup>63</sup> These hybrid rocket planes combine elements of the traditional aircraft and of spacecraft and, therefore, can fly above the lower airspace. Countries like Japan are now developing and specialising on such space planes for their future transportation system. The space plane has several concepts in one technology and it is rather difficult to apply one legal regime to it.

Space planes may be categorized into 'surface to surface' (STS) type and 'surface to outer space' (STO) type according to the purposes of their usage. These two types have different purposes while both are based upon the same technology. Therefore, different legal systems, space law and air laws are applicable. With respect to both there are problems, which are not covered by present laws and regulations. These are problems, which admittedly confuse many of the distinctions lawyers have sought to establish so far and with respect to which further research will be necessary. However, one thing is for sure, the aerodynamic lift planes need to function can no longer be a criterion to denote the boundary between airspace and outer space. It is also clear that states may consider twenty-five miles above sea level too close for security purposes.<sup>64</sup> Note that the U-2 spy plane shot down in 1960, which was discussed earlier on, was about 20 miles above Soviet territory.<sup>65</sup> In fact it is very unlikely that states will ever remain content to restrict their claim to sovereignty to 20 miles when they might claim substantially more than that without unduly interfering with outer space activities. Commonsensical as the aerodynamic lift theory seems to be, it fails to offer a sufficiently precise criterion in law or in fact for drawing the line in the air between the airspace and outer space.

As to the utility of the so-called Karman primary jurisdictional line, it can only be said that the fate of that conception cannot be different from the fate of the aerodynamic theory itself. It should be stressed that the Karman line is no more than 'an average outcome, comparable to the notion of the mean sea level, although more complicated than that'.<sup>66</sup> Up to now, therefore, the Karman line is no more than a valuable reference boundary. The evolution of aircraft that are capable of navigating in the atmosphere above this line also diminishes the usefulness it has as a criterion to achieve legal spatial demarcation. Though some writers have tried to shore this theory up by stating that the line is subject to change in line with technological progress it is still not satisfactory.<sup>67</sup> This is because the desirable legal demarcation regime should ideally be of a near permanent if not final nature and not based upon the possibility of change due to slight changes in technological progress.

---

<sup>62</sup> *Ibid.*, p. 59-60.

<sup>63</sup> The X15 is said to be able to attain heights up to 47 miles as opposed to the 25 miles that apply to conventional aircraft. See Harris, *supra* note 16, at 252.

<sup>64</sup> Some like Harris and Maurice, even say 20 miles. Whereas other accounts go up to 30 to 40 miles. This is again an indication of the scientific uncertainties that afflict research into this area. *Ibid.*

<sup>65</sup> See Maurice, *supra* note 24, at 152. For further details see Amin V.G., *Kosmicheskkiye Apparaty I Mezhdunarodnoe Pravo*, (1977) p. 55; NASA, *High Altitude Perspective*, NASA SP-427 (1978) 4.

<sup>66</sup> Goedhart, *supra* note 5, at 60

<sup>67</sup> Diedericks-Verschoor, *supra* note 4, at 18.

#### 4. The Bogota Declaration View

In the Bogota Declaration of 1976,<sup>68</sup> eight equatorial states; Brazil, Columbia, Congo, Equador, Indonesia, Kenya, Uganda and Zaire claimed sovereignty up to the geostationary orbit (GSO) above their territories, which is at a distance of 22,300 miles (i.e. 36,000km) away from earth. In the GSO, the orbit of a satellite around the earth is synchronized with the rotation of the earth on its axis. An object in that orbit over the equator travels at the same speed as the earth so that it appears to be stationary. The orbit is particularly essential for satellite telecommunications among other things.<sup>69</sup> With only three satellites placed in the geostationary orbit any state or operator can have satisfactory worldwide commercial coverage.

However, Article 2 sub. D of the Bogota Declaration 1976 stipulates that:

Devices to be placed permanently on the segment of a geostationary orbit of an equatorial state shall require previous and expressed authorization on the part of the concerned state, and the operation of the device should conform with the national law of that territorial country over which it is placed.

In other words these states claim that segments of orbit of geostationary satellites are not in outer space but are an integral part of the territory below.<sup>70</sup> So for them outer space over which the space treaties pronounce as the province of mankind begins after the geostationary orbit. Indeed it may well be argued that when an object hangs permanently over a state it has a special relationship to it, which cannot easily be overlooked. Thus, lawyers from the developing countries like Umozurike counsel: 'While the freedom of outer space exploit (sic) and the concept of common heritage to all mankind should be preserved, the special interest/risk to the subjacent states should not be ignored'.<sup>71</sup>

The Bogota Declaration was obviously an attempt to alter the international legal status of outer space in favour of those underlying equatorial states. The fact that the Declaration was made at all lends credence to the idea that certain powerful states had failed to heed the warning expressed in such documents as the ITU Malaga – Torremolinos Convention of 1973, which stipulates *inter alia*; 'Members shall bear in mind that radio frequencies and the geostationary satellite orbit are limited natural resources, that...must be used efficiently and economically'. The enormity of the problems faced by developing states is reflected in the fact that even in such instruments as the ITU Convention (1973), the right of states to these finite resources is calculated to be based not on possible future competence or capabilities but as expressed in this instance, 'according to their needs and technical facilities at their disposal'. From this perspective it can be seen that while such documents purport to ensure 'equitable access' the premise upon which this access is based is far from equitable since it is short-sighted and limited to present realities and to the neglect of future changes and needs which will surely take place. For instance as at the time the ITU Convention was made in the early 1970s the expression space powers would refer mainly to the US and the then USSR, today the term is said to include not only the major industrialized countries but others like China, India and Brazil.<sup>72</sup> By similar reasoning the list will surely continue to expand. The question is by the time it does, will there literally be any space left? It is

---

<sup>68</sup> For the text of the Bogota Declaration see *Journal of Space Law*, Vol. 6 No.2 (1978) 194; see also N.M. Matte, *Aerospace Law; Telecommunication Satellites* (1982) 341-344.

<sup>69</sup> S. Gorove, 'The Legal Status of the Geostationary Orbit: Some Remarks', *Journal of Space Law* (1985) 53.

<sup>70</sup> L. Martinez, *Communication Satellites: Power Politics In Space*, (1985) 53.

<sup>71</sup> U.O. Umozurike, *Introduction to International Law* (1993) 118.

<sup>72</sup> Bergquist, Michael Laffaitur and Kai-Uwe Schrogl, 'A European View on UNISPACE III follow up', 16 *Space Policy* (2000) 193.

for this reason among others that the parties to the Bogota Declaration insist that the ITU documents are impractical and unfair. Indeed they located within UN General Assembly resolutions support for their position.<sup>73</sup> The Bogota declarants have been careful to excise from their claims all portions of outer space that do not fall within their spatial territories. Thus, it is recognized that the international legal status of the segments of the orbit corresponding to the areas of the high seas beyond the national jurisdiction of states falls under the common heritage of mankind. Note should also be taken of the peculiar position of those equatorial states which had not ratified the Space Treaty (1967).

As would be expected the claim by the Bogota Declaration has run into the most formidable brick wall of technically constructive and legally framed refutations by the industrial powers including the communist states. Reactions emanated both in the legal subcommittees and technical Committee from the USA<sup>74</sup> the Soviet Union,<sup>75</sup> the United Kingdom,<sup>76</sup> the German Democratic Republic,<sup>77</sup> Italy,<sup>78</sup> France,<sup>79</sup> Japan,<sup>80</sup> Poland,<sup>81</sup> and Czechoslovakia.<sup>82</sup> While not exactly enjoying unanimous support among the developing countries the Bogota view received a more studied reception, not with a view to immediately declaring it as invalid but as a reflection of the special interests that must be taken into consideration in the development of a legal regime for outer space. Thus, countries like Brazil and Mexico and the Latin American states<sup>83</sup> have been quick to point out the need to place discussions over the use of the geostationary orbit on the agenda of the international community until it is resolved. It is also stated that any regime finally adopted should take account of those special cases in which equatorial countries might have particular need to use segments of the geostationary orbit above their territories.

Indeed the 1985 Report of the Legal Sub-committee notes

‘...Some delegations, though agreeing that a special legal regime should take account of the position of the developing countries, were unable to concur in the view that by reason of their geographical position the equatorial countries should be considered as having special rights to segments of the geostationary orbit superjacent to their territories.’

Very impressively the report continues by noting that, ‘nor can the present system of ‘first come, first served’ be condoned if equitable access to the geostationary orbit is to be guaranteed to all

<sup>73</sup> For instance General Assembly resolution 2692 (XXV) and even Article 2 (1) of the 1974 UN Charter of Economic Rights and Duties of States (1974) G.A. Res. 3281 (XXIX) (1975) 14 ILM 251.

<sup>74</sup> See A/AC.105/C.2/SR-297 of 5 April 1978 4-9. See also , A/AC.105/C1/SR.219 of 26 Feb. 1979, paras.7-1; A/AC.105/ C.2/315 of 5 April 1979

<sup>75</sup> *Ibid.*, paras. 30-35. See also, for example, A/AC.105/ C.2/SR.314 of 9 April 1979, para. 16 esp.

<sup>76</sup> *Ibid* paras. 24-27

<sup>77</sup> A/AC.105/C.2/SR-297 of 5 April 1978, paras. 28-29 See also , A/AC.105/C1/SR.219 of 26 Feb. 1979, paras.7-1; A/AC.105/ C.2/315 of 5 April 1979 paras 1-2.

<sup>78</sup> See A/AC.105/C.2/SR.297 of 5 April 1978, paras. 19-23

<sup>79</sup> *Ibid.*, paras.12-14.

<sup>80</sup> A/AC.105/C.2/SR.314 of 5 April 1979, paras. 13-17. See also A/AC.105-C.1/SR.199 of Feb. 1978, para. 28.

<sup>81</sup> A/AC.105/C.2/SR.297 of April 1978, paras. 1-2; A/AC.105/C.-1/SR.219 of February. 1979, paras. 16-20; See also A/AC.105/PV.236, paras. 23-25.

<sup>82</sup> See A/AC.105/C.2/SR-297 of 5 April 1978, paras. 10-11.

<sup>83</sup> See the following: A/AC.105/C.2/SR.297, paras. 35-36. GAOR: 38<sup>th</sup> Sess. Suppl. No. 20 (A/38/20), p.11, paras. 60-64; A/AC.105/320 7-11, paras. 40-45; A/AC.105/318, p. 15, paras. 80-83. See also UNGA Res. 37/89 of Dec. 10, 1983, paras. 5 (b) (iii) and 7 (b) (ii); UNGA Res. 45/72 of 11 Dec. 1990, paras. 4(b) and 7(b) (ii); GAOR: 45<sup>th</sup> Sess. Supp. No 20 (A/45/20), paras. 18-19, 112-118. For the views of the Republic of Ecuador see A/AC.105/PV.234 (March 26, 1982) 27-28.

countries. Moreover, the view was expressed that the geostationary orbit as part of outer space is a common heritage of mankind.’

The Bogota Declaration also raises certain questions about the *consentment tacite* (tacit consent) which many writers have presumed about the practice of space flight over state territory, particularly the flight or placement of satellites through national airspace. As if to consign to the dust-bin of history the right of non-spacefaring nations to object to any abuses or injustices inherent in the existing regime relating to outer space activities, Goedhart insists that it is a recognized principle that:

‘ [i]n particular circumstances a state must protest in order not to lose a right. A response from a state denoting disagreement (i.e. a protest ) is always important if a state’s violated right has been recognized in international law. Should a right, however, have a weak foundation, merely protesting will not suffice to maintain that right. In addition, objections against any infringement of law have to be made repeatedly: only if a state has objected from the outset to an international custom (i.e. the principle of the persistent objector)’.<sup>84</sup>

It may well be argued that the Bogota Declaration represents a veritable tool in the armoury of any state which in the future may seek to argue that the flight of satellites over its territory violates its airspace. This is particularly true where such state is a party to the Bogota Declaration and if the spatial demarcation problem persists. As to the condition that such objections must be made repeatedly,<sup>85</sup> it can only be asked what repetition is more potent than that the Declaration has not been unanimously withdrawn? The withdrawal of two states out of the eight evidently reduces somewhat the moral potency of this instrument but it does not remove the legal threat it poses. The statement that only if a state has objected from the outset to an international custom in the process of formation, may it contract out of that custom (i.e. the principle of persistent objector) is not as damaging to the arguments of the Bogota declarants (or indeed any other state that challenges outer space activities in or over its territories) as it may at first appear. To begin with there is no agreement in international law as to how many years is sufficient for the formation of an international custom. Nor is there any prescribed time limit within which states must declare their objections to a legal or factual practice. It may, therefore, be suggested that in all cases regard must be given to the circumstances surrounding the particular matter and to the nature of the particular state(s) involved.

In the nature of things the time lapse between 1957 (time of the first Space flight) and the making of the Bogota Declaration in 1976 may appear quite long but it must be mentioned that geostationary satellites did not immediately become fashionable. It is, therefore, fair in making any assessment to make allowance for the time it would have taken the states concerned to realize and comprehend the immediate and potential dangers they may be exposed to as well as calculate the potential benefits they may be forfeiting. With these considerations in mind it must be said that from a logical point of view these are not the most damaging arguments against the potency of the Bogota declaration (1976). In any case the question may well be raised as to why the economically poor equatorial states should adhere to the treaty obligations of maintaining outer space as a common area for all mankind while those states that are economically well off already as things are, reap the financial benefits available in the orbit and go ahead to arguably derogate from international space law by stealthily introducing the concept of private property rights over resources based even much farther than the geostationary orbit and on celestial bodies.

---

<sup>84</sup> Goedhart, *supra* note 5, at 125.

<sup>85</sup> *Ibid.*

However, one may wish to romanticize the ideas propagated under the Bogota view there is no escaping the fact that on a general note the claim, however, is quite unpopular among non-equatorial states and the majority of Space lawyers and it is especially unacceptable to the Space Powers. But again this is no compelling argument why the claims under it must be dropped. Therefore, it is still necessary to locate the real reason why the declaration cannot stand. A convincing view is that the declaration of sovereignty to a distance of 22,300 miles is a colossal proposition, which amounts to declaration of sovereignty over outer space, in violation of Article 1 Outer Space Treaty (1967) and Articles II and IV Moon Treaty (1979). It is indeed doubtful that such a distance can mark the spatial demarcation boundary between outer space and airspace.

This should not, however, be seen as a victory for the industrialized states' point of view. If anything it is a victory for the generality of states. It will be a very powerful argument indeed which will wrest from the equatorial states the rights to claim economic or strategic benefits over orbits literally hanging over their heads based on the common heritage principle and grant unrestricted property rights to the industrialized powers over space based resources without international agreement as to the nature and extent of the regime for exploitation.

### **5. The *Usque Ad Infinitum* Theory**

There are some scholars who hold steadfastly to the view that sovereignty extends *usque ad infinitum*. This is based on the exaggerated view expressed in the ancient Roman maxim *Cujus est solum ejus usque ad coelum et ad inferos*. It is no wonder then that it has few followers. As Mc Mahon correctly puts it, 'such a view may be more accurately characterized as *usque ad absurdum*'.<sup>86</sup> It is agreed that any projection of territorial sovereignty into space infinitum will not only violate international law, but will be inconsistent with basic astronomical facts. The revolution of the Earth requires that its position in relation to space and celestial bodies is never constant for the slightest conceivable fraction of time. Such a projection into Space would give us a series of adjacent irregularly shaped cones of jurisdiction, continuously moving into themselves; with celestial bodies moving into and out of these cones ceaselessly.<sup>87</sup> In these circumstances the concept of a space cone of sovereignty is both meaningless and a dangerous abstraction.

### **6. The National Security and Effective Control Theory**

According to this theory state sovereignty should extend as far out as the subjacent state could exercise effective control. The view among African scholars is that state sovereignty persists to any point in outer space if activities conducted therein affect state security or human welfare.<sup>88</sup> It is in fact posited that '...a state can deny the freedom of outer space flight above its territory if the activity endangers state security or human life'.<sup>89</sup> Cooper also suggested that 'at any particular time the territory of each state extends upward into space as far as the scientific progress of any state in the international community permits such state to control Space above it'.<sup>90</sup>

The appeal to realism of this school of thought is very strong but it is considered mistaken, harsh and unacceptable, in that the richest and most powerful states that possess the monopoly of space technology will inevitably acquire outer space both for military and other uses. It is better to be in

<sup>86</sup> McMahon, 'Legal Aspects of Outer Space', 38 *British Yearbook of International Law* (1992) 339.

<sup>87</sup> Wifred Jenks, 'International Law and Activities in Space', 5 *International Comparative Law Quarterly* (1956) 99, 102.

<sup>88</sup> Umozurike, *supra* note 62, at. 264.

<sup>89</sup> *Ibid.*

<sup>90</sup> Cooper, *supra* note 48, at 264.

agreement with the likes of Lachs and Schacter who see this view as fraught with serious dangers.<sup>91</sup> For it is not only the degree and form of control that is the issue. It is more a question of the age-old principle of equality of states. Following this rule of effective control, states that do not possess adequate technological or military potential would be deprived of rights, which should be theirs as equal subjects of international law. This will be an affront on the principle of equality of nations and is, therefore, rejected.

## 7. The Lowest Point of Orbital Flight Theory

This is a widely popular theory. Here it is suggested that sovereignty should extend to the lowest height at which an object requires to enter into orbit and circle the Earth. That point has been variously put between 70 km and 160km. This principle of the 'lowest perigee demarcation' was adopted by the International Law Association at its meeting in 1968 in Buenos Aires.<sup>92</sup> Mc Mahon sees it as a sensible approach<sup>93</sup> and J. Harris admits that it would appear to be the most likely to be accepted; but he set its limit at a lower height (between 50 and 60 miles) than that indicated by other scholars.<sup>94</sup> Other notable lawyers in this school include McNair,<sup>95</sup> Jenks,<sup>96</sup> Cooper (at a later stage in his writings),<sup>97</sup> Jastrow,<sup>98</sup> Vosburgh<sup>99</sup> and very recently Grief<sup>100</sup>

Expressed in scientific terms the central precepts of this school are explained thus, by one of its proponents:

'The reference to orbiting vehicles, or satellites immediately introduces the possibility of a physically sound definition for the limits of airspace...I have in mind the fact that at low altitudes a satellite is quickly destroyed by friction. Therefore, I suggest that the boundary to the airspace of a nation should be defined as the altitude at which the density of the atmosphere is sufficiently low to permit the completion of one circuit by an orbiting vehicle, without destruction by atmospheric friction...Our calculations of satellite lifetimes indicate that critical

---

<sup>91</sup> Manfred Lachs, *The Law of Outer Space: An Experience in Contemporary Law Making* (1972) 571. See also O. Schacter, 'Legal Aspects of Space Travel,' *Journal of British Interplanetary Society* (1952).

<sup>92</sup> The word perigee is an astronomical term representing the point in the orbit of the Moon or an artificial satellite around the Earth when it is closest to the Earth; See L. Perek, 'Scientific Criteria for the Delimitation of Outer Space', *5 Journal of Space Law* (1987) 111.

<sup>93</sup> Mc Mahon, *supra* note 77, at 343. He accepted the suggestion that a state should only exercise sovereignty over that area whose boundary is the lowest orbital at which an artificial satellite may be put in orbit at least once around the earth.

<sup>94</sup> D.J. Harris, *supra* note 16, at 253.

<sup>95</sup> McNair, *supra* note 3, at 16. He wrote 'a more sensible approach is reflected in the view that a state should only exercise sovereignty over that area whose boundary is the lowest altitude at which an artificial satellite can be put in orbit at least once around the earth'.

<sup>96</sup> W. Jenks, *supra* note 78, at 103-104.

<sup>97</sup> Cooper, 'Fundamental Questions of Outer Space Law' (Lecture given at Leiden University, October (1960)) 3. Cooper as has been noted, at an earlier time belonged to the Aerodynamic Lift School of thought as reflected in earlier papers written in 1951. See Cooper, *supra* note 48, at 259. As late as 1958, he wrote 'I am convinced that the term airspace as used in the Paris Convention in 1919, was there meant to include only those parts of the atmosphere above the surface of the earth where gaseous air is sufficiently dense to support balloons and airplanes, the only types of aircraft then in existence'. See Cooper, 'Flight -Space and the Satellite', *7 International and Comparative Law Quarterly*, (1958) 82. Cf. his views in Cooper, 'Legal Problems of Upper Space', *supra* note 48, at 209-271.

<sup>98</sup> R. Jastrow, *Proceedings, 1<sup>st</sup> Colloquium on the Law of Outer Space*, (1958) 82.

<sup>99</sup> J.A. Vosburgh, Vol. 56 *American Bar Association Journal* (1970) 134-136.

<sup>100</sup> Grief surveyed the theories on the demarcation problem and showed preference for the arguments of the lowest orbital altitude school, noting that '[a]lthough final agreement has not been reached, the lowest orbiting altitude of satellites commends itself as a logical basis for delimitation'. He also suggested that the 'von Karman formula' is very much in agreement with this view and both criteria, therefore, reinforce each other. See Grief, *supra* note 5, at 45.

altitude is 100 miles for a satellite of a typical weight and dimensions, i.e., a weight of one ton and a cross sectional area of 30 square feet. The critical altitude of 100 miles will vary by uncertainty of the density of the atmosphere at that altitude, and also for reasonable variations in satellite mass and cross sectional area, or more properly, the ratio of those last two quantities. This figure of 5 miles represents the degree of arbitrariness in the proposed definition.<sup>101</sup>

Though it is clear that technological progress can also change things, modern writers on the subject like Goedhart and Kopal<sup>102</sup> are very much still in favour of the lowest perigee approach. Admittedly there is something about this approach that appeals to the scientific mind since it takes physical concepts and technological considerations into account. This is so much so that Goedhart found no difficulty in concluding that '[a]s a matter of fact, there are very few convincing arguments against the (lowest perigee) boundary criterion...' and that '[a]t any event, it is hardly possible to exaggerate the acceptability of the lowest perigee criterion.'<sup>103</sup> A closer examination of the central arguments of this school, however, reveals no overwhelming and convincing quality. In fact, it may be argued that its strengths and weaknesses are very much shared by the other demarcation theories based on scientific and technological criteria.<sup>104</sup> To begin with proponents of this school regularly confuse it with the aerodynamic criterion. Thus, Goedhart appears to favour that argument as well.<sup>105</sup> Similarly the South African perspective relies heavily on the lowest perigee criterion so much that it is not easy to say exactly which of the two approaches it has adopted.

However, the arguments of this school are not satisfactory. In the first place the minimum perigee required for orbital flight apparently has not been determined with exactitude. The distances suggested vary widely. The exact distance cannot be given because of the vagaries of the atmosphere. Thus, no matter how sensible this approach may sound it leaves us still at the point at which we were, that is no precise demarcation line separating territorial airspace from *res communis* outer space.

Furthermore, it is in complete contrast with the equally sensible Aerodynamic Lift theory in that the minimum height at which satellites can remain in orbit is at least twice the maximum height at which aircraft can fly.<sup>106</sup> Thus, an attempt to pick one of these theories will definitely mean a disregard of the obvious advantages in the other. Another possibility is to pick a middle distance between the two claims, but of course that distance which would be arrived at will not satisfy the security or effective control school. It is also to be noted that the lure of this theory previously was probably based on the nearly total acquiescence of states to the placement of satellites in space. Since no state complained over the placement of a communication satellite over its territory it was assumed that such distance is acceptable to the generality of states. However, with the signing of the Bogota Declaration (1976) by the concerned states this position has changed.

---

<sup>101</sup> Jastrow, *supra* note 89, at 82.

<sup>102</sup> V. Kopal, *The question of defining Outer Space* (1980) 170-173; See also Kopal, 'Issues Involved in Defining Outer Space, Space Objects and Space Debris', *Proceedings 34<sup>th</sup> Colloquium* (1991) 30-44.

<sup>103</sup> Goedhart, *supra* note 5, at 50-51.

<sup>104</sup> These are the aerodynamic school (and its Von Karman line variant), the gravitational effect argument, and the atmospheric zone theories among others. The scientific basis category of schools is in contrast to the other categories such as the demarcation by arbitrary or conventional criteria theories; the security school (which some like Goedhart quite erroneously classify under the scientific criteria category) and the functional approach category.

<sup>105</sup> It has been noted that Goedhart himself falls within the aerodynamic school; *supra* notes 5 and 53.

<sup>106</sup> Perek, *supra* note 83, at 111.

## 8. Theories of Arbitrary Distances

Since the above basic schools of thought on the demarcation line between airspace and outer space have produced no overwhelming consensus and no international agreement, legal writers have suggested several arbitrary distances. The criteria for choosing these arbitrary distances vary and depend on the particular factors that appeal most to the imagination of its proposer.

One of the most intriguing suggestions was that which fixes outer space to a few meters above the tallest building.<sup>107</sup> It is sufficient to state that this is totally unacceptable as a taller edifice can always be built. Some writers break space into zones and establish different demarcations to suit different purposes. For instance a distance may be suggested to serve as a limit to territorial airspace, in which states possess exclusive jurisdiction and control, and another intermediate zone (sometimes labelled neutral zone<sup>108</sup> or *neutralia*<sup>109</sup>) as an area of innocent passage and finally comes outer space.

Murphy suggested a height of 30 miles and another 4000 miles for neutrals in wartime.<sup>110</sup> Azreges, suggests 200-300 km, being the supposed limit of air-filled Space; Neuman, thinks it is 250 miles (where there is too little air).<sup>111</sup> Cheng thinks it is between 310-610 miles<sup>112</sup> and later 300 to 500 miles based on assumptions as to where the atmosphere ends.<sup>113</sup> Danier on his own part puts the limit of the atmosphere at 650 miles and thinks Space begins there; Galina and Meyer citing some Western meteorologists put it at 7,000 miles.<sup>114</sup> If we accept Professor Westlake's immunity—from—falling—objects approach, then we must be willing to grant territorial sovereignty up to 327,000km or 161,000 miles; for it is at these distances that astronomic opinion holds that a rocket would leave the Earth's area of attraction and pass under the predominance of the moon and sun respectively, thus, eliminating all possibilities of a fall back to Earth.<sup>115</sup> In fact between 1957 and 1960 alone the proposals made ranged from 20 km to 1,500,000.<sup>116</sup>

### Developing a Conclusive Theory on A Legal Spatial Demarcation Boundary Plane between Airspace and Outer Space

From what has been argued so far, it would seem that all attempts at pinpointing the exact beginnings of outer space are doomed to fail logical tests. No matter which of the theories is finally adopted in international law, there will be obvious disadvantages and criticisms. However, as has been stated earlier this is no reason to leave the issue in the state of flux it is in now. The argument that the job should be left to competent scientists to deal with in the future is not cogent enough and therefore, is unacceptable. Scientists will, like lawyers, remain undecided on this. In any case any consensus reached now on the basis of science alone is at the mercy of the inevitable, next scientific or technological development. Besides it is more realistic to hold the view that the problem of the lack of demarcation is basically legal and political in terms of the

---

<sup>107</sup> Vazquez, *supra* note 2, at 34.

<sup>108</sup> Lachs, *supra* note 82, at 58.

<sup>109</sup> Houston Lay, *supra* note 13, at 49.

<sup>110</sup> *Ibid.*, p.43

<sup>111</sup> *Ibid.*

<sup>112</sup> Cheng, 'Recent Developments in Air Law', *supra* note 4 at 208. Cheng 'From Air Law to Space Law', *supra* note 4, at 23.

<sup>113</sup> Cheng 'From Air Law to Space Law' *ibid.*

<sup>114</sup> Houston Lay, *supra* note 13, at 49.

<sup>115</sup> See above 2.0.2: Development of the Concept of Sovereignty over Airspace; See also Cooper, *supra* note 48, at 258.

<sup>116</sup> For a tabulation of these proposals see Goedhart, *supra* note 5, at 3-4.

problems and conflicts it would lead to.

Once national space is defined, the result will be that no vehicle whether aircraft or spacecraft may fly in, into or through another state's national space without its permission, acquiescence or tolerance. Thus, the demarcation line must not be too low; as this would put a Space vehicle launcher at the mercy of surrounding states through whose airspace its vehicle must pass, on its way to or from outer space. Thus, all the low demarcation line theories must be rejected.

At the same time the demarcation line must not be too high especially since the security of the state (which is the fundamental reason for seeking jurisdiction and control over airspace) can only be safeguarded by regulating activities rather than by an extensive projection of state sovereignty. In any case (at least for now) most states do not have the requisite technical and military ability to exercise any effective control or even detect intrusion.

With these considerations in mind support is appropriate for a staggered demarcation regime in international law to regulate jurisdiction over spatial territories. This approach would have the advantage of softening the effects of any rigid demarcation. It is also suggested that an arbitrary distance will have to be chosen. Arbitrary as used here is not in the sense of a wild suggestion but on the basis of an attempt to synthesize the existing theories on the subject into one single legal theory. This spatial regime will, thus, not be based on one single consideration or criterion but will represent the smallest of all the evils that are represented in the other theories. Therefore, the following seems appropriate.

- (a) A lower demarcation line for territorial airspace of approximately 55 miles to be considered as the maximum height for the airspace, which will be subject to the complete and exclusive sovereignty of the subjacent state.
- (b) A Buffer Zone for the next 45 miles, which should be recognized as an area of innocent passage for all states.
- (c) An Outer space demarcation line of 100 miles, which should mark the beginning of Outer Space (completely free from all claims of sovereignty and jurisdiction. For graphic clarity the hypothesis may be represented in the following manner.

(O.S. = 100m) - (A.S = 55m) = (45m B.Z.)  
O.S = Outer Space  
A.S = Airspace  
BZ = Buffer Zone  
M = Miles

The appeal of this recommended formula lies in the fact that it takes consideration of approximate estimations and it is a synthesis of several other theories on the subject. The general consensus of scientific opinion appears to speak of a 25-mile limit for sufficient aerodynamic lift for an aircraft; thus, for the 'aerodynamic lift theorists' airspace ends there. To this because of the vagaries of the nature of the atmosphere, has been added another 30 miles. In like manner the generality of the 'lowest orbital flight theorists' point at a distance of around 70-90 miles as the lowest points of orbital flight. To this has been generously included 10 miles, Therefore, the suffocating feeling states have of the nearness of space objects literally 'hanging over their heads' without their permission would have at least been symbolically taken care of.

The creation of a Buffer Zone of 45 miles is justified for many reasons. First, it establishes a zone of innocent passage as recognized in the law of the sea; thus, making it possible for small and

landlocked states to launch space rockets without having to seek express permission from neighbouring states before passing through that zone while ascending or descending. It is a fact that a rocket inclines in flight in such a way that it may need to utilize that area of space over other territories. Without the recognition of such a zone of innocent passage such states may in the future be particularly vulnerable to unnecessary veto of space activities. This of course means that there will be recognisable sanctions against non-innocent passage. The security theorists would be comforted to have such a zone in which suspect aircraft particularly those that can make space flights, may be legitimately investigated. This might also involve the development of a positive right of hot pursuit in air law. Secondly, the creation of a Buffer Zone accommodates further scientific discoveries, which may necessitate an increase in the area recognized as airspace or a lowering of the precise limits of outer space. Thirdly, the legal status of the atmosphere would be better elaborated in that the lower reaches of the atmosphere, that is, troposphere and some parts of the stratosphere would be under territorial sovereignty. The upper parts of the stratosphere would constitute the Buffer Zone. The ionosphere (sometimes subdivided into the mesosphere and the thermosphere) and the exosphere would, thus, be legally in outer space. Fourthly, the Buffer Zone can become a bargaining chip and negotiating weapon for states in their international relations for various purposes.

An international convention would ultimately be needed for the recognition of such demarcation regime as has been recommended. While conceding that physical and scientific information needed to reach a controversy free decision is not yet available (and may never be available); this is no reason why the law should not anticipate scientific development. More so, once legal demarcations are fixed the law becomes specific irrespective of a probably eternal scientific indecision. Any frontier that is not unequivocal is bound to be a source of controversy.

These ideas put forward are only suggestions. They are in no way meant to be infallible. The hypothesis will of course attract all the usual arguments that any line - in - the - sand (in this case line - in - the - air) solution will attract. However, given that the settled maritime zones in the law of the sea are no more than arbitrary lines in the ocean (there is really no logical reason why the sovereignty of a state should be limited to exactly 12 miles from baseline); the adoption of this hypothesis will be equally workable. States may adopt eventually another formula. Indeed any equitable agreement among states would be a good starting point regarding this problem of legal demarcation in spatial terms. That this can be done against all odds and despite varying if not contentious opinion has been demonstrated in the delimitation of maritime zones in the law of the Sea. But then even there the regime in operation continues to generate controversies and conflicts often and again.

Ideally decisions finally reached should enjoy the greatest possible acceptance by all states. It is necessary that issues of sovereignty over airspace and outer space should be determined by all, in such a way that a balance is maintained between the interests of individual states and the general international interest. There is much wisdom in the Latin saying - *Caveat humana dominandi, quod omnes tangit ab omnes approbatur*. That is to say, what concerns all must be approved by all.

As noted earlier, the traditional concept of absolute sovereignty has become considerably eroded. So also has the concept of absolute freedom. States are under an obligation as provided for in international agreements and treaties to co-operate with one another to share the resources that are based in outer space in an equitable manner and to exploit outer space for the benefit and the interests of all mankind. The freedom of use of outer space and exploitation of its celestial bodies is not absolute and it must be exercised not only in such a way that the freedom of exploitation of others is not jeopardised but also the future of coming generations must not be threatened.

The space powers continue to play a leading role in the exploration and exploitation of outer space. They also influence considerably the drafting of space law. They must, however, realise that it is not sufficient to offer humanity a perpetual promise of respecting outer space and its celestial bodies as the common heritage of mankind. There is a basic obligation upon all states capable of exploring and exploiting space now to be responsive to the interests of developing states. It is in this light that the General Assembly Declaration on International Co-operation in the Exploration and Use of Outer Space for the Benefit and in the Interest of all States, Taking into Particular Account the Needs of Developing Countries, adopted in 1996 (resolution 51/122) must be viewed as a commendable development. This instrument recognises the importance of international co-operation in the exploration and use of outer space for the benefit and in the interest of all states, in particular the needs of developing countries. The question of harmonising the interests of developed and developing states in the economic and technological benefits accruable from state activities in outer space is not merely a voluntary requirement or luxury with which the space powers can dispense. In it probably lie our collective survival as a race and the entire earth's survival.

While the political will and the legal backing seem to be in place among majority of states to achieve these purposes a lot still has to be done in respect of the monitoring of space activities and the enforcement of legal rules in space. In this era of possible total destruction due to environmental and military catastrophes this is the least that is demanded from this generation, which has dared to penetrate the innermost sanctuaries of space. There is definitely no place for Machiavellian precepts in the building of space law. The continuing partnership of law, politics, science and technology in respect of space activities needs to be further consolidated in the interests of mankind.