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DEFINING SUBJECT MATTER UNDER SPACE LAW: NEAR EARTH OBJECTS *VERSUS* SPACE OBJECTS

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Abstract

It may seem to be an obvious, instinctive distinction, the one between (natural) near earth objects and (man-made) space objects. However, the very recent proposal tabled by the Russian Federation and the People's Republic of China for a treaty on the de-weaponisation of space apparently makes reference in this context to a prohibition to use or threaten the use of force against "outer space objects". Such varying use of terminology may raise appropriate concerns about the applicability of any such agreement, or indeed other present or future rules of space law, to the specific case of NEO's and any possible future actions to protect the earth against their potentially devastating impact. The present paper represents an effort to clearly outline the definitional issues involved, in the hope of precluding any potentially stifling confusion about the applicability or non-applicability of relevant rules of international space law.

Thus, the issue of the definition of 'space object' will be revisited and discussed in juxtaposition with such definitions as those of 'celestial bodies' and 'near earth objects', with reference to the applicability of relevant rules of international space law.

1. The definitional issue in perspective

Incoming asteroids that threaten human civilisation have been subjects not only of Hollywood movies (*Deep Impact*, *Armageddon*) but also of serious scientific research. As a consequence, it is now generally assumed that the extinction of the dinosaurs some 65 million years ago was at least partially caused by a giant asteroid (presumed magnitude: in the range of 10 kilometres across) principally hitting in the area of what is now the Yucatan peninsula.¹ More recently an originally mysterious blast over the Siberian Tunguska area in 1908 turned out to have been caused by an asteroid of perhaps 40 meters across, exploding in the air at a few kilometres altitude.²

Barring fantasy, however, little attention was paid to possibilities to actually *do* something about incoming asteroids. It is only since fairly recently, that developments in space science and space technology have made it possible *both* to predict with some accuracy (and sometimes decades in advance) whether an asteroid will come too close for comfort, *and* to undertake serious efforts to minimise the chance of actual collision with the earth.

In this context, the Association of Space Explorers (ASE) has taken the initiative, by means principally of establishment of a NEO Committee

(Near-Earth Objects, or NEO's, being the generic label used for both asteroids and comets) to develop a, preferably international, framework for dealing with such issues.³

Or, as the Open Letter of the ASE of 14 October 2005 phrased it:⁴

Due to advances in both the discovery of these objects and in space technology (especially advanced space power and propulsion) we are aware of the unique fact that these infrequent cosmic collisions are, using advanced space technology, both predictable and preventable. This distinctive and providential characteristic of NEO impacts allows the prevention of these largest of natural disasters, if, and only if, national governments and relevant international institutions understand these inevitable events and act together to prevent their occurrence.

In our opinion responsible action consists of three components; the extension of the current discovery and tracking program (Spaceguard Survey) to include the more populous smaller but still highly dangerous NEOs, the continued development of the essential space power and propulsion systems necessary for deflection of any NEO found to be on a collision course, and the cooperative development of international legal and operational policies to facilitate timely and equitable disaster prevention decision-making.

The ASE NEO initiative thus *inter alia* points at the possibility that relevant actors need to take deflective action *vis-à-vis* a NEO of which it has been calculated that the risk of collision with earth is not negligible enough to sit idle, which action might well lead to the partial or complete destruction of the NEO.⁵

Whilst this raises several international institutional and legal ramifications, this paper focuses on the definitional issue only – what, exactly, *is* a NEO in legal terms? Once legal texts would come to underpin the ASE NEO initiative, they should be clear on what triggers relevant action in order to

prevent unnecessary complications – including geo-political ones.

This is also where the Russo-Chinese proposal for a treaty on 'space dewatering' comes in.⁶ As it proposes to prohibit any use of force against "outer space objects", a literal interpretation of that proposal would or might include action against Near-Earth Objects – even if for the purpose of keeping them out of the earth's way.

2. The Outer Space Treaty

To start with, the term 'Near-Earth Object' as such does not appear in any of the five 'classical' space treaties – and neither do the terms 'asteroid' or 'comet'. This raises the question whether other terms in the treaties may still implicitly include any of these concepts. Analysis, obviously, starts with the first and most fundamental of them, the Outer Space Treaty⁷.

The Outer Space Treaty repeatedly uses the words "object" and "objects", for example when it provides for relevant prohibitions regarding "objects carrying nuclear weapons or any other kinds of weapons of mass destruction".⁸ Also, the Treaty makes reference to an (apparently related) concept of "space object", when providing for a duty to seriously consider requests "to observe the flight" thereof.⁹

Though these concepts have not been defined closer by the Treaty, and the lack of precision in terminology may be somewhat confusing, following the standards for treaty interpretation set by the 1969 Vienna Convention on the Law of Treaties¹⁰ a fairly precise idea can be obtained of what they were supposed to mean.

Firstly, the intention, indeed the whole – 'teleological' – context of the Outer Space Treaty was to deal with activities of mankind and "man's entry into outer

space”¹¹, and to provide a legal context and framework for those. The ‘objects’ considered at the time were probes, satellites, manned space vehicles and in a further future manned space stations or stations on celestial bodies used in the context of that entry.¹²

Secondly, the concepts were always used in close conjunction with that of “launching”,¹³ clearly an activity irrelevant in the context of asteroids or comets. Thus, liability for damage caused by space activities was framed as damage caused *by an object launched* into outer space.¹⁴ Similarly, the Treaty provided for jurisdiction over an “object launched into outer space”, further addressing “ownership” thereof, and even of “component parts” thereof, more or less suggesting a process of ‘composition’ by human hands.¹⁵ Also the reference to the observation of “the flight of space objects” (as “launched by those States”) makes clear that the Treaty addressed hardware manufactured by humans and then launched into outer space.¹⁶ In other words, the Treaty used such concepts as ‘objects’ and ‘space objects’ to deal with *human artefacts* happening to traverse outer space.¹⁷

Actually, the Outer Space Treaty uses a quite different term for the category of things NEO’s *would* easily fit in: that of ‘celestial bodies’. That term is used usually in conjunction with the moon and adorned for the purpose with the adjective ‘other’, so as to make clear that, at any rate, the moon is one specimen of that category.¹⁸

A summary analysis of the contexts in which the term is used, makes already clear that the concept of ‘celestial bodies’ refers to natural objects of a tangible and visible nature, to pieces of more or less solid substance traversing outer space.

Thus, celestial bodies should be explored and used freely as long as “for

the benefit and in the interests of all countries”.¹⁹ They are not to be subjected to any territorial sovereignty, whether “by means of use or occupation, or by any other means”.²⁰ More forcefully still, the Treaty prohibits the installation of weapons of mass destruction on celestial bodies as well as the establishment of military bases, installations and fortifications thereon: such activities logically require a solid natural body of some size upon which to occur.²¹ A similar conclusion arises from Article V, which refers to “activities (...) on celestial bodies”.²²

Though the focus was clearly on natural objects of some size, on the other hand there is no principled exclusion of any smaller-size objects. Indeed, for example the “use” of such small-size celestial bodies would still be feasible, and regulating it therefore would still make sense.²³

As to the Outer Space Treaty, the conclusion thus arises that NEO’s, asteroids and comets are included in the concept of ‘celestial bodies’, as natural objects of a tangible and visible nature – and as opposed to ‘objects (in outer space)’ or ‘space objects’, which are man-made objects launched into outer space.

Next, it has to be analysed in how far this conclusion is reconfirmed and/or augmented by the other space treaties, firstly the three later treaties which are more or less globally applicable and secondly the Moon Agreement which requires special treatment for a number of reasons.

3. The three later space treaties of global application

3.1. The Rescue Agreement

The first space treaty to follow upon the heels of the Outer Space Treaty, the 1968 Rescue Agreement²⁴, deals with

the issue of ‘objects’ very prominently – its very title in the comprehensive version already speaks of “the Return of Objects Launched into Outer Space”. Again, though it was not considered necessary to define the concept of ‘object’, the reference to its being ‘launched into outer space’ makes clear that, as in the Outer Space Treaty, this concerns man-made objects, not natural objects such as NEO’s.

Interestingly, the operative text of the Rescue Agreement hardly refers to ‘objects launched into outer space’ beyond the title and the Preamble; rather, it refers to “spacecraft” where such objects are (to be) launched into outer space with humans on board,²⁵ and to “space objects” whenever unmanned objects are also concerned.²⁶ With a view to the general focus of the Agreement, this also means that (space) objects are man-made and launched, as opposed to being of natural origin and just happening to pass by.

Once more, also, the inconsistent and somewhat confusing alternation of ‘objects (launched into outer space)’ and ‘space objects’ should be blamed on the absence at the time of any need to further define those terms – it was clearly not foreseen that the question addressed in the current paper might come up. There is little doubt that the two terms are, for all practical purposes, identical – as a matter of fact the very same Article 5 uses “space object” in its paragraphs 1, 2, 4 and 5; “object” without further ado in its paragraph 2; and “objects launched into outer space” in its paragraph 3.²⁷

In any event, the same conclusion applies here as with the Outer Space Treaty: the Rescue Agreement deals with man-made objects whenever referring to ‘objects’ and ‘space objects’. As a matter of fact, the Rescue Agreement does not at all deal with the other concept of ‘celestial bodies’²⁸ –

which of course logically follows from the aims and objectives of the Agreement, once the mutual exclusivity of the two concepts is accepted.

3.2. *The Liability Convention*

The 1972 Liability Convention²⁹ no more refers to ‘objects’ or ‘objects launched into outer space’, but to ‘space objects’ throughout its provisions – which of course deal with the liability for damage caused by such space objects; this already indicates the unlikelihood of encompassing NEO’s, asteroids or comets in that context.

This time, the Convention does also define the concept, albeit not very precise – and partly in circular fashion: “The term “space object” includes component parts of a space object as well as its launch vehicle and parts thereof.”³⁰

Further analysis of the text of the Convention clarifies that, wherever relevant, the term ‘space object’ comprises manned spacecraft, which obviously makes sense only for man-made objects.³¹

Finally, in line with earlier analysis, the close conjunction of the concepts of ‘(space) object’ and ‘launching’, explicitly reconfirmed here and the reference to ‘component parts’ leave room for no other conclusion than that also the Liability Convention is not concerned at all with the natural objects the ASE NEO initiative is concerned with – and does not refer to ‘celestial bodies’ anywhere, either.

3.3. *The Registration Convention*

Since it was drafted in close conjunction with the 1972 Liability Convention, the 1975 Registration Convention³² follows the same approach to the subject matter.

Using a (semi-)definition identical to that of the Launching Convention, the Registration Convention provides for

obligations related to the registration of 'space objects', in principle without exception.³³ Such obligations pertain to "a space object (...) launched into Earth orbit or beyond", and rest upon the "launching State" or states.³⁴

'Registration', with a further goal of allowing relevant states to maintain jurisdiction over registered space objects,³⁵ does indeed only make sense with regard to man-made artefacts, not NEO's. This is finally confirmed by the requirements which Article IV of the Registration Convention imposes when it comes to providing the UN Secretary General with relevant registration information, which include the "name of launching State or States", an "appropriate designator of the space object or its registration number", the "date and territory or location of launch" and the "general function of the space object".³⁶ Needless to say, the concept of 'celestial bodies' does not figure anywhere in the Convention.

4. The Moon Agreement

The 1979 Moon Agreement³⁷, the last of the five 'traditional' space treaties, requires special attention from the current perspective. On the one hand, its relatively poor ratification, with to date only thirteen states being parties,³⁸ means that its provisions find only limited direct legal application. This the more so as in particular the only states currently capable of the monitoring and response activities required with regard to NEO's – principally the United States, to a lesser extent possibly Russia, China and the major European states jointly through the European Space Agency (ESA)³⁹ – are not amongst those parties.

On the other hand, the Moon Agreement focuses precisely on that category of 'objects' in outer space

which is to be contrasted, being effectively mutually exclusive, with that of 'objects (launched into space)' or 'space objects' and hence, presumably, encompasses NEO's: the celestial bodies.

Unfortunately from our perspective, the term 'celestial bodies' is not defined by the Agreement, although the combination in its comprehensive title of the words "the Moon" with the words "other celestial bodies" already gives away a first clue: the moon is a prime example of a celestial body, however that might be defined.⁴⁰

Whereas the Moon Agreement furthermore refers prominently to the 'exploration' of the moon and other celestial bodies,⁴¹ this term has never been applied in any of the space treaties to 'objects (launched into outer space)' or 'space objects'. Apparently, space objects are not a object of exploration – which is only logical, if 'space objects' indeed would be concerned exclusively with man-made objects.

Many other provisions refer to issues, scenarios, events or situations that do not make sense *vis-à-vis* man-made space objects as well, whilst making a lot of sense *vis-à-vis* natural bodies. Information is due on activities "in the same area of (...) the Moon" where another State is active⁴²; information is also due in case of a "crash landing, forced landing or other unintended landing" on a celestial body⁴³; the collection and removal of "samples of its mineral and other substances" is allowed⁴⁴; whereas the "natural resources" of celestial bodies should be considered "the common heritage of mankind"⁴⁵.

In addition, several Articles more generally address activities that simply presume an 'object' of a size man-made space objects for the time being are not likely to be, such as "the establishment of military bases, installations and

fortifications”⁴⁶, “expeditions to or installations on” the moon and other celestial bodies⁴⁷; activities “on or below (...) [the] surface”⁴⁸; “the placement of personnel, space vehicles, equipment, facilities, stations and installations on or below the surface”⁴⁹; a right of access to those⁵⁰; operations of “manned and unmanned stations”⁵¹; or even the need to protect the environment⁵².

Most interestingly, however, the Moon Agreement “does not apply to extraterrestrial materials which reach the surface of the Earth by natural means”,⁵³ which at the very least suggests that in the absence of such a clause extraterrestrial material would, or might well, have fallen within the scope of this agreement regulating human behaviour *vis-à-vis* the moon and other celestial bodies.

In short: the Moon Agreement throughout its provisions underscores that ‘celestial bodies’ on the one hand, and ‘objects (launched into outer space)’ / ‘space objects’ on the other hand, are indeed mutually exclusive categories – and that NEO’s unequivocally belong to the former category.

Of course, the poor rate of ratification of the Moon Agreement, in particular with the space powers that primarily matter from the NEO perspective in that they can actually respond if perceived necessary, may question the global legal validity and applicability of this conclusion. It should be noted, however, that it was above all the clauses regarding the ‘common heritage of mankind’ and the prospective regulation of (commercial) exploitation of the moon (and their further expected elaboration) that caused the large majority of states to refrain from signing and ratifying the Agreement.⁵⁴

In other words, this does not take away the general acceptability for purposes

of legal analysis of relevant phrases – including “natural resources”⁵⁵ or “natural resources in place”⁵⁶, logically applicable only to ‘celestial bodies’.

5. Back to the Russo-Chinese proposal

The next question would then be: what does the Russo-Chinese proposal for an international treaty on ‘space denuclearisation’ mean for the development of a NEO- threat response initiative, taking into consideration that the former is as of yet nothing more than a *proposal* for a treaty, rather than an established part of international law on the issue?

The primary issue – of potential conceptual confusion – is defused directly by the definition of “outer space object” in the draft: it means “any device, designed for functioning in outer space, being launched into an orbit around any celestial body, or being in the orbit around any celestial body, or on any celestial body except the Earth, or leaving the orbit around any celestial body towards this celestial body, or moving from any celestial body towards another celestial body, or placed in outer space by any other means”.⁵⁷

Thus, whatever the other merits or problems of the proposal, the prohibition that it most fundamentally tries to establish (of using or threatening the use of force against such outer space object⁵⁸) applies only to man-made artefacts – the same objects that the space treaties refer to as “space objects” or “objects (launched into outer space)”.

That the proposal is not intended to prohibit the use of any force in outer space comprehensively is also confirmed by a fundamental, almost standard escape clause, where the use of force in outer space for purposes of

self-defence is carved out from the general prohibition.⁵⁹ Of course, the reference to ‘self-defence’ is to the classical concept as this refers to defence against ‘an armed attack’ against a sovereign state – by another state or (arguably) other congregations of humans such as non-official armed bands, terrorists or guerrillas.⁶⁰ Yet, if that were to mean *a contrario* that a form of ‘defence’ against a ‘non-human’ attack would not be permissible, that could only be qualified as “a result [of interpretation] which is manifestly absurd or unreasonable”⁶¹ – in other words: would be an incorrect interpretation.

Actually, the Russo-Chinese proposal – if it were to become a treaty ratified by a relevant number and category of states, and thus would become part of international (space) law – would only come to affect actions against NEO’s in a different manner, namely where any response to a perceived NEO threat would involve the use of something that could be considered a ‘weapon’.

The draft firstly defines a ‘weapon in outer space’ as “any device placed in outer space, based on any physical principle, *specially produced or converted* to eliminate, damage or disrupt normal function of objects in outer space, on the Earth or in its air, as well as to eliminate population, components of biosphere critical to human existence or inflict damage to them”.⁶² As this definition focuses on ‘production or conversion’ of a ‘device’, not on its (intended) usage, it automatically applies to any device produced or converted for the purpose of disruption of operation of man-made artefacts in outer space, whether it actually is *used* for that purpose or not. Unless devices to be used for response to NEO threats would by contrast be produced or converted “specially” for dealing with such threats, they could

well be considered a ‘weapon in outer space’.

Secondly then, the Draft prohibits not only the use of force or threat of such use involving weapons in outer space, but also “to place in orbit around the Earth any objects carrying any kind of weapons, not to install such weapons on celestial bodies, and not to station such weapons in outer space in any other manner”.⁶³

Thus, if the Russo-Chinese draft were to become part of international law, any state bound by it would be restrained from placing into orbit or otherwise in outer space any anti-NEO device falling within the definition of ‘weapon’ as given above, unless *either* the clause of Article V on self-defence should be interpreted as encompassing ‘defence’ against a threatening NEO *or* an amendment under Article X would be incorporated in the draft treaty so as to carve out the relevant exception here. In view of the dual-use nature of any anti-NEO device that would fall within the definition of a ‘weapon in outer space’ it is not feasible here to refer to the clause of the Vienna Convention on the Law of Treaties mentioned before, on ‘manifest absurdity or unreasonableness’: the draft treaty for obvious reasons and quite consciously does focus on the character and potential of the devices, not on the actual usage.

6. Concluding remarks

Whilst thus, from the perspective of the NEO-response discussions, any entry into force of the Russo-Chinese draft treaty without further ado would indeed generate some problems, this is *not* the consequence of any definitional confusion. In spite of several inconsistencies in the space treaties as discussed, where terms such as

'objects', 'objects in outer space' and 'space objects' are frequently used in interchangeable fashion, it is sufficiently clear that all of those concepts refer to man-made artefacts and not to NEO's of any sort. The same conclusion also applies regarding the term 'outer space object' introduced by the Russo-Chinese draft.

If anything, the extended analysis of these concepts has thus resulted in further support for the conclusion that, by contrast, NEO's form part of that larger concept of 'celestial bodies' (which even recurs in the Russo-Chinese draft⁶⁴) and that those two concepts – of '((outer) space) objects (launched into outer space)' respectively 'celestial bodies' are mutually exclusive. Though the confusion might be to some extent unavoidable, recognising that the word 'object' is part and parcel of the concept of 'NEO', one is thus left to wonder whether it would not be a feasible alternative to speak no longer of 'defence against Near-Earth Objects' but rather of 'response to threatening near-earth celestial bodies'...

Endnotes

¹. With an estimated explosive power of millions of nuclear bombs; see e.g. http://en.wikipedia.org/wiki/Cretaceous-Tertiary_extinction_event#cite_note-Alvarez-62;

<http://www.enchantedlearning.com/subjects/dinosaurs/glossary/K-T.shtml>.

². With an estimated explosive power of 10-15 Megatons, which is still some 1,000 times that of the bomb dropped in 1945 on Hiroshima; see e.g. http://en.wikipedia.org/wiki/Tunguska_event.

³. For more information on the ASE NEO initiative, see <http://www.space-explorers.org/committees/NEO/neo.html>.

⁴. Open Letter of the Association of Space Explorers, 19th Annual Congress, Salt Lake City, UT, 14 October 2005; see http://www.space-explorers.org/committees/NEO/docs/Open_Letter.pdf.

⁵. Note that on the other hand not every deflection of a potentially threatening NEO requires physical destruction; technologies have been developed (of which some are essentially operational) that amount to slowing down alternatively speeding up the NEO in its orbit, thus decreasing its chances of intersecting the earth's orbit at the moment the earth is actually passing such intersection.

⁶. Draft PPWT Treaty, or Draft Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects; presented 12 February 2008 to the Conference on Disarmament; e.g. <http://www.reachingcriticalwill.org/legal/paros/parosindex.html> (click on the treaty's comprehensive name).

⁷. Outer Space Treaty, or Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967).

⁸. Art. IV, Outer Space Treaty.

⁹. Art. X, Outer Space Treaty.

¹⁰. Cf. Art. 31, Vienna Convention on the Law of Treaties, Vienna, done 23 May 1969, entered into force 27 January 1980; 1155 UNTS 331; UKTS 1980 No. 58; Cmnd. 4818; ATS 1974 No. 2; 8 ILM 679 (1969).

¹¹. Preamble, 1st para., Outer Space Treaty.

¹². See e.g. already G. Gal, *Space Law* (1969), 207-9; also C. Zanghi, *Aerospace Object*, in *Outlook on Space Law over the Next 30 Years*, Eds. G. Lafferranderie & G. Crowther (1997), 115-23.

¹³. See also e.g. V. Kopal, *Some Remarks on Issues Relating to Legal Definitions of "Space Object", "Space Debris" and "Astronaut"*, in *Proceedings of the Thirty-Seventh Colloquium on the Law of Outer Space* (1995), 100-3.

¹⁴. See Art. VII, Outer Space Treaty, which provides in particular: "Each State Party to the Treaty that *launches or procures the launching of an object into outer space*, including the Moon and other celestial bodies, and each State Party from whose territory or facility *an object is launched*, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons *by such object or its component parts* on the Earth, in air space or in outer space, including the Moon and other celestial bodies." Emphasis added.

¹⁵. Art. VIII, Outer Space Treaty. Also Art. VII already referred to "component parts"; see *supra*, n. 14.

¹⁶. Art. X, Outer Space Treaty.

¹⁷. Cf. further in detail e.g. Zanghi.

¹⁸. See further already the full title of the Outer Space Treaty.

¹⁹. Art. I, Outer Space Treaty; further Art. III.

²⁰. Art. II, Outer Space Treaty.

²¹. See Art. IV(2), Outer Space Treaty.

²². Emphasis added.

²³. Cf. e.g. Artt. I, II, Outer Space Treaty.

²⁴. Rescue Agreement, or Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, London/Moscow/Washington, done 22 April 1968, entered into force 3 December 1968; 672 UNTS 119; TIAS 6599; 19 UST 7570; UKTS 1969 No. 56; Cmnd. 3786; ATS 1986 No. 8; 7 ILM 151 (1968).

²⁵. Artt. 1-4, Rescue Agreement.

²⁶. Art. 5, Rescue Agreement.

²⁷. Furthermore, also in the Rescue Agreement, reference is made to "component parts" as suggesting some human activity of 'composition' to have been involved; Art. 5(1), (2), (3), (4) & (5), Rescue Agreement.

²⁸. The Rescue Agreement does not refer to 'celestial bodies' anywhere; at best it could be presumed included in "any other place not under the jurisdiction" of any state (see e.g. Artt. 3, 4, (1), cf. also 5(3), Rescue Agreement); but obviously this concerns cases where astronauts are in

distress *on* such celestial bodies, not any obligation to 'return' one.

²⁹. Liability Convention, or Convention on International Liability for Damage Caused by Space Objects, London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965 (1971).

³⁰. Art. I(d), Liability Convention.

³¹. Cf. e.g. Artt. III, IV(1), Liability Convention (referring to "persons (...) on board such a space object").

³². Registration Convention, or Convention on Registration of Objects Launched into Outer Space, New York, done 14 January 1975, entered into force 15 September 1976; 1023 UNTS 15; TIAS 8480; 28 UST 695; UKTS 1978 No. 70; Cmnd. 6256; ATS 1986 No. 5; 14 ILM 43 (1975).

³³. See, respectively, Art. II, esp. (1) & (3), and Artt. II, III, IV, Registration Convention. That *de facto* registration is often lacking with regard to specific space objects, is more a consequence of abusing several 'escape' clauses qualifying the obligation to register, for example the one stating registration should take place "as soon as practicable"; see also Y. Lee, Registration of space objects: ESA member states' practice, 22 *Space Policy* (2006), 42 ff., esp. 44, 50.

³⁴. Art. II(1), Registration Convention.

³⁵. See Art. VIII, Outer Space Treaty, in conjunction with Art. II(2), Registration Convention.

³⁶. See Art. IV(1), Registration Convention, resp. sub (a), (b), (c) and (e).

³⁷. Moon Agreement, or Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, New York, done 18 December 1979, entered into force 11 July 1984; 1363 UNTS 3; ATS 1986 No. 14; 18 ILM 1434 (1979).

³⁸. Status as of 1 January 2008; see <http://www.unoosa.org/oosa/en/SpaceLaw/treaties.html>.

³⁹. ESA was established by means of the Convention for the Establishment of a European Space Agency (hereafter ESA Convention), Paris, done 30 May 1975, entered into force 30 October 1980; 14 ILM 864 (1975); Space Law – Basic Legal Documents, C.I.I. Currently, it comprises eighteen member states: Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal Spain, Sweden, Switzerland and the United Kingdom.

⁴⁰. Cf. further e.g. Gal, 186-8; also the discussion at C.Q. Christol, *The Modern International Law of Outer Space* (1982), 20-2.

⁴¹. See e.g. Preamble, Artt. 2, 4, 5, 7, 8, Moon Agreement.

⁴². Art. 5(2), Moon Agreement.

⁴³. Art. 13, Moon Agreement.

⁴⁴. Art. 6(2), Moon Agreement.

⁴⁵. Art. 11(1), Moon Agreement.

⁴⁶. Art. 3(4), Moon Agreement.

- ⁴⁷. Art. 6(3), Moon Agreement.
- ⁴⁸. Art. 8(1), Moon Agreement.
- ⁴⁹. Art. 11(3), Moon Agreement. See also e.g. Art. 12(1), providing for jurisdiction and control over such items.
- ⁵⁰. See Art. 15, Moon Agreement.
- ⁵¹. Art. 9, Moon Agreement; cf. further e.g. Art. 10(2).
- ⁵². Art. 7(1), Moon Agreement.
- ⁵³. Art. 1(3), Moon Agreement.
- ⁵⁴. See on this argument further e.g. the author's *The Moon Agreement and the Prospect of the Commercial Exploitation of Lunar Resources*, 32 *Annals of Air and Space Law* (2007), 98-109.
- ⁵⁵. E.g. Art. 11(1), (5), (7) & (8), Moon Agreement.
- ⁵⁶. Art. 11(3), Moon Agreement.
- ⁵⁷. Art. I(b), Draft PPWT Treaty; emphasis added.
- ⁵⁸. See Art. II, Draft PPWT Treaty; emphasis added.
- ⁵⁹. See Art. V, Draft PPWT Treaty, which runs as follows: "Nothing in this Treaty can be construed as impeding the realization by the States Parties of the sovereign right for self-defense in accordance with Article 51 of the Charter of the United Nations." This clause furthermore echoes the general provision of Art. III, Outer Space Treaty, that "States Parties to the Treaty shall carry on activities in the

exploration and use of outer space, including the Moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding."

⁶⁰. See Art. 51, Charter of the United Nations, San Francisco, done 26 June 1945, entered into force 24 October 1945; USTS 993; 24 UST 2225; 59 Stat. 1031; 145 UKTS 805; UKTS 1946 No. 67; Cmd. 6666 & 6711; CTS 1945 No. 7; ATS 1945 No. 1. This Article specifically refers to "an armed attack (...) against a Member of the United Nations", but without going any deeper into the discussion regarding the extent to which a customary right of self-defence exists broader than and beyond the UN Charter, for purposes of the present analysis it can be safely equated to 'an armed attack against a state'.

⁶¹. Art. 32(b), Vienna Convention on the Law of Treaties, as providing for some "Supplementary means of interpretation" of treaties.

⁶². Art. I(c), Draft PPWT Treaty; emphasis added. A weapon "will be considered as 'placed' in outer space if it orbits the Earth at least once, or follows a section of such an orbit before leaving this orbit, or is stationed on a permanent basis somewhere in outer space"; Art. I(d).

⁶³. Art. II, Draft PPWT Treaty.

⁶⁴. See Artt. I(b), II, Draft PPWT Treaty.