

AIR COMMAND AND STAFF COLLEGE

AIR UNIVERSITY

**DELINEATING OUTER SPACE: THE IMPACT ON NEAR-SPACE
INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE**

by

David M. Dersch, Jr, Major, United States Air Force Reserve

A Research Report Submitted to the Faculty

In Partial Fulfillment of the Graduation Requirements

Advisor: Mr. Michael P. Ivanovsky

Maxwell Air Force Base, Alabama

March 2010

Disclaimer

The views expressed in this academic research paper are those of the author and do not reflect the official policy or position of the United States government or the Department of Defense. In accordance with Air Force Instruction 51-303, it is not copyrighted, but is the property of the United States government.

Abstract

The legal definition of where air space ends and outer space begins has not been codified into international law. States have sovereignty over their air space, but according to international law, no state sovereignty exists in outer space. Therefore there is a question as to where state sovereignty ends and the space commons begin. The question of definition becomes increasingly important as technology advances and states develop platforms which will operate in near-space, this legally ambiguous zone. The United Nations Committee on the Peaceful Use of Outer Space has asked the United States whether or not it supports specifically delimiting space. This paper, after a review of space law and air law, concludes that regarding its intelligence, surveillance, and reconnaissance (ISR) platforms, it is in the best interest of the United States not to pursue a specific definition. Instead, the United States should allow the current tension between the laws to remain and the definition of the beginning of space to be left legally ambiguous. This ambiguity provides the United States with the greatest amount of flexibility in the employment of near-space assets. However, even if space were delimited, it would not have a significant impact on the use of proposed near-space ISR platforms.

DELINEATING OUTER SPACE: THE IMPACT ON NEAR-SPACE INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE

Introduction

No one disputes the increasing reliance upon space assets by both the United States military and its general populous. Whether for communication (COM), position, navigation and timing (PNT), or weather prediction, the satellites that enhance these capabilities are almost taken for granted. With the recent anti-satellite kinetic attack capability that China publicly demonstrated, as well as development of directed energy weapons by various nations, there is concern that the United States' space capabilities are increasingly at risk. Indeed, the phrase "space Pearl Harbor" has been bandied about to popularize and emotionally emphasize the devastating effects an unexpected asymmetric attack upon United States' satellites would produce.¹

One of the primary military functions satellites provide is intelligence, surveillance, and reconnaissance (ISR). Due to the nature of orbital mechanics and the weight of ISR payloads, maintaining persistent ISR through individual satellites is not practical. Currently various airplanes, both manned and unmanned, provide ISR coverage during gaps in satellite coverage. However, the loiter times of these platforms is not sufficient to maintain the level of persistent ISR that commanders desire. To alleviate this, the Defense Advanced Research Projects Agency (DARPA) is developing a high-altitude long endurance platform called ISIS (Integrated Sensor Is Structure). Essentially the ISIS airship is a massive blimp with a radar sensory array built as part of the structure, designed to stay aloft for years at a time in near-space at an altitude above 60,000 feet. An ISIS prototype is projected to test fly in 2012-2013. ISIS is just one of three different types of high altitude ISR platforms being developed to utilize this hitherto untapped region.²

There is a movement within the United Nations Committee on the Peaceful Uses of Outer Space (COPUS) to more definitely delineate where air space ends and outer space begins. This directly impacts the legal standing of proposed lighter than air (LTA) high altitude ISR platforms,

as well as the techniques, tactics, and procedures (TTPs) employed in fielding them. How should the United States respond to this COPUS initiative? Should the United States promote the clarification of boundaries, or simply refrain from entering the debate, giving consent to the ambiguous status quo? And if unambiguous boundaries are legally established, how might this impact the use of future LTA near-space ISR platforms? This paper proposes there is no pressing need for the United States to call for the delineation of space. Rather, it is in the strategic interest of the United States for the space delineation line to be ambiguous. If international law does evolve to definitively grant nations sovereignty over their near space above 60,000 feet, this will not dramatically alter current public practice.

Significance

This topic is important because United States military doctrine strives to conform to international law. Where the law is ambiguous, doctrine and TTPs can be more flexible. Where the law is more precise, various options or courses of action may be unacceptable because they are illegal. Near-space, because of its potential to effectively accommodate ISR and other functions, is likely to become more of a battleground in the future. In theory, international law that constrains the United States will also constrain its adversaries. Whether or not near-space is more carefully defined is also important for its precedent setting measures. In exploring new frontiers, precedents are important. Early on in space exploration the international community put into law not to use or base nuclear weapons in outer space. Once these initial precedents have been agreed upon, psychological inertia sets in and it becomes more difficult to make changes. Today the exploitation of near-space is near the same stage where space exploitation was when Sputnik was launched in 1957. The primary difference is that engineering, electronic, and materials technology is more advanced on a world-wide scale. In the 1950's-60's there were really only two nations in the space race, the United States and the Soviet Union. Once the benefits of near-space are fully

comprehended, there may be many nations, as well as commercial entities, racing to exploit their niche of near-space.

Limitations and Assumptions

This paper is written at the unclassified level. At the classified level, there may be operational concepts or TTPs already in place that answer some of the questions raised. Another limitation in this study relates to other mission functions operating in or from near-space. This paper deals primarily with ISR; it does not consider all the ramifications or legality of placing weapons in near-space.³ The weaponization of space and near-space is a topic and policy decision of great strategic importance, but beyond the scope of this paper.

An important assumption this writer makes is that it is impossible to maintain a significant long term monopoly on near-space technology. With technological espionage rampant, the general openness of society in the United States, and the vulnerabilities of computer network to hacking, even top secret manufacturing processes and designs for near-space ISR platforms will not stay secret too long. The proliferation of nuclear weapons and technology illustrates this point. An important corollary to this is once technology enabling persistent near-space ISR is in the public domain, it will be easily reproduced by both allies and adversaries. High cost and complex technology is a major barrier preventing most nations from exploiting outer space. It is projected that after the research and development phase is over, near-space ISR technology will be much cheaper than space technology.⁴ If near-space technology is not too expensive or exotic, then more nations will utilize near-space than outer space. Nations will have an economic incentive to substitute more capable, less expensive near-space platforms for more expensive outer space satellites.⁵

Analysis of Applicable International Space Law and Air Law

Emerging technology, including computerization, miniaturization, and photovoltaic energy

propulsion will soon allow the fielding of persistent ISR assets in near space.⁶ Current international law is unsettled regarding delineating the border of atmospheric air space and outer space. Nations are recognized to have sovereign control over their air space. According to the International Civil Aviation Organization, positive control of national air space is exercised up to 60,000 feet.⁷ Except in cases of war, as prescribed in Article 89 of the *Convention on International Civil Aviation*, flying in another nation's air space without its permission is considered illegal and a breach of its sovereignty.⁸

On the other hand, international space law, similar to and based on long standing international maritime law, recognizes the domain of outer space to be free from any nation's sovereign control. Dr. Everett Dolman succinctly contrasts the origins of air compared to maritime law. He says "the bulk of air law, codified in the twentieth century in conjunction with rapid technological developments of the air, then jet plane, has developed primarily through bilateral treaties and multilateral conventions. Law of the sea, on the other hand, developed primarily by codifying existing customary and normative behaviors of seafaring states."⁹ According to Dolman, there are four contentious issues which sea law addresses, and which space law must also: "delimitations, sovereignty, registration and liability, and innocent passage."¹⁰ Currently accepted space law, while addressing the last three, does not deal with the first one, delimitations.

There are four internationally recognized treaties forming space law. The most important one for this topic is the original Outer Space Treaty, formulated in 1967.¹¹ Outer space is considered an international commons, the heritage of all mankind, much like the oceans of the world. This treaty establishes that no nation owns outer space or has sovereignty over it (Article II), but that all nations should have the freedom to access, explore, and investigate space and celestial bodies. Thus it establishes unrestricted space over flight or transit by spacecraft, missiles, and satellites.

Beyond the legal treaties, the United Nations General Assembly has also passed several resolutions containing principles for space exploration and use. The one germane to this discussion was passed in 1986 and is called “Principles Related to the Remote Sensing of Earth from Outer Space.” The gist of these 15 principles is that sensing data should promote international cooperation and peace, and, as practicably as possible, the data should be shared with other states for mutual benefit. Such sharing is a goal, but not a legal requirement. It is especially noteworthy that none of these treaties or statements of principles actually defines where air space ends and outer space begins. This topic has been a matter of discussion and debate among the members of the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space (COPUS) since 1967.¹²

Where does national air sovereignty end and unrestricted space over flight begin? There are various scientific, engineering, or functional definitions of the beginning of outer space. But there is not an internationally recognized legal definition. As alluded to in the introduction, at its forty-fifth session in 2006, the Legal Subcommittee asked its members whether their governments “considered it necessary to define outer space and/or to delimit airspace and outer space, given the current level of space and aviation activities and technological development in space and aviation technologies.” Since then 17 of the 23 respondents formally replied that it was necessary to have such a definition. The other six were either ambivalent or did not think a definition necessary at this time. The United States to date has not issued a formal written reply.¹³

Maintaining the status quo of an undefined boundary at this point in time works in favor of the United States. As the United States continues to develop its near-space ISR lighter than air platforms, it could, if necessary, make the case that they are not airplanes in the traditional sense. Since they operate above the 60,000 foot controlled airspace ceiling, they would not be subject to over flight restrictions. However, the precedent of over flight of near-space ISR could become a

two-edged sword. As other states develop their capability in this area, there would be nothing legally to prevent them from sending an airship over United States territory. Ostensibly, neither the public nor a nation's government would tolerate a foreign country's persistent ISR platform spending months slowly transiting across their territory without permission (imagine a Japanese airship over Alaska), let alone one from a perceived adversary. Although this attitude seems intuitive, actual practices demonstrate otherwise. The Open Skies Treaty adds a wrinkle to current law and international attitudes regarding ISR collection which could, in the future, apply to near-space collection platforms.

The Open Skies treaty was originally proposed by President Eisenhower for the purpose of confidence building, testing equipment, and treaty verification between the Cold War adversaries of the Soviet Union and the United States. It was re-initiated by President George H.W. Bush in 1989 after the Berlin Wall fell during the period of Russian *glasnost*. The treaty, between individual NATO members and former members of the Warsaw Pact, dictates a specified number of annual joint ISR aircraft flights over a nation's territory. The aircraft and sensors are pre-certified, and all information gathered is available to every signee of the treaty. Since its provisional signature in 1992 and full ratification and implementation a decade later, more than 530 observation flights have occurred over the 34 member states' territories.¹⁴ It remains today as "one of the most wide-ranging international efforts to date to promote openness and transparency of military forces and activities."¹⁵ This treaty has softened attitudes toward over flight ISR and perhaps paved the way or set precedents for near-space ISR platforms to be used in the same manner. In light of this, removing the current ambiguity as to where air sovereignty ends and space over flight begins may be a moot point, at least regarding ISR platforms without weapons.

If national air sovereignty were legally expanded into near-space, while this would stop unwanted over-flight by LTAs, there would still be great opportunities for legal ISR of adversaries

from near-space. The surveillance footprint of the proposed ISIS airship system is over 300 miles.¹⁶ An airship parked off an adversary's coast in international near-space, or in a bordering allied nation's near-space, could still provide extraordinary and invaluable persistent ISR coverage, just as the U-2 or RC-135 do today when they fly along an adversary's national border. Even if air sovereignty were internationally legally expanded above the 60,000 air control ceiling and permission for near-space over flight denied, the proposed ISR platforms would still legally be able to provide persistent ISR over coastal submarine launching facilities and shipping ports. ISR of an adversary's land beyond 300 miles would still be accomplished by space satellites.

Although ISR from near-space could still be conducted because of its large footprint, if national sovereignty in near-space prevents unrestricted over flight, this could limit the responsiveness of near-space platforms to emergency situations. Airships are not fast, and if they have to travel around countries to get to their destinations, this hinders their response time.¹⁷ Such a limitation can be overcome through forward deployment of multiple airships instead of CONUS basing. This provides another reason to keep the current definition ambiguous.

Another point to consider is that during war national air sovereignty does not enjoy the legal protection that it does during times of peace. Therefore, if the United States were to go to war, it could legally deploy an ISR platform into the near-space above its adversary. Of course, the enemy could also legally try to destroy the asset. In light of this, any deployment during war over an enemy would have to take into account the survivability of the platform. Because these platforms are unmanned, the risk is more economic than loss of life, which makes the deployment decisions emotionally simpler.

A current primary application of persistent ISR is for governments (or tactical commanders, as in Afghanistan or Iraq) who are engaged in low-intensity, irregular conflict to obtain pattern of life and travel intelligence. Airships, as well as tethered aerostats, are currently

performing such border patrol in five different locations in the United States. It is not inconceivable that foreign nations who are battling insurgencies, such as Colombia, Yemen, or even Russia, would invite United States near-space ISR assets to aid them in their struggles.

Current United States TTPs include asking for over flight permission for air-breathing assets, such as the U-2 or Global Hawk, even though they may be flying above IACO controlled air space.¹⁸ Furthermore, although not specifically defining where space begins, the General Counsel for the Air Force indicated that “it will be higher than near-space.”¹⁹ Such deference has not always been practiced. When the U-2 was originally put into service, it made clandestine flights over Russia during the Cold War. In fact, these caused an international incident and embarrassment for the United States in 1960 when Gary Powers was shot down, the violation of Russian air sovereignty was exposed, and plausible deniability could no longer be maintained.

Conclusion and Recommendation

The current United States’ practice of purposeful ambiguity regarding the definition of near space is effective, and this posture should be maintained by its delegations to COPUS. Allowing the tension between air law and space law to continue gives the United States the most freedom of action in near-space. As long as the United States continues to maintain its technological advancement and relative superiority in both space and near-space, there is no need to form a definition that would limit its freedom of action. However, even if near-space ISR assets were legally restricted by nations from transiting through their sovereign near-space, this could hinder their responsiveness, but would not totally obviate the platform’s ability to conduct its ISR mission.

-
1. The phrase “space Pearl Harbor” became popular after being widely read in the 2001 Space Commission report.
 2. Edward B. Tomme, “Paradigm Shift to Effects-Based Space,” 17-20, and Lewis Jamison, *High Altitude Airships for the Future Force Army*, pages 2-3, describe these lighter than air vehicles as free-floaters, (similar to weather balloons), steered free-floaters, and maneuvering vehicles, like ISIS.
 3. Ned Allen’s article “Our Strategic Space Shore Opportunities in Near Space,” as well as Everett Dolman in *Astropolitik*, make compelling arguments for the weaponization of near-space and space, respectively. For a contrary view, see Michael O’Hanlon, *Neither Star Wars nor Sanctuary*.
 4. Edward B. Tomme, “Paradigm Shift to Effects-Based Space,” 22-23.
 5. According to Lewis Jamison, *High Altitude Airships*, page 7, there are 32 companies world-wide working on developing some type of near-space platform.
 6. Edward B. Tomme, “Paradigm Shift to Effects-Based Space,” 5.
 7. Edward B. Tomme, “Paradigm Shift to Effects-Based Space,” 15.
 8. *Convention on International Civil Aviation*, Ninth Edition, by International Civil Aviation Organization.
 9. Everett Dolman, *Astropolitik*, 113.
 10. Ibid., 114. Italics are in the original.
 11. The official title of this treaty is “Treaty on Principles Governing the Activities of States in the Exploration of Outer Space, including the Moon and Other Celestial Bodies.” See *United Nations Treaties and Principles on Outer Space*.
 12. For a detailed history of this discussion, see the “Historical Summary on the Consideration of the Question on the Definition and Delimitation of Outer Space” presented by the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space at its forty-first session in Vienna in April, 2002.
 13. These facts were derived from a review of the member states’ replies to this question put forward by the Legal Subcommittee of COPUS. These replies came over a four year period. The texts of these replies can be found at <http://www.unoosa.org/oosa/SpaceLaw/national/def-delim/question.html>. That the United States did not respond is not necessarily unusual. Other prominent space powers, such as Russia, China, Japan, and France also did not issue formal written replies.
 14. Fact Sheet on the Open Skies Treaty, 1.
 15. Ibid.
 16. Henry S. Kenyon, *Airborne Sensor Sees Multitude of Threats*, 2.
 17. For a discussion of responsiveness, see Lewis Jamison, *High Altitude Airships*, 20-22.
 18. The United States sought for and received such clearances for the first Global Hawk which flew into the Centcom AOR.
 19. In a memorandum to the Secretary and Chief of Staff of the Air Force, titled *Legal Regime Applicable to “Near-Space,”* 27 September 2004, as quoted by Tomme, *Paradigm Shift*, 15 and footnote 66.

Bibliography

- Ackerman, Robert K. "Space Now a Contested Venue." *SIGNAL Magazine*, June 2009, accessed 27 March 2010 at www.afcea.org/signal/articles/templates/SIGNAL_Article_Template.asp?articleid=1970&zoneid=124.
- Air Force Doctrine Document (AFDD) 2-2.1 *Counterspace Operations*, 2 August 2004.
- Allen, Ned. "Our Strategic Space Shore: Opportunities in Near-Space." *Aerospace America* September 2007.
- Convention on International Civil Aviation*, Ninth Edition, Document 7300/9, by International Civil Aviation Organization, accessed at http://www.icao.int/icaonet/dcs/7300_cons.pdf.
- Department of Defense (DOD) Directive 3100.10 *Department of Defense Space Policy*.
- Dolman, Everett C. *Astropolitik: Classical Geopolitics in the Space Age*. Portland, OR: Frank Cass Publishers, 2002.
- "Fact Sheet on the Open Skies Treaty." Department of State, 18 May 2009. Accessed 20 Mar 2010 at <http://www.state.gov/t/vci/rls/123551.htm>.
- Harrington, Caitlin. "Briefing: Near-space Airships." *Jane's Defense Weekly* 43, no 44 (1 November 2006): 26-29.
- United Nations Committee on the Peaceful Uses of Outer Space. "Historical Summary on the Consideration of the Question on the Definition and Delimitation of Outer Space." Presented to the Legal Subcommittee, Forty-first Session, Vienna, 2-12 April 2002. Document A/AC.105/769. http://www.unoosa.org/pdf/reports/ac105/AC105_769E.pdf.
- Joint Publication (JP) 3-14 *Space Operations*, 06 January 2009.
- Kenyon, Henry S. "Airborne Sensor Sees Multitude of Threats." *SIGNAL Magazine*, January 2007, accessed 20 March 2010 at http://www.afcea.org/signal/articles/templates/SIGNAL_Article_Template.asp?articleid=1243&zoneid=196.
- Knoedler, Andrew J. "Lowering the High Ground: Using Near-Space Vehicles for Persistent ISR." *Military Technology* 32 no 6 (2008): 178-182.
- Lambeth, Benjamin S. *Mastering the Ultimate High Ground: Next Steps in the Military Uses of Space*. Santa Monica, CA: RAND, 2003.
- Lewis, Jamison, and Geoffrey S. Sommer, Isaac R. Porche III. *High Altitude Airships for the Future Force Army*. Santa Monica, CA: RAND, 2005.
- O'Hanlon, Michael E. *Neither Star Wars Nor Sanctuary: Constraining the Military Uses of Space*. Washington DC: The Brookings Institution, 2004.
- Space Primer*. Maxwell AFB, AL: Air University Press, September 2009.
- Steves, Mark. "Near Space 2015: A Conceptual Vision of Near-space Operations." *Air and Space Power Journal* 20 no 2 (Summer, 2006): 110-117.
- Stewart, Phil. "U.S. Looks to Export Drone Technology to Allies." Thomson Reuters, accessed 25 Mar 2010 at <http://www.reuters.com/article/idUSTRE62O5RW20100325>.
- Tomme, Edward B. "The Paradigm Shift to Effects-Based Space: Near-Space as a Combat Space Effects Enabler." Maxwell AFB, AL: Air University College of Aerospace Doctrine, Research, and Education, research paper 2005-01.
- United Nations Treaties and Principles on Outer Space*. New York, NY: United Nations, 2002, accessed at <http://www.unoosa.org/pdf/publications/STSPACE11E.pdf>.