

HUMAN COLONISATION/EXPLORATION BEYOND LOW-EARTH ORBIT: RECONSIDERING THE EXISTING LAW IN LIGHT OF SAFETY IMPERATIVES

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[Abstract]

With the prospect of human colonisation/exploration beyond low-Earth orbit, it will be necessary to debate whether, and to what extent, the existing international space law regime is flexible in permitting mechanisms to safeguard explorers/settlers from asteroids or comets. Imagining a hypothetical scenario in which humans have established colonies in outer space, or on the surface of the Moon or Mars, and considering the worst possible threat (an impending impact with an asteroid/comet), what are the legal impediments to establishing a defensive system comprising of a nuclear weapon?

Such a defensive system could arguably breach the 'peaceful purposes' requirement of the Outer Space Treaty, and would most certainly violate the prohibition on the deployment of nuclear weapons covered by Article IV of the same treaty, and potentially, also the Limited Test Ban Treaty. Should the international community deem that the establishment of such a defensive system is necessary, both treaties provide mechanisms that allow for their amendment.

The purpose of this paper is to consider whether such exploratory endeavours necessitate a different approach to safety considerations in space law, and whether new legal mechanisms need to be adopted accordingly.

INTRODUCTION

"War and space exploration are alternative uses of the assertive, exploratory energies that are so characteristic of human beings. They may also be mutually exclusive because if one occurs on a massive scale, the other probably will not."¹

On January 14, 2004, U.S. President George Bush announced a "A Renewed Spirit of Exploration" – a policy that proposed to put humans back on the moon by 2020 in "preparation for human exploration of Mars and other destinations".² The announcement marked an important point in history of our relationship with the cosmos – that which had formally been the exclusive

province of science fiction was now being given structure and substance.

It also raises a number of legal issues, though. Most importantly, to what extent does the existing international legal regime effectively cater to this expanded exploratory endeavour? The existing legal regime as it relates specifically to outer space, the Moon and celestial bodies was drafted decades ago – in an era where the primary concern of the international community was preventing the outbreak of a nuclear war, and the possible use of space was conceptually restricted to the fear that it might be militarized, in order to gain the ‘ultimate high ground’. Though the so-called ‘Cold War’ has ended, and international relations are comparatively ‘warmer’ than before, the use of outer space as a strategic military advantage is still a very real concern – and this concern has affected approaches to international law- and policy-making.

It is suggested that the current legal regime does not make sufficient allowances for the safety imperatives of explorers/settlers, when faced with threats posed by the possible impact of an asteroid or comet. Though the possibility of impact has been already considered in terms of Earth as the target, if human colonisation/space exploration beyond low-Earth orbit is realised, then humanity necessarily becomes a larger and more vulnerable target.

The purpose of this paper is not to engage in, or attempt to answer, any of the issues that have been subject to a great deal of debate, but rather, to consider new questions that are prompted by the prospect of human colonisation/space exploration beyond low-Earth orbit. Part I will consider the nature of the potential threat. Part II will consider the legal impediments to the establishment of a nuclear weapon defensive system to protect against the threat. Part III will outline the necessary mechanisms that need to be activated in order to amend the existing law, should it be deemed necessary.

PART I – THE THREAT

The possibility that an asteroid or comet will impact with, and cause significant damage to, the surface of the Earth is extremely remote.³ The relatively recently discovered Asteroid 99942 Apophis (2004 MN4), was originally predicted to have a high-risk of collision with the Earth in 2029, though this has since been downgraded to an “extremely close shave” in 2036.

Notwithstanding this recent, widely-publicised threat, the risk posed to Earth appears to be extremely low. The threat of an impact on Earth by a Near Earth Object (“NEO”) is being continually monitored by organisations/projects such as NASA,⁴ the LINEAR Project,⁵ LONEOS

program and the like.⁶

However, in the context of human settlement/exploration beyond low-Earth orbit, the focus of concern shifts away from the Earth, and towards the intended destinations – outer space, the Moon and Mars. To whatever extent the atmosphere of the Earth offers protection from and mitigates the impact of an asteroid, the same protection would not necessarily exist in outer space, or on other celestial bodies. The uncertainties that exist as to the number, location, size, and trajectories of NEOs as in relation to Earth, only become amplified when considered in this new context. Therefore, it will be necessary to re-evaluate the level of the threat posed by asteroids/comets to settlements that are situated beyond low-Earth orbit.

In a worst-case scenario, assuming that the asteroid/comet would impact a colony on the surface of the Moon or Mars, or space station situated in outer space, that cannot maneuver out of its trajectory, one possibility is to intercept the asteroid/comet with a nuclear weapon. Ideally, deflection technology would be preferable, but assuming that the technology is insufficient for the task, or it proves logistically impossible given this particular hypothetical scenario, a nuclear weapon could be used as a absolute last resort. This could conceivably either deflect, or likely destroy, the asteroid/comet, depending on

its size. Though, admittedly, it is an extreme method, nuclear weapons represent the most powerfully destructive defensive mechanism against the threat posed by asteroids/comets given current technological levels.⁷

It certainly seems counter-intuitive that safety and security is space exploration should be predicated on the deployment of nuclear weapons. However, given a hypothetical scenario that humankind has established colonies in outer space or on the surface of the Moon or Mars, and considering the worst possible threat coupled with the most destructive response (a nuclear weapon defensive system), this paper shall consider the legal impediments to the establishment of such a system in outer space, and propose a possible solution, should its implementation be deemed to be necessary by the international community at large.

PART II – THE PRESENT LAW

The proposition that nuclear weapons may be necessary to safeguard humankind winds the clock on international relations back several decades to when Cold War tensions reigned. Since that time, the international community has been tenacious in its attempt to eliminate nuclear weapons – a tenacity that, according to a recent media reports, has not yet lost momentum.⁸

Given the real concerns of the threat

posed by an arms race, and that endeavours into space were rarely more ambitious than low-Earth orbit, and then the Moon, it is not surprising that the potential threat posed beyond low-Earth orbit was not thoroughly contemplated, if at all, in the legislative drafting of legal instruments.

Therefore, a number of legal impediments exist to the establishment of a nuclear weapon defensive system designed to protect against human colonisation/ space exploration beyond low-Earth orbit.

[Locating a right to self-defense]

Are organizations and countries that initiate space exploration/human settlement activities afforded a right under international law to protect themselves against threats of impact from asteroids or comets? The first, and most obvious, reference point is the United Nations Charter.⁹ Article 51 of the Charter notes that there exists an “inherent right of individual or collective self-defence if an armed attack occurs against a Member of the United Nations...”. However, before this right can be invoked, there are two important requirements that must be satisfied – there must be both an “armed attack”, and that this attack must be attributable to a State.¹⁰ Adopting this narrow interpretation of the Article leads to the conclusion that UN Charter does not

expressly permit defensive action as against the threat of impact from an asteroid or comet.¹¹

An asteroid or a comet hurtling along a trajectory which would impact with a human colony, certainly constitutes an “attack” in the colloquial sense, though perhaps not in the classical sense of the word as interpreted in matters of diplomacy and international relations. However, Article 51 must be read in conjunction with Article 2(4), which is seen as being fundamental to protect the integrity of a sovereign state. Indeed, the Charter and much of the international law concerned with area of self-defence, is predicated on the assumption that there are at least two parties involved in a dispute – an ‘aggressor’ and a ‘victim’ – in which invocation of the right of self-defence is being sought. This has no applicability in the current hypothetical scenario, though, as the asteroid/comet is not a ‘nation state’ whose territorial sovereignty must be respected.¹² As the UN Charter does not strictly prohibit the defensive action proposed, other legal instruments must also be considered.¹³

[Testing the legality of the activity]

Assuming that explorers/settlers can be proactive in either preventing or mitigating damage from an impending impact with an asteroid/comet, the question then turns to legality of the method by which they choose to do so. In

positing that the most destructive method of preventing an impact with an asteroid/comet is the use of a nuclear weapon, there are a number of relevant legal instruments to consider – namely, the Outer Space Treaty and the Limited Test Ban Treaty.

[Outer Space Treaty]

- The ‘Peaceful Purposes’ requirement

The first element to consider is the preamble of the Outer Space Treaty, in which it recognises “the common interest of all mankind in the progress of the exploration and use of outer space for *peaceful purposes*.”

This highlights one of the major tests that a proposed nuclear weapon defensive system would need to pass in order to be deemed legal – the “peaceful purposes” requirement. However, no authoritative definition has been provided as to what exactly constitutes “peaceful purpose” and what does not, and has been the subject of debate for the past several decades.

The debate centres around two possible interpretations – (1) that advocated primarily by the United States, that “peaceful purposes” means “non-aggressive”, and (2) that “peaceful purposes” means “non-military”. The latter interpretation is problematic, as state practice of some space-faring nations has, and continues to do so to this day, conducted activities that are

decidedly of a military nature.¹⁴ In adopting the logic of the interpretation that “peaceful purposes” means “non-aggressive”, it necessarily follows that a nuclear weapon being targeted and detonated at an asteroid/comet for purely defensive purposes does not, in and of itself, constitute an aggressive act as the asteroid/comet is not a nation state, nor is it the property or the territory of a nation state.¹⁵ This line of logic has been previously considered in a different context, though, and the result was declared “absurd”.¹⁶

Notwithstanding the ambiguity surrounding this phrase, and even if the proposal of a nuclear weapon defense system were to pass the “peaceful purposes” test, nuclear weapons are expressly prohibited by Article IV of the Outer Space Treaty.

- Article IV -

Article IV of the Outer Space Treaty is directly relevant to the hypothetical scenario, as it expressly prohibits the deployment, stationing and installation of nuclear weapons (and any other kinds of weapons of mass destruction) in outer space, in the orbit around the Earth or on celestial bodies. It states that:

State Parties to the Treaty undertake not to place in orbit around the Earth 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.

The moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military maneuvers 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.

[Limited Test Ban Treaty]

Furthermore, the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (1963) (“Limited Test Ban Treaty”) is also relevant to the current hypothetical scenario. Article 1(a) states:

- 1. Each of the Parties to this Treaty undertakes to prohibit, to prevent, and not to carry out any nuclear weapon test explosion, or any other nuclear explosion, at any place under its jurisdiction or control:*

(a) in the atmosphere; beyond its limits, including outer space; or under water, including territorial waters or high seas; or

Though this does not deal with deployment of nuclear weapons, it does prohibit nuclear explosions in outer space. Therefore, this falls within the province of the hypothetical scenario.¹⁷

[Moon Agreement]

To a lesser extent, the Moon Agreement is also relevant to the hypothetical scenario posed. Article 3 (3) states that “State Parties shall not place in orbit around or other trajectory to or around the moon objects carrying nuclear weapons or any other kinds of weapons of mass destruction or place such weapons on or in the moon.” This particular provision was considered as dealing “with some of the legal lacuna left in the Outer Space Treaty concerning military activities on the moon and other celestial bodies.”¹⁸

However, none of those countries most likely to initiate space exploration activities beyond low-Earth orbit have ratified the Moon Agreement. Therefore, the prohibitions imposed by the Moon Agreement are moot.¹⁹

PART III – AMENDMENT

Positing at the outset that the proposed activity of protecting human

settlement/exploration beyond low-Earth orbit fails all of the above-outlined tests, and assuming that the international community deems the nuclear weapon defense system necessary in exploration endeavors, it will be necessary to amend the Outer Space Treaty and the Limited Test Ban Treaty.²⁰

[Amendment to the treaties]

The mechanism needed to amend the Outer Space Treaty is provided in Article XV. It states that:

Any State Party to the Treaty may propose amendments to this Treaty. Amendments shall enter into force upon their acceptance by a majority of the States Parties to the Treaty and thereafter for each remaining State Party to the Treaty on the date of acceptance by it.

With 98 countries that have ratified the Treaty, this would require a minimum of 50 to pass the amendment.²¹ As outlined in Part II, any proposed amendment to the Outer Space Treaty would need to address the ‘peaceful purposes’ requirement, and the Article 6 prohibition on nuclear weapons.

The mechanism to amend the Limited Test Ban Treaty differs slightly to the Outer Space Treaty. Article 2 (2) states:

Any amendment to this Treaty must be approved by a majority of the votes of all the Parties to this Treaty, including the votes of all the Original Parties...

The Preamble of the Limited Test Ban Treaty indicates that the “Original Parties” include the United States of America, the United Kingdom of Great Britain and Northern Ireland, and the then Union of Soviet Social Republics.²² Note, however, that the Limited Test Ban Treaty does not prohibit the deployment of nuclear weapons, but only the carrying out of nuclear explosions.²³ Therefore, it is possible that there will never be a serious threat of impact, that no nuclear weapon would need be detonated, and that Article 1 (1)(a) of the Treaty will thus never be breached.

[Proposal]

As outlined above, any amendment to the Outer Space Treaty would need to directly address the peaceful purposes requirements and the prohibition on nuclear weapons. An amendment to either of these sections would raise concerns – namely, what safeguards are there to ensure that the stationed nuclear weapon will be used solely to prevent an impact from an asteroid/comet, and not used for aggressive purposes against a competing nation state, or its satellites, installations, or other exploratory activities into outer

space?

The proposed amendment would need to be drafted such that the permissible usage of a nuclear weapon would be limited to instances represented in the hypothetical scenario. That is:

- There is human settlement/space exploration beyond low-Earth orbit; and
- There is a reasonably high probability of impact of an asteroid/comet with the settlement; and
- This impact would cause severe damage; and
- Maneuvering, evacuation and deflection are not viable options.

Beyond these set of conditions, the existing international legal regime would not be augmented, and any use of a nuclear weapon would thus be prohibited. This would restrict the permissible usage of the nuclear weapon to instances in which there is a reasonable probability of impact of an asteroid/comet with a settlement. The next obvious question that would need to be answered would relate to the threshold test for activation – how is “reasonable” to be defined?

An identical clause that provides for an exception to the prohibition on nuclear explosions would also need to be incorporated into the Limited Test Ban Treaty.

[Related issues]

This raises questions of responsibility for the nuclear weapon(s), and liability for any damage caused unintentionally.

In terms of responsibility and control, the Outer Space Treaty states that State Parties to the Treaty shall “bear international responsibility for national activities in outer space, including the Moon and other celestial bodies”,²⁴ and shall “retain jurisdiction and control” over a registered object launched into outer space.²⁵ This suggests that the State Party from which the object is launched shall be both responsible and liable for the nuclear weapon – an awesome burden, given the possibility of an accidental detonation, or inflicting collateral damage. As such, an ideal scenario would remove the responsibility and control of the nuclear weapon from any one country, and require that it to be operated under the auspices of an intergovernmental organisation. In much the space cooperative spirit as represented by the International Space Station, human colonization/space exploration would be best accomplished as a joint effort.

CONCLUSION

This paper makes several assumptions. First, that human colonisation/exploration beyond low-Earth orbit is possible. Second, that asteroids/comets present a potential threat to explorers, colonies, installations and equipment, and finally, that, with no other

option available, nuclear weapons are the most effective method currently available in preventing/safeguarding against threats of impact. To the extent that any or all of these assumptions are accurate, the legal steps necessary to prepare against any such threat have been outlined above.

This hypothetical scenario encounters numerous non-legal barriers for two main reasons. First, the concept of human colonisation/exploration beyond low-Earth orbit is still too remote a possibility – it is a concept that exists well beyond the realm of the immediate concerns of the international community. Second, it is unlikely that the governments of the world would ever take the extreme step of permitting the deployment of nuclear weapons into outer space, on the surface of or in orbit around the Moon or other celestial bodies, to protect a hypothetical exploration mission/colony from a potential threat that has yet to manifest.

By the time human colonisation/exploration beyond low-Earth orbit comes to fruition, perhaps the international community will be less competitive and more cooperative in this field, and perhaps it will not. Perhaps international relations will be such that the very existence of nuclear weapons does not represent a disruptive influence on global stability, and perhaps it will not. This paper attempts to show, however, that the existing legal structure is not

readily transferable to all areas of future space exploration, and if the technology does not change before the realisation of human presence beyond low-Earth orbit, then it follows that the law must.

¹ Frank White, *THE OVERVIEW EFFECT* (1981)

² [Online]

http://www.whitehouse.gov/space/renewed_spirit.html

³ Otherwise referred to as Near-Earth Objects (NEO) when considered specifically in relation to the Earth.

⁴ NASA NEO office – [Online]

<http://neo.jpl.nasa.gov>. See also NASA NEAT - [Online] <http://neat.jpl.nasa.gov>

⁵ LINEAR Project – [Online]

<http://www.ll.mit.edu/LINEAR/>

⁶ LONEOS Project – [Online]

<http://asteroid.lowell.edu/asteroid/loneos/loneos.html>

⁷ C. R. Chapman, D. D. Durda & R. E.

Gold, *THE COMET/ASTEROID IMPACT HAZARD: A SYSTEMS APPROACH* (2001), at 14 – [Online]

http://www.international-space.com/pdf/NEOwp_Chapman-Durda-Gold.pdf

⁸ “U.N. Resolution Stresses NPT” (13

Oct. 2005) *Japan Times* – “The new draft... declares a renewed determination to call on all nuclear powers to reduce their nuclear arms in an irreversible, verifiable and transparent manner and eventually completely eliminate such weapons.” See also UN Resolution A/RES/59/65 (2004), which echoes earlier similar resolutions previously adopted by the United Nations General Assembly in stressing the “use of outer space for peaceful purpose” and that “the prevention of an arms race in outer space would avert a grave danger for international peace and security.”

⁹ Outer Space Treaty, Article III extends the applicability of the UN Charter to

outer space. It states that space activities are to be conducted “in accordance with international law, including the Charter of the United Nations...”

¹⁰ *Legal Consequences Of The Construction Of A Wall In The Occupied Palestinian Territory* (2004) ICJ REPORTS, para. 139.

¹¹ It has been suggested that the ‘inherent’ right to self-defence exists in parallel as a right in customary international law, and that this customary international law right does not have the limitation of an “armed attack” attached to it. This has been disputed – see J. de Archega, *General Course in Public International Law* (1978) 159 RECEUIL DES COURS 9.

¹² See also Evan R. Seamone, *When Wishing on a Star Just Won't Do: The Legal Basis for International Cooperation in the Mitigation of Asteroid Impacts and Similar Transboundary Disasters* (2001-2002) 87 IOWA L. REV. 1091 at 1119-1120, in which the author proposes that there exists a right of global survival, and a positive duty incumbent upon all nation states to enforce that right. This, however, cannot be applied to the present hypothetical scenario, as a threat against explorer/settlers does not strictly constitute a threat to ‘global survival’. See also Bruce A. Hurwitz, *THE LEGALITY OF SPACE MILITARIZATION* (1986) - there is an argument that the right of self-defence cannot be made applicable to outer space. The rationale behind this argument is that recognising a right to self-defence would be tantamount to recognising the territorial sovereignty of a country in outer space – in violation of the non-appropriation principle enshrined within Article II of the Outer Space Treaty.

¹³ See Carl Q. Christol, *THE MODERN INTERNATIONAL LAW OF OUTER SPACE*

(1982), at 59-60. Christol notes that space law is based “on the premise that conduct is presumed to be lawful in the absence of prohibitions. Permitted and unpermitted conduct are conditioned by both formal international law and customary law.”

¹⁴ Bhupendra Jasani (ed.), *PEACEFUL AND NON-PEACEFUL USES OF SPACE* (1991), at 45.

¹⁵ Outer Space Treaty, Article 2.

¹⁶ *Above* n 14, at 45.

¹⁷ Nandasiri Jasentuliyana, *INTERNATIONAL SPACE LAW AND THE UNITED NATIONS* (1999), at 112.

¹⁸ *Ibid.*, at 227.

¹⁹ *Vienna Convention on the Law of Treaties* (1969), art. 34. Note, though, that Article 38 of the *Vienna Convention* states that the provisions of a treaty can become binding upon a non-Party if it becomes a rule of customary international law – such is the case with the Outer Space Treaty – see Nandasiri Jasentuliyana, *above* n 17, at 190. The Moon Agreement has been ratified by only 11 countries, and this is not a sufficient number of countries to argue that its have attained the status of customary international law.

²⁰ Amendment to the prohibitive articles of the Moon Agreement is not an immediate concern for the reason expressed in Part II.

²¹ UN OOSA, *Space Law Update* (2005) Vol. 2 – [Online] <http://www.oosa.unvienna.org/SpaceLaw/spacelawupdate/slu-02-02E.pdf>

²² With 113 parties to the treaty, less the three Original Parties, a majority of 56 countries would be required to amend the Limited Test Ban Treaty.

²³ See Part II. See also Bhupendra Jasani, *above* n 14, at 47.

²⁴ Outer Space Treaty, Article 6.

²⁵ *Ibid.*, Article 8.