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FAILURE OF THE OUTER SPACE TREATY

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Exercise Solo Flight

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EXERCISE *SOLO FLIGHT* – EXERCICE *SOLO FLIGHT*

FAILURE OF THE OUTER SPACE TREATY

LCol E.H.J. Roberds

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FAILURE OF THE OUTER SPACE TREATY

Humankind has a unique desire to discover new frontiers and “boldly go where no one has gone before.”¹ Outer space is only one of the new frontiers that man² has explored and will continue to explore for the foreseeable future. With any new discovery, there are those who wish to exploit these discoveries for their own purposes with little or no concern for the well being of others, nor the preservation for future generations. In an effort to ensure outer space did not become a casualty of such exploitation, the United Nations attempted regulation and implemented the United Nations Treaties and Principles on Outer Space (we will refer to this as the “Outer Space Treaty” or “the Treaty”) in 1967 for the benefit of all peoples wishing to explore space.³ Unfortunately, while the overall concept and intentions were in the best interests of science and the future, the treaty itself cannot be considered a success due to failures in three specific areas. The areas that highlight this failure are: the development of anti-satellite weapons, the development of space weaponization programs and finally, in preventing nations from depositing debris in Outer Space. This essay will give a short overview of each area, demonstrate how the failures in the above three areas have detracted from the success of the Outer Space Treaty and the potential consequences these failures could have on society.

The first area that demonstrates a failure of the Outer Space Treaty is the development of anti-satellite (ASAT) weapons capabilities. Although ASAT weapons

¹ This is an excerpt from the Star Trek television series and movies. It is included to demonstrate the passion that we have with space exploration.

² For the purpose of this paper, man will imply humankind and is not meant to slight women in any manner.

³ United Nations General Assembly, *United Nations Treaties and Principles on Outer Space* (New York: UN, 2002), 3.

can be either conventional or nuclear, they both have the same objective and that is to destroy or neutralize a satellite currently in orbit around the earth. ASAT weapons can be launched from space-based platforms, but for the purpose of this argument, we will focus on ASAT weapons launched from the earth or from earth-based aircraft.⁴ Currently there are several countries, the United States, Russia and China who are advanced in this capability, with others, notably India, expressing the desire to develop it.⁵

The main premise of Article 1 of the Treaty is to allow all states and peoples wishing to explore space for peaceful purposes the opportunity to do so.⁶ The development of ASAT weapons brings into the question just how free countries, that do not possess these weapons, are to explore space. Regardless the purpose of a satellite when placed in orbit around the earth, the existence of these satellite-killing weapons is cause for concern to the owners of the satellites. Some states could argue that not all space exploration will be accomplished for peaceful purposes, and therefore this ASAT capability needs to be available to counter non-peaceful deployments of satellites. However, this in itself shows the weakness in the treaty.

The failure to prevent the development of ASAT weapons brings with it the potential for severe consequences to the general populace. Satellite technology and the capabilities supported by satellites have become critical to our everyday life and any disruption of these services could be devastating. Everything from what we watch on television, receiving phone calls, performing banking transactions and to conducting

⁴ Although ASAT weapons could be based in space, we will cover that more in-depth during the next argument on the weaponization of space.

⁵ Laura Grego, "A History of Anti-Satellite Programs," *Union of Concerned Scientists*, (January 2012): 2.

⁶ United Nations General Assembly, *United Nations Treaties and Principles on Outer Space* (New York: UN, 2002), 4.

Search and Rescue operations can, and are supported from space via satellites.⁷

Disruption to any of these services could have effects from being a minor inconvenience to causing severe infrastructure and economic damage to both individuals and states. In the worst of cases, the collapse of an economy and the deaths of innocent and unsuspecting citizens could be the outcome.

The Outer Space Treaty should be considered the regulating document to prevent the development of these weapons. Unfortunately, the United States, Russia and China show very little interest in standing-down their ASAT programs and are more intent on finding loopholes in the Outer Space Treaty to continue with their programs.⁸ In fact, Russia is allegedly currently occupied in producing a directed-energy weapon that could be used to destroy any airborne or earth based target, while the United States is developing conventional ASAT weapons. In both cases, officials are focusing on Article IV⁹ of the Outer Space Treaty that prohibits nuclear weapons or weapons of mass destruction instead of focusing on Article I, which as explained earlier, allows for all nations the freedom of peaceful exploration. Unfortunately, the inability of the United Nations to either enforce or persuade states to follow the Outer Space Treaty demonstrates the failing of the treaty.

The next area for review is that of the weaponization of Outer Space. For the purpose of this argument weapons based in space either on a manmade platform or on a celestial body will be considered in the weaponization of space. Weapons traveling

⁷ Union of Concerned Scientists, "What Are Satellites Used For?," last accessed 30 May 2015, http://www.ucsusa.org/nuclear_weapons_and_global_security/solutions/space-weapons/what-are-satellites-used-for.html#.VWi1HWDd7AM

⁸ Rex Zedalis and Catherine Wade, "Anti-Satellite Weapons and the Outer Space Treaty," *California Western International Law Journal*, vol. 8 (1978): 455.

⁹ United Nations General Assembly, *United Nations Treaties and Principles on Outer Space* (New York: UN, 2002), 4.

though space to reach their targets and ASAT weapons will not be considered, as they do not have a permanent presence in outer space. One of President Bush's top priorities for space was to ensure unhindered space operations by the US and in 2006 signed a new National Space Policy rejecting any future constraints that could limit the US from deploying space weapons.¹⁰ Since Secretary Rumsfeld's second tour at the Pentagon, the United States has led the world in pursuing a program for the weaponization of space. One of the primary goals in the "Long Range Plan" of the United States Space Command is to become the "Masters of Space" and by the two principle themes in the US Space Command's "Vision for 2020", "dominating the space medium and integrating space power throughout military operations."¹¹ While it is acceptable within today's environment to ensure the protection of your own economy and territory, it is entirely a different argument when your goal is to establish dominance in a realm that can have a global reaching affect were "all States without discrimination of any kind" should have "free access."¹² Should one country gain this total dominance of outer space, it is unlikely that all states will be free to move freely within this space.

Although Russia and China currently appear to be against the weaponization of space, the continued aggression by the United States to dominate space could consequently lead to "a costly and dangerous arms race in outer space."¹³ However, it should be noted that currently the US is the only country with the capability in the

¹⁰ Alex B. Englehart, "Common Ground in the Sky: Extending The 1967 Outer Space Treaty to Reconcile US and Chinese Security Interests," *Pacific Rim Law & Policy Journal* vol.17, no.1 (January 2008): 137.

¹¹ Jonathan Granoff and Craig Eisendrath, "United States – Master of Space? The US Space Command's Vision for 2020," *Global Security Institute* (December 2005): 14.

¹² United Nations General Assembly, *United Nations Treaties and Principles on Outer Space* (New York: UN, 2002), 4.

¹³ Jonathan Granoff and Craig Eisendrath, "United States – Master of Space? The US Space Command's Vision for 2020," *Global Security Institute* (December 2005): 4.

foreseeable future to actually be in a position to deploy space weapons.¹⁴ History and human nature have proven that nations and their people will respond with whatever means necessary to prevent domination by others; this is what will most likely lead to the arms race for outer space.

While the United States continues down the road to Outer Space weaponization, there are other dangers that lurk beneath the surface. Should it occur that weapons are placed in space, given current military practices, it is not a stretch to assume that space mines could become a common feature. There are currently over 600 different types of landmines, both antipersonnel landmines and antitank mines in the world. It is estimated that approximately 110 million antipersonnel landmines are in the ground, so it is a reasonable conclusion that mines will be used in the weaponization of space.¹⁵ There now becomes a tangible danger to nations using space for peaceful exploration or space-aided commerce to lose valuable assets by encountering these obstacles.¹⁶ This would not only apply to satellites, but also to the orbital planes, either manned or automated, essential to commercial activities. In addition to this direct interaction, nations would also have concerns about objects placed in a low-Earth orbit as these could be manoeuvred on short notice to place the weapons over any country chosen by the owner. It is situations like these that prompted the United Nations to develop the Outer Space Treaty, however, if it is not followed, it is unsuccessful in its purpose.

¹⁴ Alex B. Englehart, "Common Ground in the Sky: Extending The 1967 Outer Space Treaty to Reconcile US and Chinese Security Interests," *Pacific Rim Law & Policy Journal* vol.17, no.1 (January 2008): 138.

¹⁵ CARE, "Facts About Landmines," last accessed 30 May 2015, <http://www.care.org/emergencies/facts-about-landmines>

¹⁶ Michael Krepon, "Weapons in the Heaven: A Radical and Reckless Option" in *Arms Control Today*, November 2004, reprinted with permission as, "Avoiding the Weaponization of Space": 16.

Although one could argue that “free access to all areas of celestial bodies”¹⁷ will not be possible if space is weaponized, the 1967 treaty does not specifically prohibit the weaponization of space. While article IV does forbid “the establishment of military bases, installations and fortifications... on celestial bodies,”¹⁸ and prohibits the placement of nuclear weapons and other weapons of mass destruction anywhere in space, it does not specifically prohibit other weapons types from being deployed to manmade platforms in space. This oversight and failure of the Outer Space Treaty has left the door open to interpretation and is being exploited by the United States in their development of policy and plans to dominate the space medium.

The final and probably most significant area in which the 1967 treaty has failed is in the regulating and control of space junk by nations that adds to the amount of debris in orbit around the earth. For the purposes of this argument the terms space junk and debris will be interchangeable and it is understood that these categories are made up of manmade particles and natural particles that are uncontrolled.¹⁹ It is estimated that more than 5000 satellites have been launched into orbit around the earth. Of these, it is believed that 950 are still operating with another 2300 considered to be “dead” satellites and incapable of being manoeuvred or repositioned.²⁰ While more than 50 countries own satellites, not all countries have the capability to launch a vehicle into outer space and this makes the job of recovery much more difficult. Where this can become an issue is what do you do with “dead” satellites? It becomes a very expensive task for non-launch

¹⁷ United Nations General Assembly, *United Nations Treaties and Principles on Outer Space* (New York: UN, 2002), 4.

¹⁸ *Ibid.*

¹⁹ Leonard David, “Space Junk Menace: How to Deal With Orbital Debris,” *Space Insider*, 25 January 2015, last accessed 29 Jun 2015, <http://www.space.com/19445-space-junk-threat-orbital-debris-cleanup.html>

²⁰ Laura Grego, “A History of Anti-Satellite Programs,” *Union of Concerned Scientists*, (January 2012): 1.

capable nations to recover the dead satellite and the preferred option appears to be just leaving the junk in space. While the cost appears to be prohibitive for the recovery, is there an alternative any better?

Non-functioning satellites that remain in orbit are becoming an increasing problem for both man and unmanned spacecraft trying to continue with space exploration. While these dead satellites are often forgotten by the owning nation, they continue to pose a hazard as there is only a limited number of orbits available and as these derelict objects are not controlled, it is up to the countries with active spacecraft to monitor and avoid. Even this does not prevent collisions and there is always the threat of creating further space debris through the colliding of dead satellites with other dead satellites and even worse, dead satellites colliding with active satellites. Once they collide, the result is more space debris, which results in an increase in the potential for debris to interfere with operating space vehicles and further limit space manoeuvrability and exploration. This cascading effect of space debris colliding and creating additional space debris is called the Kessler Effect, after the National Aeronautic Space Administration (NASA) scientist Donald Kessler.²¹ The threat of collision between debris and functioning space vehicles will continue to rise...”even if not another satellite were launched.²²

There is also a significant cost to monitoring objects in space. Both the United States and Russia have a space debris tracking capability with the European Union looking to develop theirs. In Sep 2012 the US Space Surveillance Network (SSN) was

²¹ Space.com, “Space Junk Explained: How Orbital Debris Threatens Future of Spaceflight,” last accessed 30 May 2015, <http://www.space.com/23039-space-junk-explained-orbital-debris-infographic.html>

²² Leonard David, “Space Junk Menace: How to Deal With Orbital Debris,” *Space Insider*, 25 January 2015, last accessed 29 Jun 2015, <http://www.space.com/19445-space-junk-threat-orbital-debris-cleanup.html>

tracking in excess of 23,000 objects of 2-4 inches or larger. If extrapolated to smaller objects it is predicted that there are over 700,000 objects in orbit larger than .4 inch.²³ The US has a program in place called the “Space Fence” which feeds data to the Joint Space Operations Center (JSpOC) at Vandenberg AFB, CA and is expected to be operational by December 2016.²⁴ While these sensors and the supporting system will have an incredible capability to detect debris, it will still only act as a warning system and operator action to avoid collisions between active spacecraft and debris will still be required. In its entirety, Spence Fence is expected to cost the US over \$6.1 billion dollars to provide surveillance and tracking only.²⁵

Although the monitoring and tracking of space debris will continue, there is still the issue of avoidance by spacecraft once the debris is identified. With the now out of service space shuttle, evasive action could have been taken in a matter of hours. However, if the International Space Station (ISS) is required to adjust its orbit, about 30 hours lead-time is required.²⁶ While it is possible to avoid some of the space debris if found and tracked, it will not be possible to avoid collisions 100% of the time. It is inevitable that objects that could not be avoided will strike some spacecraft. We now need to look at the cost of potential damages to spacecraft and earth infrastructure from unavoidable collisions or crashes by objects.

On average two objects colliding in space will approach each other at an approximate speed of 15,200 mph and create significant force when they collide. The

²³ Space.com, “Space Junk Explained: How Orbital Debris Threatens Future of Spaceflight,” last accessed 30 May 2015, <http://www.space.com/23039-space-junk-explained-orbital-debris-infographic.html>

²⁴ Defense Industry Daily, “Don’t Touch Their Junk: USAF’s SSA Tracking Space Debris,” last accessed 30 May 2015, <http://www.defenseindustrydaily.com/air-force-awards-first-phase-of-next-generation-space-fence-05511/>

²⁵ *Ibid.*

²⁶ NASA, “Space Debris and Human Spacecraft,” last accessed 29 May 2015, http://www.nasa.gov/mission_pages/station/news/orbital_debris.html

potential damage cause by a four-inch particle coming in contact with a spacecraft would be devastating and most likely lead to “catastrophic disintegration”²⁷ of the impacted vessel. For example, any object larger than a baseball that has the potential to impact the ISS, is considered large enough by NASA to be a “catastrophic threat.”²⁸ Personnel aboard the ISS would appreciate not having to constantly be worrying about manmade debris impacted their place of work as there is enough natural debris for them to worry about. It does not take a large object to cause damage and the smaller particles while not considered as catastrophic also pose a threat to space exploration. In 1983 a 4mm crater was discovered in the front window of the space shuttle. It was determined that it was caused by a smaller than .2mm paint chip that was travelling at 3 miles per second.²⁹ With the high price of spacecraft and the limited ability of man to survive in the harsh conditions of outer space, every effort must be made to avoid an increase in space debris leading to collisions. NASA has reported that over 100 windows were replaced on the space shuttles during their time in service at a cost of 100k per window. While this is not a large amount given the price of a space shuttle, the cost of fuel, training and support, it is a significant amount of money that could have been avoided.

While section C of the treaty creates the guidelines for liability based on damage caused by space objects and section D requires the registration of objects launched into outer space,³⁰ very little constructive action has been taken to prevent space debris. Since the implementation of the 1967 Outer Space Treaty, there remains in excess of 2300 dead

²⁷ Space.com, “Space Junk Explained: How Orbital Debris Threatens Future of Spaceflight,” last accessed 30 May 2015, <http://www.space.com/23039-space-junk-explained-orbital-debris-infographic.html>

²⁸ BBC, “Future – Space Junk: Why it is Time to Clean Up The Skies,” last accessed 30 May 2015, <http://www.bbc.com/future/story/20120518-danger-space-junk-alert>

²⁹ *Ibid.*

³⁰ United Nations General Assembly, *United Nations Treaties and Principles on Outer Space* (New York: UN, 2002).

satellites in orbital patterns around the earth. If you consider another potential 500,000 particles that could collide with these satellites, using the Kessler Effect, this number could grow exponentially. When you compare the cost to monitor this debris, \$6.1 billion by the US alone, and the cost of windows in the space shuttle, approx. \$10 million, it does not take long for the numbers to add up. While the 1967 treaty set-up provisions for liability, there have never been any claims and the claim process has not been invoked. So if the clause in the treaty has never been invoked, there is nothing holding nations accountable if they leave their junk in space. Other than looking good on paper, the Outer Space Treaty has failed in preventing space debris.

The 1967 Outer Space Treaty established by the United Nations was created in an attempt to regulate the “Final Frontier.”³¹ It articulated that all nations had the right to explore outer space, including the Moon and other celestial bodies, equally. It further went on to stipulate that no state had the right to lay a claim of sovereignty nor did they have the right to occupy and prevent the peaceful scientific exploration by other nations. In an attempt to ensure the peaceful use of outer space and prevent outer space from becoming a battlefield it was further articulated that nuclear weapons and other weapons of mass destruction would not be placed in outer space or on any celestial body. Finally, the treaty identified means to register objects launched into space and established a convention on liability for damage caused by space objects.³²

Unfortunately, the treaty has failed in a couple of critical areas. As we have seen, the development of ASAT contradicts the statement that all nations are free to explore space without discrimination. The destructive capability of ASAT that is controlled by a

³¹ Star Trek reference used for effect.

³² United Nations General Assembly, *United Nations Treaties and Principles on Outer Space* (New York: UN, 2002).

few nations has the potential to limit space exploration by others. Given the political climate of modern society, it would not take much for a nation with ASAT to decimate a nation's space program that did not have ASAT. Another area where the treaty has failed is in the prevention of the weaponization of space. In section A, article IV, it is clear that nuclear weapons and weapons of mass destruction are not to be placed in outer space. However, the treaty does nothing to ensure conventional weapons, or any future technology weapons, to be placed in outer space. This leads us back to the same conclusion that not all countries have the equal right to explore space due to the fact that only the US currently has the capability and technology to weaponize outer space. Finally, the Treaty has failed to prevent outer space becoming nothing more than a debris field causing problems for space exploration. Whether is the threat of destruction, the cost of repairs or the cost to track space debris, the 1967 Outer Space Treaty has done nothing to prevent this. As we move forward into the next era of space exploration a major re-write of the Treaty is required to fix the shortfalls identified above. The next Outer Space Treaty must keep outer space free to all nations and hold accountable those nations that fail to follow the regulations.

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