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MILITARY USE OF SATELLITE COMMUNICATIONS, REMOTE SENSING, AND GLOBAL POSITIONING SYSTEMS IN THE WAR ON TERROR

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ABSTRACT

IN THE DECADES since *Sputnik*, various satellite applications have been developed with both military and civilian uses. The military and public both regularly utilize satellite technologies like remote sensing, telecommunications, and direct television

broadcasting. Global positioning systems, designed initially for military applications, have also successfully transitioned to civilian use. However, it is notable that before the present millennium, military and civilian satellites were usually exclusive of each other and both tended to be government owned. Only in recent years have private and commercial satellites become a significant provider of satellite services, including for the military. This article discusses the legal issues arising from this new trend of using civilian satellite applications in global military efforts. Particular focus is placed on the use of commercial remote sensing data, communications, and global positioning systems by armed forces deployed in the War on Terror. Through these examples, the article observes that there is a need for international guidelines on military use of dual-use satellite technologies.

I. INTRODUCTION

> The image of special operations forces riding horses alongside Northern Alliance forces [in Afghanistan] belies their true capabilities. Inside their saddle packs are global positioning system (GPS) trackers, laser designators, satellite-communications gear that enables them to talk directly to pilots overhead, and laptop computers on which to download satellite imagery. They know where they are. Through the clever combination of GPS-derived position data, advanced communications, and a variety of Space and airborne sensors, they are able to give fellow soldiers and their commanders—in and outside the theater—a continuous picture of their location and movements. . . . These force enhancement capabilities enable our special operations soldiers to accurately identify the locations of targets from a safe distance, relay the target coordinates via satellite phones or laptop computers to warplanes circling overhead, and then get back on their horses to ride to the next target.[1]

Information and communications technologies are now integral to the conduct of military operations. Forces around the world are committing to constant technological innovation, especially since the attacks of September 11, 2001 (9/11), and the subsequent "War on Terror."[2] The United States alone has

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[1] Joseph M. Cosumano, Jr., *Space Criticality to Ongoing Military Operations*, ARMY SPACE J., Spring 2002, at 2.

[2] For discussion on the conduct of the War on Terror by the United States and its allies, see Arnaud Blin, *The United States Confronting Terrorism*, *in* THE HISTORY OF TERRORISM: FROM ANTIQUITY TO AL QAEDA 398, 414 (Gérard Chaliand &

poured billions of dollars into research and development programs, notably reinvigorating the then-ailing U.S. satellite technology sector.[3] Technology is promoted as cleaning up war, allowing for more accurate information and targeting, and thus reducing collateral damage and both military and civilian casualties.[4] In the War on Terror Operations, where ground communications infrastructure was often unavailable (as in the case of Afghanistan) or unsecured (as in the case of Iraq), technology proffered a mechanism to overcome such limitations.[5] Various satellite applications, including remote sensing, communications systems, and GPS, have been utilized by the allied forces in the War on Terror to facilitate and support their military and

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Arnaud Blin eds., Edward Schneider et al. trans., 2007); VICTOR DAVIS HANSON, AN AUTUMN OF WAR: WHAT AMERICA LEARNED FROM SEPTEMBER 11 AND THE WAR ON TERRORISM (2002); AHMED RASHID, DESCENT INTO CHAOS: THE UNITED STATES AND THE FAILURE OF NATION BUILDING IN PAKISTAN, AFGHANISTAN, AND CENTRAL ASIA (2008); BOB WOODWARD, BUSH AT WAR (2002); BOB WOODWARD, PLAN OF ATTACK (2004); ANONYMOUS, IMPERIAL HUBRIS: WHY THE WEST IS LOSING THE WAR ON TERROR (2004).

[3] *See, e.g.*, Tony Capaccio, *Lockheed Poised for $2.6 Billion U.S. Satellite Contract*, BLOOMBERG (Dec. 17, 2012, 3:09 PM), http://www.bloomberg.com/news/2012-12-17/lockheed-poised-for-2-6-billion-u-s-satellite-contract.html; Jeffrey Hill, *Globecomm Inks $5.9 Million in Government Contracts*, SATELLITETODAY.COM (Aug. 27, 2012), http://www.satellitetoday.com/military/headlines/Globecomm-Inks-$5-9-Million-in-Government-Contracts_39378.html; Jeffrey Hill, *U.S. Government Satellite Industry Awaits Real Impact of Sequestration*, SATELLITETODAY.COM (Mar. 28, 2013), http://www.satellitetoday.com/st/feature/U-S-Government-Satellite-Industry-Awaits-Real-Impact-of-Sequestration_40924.html; Mark Holmes, *MetiSpace CEO Confident It Can Strike U.S. Government Deals This Year*, SATELLITETODAY.COM (Apr. 18, 2013), http://www.satellitetoday.com/regional/north-america/2013/04/18/MetiSpace-CEO-Confident-It-Can-Strike-U-S-Government-Deals-This-Year_41061.html; Rebecca Lincks, *U.S. Government Renews ViaSat Broadband Airborne Satcom Services Contract*, SATELLITETODAY.COM (Dec. 20, 2012), http://www.satellitetoday.com/military/headlines/U-S-Government-Renews-ViaSat-Broadband-Airborne-Satcom-Services-Contract_40305.html.

[4] *See* William Saletan, *In Defense of Drones: They're the Worst Form of War, Except for All the Others*, SLATE (Feb. 19, 2013, 11:40 PM), http://www.slate.com/articles/health_and_science/human_nature/2013/02/drones_war_and_civilian_casualties_how_unmanned_aircraft_reduce_collateral.html; WILSON W.S. WONG, EMERGING MILITARY TECHNOLOGIES: A GUIDE TO THE ISSUES (2013); David Hambling, *5 Weapons Systems to Reduce Collateral Damage*, POPULAR MECHANICS, http://www.popularmechanics.com/technology/military/planes-uavs/5-weapons-systems-to-reduce-collateral-damage#slide-1 (last visited May 19, 2014).

[5] Eric Beidel et al., *10 Technologies the U.S. Military Will Need for the Next War*, NAT'L DEF. (Nov. 2011), http://www.nationaldefensemagazine.org/archive/2011/November/Pages/10TechnologiestheUSMilitaryWillNeedFortheNextWar.aspx; Sandra I. Erwin, *Army Networks Test Limits of Commercial Technologies*, NAT'L DEF. (May 2006), http://www.nationaldefensemagazine.org/archive/2006/May/Pages/ArmyNetworks5357.aspx.

intelligence gathering.[6] The result of such technological deployment has been a continued focus by the allied forces and their respective governments to both innovate their technology and develop different ways in which existing military and civilian technologies, including satellite applications, can facilitate operations and make them more effective.[7]

This article explores such technology, specifically satellite applications, used by U.S. and allied military forces in the War on Terror and uses practical examples to illustrate how such technology facilitates military and intelligence-gathering operations. The article then discusses the general and specific principles of international law dealing with military uses of satellite applications to argue that the present state of law is inadequate to respond to recent developments in military uses of outer space. The article concludes by suggesting several international guidelines—a precursor to a possible multilateral treaty—that the international community should consider. These suggestions provide some freedoms and restrictions on the military uses of outer space, both in the context of the War on Terror and in future international armed conflicts.

II. MILITARY USE OF SATELLITE APPLICATIONS IN THE WAR ON TERROR

A. PAST AND PRESENT MILITARY OPERATIONS IN THE WAR ON TERROR

In suggesting that there has been rapid advancement in warfare technology in the context of the War on Terror, this article does not seek to suggest either that the War on Terror is new or that the use of technologies in theaters of war is novel. For instance, although the term "War on Terror" is customarily used to describe the intelligence gathering and military operations

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[6] *See, e.g.*, Chris Watt, *Space Superiority Essential in War*, SPACEDAILY.COM (Apr. 27, 2011), http://www.spacedaily.com/news/milspace-04k.html.

[7] *Id.*; *see also* Marco Cáceres, *Military Satellites: The Next Generation*, AEROSPACE AM., Jan. 2002, at 20; Lina Khatib, *Satellite Television, the War on Terror and Political Conflict in the Arab World*, *in* SPACES OF SECURITY AND INSECURITY: GEOGRAPHIES OF THE WAR ON TERROR 205, 215–16 (Alan Ingram & Klaus Dodds eds., 2009); Jeremy Singer, *Satellite Operations Must Evolve for War on Terrorism, Experts Say*, SPACE NEWS, June 2004, at 16; David Usborne, *Space: The Final Frontier in America's War on Terror*, INDEPENDENT (May 25, 2010), www.independent.co.uk/news/world/americas/space-the-final-frontier-in-americas-war-on-terrorism-1981976.html; Avi Yariv, *Israeli Spy Satellites Role in War Against Terror*, I-HLS (Dec. 26, 2012, 3:42 PM), http://i-hls.com/2012/12/israeli-spy-satellites-role-in-war-against-terror/.

undertaken since the 9/11 terrorist attacks in the United States, it would be inaccurate to suggest that military operations against terrorism did not take place before that date.[8] It would also be incorrect to suggest that technology has not played a role before the War on Terror.[9] However, there is no doubt that the War on Terror heated up after the 9/11 terrorist attacks.[10] For instance, on September 12, 2001, the North Atlantic Treaty Organization (NATO) invoked Article 5 of the North Atlantic Treaty and declared the terrorist attacks, directed from abroad, to be an armed attack against all nineteen members of NATO.[11] The Bush Administration used the phrase "War on Terror" soon after the 9/11 terrorist attacks.[12] On September 16, 2001, President Bush said, "This crusade—this war on terrorism—is going to take a while, and the American people must be patient. I'm going to be patient. But I can assure the American people I am determined."[13]

The War on Terror waged by the United States and its allies can be described broadly; in the context of this article, the term includes the following operations (together, the "War on Terror Operations"):

1) Operation Active Endeavour, a NATO naval operation in the Mediterranean Sea beginning on October 4, 2001, intended to prevent the maritime movement of terrorists and weapons of mass destruction;[14]

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[8] *See* Gerard Chaliand & Arnaud Blin, *The "Golden Age" of Terrorism, in* THE HISTORY OF TERRORISM: FROM ANTIQUITY TO AL QADEA, *supra* note 2, at 175.

[9] *See id.*

[10] *See* Blin, *supra* note 2, at 398–419.

[11] As of September 12, 2001, NATO had nineteen Member States: Belgium, Canada, Czech Republic, Denmark, France, Germany, Greece, Hungary, Iceland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Spain, Turkey, the United Kingdom, and the United States. Since then, nine more Member States have acceded to the alliance: Albania, Bulgaria, Croatia, Estonia, Latvia, Lithuania, Romania, Slovakia, and Slovenia. *See* North Atlantic Treaty art. 5, Apr. 4, 1949, 63 Stat. 2241, 34 U.N.T.S. 243 (entered into force Aug. 24, 1949); *see also* Michael A. Goldberg, *Mirage of Defense: Reexamining Article Five of the North Atlantic Treaty After the Terrorist Attacks on the United States*, 26 B.C. INT'L & COMP. L. REV. 77, 77, 82–83 (2003); Broderick C. Grady, *Article 5 of the North Atlantic Treaty: Past, Present, and Uncertain Future*, 31 GA. J. INT'L & COMP. L. 167, 169–70 (2002).

[12] *See* Kenneth R. Bazinet, *A Fight vs. Evil, Bush and Cabinet Tell U.S.*, N.Y. DAILY NEWS (Sept. 17, 2001), www.nydailynews.com/archives/Fight-evil-bush-cabinet-u-s-article-1.919650.

[13] *Id.*; *see also* SID JACOBSON & ERNIE COLÓN, AFTER 9/11: AMERICA'S WAR ON TERROR (2001–) (2008).

[14] *See* JENNIFER MEDCALF, GOING GLOBAL OR GOING NOWHERE? NATO'S ROLE IN CONTEMPORARY INTERNATIONAL SECURITY 20 (2008); RICHARD E. RUPP, NATO AF-

2) Operation Enduring Freedom, the name given to a number of military operations involving the United States and its allies in Africa, the Middle East, the Philippines, and, most notably, Afghanistan, where the United States and a coalition of allies invaded on October 7, 2001, with the goal of deposing the Taliban regime for giving shelter and support to Osama bin Laden and al-Qaeda;[15]
3) Operation Iraqi Freedom, also known as "Operation Falconer" in Australia and "Operation Telic" in the United Kingdom, involved the invasion of Iraq on March 20, 2003, by U.S.-led forces and its continuing occupation that ended, at least on paper, on September 1, 2010;[16] and
4) Operation New Dawn, the name given to the continuing involvement of U.S.-led forces in non-combat operations in Iraq.[17]

What this article does suggest is that, irrespective of the debate on the usage of "War on Terror," it remains true that all the associated conflicts share a common element: they involved the widest scope of military use of satellite applications and the largest amount of U.S. government investment in military and dual-use space assets since the end of the Cold War.[18]

TER 9/11: AN ALLIANCE IN CONTINUING DECLINE 190 (2006); Kate Glassborrow, *Interview: Rear Admiral Richard Leaman (OBE)*, 111 JANE'S NAVY INT'L 66 (2006); *see generally* OPERATION ACTIVE ENDEAVOUR (Lambert M. Surhone et al. eds., 2011).

[15] *See generally* ANTHONY H. CORDESMAN ET AL., WINNING IN AFGHANISTAN: CREATING EFFECTIVE AFGHAN SECURITY FORCES (2009); SETH G. JONES, IN THE GRAVEYARD OF EMPIRES: AMERICA'S WAR IN AFGHANISTAN (2009); SEAN M. MALONEY, ENDURING THE FREEDOM: A ROGUE HISTORIAN IN AFGHANISTAN (2005); TIM RIPLEY, OPERATION ENDURING FREEDOM: THE SEEDS OF WAR IN AFGHANISTAN (2011); DONALD P. WRIGHT ET AL., A DIFFERENT KIND OF WAR: THE UNITED STATES ARMY IN OPERATION ENDURING FREEDOM (OEF) OCTOBER 2001–SEPTEMBER 2005 (2010); AFGHANISTAN: TRANSITION UNDER THREAT (Geoffrey Hayes & Mark Sedra eds., 2008); CENTER FOR LESSONS LEARNED, OPERATION ENDURING FREEDOM: TACTICS, TECHNIQUES AND PROCEDURES (2008).

[16] *See* WALTER J. BOYNE, OPERATION IRAQI FREEDOM: WHAT WENT RIGHT, WHAT WENT WRONG, AND WHY (2003); THOMAS DONNELLY, OPERATION IRAQI FREEDOM: A STRATEGIC ASSESSMENT (2004); GREGORY HOOKER, SHAPING THE PLAN FOR OPERATION IRAQI FREEDOM: THE ROLE OF MILITARY INTELLIGENCE ASSESSMENTS (2005); KRISTIN F. LYNCH ET AL., LESSONS IN OPERATION IRAQI FREEDOM (2005); HISTORY AS POLICY: FRAMING THE DEBATE ON THE FUTURE OF AUSTRALIA'S DEFENCE POLICY (Ron Huisken & Meredith Thatcher eds., 2007).

[17] MICHAEL M. O'BRIEN, AMERICA'S FAILURE IN IRAQ: INTERVENTION TO WITHDRAWAL 1991–2010, at 425–26 (2010); Nathan Hodge, *As Combat Mission Ends, a New U.S. Operation Begins*, WALL ST. J. (Sept. 1, 2010, 12:01 AM), http://online.wsj.com/news/articles/SB10001424052748704421104575463810656347880.

[18] PAT TOWELL ET AL., CONG. RESEARCH SERV., R40567, DEFENSE: FY2010 AUTHORIZATION AND APPROPRIATIONS 18 (2009); William Matthews, *U.S. House-Senate*

While the use of advanced technology in warfare is not new, the War on Terror certainly provided an impetus for the greater militarization of space and cyberspace.[19] For example, the U.S. Air Force has a $46 billion portfolio on military satellite communications systems alone.[20] Increasing demands on satellite applications by U.S. Armed Forces have spurred the evolution of satellite technologies and the continuing expansion of commercial capacity, with the military becoming the largest customer for commercial and dual-use satellite applications.[21] The section that follows will highlight the core satellite technologies and their capabilities that have developed following the War on Terror Operations since 2001. By understanding their functions and capabilities, one may then appreciate the legal issues that arise from their use by military establishments in the War on Terror.

B. SATELLITE COMMUNICATIONS

1. MILSTAR *and* AEHF *Systems*

The U.S. Air Force operates its Military Strategic and Tactical Relay (*MILSTAR*) five-satellite communications system in geostationary orbit, providing jam-resistant and secure communications worldwide for the U.S. military.[22] This is in contrast to the civilian and commercial satellite communications, such as *INMARSAT*, that do not have such defensive capabilities.[23] Each of the *MILSTAR* satellites has a price tag of $800 million and pro-

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Defence Bill Hits Arms Costs $491 Billion Funds JSF, but Trims FCS, Space Radar and Satellite Programs, DEF. NEWS (Jan. 2, 2006); Richard Sanders, *Satellites of War: RADARSAT and Canada's Leading Role in the Militarisation of Space*, CAN. DIMENSION, Jul. 2006, at 14.

[19] *See* Dan Freyer, *Commercial Bus Rides: Fast Ticket to Space*, VIA SATELLITE, Sept. 2009, at 12, *available at* http://www.satellitetoday.com/publications/2009/09/01/commercial-Bus-Rides-Fast-Ticket-to-space.

[20] *Id.*; Mark Holmes, *Harding: Addressing Satcom Demand*, SATELLITETODAY.COM (Apr. 1, 2010), http://www.satellitetoday.com/military/netwarfare/Harding-Addressing-Satcom-Demand_33780.html; Anne Wainscott-Sargent, *Commercial's Growing Profile in the New MilsatCom Landscape*, VIA SATELLITE, Sept. 2011, at 6, *available at* http://www.satellitetoday.com/publications/Milsup/features/2011/09/01/commercials-growing-profile-in-the-new-milsatcom-landscape/.

[21] Greg Berlocher, *Military Demand Brings Antenna Improvements*, VIA SATELLITE, Sept. 2010, at 6; Mark Holmes, *Military Satellite Market To Remain Strong Around Globe*, VIA SATELLITE, Apr. 2009, at 14.

[22] U.S. Air Force, *Milstar Satellite Communications System*, AIR FORCE SPACE COMMAND (June 20, 2011), http://space.au.af.mil/factsheets/milstar.htm.

[23] MICHAEL P. GLEASON, EISENHOWER CTR. FOR SPACE & DEF. STUDIES, SPACE POLICY PRIMER: PRINCIPLES, ISSUES, AND ACTORS 12–13 (2010).

vides low data rate communications for voice and data at 75 bps to 2,400 bps and medium data rate communications at 4.8 kbps to 1.544 mbps.[24]

The U.S. Air Force is in the process of replacing the *MILSTAR* system with the new Advanced Extremely High Frequency (*AEHF*) system, comprising six geostationary satellites providing secure relay communications for the U.S. Air Force as well as the armed forces of Canada, the Netherlands, and the United Kingdom at a cost of $12.449 billion.[25] In addition to voice and data, the *AEHF* system will have the capacity to transmit tactical communications such as real-time video, battlefield maps, and targeting data exclusively for military applications.[26]

2. UFO *System and* MUOS

The U.S. Navy utilizes the UHF Follow-On (*UFO*) satellite communications system for their ground communications, given the need to maintain voice and data communications channels across the world for its involvement in the War on Terror Operations.[27] The proposed Mobile User Objective System (*MUOS*) would double the declared military capacity for UHF voice communications in high-density conflict zones, though it is not expected to be operational until after 2018.[28] Marco Cácares has suggested a reason for the delay: "The sense we are getting is that the U.S. military is perfectly willing to slow down development of some of its space-based assets during the next few years unless Congress [authorizes] generous increases in funding."[29]

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[24] *See* U.S. Air Force, *supra* note 22.

[25] Amy Butler, *USAF Plans for AEHF Launch Next Week*, AVIATION WK. (Aug. 5, 2011), http://www.aviationnewsreleases.com/2010/08/usaf-plans-for-aehf-launch-next-week.html.

[26] Jane's Info. Grp., *Advanced EHF (AEHF) System (United States), Satellite Systems and Equipment*, JANE'S MILITARY COMM. (June 22, 2011), http://articles.janes.com/articles/Janes-Military-Communications/Advanced-EHF-AEHF-system-United-States.html; Justin Ray, *Air Force Launches Advanced New Military Satellite*, SPACE.COM (Aug. 14, 2010, 6:57 PM), http://www.space.com/8950-air-force-launches-advanced-military-satellite.html.

[27] Cácares, *supra* note 7; Donald V.Z. Wadsworth, *Military Communications Satellite System Multiplies UHF Channel Capacity for Mobile Users*, *in* 2 MILCOM 1999: IEEE MILITARY COMMUNICATIONS CONFERENCE PROCEEDINGS 1145, 1145–52 (1999).

[28] David A. Fritz et al., *Military Satellite Communications: Space-Based Communications for the Global Information Grid*, 27 JOHNS HOPKINS APL TECH. DIG. 32, 34 (2006); Donald V.Z. Wadsworth, *supra* note 27, at 1145; Cácares, *supra* note 7.

[29] Cácares, *supra* note 7.

3. DSCS, WGS, *and Dual-Use Satellites*

The U.S. Army and other branches of the U.S. Armed Forces utilize the Defense Satellite Communications System (*DSCS*), which is a constellation of geostationary satellites designed to provide high-volume and secure voice and data communications.[30] The *DSCS* is now operational beyond its expected ten-year lifespan and is to be replaced by the Wideband Global SATCOM (*WGS*) system, a joint venture between the Australian and U.S. governments.[31] The *WGS* system is expected to enable the armed forces of both countries to have significantly enhanced capabilities in tactical command and control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR).[32]

The deployment of the *WGS* system would enable U.S. and allied forces to be less dependent on commercial satellite operators for communications services.[33] In Australia, for example, the Ka-band and X-band telecommunications links provided by the *Optus C1* satellite, launched in 2003, is presently used for medium- to high-data-rate defense theater coverage as well as for voice and data communications.[34] When the *WGS* partnership between Australia and the United States was announced, the spokesperson for the Australian Department of Defence said:

> Optus C1 provides SATCOM (satellite communication) coverage over Australia and leased SATCOM services are used to provide wideband SATCOM support to the [Australian Defense Forces (ADF)] elsewhere in the world . . . . The WGS system will provide global SATCOM coverage to the ADF and communications capacity orders of magnitude greater than that provided by the current SATCOM system. . . . Use of WGS allows [the ADF] to

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[30] WILLIAM E. BURROWS, DEEP BLACK: SPACE ESPIONAGE AND NATIONAL SECURITY 18–20 (1986).

[31] *Australia to Fund Sixth WGS Satellite*, SATELLITETODAY.COM (Oct. 3, 2007), http://www.satellitetoday.com/st/topnews/19168.html.

[32] Justin Ray, *Atlas 5 Rocket Successfully Launches Military Satellite*, SPACEFLIGHTNOW.COM (Apr. 3, 2009), http://spaceflightnow.com/atlas/av016/; *Australia to Fund Sixth WGS Satellite, supra* note 31.

[33] *Australia to Fund Sixth WGS Satellite, supra* note 31.

[34] IAN M. DAVIS ET AL., A NEW X AND KA BAND SATELLITE EARTH TERMINAL CAPABILITY FOR THE AUSTRALIAN DEFENCE FORCE (2005) (paper presented at the 9th Australian Symposium on Antennas, Feb. 16–17, 2005 in Sydney, Australia); Trevor W. Mahoney, *A Hybrid Civilian/Military Payload to Support Battlefield Communications*, J. BATTLEFIELD TECH. (Mar. 1998), at 29; Press Release, Optus, Optus C1 Satellite Successfully Launched (Jan. 12, 2003).

> reduce the operating budget associated with commercial SATCOM leases . . . .[35]

The military use of dual-use communications systems, such as the *Optus C1*, raises national security considerations.[36] For instance, one cause for concern is the Australian armed forces' dependence on *Optus*, a satellite owned by a foreign operator, Singapore Telcommunications, Inc.[37] These concerns are alleviated by Australian involvement in *WGS*.[38]

4. *Increasing Demand for Military Satellite Communications*

The use of telecommunications satellites to provide mobile communications beyond line-of-sight is one of the two most essential satellite applications used in military operations (the other being GPS).[39] For example, with 38,000 NATO and 47,000 U.S. troops in Afghanistan as well as 115,000 U.S. troops in Iraq at the times of maximum deployment, the military has a great demand for satellite communications services.[40]

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[35] Tim Lohman, *Defence to Boost Satellite Communication Capabilities*, COMPUTERWORLD.COM (Oct. 19, 2009, 9:09 PM), http://www.computerworld.com.au/article/322575/defence_boost_satellite_communication_capabilities/.

[36] *See* David Fickling, *SingTel Stands to Get Forex Gain in Any Optus Satellite Sale*, BLOOMBERG (Mar. 19, 2013, 4:21 AM), http://www.bloomberg.com/news/2013-03-19/singtel-stands-to-reap-forex-gain-in-any-optus-satellite-sale.html.

[37] *Id.*; Mitchell Bingemann, *Optus Floats Idea of Cutting Ties to Satellites*, AUSTRALIAN (Mar. 19, 2013, 12:00 AM), http://www.theaustralian.com.au/australian-it/optus-floats-idea-of-cutting-ties-to-satellites/story-e6frgakx-1226600125468; Gaurav Raghuvanshi et al., *SingTel Looks at Sale: Telecom Puts Its Australian Satellite Business Under Review*, WALL ST. J. (Mar. 18, 2013, 1:39 PM), http://online.wsj.com/article/SB10001424127887323415304578367402547584568.html; David Ramli, *SingTel Sale to Boost Optus*, AUSTRALIAN FIN. REV. (Mar. 19, 2013, 5:31 PM), http://www.afr.com/p/business/companies/singtel_sale_to_boost_optus_ux1KXMwUZCIJ6ePytr1wFK.

[38] *See* Tom Allard, *Australia to Share Defence Satellite*, SYDNEY MORNING HERALD (Oct. 3, 2007), http://www.smh.com.au/news/national/australia-to-share-defence-satellite/2007/10/02/1191091115313.html; Grant Holloway, *Singapore Spy Claims Raise Australian Defense Fears*, CNN (Aug. 8, 2001, 11:41 PM), http://edition.cnn.com/2001/WORLD/asiapcf/auspac/08/08/aust.sing.spies/; *Lateline: Optus Deal Questioned After Spy Allegations*, ABC (Sept. 8, 2001), http://www.abc.net.au/lateline/stories/s344102.htm; Joris Janssen Lok, *Australia Joins U.S. WGS Satcom Network*, AVIATION WK. (Oct. 3, 2007, 8:08 AM), http://www.aviationweek.com/Blogs.aspx?plckBlogId=Blog:27ec4a53-dcc8-42d0-bd3a-01329aef79a7&plckPostId=Blog:27ec4a53-dcc8-42d0-bd3a-01329aef79a7Post:1f944a0e-ba7f-45e3-aaa7-a9874ff82654.

[39] *See* Richard Kusiolek, *Pace of Operations Increases Demand on Satcom on the Move*, VIA SATELLITE, Apr. 2010, at 6.

[40] *Id.*; Mark Holmes, *Satellite Vendors Ready to Meet Military Challenges*, VIA SATELLITE, Apr. 2008, at 6.

Regardless of how much capacity is increased by the launch and deployment of military satellite communications systems, there will always be a need to supplement this capacity with the purchase of bandwidth on commercial satellite systems.[41] At present, around 80% of all U.S. governmental satellite communications traffic, including that for the military, is carried over commercial satellite communications systems.[42] However, Richard Dalbello observed:

> The government is our single largest customer . . . . And while they are an extremely large and important customer, they represent only [12%] of Intelsat's total business. There has been an explosion of demand for cellular backhaul services in Africa and for video services in the Middle East . . . . There have been times the government has needed bandwidth in specific regions and it simply wasn't available.[43]

With the War on Terror expanding beyond Afghanistan and Iraq, it is crucial for the United States and its allies to increase their communications capacity to meet their short- and long-term C4ISR requirements.[44] This demand can only be met through deployment of advanced satellite communications systems in the near future, thereby increasing the military dependence on space assets for communications.[45]

C. Remote Sensing

1. Overview

Remote sensing has been used for centuries, both before and during battle, to maintain an advantage over the enemy by having knowledge of the deployment of strategic targets.[46] Aerial remote sensing began with hot air balloons before World War I and advanced to the high-resolution satellites used today.[47] Since the beginning of the Space Age, satellite reconnaissance

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[41] Greg Berlocher, *Military Continues to Influence Commercial Operators*, Via Satellite, Sept. 2008, at 6.

[42] *Id.*

[43] *Id.* at 8.

[44] Mark Holmes, *Governments Seek New Ways to Meet Communications Needs*, Via Satellite, Apr. 2010, at 12; Watt, *supra* note 6.

[45] Holmes, *Governments Seek New Ways to Meet Communications Needs*, *supra* note 44.

[46] *See* Richard C. Olsen, Remote Sensing from Air and Space (2007); Julie K. Peterson, Understanding Surveillance Technologies: Spy Devices, Privacy, History & Applications (2007).

[47] Brian D. Graves, Remote Sensing and Military Transformation: Lifting the Fog of War (Dec. 6, 2005) (unpublished student project, Emporia State Univer-

has been an invaluable tool for the military.[48] During the Cold War, the earliest U.S. satellite programs were classified military remote sensing programs, and this has remained the case well after the Cold War.[49] The technologies utilized by the U.S. National Reconnaissance Office, which operates and manages satellite remote sensing imagery data for the U.S. intelligence services, include:

- optical satellites that use a mirror to gather visible light for photography;
- infrared and ultraviolet satellites that record imagery in those parts of the spectra;[50]
- radar imaging satellites that use microwave signals to scan the surface of the Earth;[51] and
- signal intercepting satellites that detect and record radio, telephone, and data transmissions on the Earth and transmissions relayed by communications satellites.[52]

The availability of satellite remote sensing data is invaluable to armed forces across the globe.[53] From a military perspective, access to high-resolution remote sensing imagery is of such importance that the provision of such imagery by free services, such as Google Earth, has raised significant security concerns for a number of nations, including the United States.[54] For military opera-

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sity), *available at* http://academic.emporia.edu/aberjame/student/graves1/project.html.

[48] *See* Gary L. Hopkins, *Legal Implications of Remote Sensing of Earth Resources by Satellite*, 78 MIL. L. REV. 57, 59–60 (1977); Ricky J. Lee, *Reconciling International Space Law with the Commercial Realities of the Twenty-First Century*, 4 SING. J. INT'L. & COMP. L. 194, 216 (2000); Malcolm Russell, *Military Activities in Outer Space: Soviet Legal Views*, 25 HARV. INT'L L.J. 153, 154–59, 163, 175–80 (1984).

[49] EYE IN THE SKY: THE STORY OF THE CORONA SPY SATELLITES 1, 3–4, 18 (Dwayne A. Day et al. eds., 1998).

[50] Richard D. Hudson, Jr. & Jacqueline W. Hudson, *The Military Applications of Remote Sensing by Infrared*, 63 PROC. IEEE 104, 106–08 (1975).

[51] Mark Van Persie et al., *Use of Remote Sensing Imagery for Fast Generation of Military Maps and Simulator Databases* 577 (Nat'l Aerospace Lab. N.L.R., Working Paper Grp. No. NLR-TP-2000-397), *available at* http://reports.nlr.nl:8080/xmlui/bitstream/handle/10921/857/TP-2000.397.pdf?sequence=1.

[52] Brian Crothers et al., *U.S. Space-Based Intelligence, Surveillance and Reconnaissance, in* AU-18 SPACE PRIMER 167, 168, 176 (2009).

[53] Dan Elliott, *Glitch Highlights U.S. Military Reliance on GPS*, NBC NEWS (June 1, 2010, 2:11 PM), http://www.nbcnews.com/id/37451462/ns/us_news-security/#.UvEbhuDnaos; Graves, *supra* note 47.

[54] *See* Peter Eisler, *Google Earth Helps Yet Worries Government*, USA TODAY (Nov. 6, 2008, 5:20 PM), http://usatoday30.usatoday.com/tech/news/surveillance/2008-11-06-googleearth_N.htm?csp=34; Katie Hafner & Saritha Rai, *Governments Tremble at Google's Bird's-Eye View*, N.Y. TIMES (Dec. 20, 2005), http://www.nytimes.

tions, remote sensing data is essential for strategic planning, deployment, monitoring, targeting, and threat assesment.[55] Their strategic and tactical value cannot be understated.

2. Remote Sensing Use in the War on Terror Operations

Satellites have been heavily utilized by U.S. and allied troops during the War on Terror to perform geospatial surveillance and remote sensing.[56] Soon after the 9/11 terrorist attacks, the U.S. Department of Defense acquired exclusive rights to the data produced by the commercial *Ikonos* satellite so that it could obtain imagery in Afghanistan and other theaters and also improve situational awareness at all major U.S. military installations.[57] However, this move was likely made for the twin purposes of obtaining the high-resolution remote sensing imagery of Afghanistan while preventing the Taliban, al-Qaeda, private actors, and the worldwide media from acquiring similar quality images that could have assisted their combat operations against U.S. and allied forces.[58]

The U.S. Armed Forces have access to governmental remote sensing satellites, the most notable being the *Keyhole* (*KH*) and *Lacrosse* series of satellites.[59] The most advanced *KH* satellites have a resolution of around ten to fifteen centimeters but cannot see through clouds and do not have "dwell capability" (the ability to remain in orbit over an area of interest).[60] The *Lacrosse* satellites are radar imaging satellites that, while having a lower

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com/2005/12/20/technology/20image.html?pagewanted=all&_r=0; Kelly Hearn, *Terrorist Use of Google Earth Raises Security Fears*, NAT'L GEOGRAPHIC (Mar. 12, 2007), http://news.nationalgeographic.com/news/2007/03/070312-google-censor.html.

[55] *See, e.g.*, Katrina Laygo et al., *Drone Bombings in the Federally Administered Tribal Areas: Public Remote Sensing Applications for Security Monitoring*, 4 J. GEOGRAPHIC INFO. SYS. 136 (2012); John Shroder, *Remote Sensing and GIS as Counterterrorism Tools for Homeland Security: The Case of Afghanistan, in* GEOSPATIAL TECHNOLOGIES AND HOMELAND SECURITY 11, 11–12, 18, 20 (Daniel Z. Sui ed., 2008).

[56] *See* Shroder, *supra* note 55, at 18–19.

[57] Bijal P. Trivedi, *U.S. Buys Up Afghanistan Images from Top Satellite*, NAT'L GEOGRAPHIC (Oct. 25, 2001), http://news.nationalgeographic.com/news/2001/10/1025_TVikonos.html; David Whitehouse, *U.S. Buys Afghan Image Rights*, BBC NEWS (Oct. 7, 2001, 11:57 GMT), http://news.bbc.co.uk/2/hi/science/nature/1604426.stm.

[58] Whitehouse, *supra* note 57.

[59] Emily Clark, *Military Reconnaissance Satellites*, CTR. FOR DEF. INFO. (Oct. 16, 2001), *available at* http://www.scribd.com/doc/78523547/Terrorism-Satellite-Reconnaissance (Center for Defense Information merged with Project on Government Oversight in 2002, and its original website is no longer available).

[60] *Id.*

resolution than the *KH* satellites at one meter, use radar instead of the visible spectrum, which allows real-time use in any kind of weather, both during the day and at night.[61]

Similarly, in Iraq, U.S. and allied forces accessed remote sensing imagery from both *KH-11* and *Lacrosse* satellites.[62] However, some commentators question whether it was as effective as other forms of intelligence gathering given the enemies were not state actors.[63] Brian Graves, for example, referred to a case study where the use of remote sensing imagery data was ineffective "due to the use of simple camouflage techniques and the hiding of forces among the buildings and streets of the urban area."[64] Graves tempers this with a success story that saw coordination of information that fed into highly successful and accurate air strikes.[65] These types of successes prove the ability of remote sensing imagery to facilitate rapid engagement of targets using fewer military assets:

> This is also a key indicator of the significance of multi-spectral sensors as the sandstorm would have blinded all other traditional optical reconnaissance methods. The technology used . . . is not new, but the manner in which this and future tactical engagements can be waged through the "fog of war" is indicative of the manner in which the US military must proceed to maintain the decisive edge.[66]

Both the Australian and U.S. military forces are focused increasingly on advances in new technologies and integration with existing technologies to create synergy between national assets operated by their respective military establishments.[67] In particular, it was recently reported that both governments signed an agreement to share remote sensing imagery data from the *Lacrosse* radar satellites, underlining the importance of remote sensing data for the War on Terror.[68]

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[61] Corina Neagu, *Political and Legal Issues on Satellite Remote Sensing: Use of Artificial Satellites in Remote Sensing*, 16 LEX ET SCIENTIA INT'L J. 50, 52 (2009); STANSFIELD TURNER, BURN BEFORE READING: PRESIDENTS, CIA DIRECTORS, AND SECRET INTELLIGENCE 161 (2005); Clark, *supra* note 59.

[62] Clark, *supra* note 59.

[63] *See* Graves, *supra* note 47.

[64] *Id.*

[65] *Id.*

[66] *Id.*

[67] Philip Dorling, *Australia and U.S. Sign Secret Satellite Spy Deal*, SYDNEY MORNING HERALD (Feb. 7, 2011), http://www.smh.com.au/national/australia-and-us-sign-secret-satellite-spy-deal-20110206-1aigu.html.

[68] *Id.*

D. Global Positioning Systems

One of the most important satellite applications for U.S. and allied armed forces since the Cold War has been GPS.[69] GPS is a satellite-based navigational system involving satellites and computers that can determine the latitude and longitude of a receiver on Earth by computing the time difference for signals from different satellites to reach the receiver.[70] GPS can determine location regardless of topography, weather, or time of day, anywhere on Earth, provided the GPS receiver is not physically obstructed.[71] The military value of such technology was recognized early in the Cold War by both the United States and the Soviet Union and, consequently, GPS and equivalent systems were deployed and maintained by both sides.[72]

The military value of GPS in the War on Terror cannot be understated. For example, when new software was installed in the ground control systems for GPS satellites on January 11, 2010, it was reported that some GPS receivers were rendered inoperable for days, affecting as many as 10,000 U.S. military receivers on weapons, jet fights, ground forces, and naval vessels.[73] This coincided with reports that U.S. Strategic Command and Air Force Space Command planned to reposition GPS satellites to improve coverage for military GPS users in Afghanistan and Iraq, as small units of troops are each given GPS receivers to better pinpoint their geographical location and identify the coordinates of surrounding terrain as well as enemy targets.[74]

E. Direct Television and Radio Broadcasting

The military uses of communications satellites in direct television and radio broadcasting have not received much attention, particularly in the War on Terror Operations. Such military uses of the broadcast of radio and television programming include:

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[69] Bradford W. Parkinson et al., *The Origins of GPS*, GPS World, May 2010, at 30–31, GPS World, June 2010, at 8 (story published in two separate issues).

[70] *See* Ahmed El-Rabbany, Introduction to GPS: The Global Positioning System 1–3 (2002).

[71] *See id.* at 1; Thomas Bornschlegel, *The History of the Global Positioning System GPS* 32 (May 14, 2009) (unpublished paper), *available at* http://www.imamu.edu.sa/Scientific_selections/abstracts/Physics/The%20history%20of%20GPS.pdf.

[72] Parkinson et al., *supra* note 69; Bornschlegel, *supra* note 71, at 8–9, 10, 21–22.

[73] Elliott, *supra* note 53.

[74] *USAF Repositions GPS Constellation to Improve Coverage in Afghanistan and Iraq*, Inside GNSS (Jan. 11, 2010), http://www.insidegnss.com/node/1839.

- morale enhancement;
- broadcast of weather and other non-sensitive information;
- propaganda dissemination; and
- operational support.[75]

Although the military and tactical potential for such uses was recognized early on, particularly in the context of propaganda dissemination, the use of direct television and radio broadcasting in the War on Terror Operations has been somewhat restricted by the limited availability of receiving equipment among the local populations of Afghanistan and Iraq.[76]

III. OVERVIEW OF RELEVANT LEGAL ISSUES

In order to determine the legal implications arising from the military use of various satellite applications in the course of the War on Terror, it is prudent to take into account three broad areas of consideration:

1) the general principles of public international law in relation to military activities, particularly those contained in the U.N. Charter, such as the prohibition on the use of force under Article 2(4) and the right to self-defense under Article 51;
2) the general principles of international space law in relation to military activities, particularly those contained in the multilateral space treaties negotiated under the auspices of the United Nations; and
3) the specific principles of international space law in relation to the specific satellite applications to the extent that they are binding and applicable, and any restrictions and prohibitions on military uses, whether directed against terrorism or otherwise.

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[75] Aaron Hale & Dustin Ballinger, *Military Applications for Digital Audio Radio Service (DARS), in* AEROSPACE CONFERENCE PROCEEDINGS 1039, 1044–48 (2002).

[76] Donald S. Harlacher, *On Direct Satellite Broadcasting*, AIR U. REV., Sept.–Oct. 1983, at 86; William J. Wallisch, Jr., *Direct Satellite Broadcasting: You Haven't Seen Anything Yet!*, AIR U. REV., Mar.–Apr. 1983, at 111; *U.S. International Broadcasting into the War Zone: Iraq and Afghanistan: Hearing Before the Subcomm. on Int'l Operations & Orgs., Human Rights, Democracy, & Global Women's Issues of the S. Comm. on Foreign Relations*, 111th Cong. 34 (2009) (responses of Joaquin Blaya, Jeffrey Hirschberg, & Steven Simmons to questions submitted by Sen. John F. Kerry).

These considerations are illustrated and summarized in FIGURE 1 below.

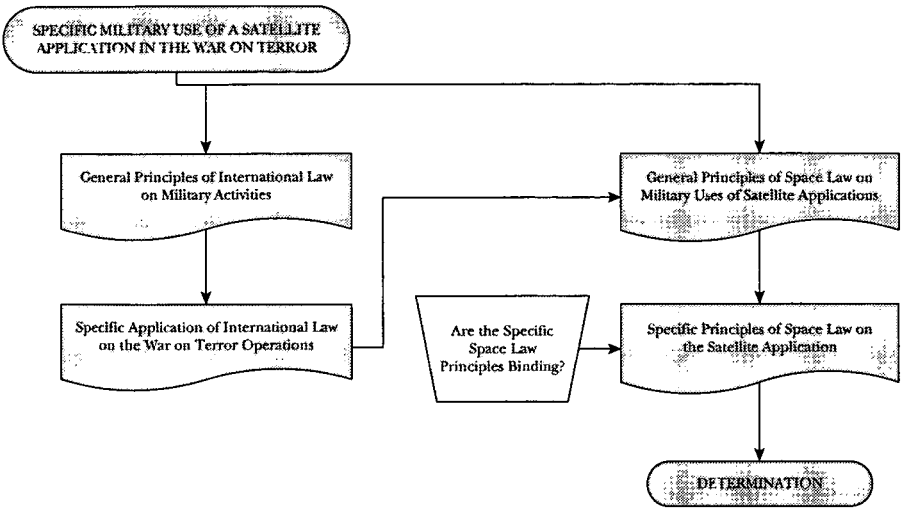

Figure 1. Legal Considerations in the Military Use of Satellite Applications in the War on Terror

In any analysis of the legality of the military use of various satellite applications, particularly those in the War on Terror, it is pertinent to consider the various scenarios for the legal basis for military operations under the U.N. Charter and then consider them in the context of the legal principles under the United Nations' space treaties and declarations.

IV. OPERATIONS DECIDED ON BY THE SECURITY COUNCIL

A. ARTICLE 2(4) OF THE U.N. CHARTER

Article 2(4) of the U.N. Charter provides that states are to refrain "from the threat or use of force against the territorial integrity or political independence of any state, or in any other manner inconsistent with the Purposes of the United Nations."[77] This principle has been found by the International Court of Justice to be binding on all states as a customary norm, though the prohibition is more relevant to international relations in the event of its breach rather than its observance.[78]

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[77] U.N. Charter art. 2, para. 4.

[78] *See* Military and Paramilitary Activities in and Against Nicaragua (Nicar. v. U.S.), 1986 I.C.J. 14, 22, 98–101 (June 27).

The legal prohibition on the use of force is not without exceptions.[79] Under Chapter VII of the U.N. Charter, the Security Council may authorize the use of force "to maintain or restore international peace and security" if there is a "threat to the peace, breach of the peace, or act of aggression" for which economic and trade sanctions would be inadequate.[80] Further, Article 51 provides that there is an inherent right of individual or collective self-defense "until the Security Council has taken measures necessary to maintain international peace and security."[81] Without some legal basis for the use of force in the War on Terror Operations, these military actions would contravene the legal prohibition on the use of force. Additionally, the use of satellite applications in furtherance of such actions would not be sanctioned by operation of the provisions of the U.N. Charter.

Ian Brownlie and David Harris both argue that even if Article 2(4) of the U.N. Charter is narrowly construed, it nevertheless amounts to a general prohibition on the use of armed force.[82] This is because one of the purposes of the United Nations is to "maintain . . . peace and security," and any form of use of force, regardless of whether it is located in the territory of the other state or not, is contrary to the stated purposes.[83] As a result, the use of force can be legally justified only where it is intended for and restricted to self-defense or action authorized by the Security Council under Article 42 of the U.N. Charter.[84]

B. ARTICLE 42 OF THE U.N. CHARTER

Article 42 of the U.N. Charter forms the fundamental legal basis for the authority of the Security Council to authorize or require the use of force by states. It provides:

> Should the Security Council consider that measures provided for in Article 41 would be inadequate or have proved to be inadequate, it may take such action by air, sea, or land forces as may be necessary to maintain or restore international peace and security. Such action may include demonstrations, blockade, and other

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[79] *See id.* at 102.

[80] U.N. Charter arts. 39, 42.

[81] U.N. Charter art. 51.

[82] IAN BROWNLIE, INTERNATIONAL LAW AND THE USE OF FORCE BY STATES 266–68 (1963); DAVID J. HARRIS, CASES AND MATERIALS ON INTERNATIONAL LAW 889–90 (6th ed. 2004).

[83] *See* U.N. Charter art. 42.

[84] *See id.*; *see also* BROWNLIE, *supra* note 82, at 268–69.

operations by air, sea, or land forces of Members of the United Nations.[85]

Traditionally, Article 42 was the only provision in the U.N. Charter that allows the Security Council to "take action by air, sea or land forces" where necessary to maintain or restore international peace and security.[86] However, the International Court of Justice took a contrary view in *Certain Expenses of the United Nations*, rejecting the proposition that the use of force in the Congo must be based on Article 42 of the U.N. Charter.[87]

Under the U.N. Charter, Member States are obliged to comply with decisions of the Security Council, and to the extent that such obligation under a decision of the Security Council is inconsistent with a treaty obligation, the decision of the Security Council prevails.[88] Consequently, the Security Council has the legal authority under Article 42 to override the prohibitions and limitations imposed under the U.N. space treaties, whatever the scope or content of these prohibitions and limitations may be.

C. Self-Defense and Article 51

Article 51 of the U.N. Charter states:

> Nothing in the present Charter shall impair the inherent *right* of individual or collective self-defence if an armed attack occurs against a Member of the United Nations, until the Security Council has taken the measures necessary to maintain international peace and security. Measures taken by Members in the exercise of this right of self-defence shall be immediately reported to the Security Council and shall not in any way affect the authority and responsibility of the Security Council under the present Charter to take at any time such action as it deems necessary in order to maintain or restore international peace and security.[89]

This recognizes the inherent right in international law of individual or collective self-defense where an armed attack takes place, at least "until the Security Council has taken the measures necessary to maintain international peace and security,"[90] In the

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[85] U.N. Charter art. 42.

[86] *See* Hans Kelsen, The Law of the United Nations: A Critical Analysis of Its Fundamental Problems 744–45 (1951).

[87] Certain Expenses of the United Nations, 1962 I.C.J. 151, 167 (July 20) (it can also be based on the consent of the Congolese government or on Article 51 of the U.N. Charter).

[88] U.N. Charter arts. 25, 103.

[89] U.N. Charter art. 51 (emphasis added).

[90] *Id.*

absence of any express provisions in a resolution of the Security Council, this doctrine could arguably justify the use of force against Iraq in the defense of Kuwait, for example, even though at the time the armed attack against Kuwait was already complete.[91]

It is interesting to note that Article 51 of the U.N. Charter considers collective self-defense to be a right rather than an obligation, even though one would probably consider collective security to be the responsibility of all states rather than a "right" to be exercised. It may be seen that states have completely surrendered their sovereignty in relation to the use of force to the Security Council and, as a result, collective self-defense has become a "right" to use force outside the authority of the Security Council rather than an obligation borne by states toward other states in the international community.[92]

The practical effect of this is that Article 103 of the U.N. Charter, applying only to obligations and not rights,[93] would have no impact on Article 51 of the U.N. Charter. The right of a state to use force in self-defense in outer space, therefore, would have to observe the prohibitions and limitations imposed under the U.N. space treaties, including those that may affect the military uses of satellite applications.

V. GENERAL PRINCIPLES OF INTERNATIONAL SPACE LAW

A. OVERVIEW

1. The Multilateral Space Treaties

In parallel with the technological advancements made in the final frontier of outer space, the creation of the present corpus

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[91] KELSEN, *supra* note 86, at 792; DEREK W. BOWETT, SELF-DEFENCE IN INTERNATIONAL LAW 216–18 (1958).

[92] *See* Malvina Halberstam, *The Right to Self-Defense Once the Security Council Takes Action*, 17 MICH. J. INT'L L. 229, 248 (1996).

> It is difficult to believe that some 180 states would have agreed to give up the most fundamental attribute of sovereignty, the right to use force in self-defense, to an international body, and particularly one like the Security Council. The Security Council decides on the basis of the political interests of the states voting—the state attacked may not even have a vote. It is inconceivable that they would have done so in language that affirms the "inherent right of individual and collective self-defense."

Id.

[93] U.N. Charter art. 103.

of international space law is due substantially to the efforts made in the adoption of multilateral treaties. In particular, many of these efforts were made by states within the multilateral framework of the United Nations.

The two most relevant of these treaties 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 (Outer Space Treaty);[94] and the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement).[95]

2. *Outer Space Treaty*

It was agreed from the early days of the workings of the Committee on the Peaceful Uses of Outer Space (COPUOS) that the adoption of a treaty containing basic and general principles of space law was preferable at that time to a comprehensive legal code on space activities, similar to that eventually created under the 1982 Convention on the Law of the Sea.[96] The main reason for this was the need to adapt to constantly evolving space technologies and new space applications. As the U.S. Secretary of State, Dean Rusk, stated at the time, the Outer Space Treaty is an "outstanding example of how the law and political arrangements can keep pace with science and technology."[97] This is not a feature exclusive to the development of space law—a similar progressive approach was taken with international human rights

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[94] *See* Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, *opened for signature* Jan. 27, 1967, 18 U.S.T. 2410 (entered into force Oct. 10, 1967) [hereinafter Outer Space Treaty].

[95] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, *opened for signature* Dec. 18, 1979, 1363 U.N.T.S. 3 (entered into force July 11, 1984) [hereinafter Moon Agreement].

[96] U.N. Convention on the Law of the Sea, *opened for signature* Dec. 10, 1982, 1833 U.N.T.S. 397 (entered into force Nov. 16, 1994). To some extent, this debate continues today with the issue being one of four discussion topics of the 2004 Colloquium on the Law of Outer Space in Vancouver, Canada. *See* Mimi Lytje, *Obstacles on the Way to a General Convention*, 47 PROC. COLLOQUIUM L. OUTER SPACE 267 (2004); Natalia R. Malysheva, *General Convention on Space Law: Some Arguments for Elaboration*, 47 PROC. COLLOQUIUM L. OUTER SPACE 254 (2004); Lotta Viikari, *Problems Related to Time in the Development of International Space Law*, 47 PROC. COLLOQUIUM L. OUTER SPACE 259 (2004).

[97] Letter of Submittal from Secretary Dean Rusk, Department of State, to President Lyndon B. Johnson, *in Hearings on the Treaty on Outer Space Before the Sen. Comm. on Foreign Relations*, 90th Cong. 109, 112 (1967).

instruments.[98] It is in this context that the United Nations adopted the Outer Space Treaty in 1967.

The fundamental legal principles contained in the Outer Space Treaty include:

1) the freedom of exploration and use of outer space and celestial bodies by all states on a non-discriminatory basis;[99]
2) the prohibition of national appropriation of outer space and celestial bodies by claim of sovereignty, use, occupation, or by any other means;[100]
3) the application of international law, especially the U.N. Charter, to space activities;[101]
4) the complete demilitarization of celestial bodies and the prohibition on the deployment of weapons of mass destruction in outer space;[102]
5) the requirement of states to render assistance to astronauts in distress and repatriate foreign astronauts and space objects found in their territories;[103]
6) international responsibility of states for "national" space activities and their liability for injury, loss, and damage caused to other states;[104]
7) the jurisdiction and control over a space object by a state through placement of the space object;[105]
8) the requirement that space activities must be conducted with due regard to the interests of other states and potential harmful interference in the activities of other states is to be avoided;[106] and

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98 Since the Universal Declaration of Human Rights of 1950, there has been a significant number of international legal instruments dealing with various issues of human rights, such as colonialism, racial discrimination, children, education, religious tolerance, women, and slavery. *See Universal Human Rights Instruments*, U.N. OFF. HIGH COMMISSIONER FOR HUMAN RTS., www.ohchr.org/en/professionalinterest/pages/universalhumanrightsinstruments.aspx (last visited May 19, 2007).

99 Outer Space Treaty, *supra* note 94, art. I.

100 *Id.* art. II.

101 *Id.* art. III.

102 *Id.* art. IV.

103 *Id.* art. V.

104 *Id.* art. VI–VII.

105 *Id.* art. VIII.

106 *Id.* art. IX.

9) states are to avoid harmful contamination of the Earth and any adverse changes to the environment of the Earth by the introduction of any extra-terrestrial matter.[107]

As of January 1, 2013, 102 states have ratified the Outer Space Treaty and another 26 states have signed it.[108] It has been noted that all states involved in space activities are parties to the Outer Space Treaty and that at least some of its provisions are likely to have crystallized into customary international law, although this is somewhat controversial due to the comparatively little state practice and *opinio juris* on space activities compared to other subject matters of international law.[109]

B. ARTICLE IV OF THE OUTER SPACE TREATY

1. Interpretation of Article IV

The United Nations, through COPUOS, has long affirmed the principle that military uses of outer space are to be limited or confined in some way by the law. However, the specific provisions of the treaties are far from clear because they appear to draw distinctions between outer space *sensu stricto*, the empty space between celestial bodies, and outer space *sensu lato*, which includes both "outer space" and the celestial bodies.[110] For example, Article IV of the Outer Space Treaty states that:

1. States Parties to the Treaty undertake not to place in orbit around the [E]arth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.
2. The moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes.

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[107] *Id.*

[108] Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., Status of International Agreements Relating to Activities in Outer Space as at 1 January 2013, U.N. Doc. A/AC.105/C.2/2013/CRP.5 (Mar. 28, 2013).

[109] Bin Cheng, *The 1967 Outer Space Treaty: Thirtieth Anniversary*, 23 AIR & SPACE L. 156, 162–63 (1998).

[110] Bin Cheng, *Introducing a New Term to Space Law: "Outer Void Space"*, 11 KOREAN J. AIR & SPACE L. 321, 321–26 (1999); Bin Cheng, *Properly Speaking, Only Celestial Bodies Have Been Reserved for Use Exclusively for Peaceful (Non-Military) Purposes, but Not Outer Void Space, in* INTERNATIONAL LAW ACROSS THE SPECTRUM OF CONFLICT: ESSAYS IN HONOUR OF PROFESSOR L.C. GREEN ON THE OCCASION OF HIS EIGHTIETH BIRTHDAY 81–117 (Michael N. Schmitt ed., 2000); Arjen Vermeer, *The Laws of War in Outer Space: Some Legal Implications for* Jus ad Bellum *and* Jus in Bello *of the Militarisation and Weaponisation of Outer Space, in* THE NEW ORDER OF WAR 69–88 (Bob Brecher ed., 2010).

> The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration of the moon and other celestial bodies shall also not be prohibited.[111]

The first limb of Article IV is a prohibition on the deployment of any nuclear weapons and other weapons of mass destruction in outer space.[112] This presumably refers to outer space *sensu lato,* thus including outer space, the Moon, and other celestial bodies. However, this prohibition does appear to prevent the stationing of any other type of weapon in outer space for military purposes, such as conventional or even laser weapons. This prohibition also does not prevent *use* or *detonation* of any nuclear weapon or other weapons of mass destruction in outer space. In other words, the prohibition in Article IV alone does not prevent states from using outer space for military purposes or activities, provided that these do not involve *deploying* nuclear weapons and other weapons of mass destruction in outer space.[113]

2. *Application of Article IV*

It is interesting to consider the effects that Article III of the Outer Space Treaty has on the prohibitions in Article IV. On one hand, the specific reference to the U.N. Charter suggests that some primacy should be given to compliance with the Charter and, accordingly, any inconsistency between the Outer Space Treaty and the U.N. Charter would cause the terms of the latter to prevail.[114] On the other hand, Article III of the Outer Space Treaty provides that it is the entire corpus of international law—not only the U.N. Charter—that applies to activities in the exploration and use of outer space.[115] The Vienna Convention on the Law of Treaties (Vienna Convention) provides that later treaties prevail over earlier treaties, subject to the operation of

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[111] Outer Space Treaty, *supra* note 94, art. IV.

[112] *Id.*

[113] Bin Cheng, *The Legal Status of Outer Space and Relevant Issues: Delimitation of Outer Space and Definition of Peaceful Use,* 11 J. SPACE L. 89, 101–02 (1983).

[114] Outer Space Treaty, *supra* note 94, art. III.

[115] *Id.*

Article 103 of the U.N. Charter.[116] Given the above discussion, it is apparent that *obligations* arising from the U.N. Charter would prevail over any rights or obligations contained in the Outer Space Treaty; otherwise, the terms of the Outer Space Treaty would prevail over the terms of the U.N. Charter in the event of any inconsistency.

Within this context, the prohibitions as contained in Article IV of the Outer Space Treaty would prevail over any other treaty, save for any obligation arising under the U.N. Charter. Article 2(4) of the U.N. Charter provides that states are to refrain "from the threat or use of force against the territorial integrity or political independence of any state, or in any other manner inconsistent with the Purposes of the United Nations."[117] This obligation prohibiting the use of force by states has been held to be an obligation *erga omnes*, as the principle is considered to be *jus cogens* and thus binding on all states as a customary norm.[118] The only provision of the U.N. Charter that provides for an *obligation* to use force arises under Article 42, which authorizes the Security Council to "take action by air, sea and land forces" where necessary to maintain or restore international peace and security.[119] States are under an express obligation to comply with decisions of the Security Council, including decisions arising under Article 42 of the U.N. Charter.[120] To the extent that Article IV of the Outer Space Treaty does not constitute *jus cogens*, a decision made by the Security Council to use military force in outer space would prevail over any prohibitions or obligations under Article IV of the Outer Space Treaty.[121]

On the subject of self-defense, Article 51 of the U.N. Charter provides:

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[116] Vienna Convention on the Law of Treaties art. 30, *opened for signature* May 23, 1969, 1155 U.N.T.S. 331 (entered into force Jan. 27, 1980) [hereinafter Vienna Convention].

[117] U.N. Charter art. 2, para. 4.

[118] Military and Paramilitary Activities in and Against Nicaragua (Nicar. v. U.S.), 1986 I.C.J. 14 (June 27); *see also* Vienna Convention, *supra* note 116, art. 53 (for the effect of *jus cogens* on the treaty obligations of states).

[119] Certain Expenses of the United Nations, Advisory Opinion, 1962 I.C.J. 151, 167 (July 20). The ICJ noted that use of military force may also be lawfully conducted with the consent of the subject state or based on the right of self-defense as provided under Article 51 of the U.N. Charter. *See* U.N. Charter art. 51.

[120] *See* U.N. Charter arts. 25, 48.

[121] *See* Ricky J. Lee, *The* Jus ad Bellum in Spatialis*: The Exact Content and Practical Implications of the Law on the Use of Force in Outer Space*, 29 J. SPACE L. 93, 112 (2003).

> Nothing in the present Charter shall impair the inherent right of individual or collective self-defence if an armed attack occurs against a Member of the United Nations, until the Security Council has taken the measures necessary to maintain international peace and security. Measures taken by Members in the exercise of this right of self-defence shall be immediately reported to the Security Council and shall not in any way affect the authority and responsibility of the Security Council under the present Charter to take at any time such action as it deems necessary in order to maintain or restore international peace and security.[122]

Considering that self-defense, even collective self-defense, is expressed as a *right* rather than an *obligation*, Article 103 of the U.N. Charter would have no effect on Article 51. The Vienna Convention provides that a later treaty, such as the Outer Space Treaty, prevails over an earlier treaty, such as the U.N. Charter, in the event of any inconsistency, subject only to Article 103 of the U.N. Charter.[123] In this context, the prohibitions contained in Article IV of the Outer Space Treaty would arguably prevail in all circumstances except where the Security Council decides expressly or impliedly that military action, including the deployment and the use of force in contravention of Article IV of the Outer Space Treaty, is sanctioned under Article 42 of the U.N. Charter. On the other hand, while this position would be correct in the context of the effects of Article IV of the Outer Space Treaty on Article 51 of the U.N. Charter, such a discussion must also take into account that the right to individual and collective self-defense has an existence as a *jus cogens* norm of customary international law external to the terms of Article 51.[124] This can be seen from the actual wording of Article 51 of the U.N. Charter, which provides for the recognition of the "inherent right" to self-defense rather than explicitly providing for the right to self-defense within its own terms.[125]

Principles that are expressed as *jus cogens* norms, or peremptory norms of general international law, have effect and prevail

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[122] U.N. Charter art. 51.

[123] Vienna Convention, *supra* note 116, art. 30.

[124] *See, e.g.*, STANMIR A. ALEXANDROV, SELF-DEFENCE AGAINST THE USE OF FORCE IN INTERNATIONAL LAW (1996); YORAM DINSTEIN, WAR, AGGRESSION AND SELF-DEFENCE 164 (2d ed., 2001); Terry D. Gill, *The Temporal Dimension of Self-Defence: Anticipation, Pre-emption, Prevention and Immediacy*, 11 J. CONFLICT SECURITY L. 361, 363 (2006); Natalia Ochoa-Ruiz & Esther Salamanca-Aguado, *Exploring the Limits of International Law Relating to the Use of Force in Self-Defence*, 16 EUR. J. INT'L L. 499, 508 (2005).

[125] U.N. Charter art. 51.

over express and implied terms of treaties in the event of any inconsistency.[126] To that end, Article 53 of the Vienna Convention provides that:

> A treaty is void if, at the time of its conclusion, it conflicts with a peremptory norm of general international law. For the purposes of the present Convention, a peremptory norm of general international law is a norm accepted and recognized by the international community of States as a whole as a norm from which no derogation is permitted and which can be modified only by a subsequent norm of general international law having the same character.[127]

Accordingly, unless Article IV of the Outer Space Treaty is also in itself a *jus cogens* norm of general international law, the right to individual and collective self-defense as a *jus cogens* norm would prevail over the prohibitions contained in the Outer Space Treaty, if such a prohibition actually exists. With this construction, it is apparent that the lawful use of force by one or more states as sanctioned under Articles 42 or 51 of the U.N. Charter would not be bound by the limitations contained in Article IV of the Outer Space Treaty. This is particularly the case in relation to the deployment of nuclear weapons and weapons of mass destruction and the demilitarization of the Moon and other celestial bodies. However, the unlawful use of force by one or more states, namely military acts of aggression, would be bound by the terms of Article IV of the Outer Space Treaty. It is also noteworthy that if Article IV of the Outer Space Treaty is in itself a *jus cogens* norm, then the right to individual and collective self-defense could conceivably be confined by its terms.

The ambit and scope of the restrictions in Article IV of the Outer Space Treaty are also contingent upon whether one interprets the text restrictively or expansively. This is because a restrictive interpretation of the provisions may lead one to argue that the "exclusively for peaceful purposes" norm is restricted to the specific military activities therein enumerated and prohibited, namely, "[t]he establishment of military bases, installations and fortifications, the testing of any type of weapons[,] and the conduct of military manoeuvers on celestial bodies."[128] In applying the logic applied by the Permanent Court of International Justice in the *Steamship Lotus* case, one may then argue that what

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[126] Vienna Convention, *supra* note 116, art. 53.

[127] *Id.*

[128] Outer Space Treaty, *supra* note 94, art IV.

is not specifically prohibited under this enumeration remains permitted in law.[129] Considering that the right of self-defense remains applicable, one can argue that these restrictions only apply during times of peace and that the preparation for these activities for the exercise of the right of self-defense remains permissible.

In deconstructing the "exclusively for peaceful purposes" norm in Article IV of the Outer Space Treaty, it is interesting to note that within the enumeration of prohibited activities, the word "attack" is not used.[130] The omission of the word "attack" strengthens the argument that the prohibitions in Article IV apply only to peacetime military activities. In international law, the word "attack" is a concept of the law of armed conflict and is defined in Article 49(1) of the Additional Protocol I to the Geneva Conventions as an act of violence against an adversary; in accordance with Article 49(2) of the Additional Protocol I, an "attack" may be made either as an offensive or defensive operation, irrespective of the territory or the international space where it is conducted.[131]

It is also important to note that the prohibited activities under Article IV of the Outer Space Treaty are not preceded with words ("like" or "such as") presupposing that the activities are generic enumerations.[132] The prohibited activities are simply stated, which leads one to presuppose that the list is closed and limited to these specific activities. From a grammatical perspective, the enumeration is not open-ended—there is no use of verbiage like "and other similar activities"—which gives further credence to the restrictive interpretation theory.[133]

Under an expansive interpretation, these enumerations must simply be seen as examples of generic activities that are prohibited, or as examples that do not restrict the "exclusively for peaceful purposes" verbiage.[134] It should be noted that states are generally reluctant to give expansive interpretations to restrictive terms, or vice versa, that could restrict their latitude of action on issues of national security. In the context of the military

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[129] S.S. Lotus (Fr. v. Turk.), 1927 P.C.I.J. (ser. A) No. 10 (Sept. 7).

[130] Outer Space Treaty, *supra* note 94, art. IV.

[131] Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I) art. 49, June 8, 1977, 1125 U.N.T.S. 3 [hereinafter Additional Protocol I].

[132] Outer Space Treaty, *supra* note 94, art. IV.

[133] *Id.*

[134] *Id.*

use of satellite applications, a wide definition of "peaceful purposes" would make more military applications of satellite applications permissible; conversely, a narrower definition of "peaceful purposes" may pose a legal obstacle to some military applications of space activities.[135]

VI. SPECIFIC SPACE LAW PRINCIPLES ON SATELLITE APPLICATIONS

A. OVERVIEW

In the 1980s, after the adoption of the U.N. space treaties, the international community, particularly the Legal Sub-Committee of COPUOS, sought to formulate legal principles in relation to specific space activities.[136] Rather than adopting these principles in the form of multilateral treaties, these principles were set out in declarations annexed to resolutions of the U.N. General Assembly.[137] Although the resolutions lack the legal certainty provided by treaties, there is general acceptance that they have some value in international rulemaking, as noted by the International Court of Justice in the *Advisory Opinion on the Legality of the Threat or Use of Nuclear Weapons*:

> The Court notes that General Assembly resolutions, even if they are not binding, may sometimes have normative value. They can, in certain circumstances, provide evidence important for establishing the existence of a rule or the emergence of an *opinio juris*. To establish whether this is true of a given General Assembly resolution, it is necessary to look at its content and the conditions for its adoption; it is also necessary to see whether an *opinio juris* exists as to its normative character. Or a series of resolutions may show the gradual evolution of the *opinio juris* required for the establishment of a new rule.[138]

In the case of remote sensing, direct television broadcasting, and the use of nuclear power sources, the General Assembly has adopted specific declarations setting out the legal principles for-

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[135] *Id.*

[136] For an index of resolutions relating to outer space, see *Index of Online General Assembly Resolutions Relating to Outer Space*, U.N. OFF. FOR OUTER SPACE AFF., http://www.oosa.unvienna.org/oosa/SpaceLaw/gares/index.html (last visited May 19, 2014).

[137] *See United Nations Committee on the Peaceful Uses of Outer Space*, U.N. OFF. FOR OUTER SPACE AFF., http://www.oosa.unvienna.org/oosa/en/COPUOS/copuos.html (last visited May 19, 2014).

[138] Legality of the Threat or Use of Nuclear Weapons, Advisory Opinion, 1996 I.C.J. 226, 254–55 (July 8).

mulated by the Legal Sub-Committee that apply to those activities.[139] In the case of satellite telecommunications, in contrast to other satellite applications, the international community has gone much further by having these activities regulated by the International Telecommunication Union (ITU), as discussed in greater detail below.[140] At the other end of the continuum, there are no specific principles of international law concerned with the use of global positioning systems.

B. Remote Sensing

1. The Law of Remote Sensing

In response to the need for specific legal rules for remote sensing activities, the U.N. General Assembly adopted the Remote Sensing Principles to govern the remote sensing activities of states, their nationals, and commercial entities.[141] In the Remote Sensing Principles, "remote sensing" is defined as activities involving "the sensing of the Earth's surface from space by making use of the properties of electromagnetic waves emitted, reflected or diffracted by the sensed objects."[142]

One major concern related to remote sensing is its potentially detrimental effect on the sovereignty and interests of the "sensed" states. This is especially the case where the states that are subject to the remote sensing activities of other states have not consented to the activities and have not been consulted prior to the activities taking place. As a result, the Remote Sensing Principles address remote sensing as well as the data produced, including the processing of the "primary data" and the dissemination of "analyzed information."[143] As with most other international space law instruments, the Remote Sensing Principles require states to "promote international cooperation" by allowing participation of all states on "equitable and mutually acceptable terms."[144] Further, the Remote Sensing Principles

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[139] *See, e.g.*, Ricky J. Lee, Law and Regulation of Commercial Mining of Minerals in Outer Space 116–17 (2012).

[140] Constitution and Convention of the International Telecommunication Union art. 45, Dec. 22, 1992, 1825 U.N.T.S. 331 [hereinafter ITU Constitution and Convention].

[141] Principles Relating to Remote Sensing of the Earth from Outer Space, G.A. Res. 41/65, Annex, U.N. Doc. A/RES/41/65 (Dec. 3, 1986) [hereinafter Remote Sensing Principles].

[142] *Id.*

[143] *Id.* princ. XII.

[144] *Id.* princ. V.

call for the establishment of international processing facilities for remote sensing data "within the framework of regional agreements and arrangements wherever feasible."[145] The use of vague phrases such as "whenever feasible" and "mutually acceptable" have ensured that the terms of the Remote Sensing Principles would not be specific enough to be overly controversial for the industrialized states but would still address the real or ideological concerns of the developing states.[146]

This is not to suggest that the Remote Sensing Principles provide no legal obstacles to military satellite reconnaissance activities. Specifically, Principle I requires remote sensing activities to be undertaken to improve "natural resources management, land use and the protection of the environment."[147] This leaves open the interpretation that remote sensing technologies can only be applied for those limited purposes, thus prohibiting any military application as well as other civilian purposes.[148] Alternatively, a more creative argument would be to suggest that remote sensing for other purposes is not prohibited but rather falls outside the purview of the Remote Sensing Principles and is therefore governed by existing principles of international law that may relate to such activities.[149]

In terms of international state responsibility for governmental and private activities, Principle IV of the Remote Sensing Principles prohibits activities from being "conducted in a manner detrimental to the legitimate rights and interests of the sensed [s]tate" and madates that they be conducted "with due regard to the rights and interests, in accordance with international law, of other [s]tates."[150] In regard to the dissemination of data, the Remote Sensing Principles require the distribution of data to be done on a "non-discriminatory basis" and on "reasonable cost terms."[151] Specifically, Principle XII states:

> As soon as the primary data and the processed data concerning the territory under its jurisdiction are produced, the sensed [s]tate shall have access to them on a non-discriminatory basis

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[145] *Id.* princ. VI.

[146] *See* STEPHEN GOROVE, DEVELOPMENTS IN SPACE LAW: ISSUES AND POLICIES 293–302 (1991).

[147] Remote Sensing Principles, *supra* note 141, princ. I(a).

[148] Ricky J. Lee, *Reconciling International Space Law with the Commercial Realities of the Twenty-First Century*, 4 SING. J. INT'L COMP. L. 198, 216 (2000).

[149] Ram Jakhu, *International Policy and Law-Making Process for Remote Sensing by Satellite*, 22 ANNALS AIR & SPACE L. 451, 452 (1997).

[150] Remote Sensing Principles, *supra* note 141, princ. IV.

[151] *Id.* princ. XII.

> and on reasonable cost terms. The sensed [s]tate shall also have access to the available analysed information concerning the territory under its jurisdiction in the possession of any [s]tate participating in remote sensing activities on the same basis and terms, taking particularly into account the needs and interests of the developing countries.[152]

As Ram Jakhu pointed out, there is no definition and no indication as to what is "reasonable" and what would constitute a "non-discriminatory basis."[153] Meanwhile, there is no limitation on the use of the disseminated data afterwards, which is arguably the stage at which most harm can be done to the sensed states.

The Remote Sensing Principles also require states to ensure that remote sensing activities are conducted in accordance with the Principles and that the operator complies with the "norms of international law on [s]tate responsibility for remote sensing activities."[154] This is rather ambiguous since there are, at present, no norms of international law on state responsibility *for* remote sensing activities. The French text, to which the Russian version is similar, uses the phrase *en ce qui concerne* instead of "for," inferring that the provision relates to the applicability of the general principles of state responsibility to remote sensing activities.[155] As each of the texts is equally official in status, it is difficult to determine which interpretation provides the correct operation and approach of the provision.

These views have to be balanced with the specific circumstances in which the Remote Sensing Principles were adopted, along with the terms of the Resolution itself. The Remote Sensing Principles resolution was adopted without a vote by the General Assembly in 1986, as were most other space law principles.[156] However, some states nonetheless expressed serious reservations with some of the terms and provisions of the Remote Sensing Principles, especially the issue of requiring consent from sensed states.[157] The continuing debate over the

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[152] *Id.*

[153] Jakhu, *supra* note 149, at 452.

[154] Remote Sensing Principles, *supra* note 141, princ. XIV.

[155] *See* Vladimir Kopal, *Principles Relating to Remote Sensing of the Earth from Outer Space: A Significant Outcome of International Cooperation in the Progressive Development of Space Law*, 30 PROC. COLLOQUIUM L. OUTER SPACE 322, 327 (1987).

[156] *See Resolutions Adopted by the General Assembly at Its 41st Session*, U.N. DAG HAMMARSKJÖLD LIBR., http://www.un.org/Depts/dhl/resguide/r41_en.shtml (last visited May 19, 2014).

[157] Even though formal consensus was reached, the speeches from various delegations at the final negotiations indicated that serious differences of opinion

meaning of the terms "discrimination" and the "reasonable basis" for the supply of data lends further support to the view that the Remote Sensing Principles, as a whole, cannot be considered as evidence of existing principles of customary international law.

Although the Remote Sensing Principles as a whole may not be considered the embodiment of customary international law, this has not prevented some of its provisions, especially Principle IV, from crystallizing into custom. In the authors' view, the fact that the resolution containing the Remote Sensing Principles was adopted by consensus, with most of the reservations being made by states advocating a further requirement of consent to the existing obligation of Principle IV, suggests that the requirement of not undertaking remote sensing activities to the detriment of legitimate rights and interests of sensed states is one of virtually universal support and therefore has crystallised into customary international law. Similarly, the lack of express reservations or disputes over the operation and application of Principle XII may allow such a principle to be asserted as a binding principle of custom as well.

2. *Implications of Military Use of Remote Sensing*

As discussed above, Article IV of the Outer Space Treaty poses no obstacles to the use of remote sensing for military purposes, especially when the use of satellite remote sensing is to further the fulfillment of the requirements of a Security Council decision under Chapter VII of the U.N. Charter.[158] Therefore, the crucial factor in determining the legality of the military use of remote sensing is whether there is a contravention of Principle XII, assuming it has crystallized into customary law.

In an armed conflict, the sensing state is highly unlikely to make available any data collected from the remote sensing operation to the sensed state on a non-discriminatory basis and on reasonable cost terms. Therefore, this produces a prima facie breach of Principle XII of the Remote Sensing Principles, which does not provide any exceptions in its application, unless there is a resolution of the Security Council authorizing the denial of the remote sensing data to the sensed target state, even if it was

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remained in the States' approaches to the issue. *See* Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., Summary Record of the 290th Meeting, Mar. 20, 1978, U.N. Doc. A/AC.105/C.2/SR.290 (Mar. 23, 1978).

[158] *See* Outer Space Treaty, *supra* note 94, art. IV; U.N. Charter ch. VII.

merely through reference to the use of "any means necessary" or phrases with like effect.[159] This is because the obligations arising under the U.N. Charter would override any obligation imposed in customary international law (though not by the operation of Article 103, as it only applies to conflicts with treaties) unless it has attained the status of *jus cogens*.[160]

C. Satellite Communications

In addition to the Outer Space Treaty and other general space law instruments, satellite telecommunications are mainly regulated by the ITU, whose Member States are bound by the terms of the ITU Constitution and Convention.[161] There are two main reasons for the need for international regulation of satellite telecommunications. First, the use of radio frequencies is a finite resource that must be centrally allocated at an international level in order to prevent interference arising from different states utilizing the same or similar frequencies for their services.[162] Secondly, with the advent of satellite telecommunications, it was recognized early on that the use of the geostationary orbit would have to be controlled.[163] Article 44 of the ITU Constitution and Convention states that:

> 1. Members shall endeavour to limit the number of frequencies and the spectrum used to the minimum essential to provide in a satisfactory manner the necessary services. To that end, they shall endeavour to apply the latest technical advances as soon as possible.
> 2. In using frequency bands for radio services, Member States shall bear in mind that radio frequencies and any associated orbits, including the geostationary-satellite orbit, are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have equitable access to those orbits and frequencies, taking into account the special needs of the developing countries and the geographical situation of particular countries.[164]

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[159] Remote Sensing Principles, *supra* note 141, princ. VII.

[160] *See* Kamrul Hossain, *The Concept of Jus Cogens and the Obligation Under the U.N. Charter*, 3 Santa Clara J. Int'l L. 72 (2005).

[161] ITU Constitution and Convention, *supra* note 140, art. 3, para. 1.

[162] *Id.* art. 44, para. 1.

[163] *Id.* art. 44, para. 2.

[164] *Id.* art. 44.

In addition to general regulatory provisions, the ITU Constitution and Convention also sets out several principles in relation to the conduct of satellite telecommunications.[165] For example, telecommunications devices cannot be established or operated in such a manner that causes harmful interference to the radio communications or services of other states.[166] The term "harmful interference" is defined in the Annex of the ITU Constitution as "interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with the Radio Regulations."[167]

More relevant to the issue of military use is Article 48, which provides:

1. Member States retain their entire freedom with regard to military radio installations.
2. Nevertheless, these installations must, so far as possible, observe statutory provisions relative to giving assistance in case of distress and to the measures to be taken to prevent harmful interference, and the provisions of the Administrative Regulations concerning the types of emission and the frequencies to be used, according to the nature of the service performed by such installations.
3. Moreover, when these installations take part in the service of public correspondence or other services governed by the Administrative Regulations, they must, in general, comply with the regulatory provisions for the conduct of such services.[168]

It is clear that the "entire freedom" referred to in the first paragraph of Article 48 means that any military use of radio communications would be subject only to the obligations set out in the second paragraph of Article 48. This is an implicit endorsement of the view that Article IV of the Outer Space Treaty does not amount to a broad requirement for outer space to be used for peaceful purposes only—such a broad interpretation would clearly eliminate any existing "freedom" concerning military radio installations. Consequently, there would be some difficulty in asserting that international law, particularly international space law, imposes any restriction on the military use of satellites for communications purposes.

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165 *Id.* arts. 33–43.

166 *Id.* art. 45.

167 *Id.* Annex.

168 *Id.* arts. 45, 46.

VII. FUTURE USE OF SATELLITE APPLICATIONS IN THE WAR ON TERROR

A. Overview

The U.S. military is currently investigating the use of high altitude, *Long Loiter* airships, akin to early reconnaissance platforms as simple as hot air balloons.[169] This technology offers the ability to persistently survey an area without the need for refueling, can operate at altitudes between eighteen and sixty kilometers above the Earth, and has a lower cost than the launching of satellites.[170] This ability to consistently monitor would give greater strategic advantage than ground surveilance, avoiding the problems of camouflage techniques and the hiding of forces among the buildings and streets of urban areas. Notably, this system operates at a height where international space law principles may not be considered applicable.[171] However, the operation of the system would likely raise a myriad of aviation law and other international law considerations.

B. Radio Interference

It is no secret that GPS navigation systems are vulnerable. Given their critical importance to national security strategies, development of risk mitigation strategies are crucial. GPS signals are weak and are susceptible to radio interference. GPS jammers are readily available, and a jamming attack could be mounted at low cost at any time.[172] In 2000, U.S. and Australian militaries conducted trials that "demonstrated that the vulnerability of [GPS] receivers to interference can be greatly reduced."[173] A system called the GPS Jammer Locater system (JLOC) has been designed to "locate GPS jamming/interference sources and provide data . . . to assist in defeating these sources."[174]

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169 *High Altitude, Long Loiter (HALL) UAV*, Defense-Update.com, http://defense-update.com/20081030_hall_uav.html (last visited May 19, 2014).

170 *Id.*

171 *Id.*

172 Dan Parsons, *Simple, Inexpensive Jammers Threaten GPS*, Nat'l Def. (Sept. 2013), http://www.nationaldefensemagazine.org/archive/2013/september/pages/simple,inexpensivejammersthreatenGPS.aspx; *see IT Security Expert Advisory Group (ITSEAG)*, Trusted Info. Sharing Network, http://www.tisn.gov.au/Pages/IT-Security-Group.aspx (last visited Jan. 29, 2014).

173 Press Release, DSTO 4/2000, Australia-U.S. Defense Trials Point to More Reliable GPS Navigation (June 29, 2000), *available at* www.dsto.defence.gov.au/news/3290/?print=true.

174 *Id.*

C. Anti-Satellite Weapons

1. *Overview*

Although there is no international legal instrument presently in force that specifically regulates the testing, deployment, and use of anti-satellite (ASAT) weapons in outer space, these military exercises nonetheless do not occur in a legal vacuum. From a legal perspective, these tests bring to the forefront certain legal issues concerning the testing of weapons and military exercises in outer space. In this context, Articles IV and IX of the Outer Space Treaty need to be analyzed and considered.

2. *Article IX of the Outer Space Treaty*

Article IX of the Outer Space Treaty creates three specific duties, specifically:

1) State Parties are to conduct their activities with due regard to the corresponding interests of all other State Parties to the Outer Space Treaty;
2) studies of outer space are to be pursued and explorations of outer space are to be conducted so as to avoid harmful contamination of outer space and adverse changes in the environment of the Earth resulting from the introduction of extra-terrestrial matter and, where necessary, appropriate measures are to be adopted for this purpose by State Parties; and
3) if a State Party has reason to believe that an *activity* or *experiment* planned would cause potentially *harmful interference* with the activities of other State Parties in their peaceful exploration and use of outer space, then the planning State Party is to undertake appropriate international consultations before proceeding with the activity.[175]

Further, Article IX creates two corresponding rights for each state. These are:

1) the right to have its interests in outer space cared for by other State Parties through the exercise of due regard; and
2) the right to request consultation on a specific activity should a State Party have reason to believe that an activity or experiment planned by another State Party in outer space could cause potentially harmful interference with its

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[175] Outer Space Treaty, *supra* note 94, art. IX (emphasis added).

> activities in the peaceful exploration and use of outer space.[176]

The duty to avoid harmful interference applies to states that pursue studies of and conduct exploration of outer space.[177] Consequently, this duty would only apply to the testing of space weapons that include the pursuit of a study of or the conduct of exploration of outer space; the duty would not be applicable to the simple test of a space weapon occuring independently of these two factors. Furthermore, this duty establishes an example of a specific procedural content to the application of the norm of due regard in the Outer Space Treaty.[178] Although a literal reading of the provisions of Article IX would suggest that there is no duty to avoid harmful interference if the activity being conducted is not of an academic, scientific, or exploratory nature, it is submitted that this would not confine the meaning and scope of the duty to have due regard to the corresponding interest of other states. In other words, the reference to the conduct of scientific or exploratory pursuits may be interpreted in an expansive rather than restrictive context.

The positive duty to conduct international consultations where there is a risk of harmful interference is applicable to the testing of space weapons but is contingent upon the subjective perception of the state conducting the test.[179] Consequently, the normative disposition of this obligation is structurally weak as it is contingent upon the self-interest of the state, as determined subjectively by that state, in applying the norm. Again, in analyzing state practice, one can only conclude that China and the United States did not consider that the resulting debris field from their ASAT kinetic-kill vehicle tests would cause harmful potential interference to the space activities of other states. This pattern of state practice in interpreting the Outer Space Treaty is certainly a cause for concern insofar as it indicates that ASAT tests remain extraneous to the Treaty's normative structure.

3. Article IV of the Outer Space Treaty

The space weapons under development or consideration today are primarily conventional. Some space weapons, such as ASAT kinetic-kill vehicles, function purely on the destructive

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176 *Id.*
177 *Id.*
178 *Id.*
179 *Id.*

force of their kinetic energy.[180] Consequently, considering the history of the term "weapons of mass destruction," one can debate whether the normative disposition of the Outer Space Treaty encompasses such weapons. If one were to reinterpret the normative dispositions concerning weapons of mass destruction in Article IV of the Outer Space Treaty, specifically under a broad definition of the term "weapon of mass destruction" that would reincorporate the original meaning the term, Article IV of the Outer Space Treaty could well apply to conventional space weapons that may cause mass destruction from their use. It should be noted that such restriction would apply to the effect of and not to the weapon itself. An ASAT kinetic-kill vehicle that creates a debris field large enough to indiscriminately destroy other satellites and that impedes or makes it dangerous to access or use outer space may well be considered a weapon of mass destruction, though it is unlikely that the international community would elect to adopt such a broad interpretation of the term "weapon of mass destruction" and thereby restrain the development of such weapons.

D. WEAPONIZATION

1. Generally

From the above analysis, it is apparent that the deployment of conventional weapons in outer space, even in orbit around Earth, is not prohibited by the corpus of international space law. This is because Article IV of the Outer Space Treaty prohibits only the placement of nuclear weapons and other weapons of mass destruction in outer space *sensu stricto* and is silent on the subject of conventional weapons.[181] The specificity in referring to nuclear weapons and weapons of mass destruction may be a deliberate exclusion of conventional weapons on the part of the framers of Article IV from the scope of the Treaty's application. Further, as discussed above, there is a real possibility that the deployment of such conventional weapons in outer space would not contravene the duties and obligations imposed under Articles I and IX of the Outer Space Treaty.

Such a conclusion is subject to the caveat that Article IV of the Outer Space Treaty requires the Moon and other celestial bod-

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[180] *A History of Anti-Satellite Programs*, UNION CONCERNED SCIENTISTS, http://www.ucsusa.org/nuclear_weapons_and_global_security/space_weapons/policy_issues/a-history-of-anti-satellite.html (last visited May 19, 2014).

[181] Outer Space Treaty, *supra* note 94, art. IV.

ies to be used exclusively for "peaceful purposes" and specifically prohibits the "establishment of military bases, installations and fortifications, the testing of any type of weapons[,] and the conduct of military maneuvers" on the Moon and celestial bodies.[182] Some states, such as the former Soviet Union, interpreted the phrase "exclusively for peaceful purposes" as prohibiting all military activities, with the exception of those which are specifically permitted within the Outer Space Treaty.[183] As Nandasiri Jasentuliyana pointed out, advocates of this theory cite the Statute of the International Atomic Energy Agency that differentiates "peaceful" from "military" uses of atomic energy, making all military activities nonpeaceful.[184] Ivan Vlasic also highlighted that in early interpretations of the Outer Space Treaty, the Soviet publicists had preferred to interpret "peaceful" as meaning "non-military."[185] Conversely, western states have consistently interpreted the word "peaceful" to exclude only acts of aggression.[186] The Moon Agreement further prohibits "any threat or use of force or any other hostile act or threat of hostile act," including using celestial bodies "in order to commit any such act or to engage in any such threat."[187] Such prohibitions in the Moon Agreement apply not only to the Moon and other celestial bodies in the Solar System but also to the orbits around them and trajectories to and around them.[188] These prohibitions, however, would have limited legal effect in the context of the lawful use of military force as sanctioned by the Security Council under Article 42 of the U.N. Charter or as part of the

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182 *Id.*

183 NANDASIRI JASENTULIYANA, INTERNATIONAL SPACE LAW AND THE UNITED NATIONS 105–06 (1999).

184 *Id.*

185 Ivan A. Vlasic, *The Legal Aspects of Peaceful and Non-Peaceful Uses of Outer Space, in* PEACEFUL AND NON-PEACEFUL USES OF SPACE: PROBLEMS OF DEFINITION FOR THE PREVENTION OF AN ARMS RACE 39 (Bhupendra Jasani ed., 1991).

186 Christol provides an excellent description of the drafting history of the Outer Space Treaty along with a discussion of the possible interpretations of "peaceful purposes" and various proposals made by the United States and the Soviet Union. CARL Q. CHRISTOL, THE MODERN INTERNATIONAL LAW OF OUTER SPACE 22–26 (1982).

187 Moon Agreement, *supra* note 95, art. 3(2).

188 *Id.* arts. 1(1)–(2). However, it must be noted that as of January 1, 2013, only fifteen states have ratified the Moon Agreement, and the only space powers among this group are Australia and France. *See Status of the Moon Agreement*, U.N. OFF. FOR OUTER SPACE AFF., www.oosa.unvienna.org/oosa/SpaceLaw/treatystatus/index.html (last visited May 19, 2014).

exercise of the *jus cogens* right to self-defense as recognized by Article 51 of the U.N. Charter.

The operation of these two principles prevail over the prohibitions contained in Article IV of the Outer Space Treaty and Article 3 of the Moon Agreement, the former as a result of the operation of Articles 25 and 103 of the U.N. Charter, and the latter as a result of the operation of Article 53 of the Vienna Convention. Accordingly, to the extent that any restriction can be said to apply to the weaponization of outer space under the Outer Space Treaty, such restriction must be considered within the context of the legality of the activity under the U.N. Charter. In other words, the legality of such actions depend not on the Outer Space Treaty but rather on the U.N. Charter.

2. *Weaponization by Private Actors*

The legality of the deployment of conventional weapons in Earth orbit by a private entity is, however, somewhat legally dubious. Belligerent rights, namely the application of military force within the international community, may only be exercised by states in a manner that is consistent with international law.[189] Consequently, non-state actors cannot use these arguments to justify the legality of the deployment of weapons in outer space, though commentators have suggested that state actors have the inherent right to use force in self-defense against non-state actors.[190] Should non-state actors ever place conventional weapons in Earth orbit, the use of such weapons during an international armed conflict would be legally questionable, subject to the norms concerning the direct participation in hostilities by civilians and mercenaries. The principles recognized in *The Hostages Trial* at the end of the World War II may apply to military operations in outer space, namely:

> [T]he rule is established that a civilian who aids, abets or participates in the fighting is liable to punishment as a war criminal under the laws of war. Fighting is legitimate only for combatant personnel of a country. It is only this group that is entitled to

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[189] *See, e.g.*, Tarcisio Gazzini, *The Rules on the Use of Force at the Beginning of the XXI Century*, 11 J. CONFLICT SECURITY L. 319, 322 (2006); ALEXANDROV, *supra* note 124; DINSTEIN, *supra* note 124, at 164.

[190] *See, e.g.*, Michael Bothe, *Terrorism and the Legality of Pre-Emptive Force*, 14 EUR. J. INT'L. L. 227, 233 (2003); Tom Ruys & Sten Verhoeven, *Attacks by Private Actors and the Right of Self-Defence*, 10 J. CONFLICT SEC. L. 289, 289 (2005); Eric P.J. Myjer & Nigel D. White, *The Twin Towers Attack: An Unlimited Right to Self-Defence?*, 7 J. CONFLICT SEC. L. 5, 7 (2002).

> treatment as prisoners of war and incurs no liability beyond detention after capture or surrender.[191]

Further, Article VI of the Outer Space Treaty requires that:

> States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty.[192]

It is clear from the terms of Article VI that states are required to ensure that activities of private entities are subject to "authorization" and "continuing supervision" and that they are to bear international responsibility for such activities.[193] Accordingly, the states would be required to ensure that the military activities of private entities, including the deployment and use of conventional weapons in Earth orbit, conform to the principles of international law.

VIII. CONCLUSIONS

The use of satellite applications has become an integral part of the contemporary conduct of military operations, from the low-bandwidth uses of GPS, voice communications, signals intercepts, and low-resolution radar remote sensing imagery, to high-bandwidth uses of live video streaming, direct media broadcasting, and high-resolution optical remote sensing imagery. This is particularly notable in the War on Terror Operations, where ground communications infrastructure may be unavailable (like in Afghanistan) or unsecured (like in Iraq).

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[191] *The Hostages Trial: Trial of Wilhelm List and Others*, 8 LAW REP. TRIALS WAR CRIMINALS 34, 58 (1949); *see also* Additional Protocol I, *supra* note 131. For an excellent analysis of Additional Protocol I, see Michael N. Schmitt, *"Direct Participation in Hostilities" and 21st Century Armed Conflict*, *in* CRISIS MANAGEMENT AND HUMANITARIAN PROTECTION 505–29 (Horst Fischer and Dieter Fleck eds., 2004).

[192] Outer Space Treaty, *supra* note 94, art. VI.

[193] *See* Armel Kerrest, *Commercial Use of Space, Including Launching*, *in* 2004 SPACE LAW CONFERENCE: PAPER ASSEMBLE 200 (2005); Elisabeth Back Impallomeni, *Article VI of the Outer Space Treaty*, *in* PROCEEDINGS OF THE UNITED NATIONS/REPUBLIC OF KOREA WORKSHOP ON SPACE LAW 348–51 (2003); Ricky J. Lee, *Liability Arising from Article VI of the Outer Space Treaty: States, Domestic Law and Private Operators*, 48 PROC. COLLOQUIUM L. OUTER SPACE 216 (2005).

The present race by the U.S. government to acquire additional satellite capacity to fulfill its insatiable demand for bandwidth is a clear sign of the need to command available space assets in the conduct of modern military operations.

It is apparent that the existing body of international law, despite the policy pronouncements of reserving outer space *sensu lato* exclusively for peaceful uses and purposes, does not in fact prohibit the use of satellite applications for military purposes, regardless of the lawfulness of the underlying military activities making use of the satellite applications.

With the international community unlikely to agree to any legal prohibition on military uses of satellite applications per se, the question that needs to be resolved in the reasonably near future is whether certain restrictions ought to be imposed on the military use of satellite applications. In particular, the military use of satellite remote sensing and direct radio and television broadcasting services and their interference or jamming by states and private actors ought to be subjected to some international legal restrictions. Such restrictions would help ensure that the tactical or strategic value of such assets would be limited in practice to reduce the likelihood that such assets would become legitimate targets for the use of armed force in outer space or for the growing population of spacecraft to be dominated by military assets.