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OUTER SPACE TRAFFIC MANAGEMENT: SPACE SITUATIONAL AWARENESS REQUIRES TRANSPARENCY

By Paul B. Larsen*)

Introduction

The purposes of outer space traffic management are to avoid intentional and unintentional collisions, to make outer space traffic safe and to assure the freedom of access, egress and uses of outer space granted by the Outer Space Treaty (OST), Art I.[1] China's 2007 anti-satellite exercise followed by the 2008 US shoot-down of its reconnaissance satellite awakened states to the importance of space situational awareness. This paper describes current space traffic laws and regulations It concludes that the main stakeholders are beginning to realize that in order to assure safety of their space objects from collisions by others, they must disclose their locations. Dialogues at the highest levels have begun between private space operators and the military. Furthermore US Senator Barack Obama's recent policy statement expressed that he would negotiate international agreements on rules of the road for outer space. [2] Outer space traffic management is now in a state of change which may eventually lead to standard-setting by an international organization. The paper also concludes it would be impractical at this time to encumber traffic management with military disarmament talks.

A. Issues:

*) Cypyright 2008 Paul B. Larsen, (larsenpb@law.georgetown.edu). Published by the American Institute of Aeronautics and Astronautics Inc. with permission. Released to AIAA to publish in all forms The author teaches space law at Georgetown Univ. Law Center, Washington DC.

[1] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, 610 UNTS 2005 (1967).

[2] Policy Statement released Aug. 16. 2008 http://www.spaceref.com/news/viewsr.htma?pid=28880
Senator Obama recognizes the importance of an international approach towards "enhancing capabilities for space situational awareness." He favors an international agreement on rules of the road and plans to enter into negotiations with other countries "to ensure all nations have a common understanding of acceptable behavior."

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Existing traffic in outer space is mostly concentrated in identifiable orbits: The many communication satellites in Geostationary Orbit (GSO); the International Space Station and many observation satellites in Low Earth Orbit (LEO); the GNSS satellites in Mid Earth Orbit (MEO). The traffic is a mix of civilian and military space objects of various national registrations. The traffic is mainly tracked by the United States and by Russia. The Europeans have plans to establish their own tracking systems. Only large space objects are being tracked. Several hundred thousand objects, like flecks of paint and droplet of fuel, are not tracked. Traveling at orbital speeds in excess of 25,000 miles per hour, even small space objects can cause great damage. The increasing amount of traffic since the beginning of the space age, in particular the great increase of space debris, and the great economic investments in outer space objects, make collision avoidance an urgent issue. How can outer space traffic be effectively and safely managed, and ultimately how can access, egress and use of outer space be assured? What traffic rules and guidelines are the spacepowers willing to accept?

Outer space traffic management is an ongoing concern among thinkers and writers.. Lubos Parek wrote groundbreaking assessment of the issues in his 1982 paper.[3] In 2007 Corinne Jorgenson, Kai-Uwe Schrogl and Petr Lala studied the issues in their IAA Space Traffic Management Study, taking into account the most recent developments.[4] Several studies have been published in the International Space Law Colloquium. In view of the plans to send humans to the Moon by 2020, planned suborbital flights of humans, the increasing magnitude of plans for economic exploitation of the Earth's orbits, and the increasing military uses of outer space, the study of outer space traffic management must go on. Particular attention-grabbing events during the last year and a half were the intentional shoot-down of the Chinese satellite and the US reconnaissance satellite shoot-down, as well as unilateral demands for freedom of action in outer space for reasons of national security.

B. The Stakeholders

The stakeholders in safe unimpeded outer space flight include the following:

1. The commercial satellite operators, including INTELSAT, the Direct Broadcast Satellite operators, the remote sensing satellite operators, the manufacturers of satellites and satellite equipment, the launch operators, and the operators of spaceports.
2. The military users including the military establishments that operate military reconnaissance satellites, dual purpose satellite services such as Global Navigations Satellite Services

[3] L. Parek, Traffic Rules of Outer Space, 1982 Colloquium on the Law of Outer Space, 37.

[4] Corinne Jorgenson, Kai-Uwe Schrogl, and Petr Lala, Space Traffic Management, IAA Cosmic Study, 2007 Colloquium on the Law of Outer Space, 580. See also discussion of AIA Report in S. Aoki, Space Traffic Management for the Prevention of Weaponization of Outer Space, 2008 Colloquium on the Law of Outer Space. The AIA Report concludes that transparency is essential for outer space traffic management.

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(GNSS), as well as secret satellite operations.
3. The countries that do not have current space capability but who want to be assured that they can use outer space when they do obtain space capability individually or in cooperation with other countries.
4. Governmental and nongovernmental international organizations interested in preserving unimpeded access to and use of outer space.

I. Magnitude of Space Traffic Congestions.

A. Keeping Track of Outer Space Traffic

Simply tracking outer space objects does not mean that the traffic is managed and that order is established, but tracking is important in order to know how to circumvent space objects. The course of non-functional space debris cannot be changed, but data collection about location identifies traffic hazards. Thus the few space objects such as the International Space Station (ISS) that can change course, have to be moved out of the way of debris. The ISS experiences at least one major debris encounter each year. The following are important sources of information about the location of objects in outer space; they are all imperfect but all contribute towards a comprehensive traffic data collection

1. *The Registration Convention*:[5] Under the Registration Convention countries are required to register the location of their space objects including "component parts of a space object as well as its launch vehicle and parts thereof." This registry is now electronically accessible. Countries may file information about changes in location after launch. The registry is maintained by the United Nations Office of Outer Space Affairs. Some countries, like the United States, register both their functioning satellites as well as major non-functioning debris known to stem from their satellites.
2. *The International Telecommunication Union*[6] (ITU) registers and recognizes orbital locations (as well as radiofrequencies) of satellites, in particular satellites in the scarce GSO. ITU also registers changes in location of satellites. The information is used to avoid interference with registered satellites. Military satellites do not have to be registered with ITU, but they most often are registered in order to avoid radio interference.
3. *U.S. Commercial and Foreign Entities Program:* Large objects over 10 centimeters are being tracked by the United States Air Force. Each known object is assigned an identity marking that indicates what is known about its history and characteristics and location. Thus the course of

[5] Convention on Registration of Objects Launched Into Outer Space, 1023 UNTS 15 (1976).

[6] Instrument Amending the Constitution of the International Telecommunication Union, (ITU), Project 2001, Legal Framework for Commercial Satellite Telecommunications, 325.

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satellites can be changed to avoid known non-functional debris. Orbital data are distributed by the US Air Force in the Commercial and Foreign Entities (CFE) program. Russia maintains a similar tracking system. This valuable information is available to operators and prospective operators of space objects. Debris objects smaller than 10 centimeters are not tracked. They are therefore exceptionally dangerous.

4. *EU/ESA:* In 2008 the EU and ESA decided to establish a space surveillance network in order to identify outer space objects. The new tracking space object network will create an independent tracking network for the EU/ESA countries and will vastly improve their space situational awareness capability. The network is designed to be dual purpose and will track both military and civilian space objects. [7]
5. *Cape Town Convention Registry*: A new comprehensive registry of space assets is being established under the Space Protocol to the Cape Town Convention.[8] This is also an electronic registry which will be publicly accessible. It will be a secondary source of information about location.
6. *National military authorities as well as private operators* keep track of and control their own satellites in order to protect their existence and operation. For that purpose they also track, to the best of their capability, extraneous space objects that may interfere with the operation of their satellites. Military information is often secret and not available to the public.
7. *NASA:* High value individual flights are tracked very carefully by their operations centers. Flights of the Space Shuttle to the ISS are anxiously watched by NASA. Each operational center guides the mission and indeed retains some operational control over the spacecraft.
8. *Private observers* track satellites and report unusual events. Their observations often find their way into the news.

B. Projections into the Future

Astronauts describe outer space as being a very dangerous environment which does not allow for mistakes in operation of space objects. Collisions are dangerous for astronauts, and can frustrate commercial and military objectives; the malfunctions of several satellites are believed to be due to debris strikes. It is important to keep in mind that the concern is not only with objects launched into outer space but also with the cascading effect of successive collisions causing fragments that collide with other satellites and fragments, which in turn cause further escalating fragmentations. The ultimate result could be virtual denial of access to outer space, somewhat like the rings of icy debris that encircle the planet Saturn. Accidental or deliberate military confrontations potentially portends a

[7] DeSelding, European Ministers Endorse Military Role for Galileo, Space News, 29 Sept. 2008, at 8.

[8] Convention on International Interests in Mobile Equipment, www.UNIDROIT.org (2001).

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virtual denial of movements into, from, and within outer space. [9]

II. Existing Laws and Regulations on Outer Space Traffic

Existing laws and regulations provide a good legal foundation for space traffic management. The existing regime is mixed international and national. However, the existing legal authority has not really been developed to establish as effective space traffic management system as exists for air, sea and road and rail traffic.

a. International Laws and Regulations.

1. The Space Law Treaties

In their outer space activities States are bound by international law and the UN Charter. Pursuant to the Outer Space Treaty, Art. VI, states have assumed "international responsibility" for the movements of their national space objects in outer space. The Outer Space Treaty provides the most significant legal foundation for management of space traffic. All countries have a right of free access to outer space; which is characterized as the "province of all mankind" (Art 1). States may not claim sovereignty over outer space, therefore individual states may not, without their permission, direct the space objects of other states to travel in specified ways (Art II). Their nationally registered space objects are subject to continuing national oversight and are under national jurisdiction and control (Art VIII). In their outer space activities States must pay due regard to the interests of other states (Art IX), and shall inform other states "to the greatest extent feasible and practicable, of the nature, conduct, locations and results of such activities." [10]

Outer space traffic collisions may cause liability. The Liability Convention, Article III, provides that, when space objects collide in outer space, the states can be liable for the damages caused by their fault or the fault of persons for whom they are responsible. The Convention also provides for joint and several liability of several states acting in unison; they would be jointly liable for damages caused by them to innocent third parties. [11]

The Registration Convention requires launching states to register the location and nature of their space objects. The Convention's definition of space objects is very broad. The definition includes component parts as well as the launch vehicle and parts of launch vehicles. This broad definition makes it difficult for states to register space debris constituting components of space objects because debris is hard to identify, particularly debris that has collided with other debris causing cascading collisions. Consequently, debris objects are often not registered in the UN registry. The sheer mass of debris

[9] See Stimson Center, Model Code of Conduct for the Prevention of Incidents and Dangerous Military Practices in Outer Space, www.stimson.org. See P. Larsen, Guidelines for Military Activities in Outer Space, 2007 Colloquium on the Law of Outer Space. Also see S. Aoki, supra n. 4.

[10] Outer Space Treaty, supra n. 1

[11] Convention on International Liability for Damage caused by Space Objects, 961 UNTS 187 (1972)

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complicates registration in the UN registry. [12]

2. ITU Registry

The ITU registers satellite orbits and radiofrequencies for effective, interference-free communication. The ITU Radiocommunications Sector ensures rational, equitable, efficient and economical use of the radio-frequency spectrum. ITU therefore registers radiofrequencies as well as orbits used by satellites.[13] ITU does not require military space objects to be registered. But orbits of military space objects are usually registered and their orbits publicly known anyway. The reasons are that military satellites need cleared radio frequencies for their operation just like civilian communication satellites do. The military authorities disclose the orbits of their satellites so that other users can avoid them. The ITU registry is therefore an excellent source of information about the location of current space objects. It is even a good primary source of information about orbits of future space objects because states often register orbits of space objects planned for future use. Assured location of satellites in GSO orbits is particularly sought after because of the density and scarcity of slots in the GSO. Special ITU diligence in placing satellites in GSO orbit is therefore required. [14] However, it should be emphasized that efficient and economic distribution of orbital resources is the main ITU objective; the main objective is not collision avoidance. Users of the ITU Registry must take this into consideration [15]

3. Environmental Regulation of Space Flight

a. Space Flight Restrictions

OST, Art IX, provides that State activity in outer space shall be conducted so as not to cause harmful contamination of the Earth. The UN Principles on use of Nuclear Power Sources (NPS) in Outer Space[16] provide detailed traffic rules for NPS-powered satellites in outer space. Launching states may use NPS to propel outer space flights only when non-nuclear power sources are not available. When used in outer space, NPS may not expose people and the biosphere to radiation in excess of minimum standards set by the NPS Resolution. While NPS may be used in restricted cases, they must be stored in "in sufficiently high orbits after the operational part of their mission." Furthermore, the launching state must inform other states of malfunctions of the NPS space object The Nuclear Test Ban Treaty bans testing of nuclear devices in outer space.[17]

b. Outer Space Debris: The Inter-Agency Debris Committee (IADC)

Traffic in outer space would be much safer if space debris were eliminated. Debris in outer space constitutes the

[12] Id. The registry is maintained by the UN Office of Outer Space Affairs (UNOOSA).
[13] Supra n. 6, ITU Constitution, Art 12, also see Arts 44 and 45.
[14] Id. ITU Constitution, Arts. 44 and 45
[15] Stefan Kaiser, Rules of the Road for Space Traffic, 2003 Colloquium on the Law of Outer Space, 351
[16] Note that the NPS Principles, UNGA Res. 47/68 (Dec. 1992), are not a treaty obligation.
[17] Treaty Banning Nuclear Weapons Tests in the Atmosphere, In Outer Space and Under Water, 480 UNTS 43 (1963)

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greatest danger of collision. Removal of all existing debris is not feasible, but generation of new debris can be diminished. That is the work objective of the IADC, [18] which is a committee composed of the major national space agencies (Italy, UK, France, China, Germany, India, Japan, USA, Ukraine, Russia and ESA). The IADC's guidelines for debris mitigation are important because they constitute the internationally agreed policy of the participating governments to prevent in orbit collisions. The IADC voluntary guidelines were endorsed by COPUOS and by the United Nations General Assembly in 2007. [19] The guidelines are a step towards greater outer space traffic safety. They limit the release of further debris, minimize the potential for break-up during operations, as well as post mission break-up and intentional destruction of satellites. Non-operational space objects must be removed from congested areas by post-mission disposal into graveyard orbits. In view of the recent debris-causing shoot-down of their satellites in outer space by China and the United States, it is significant that both countries support the IADC rules. All the spacefaring states have promised to abide by the IADC rules. The rules will continue to be improved.

Individual nations, most importantly the space powers represented on the IADC, have adopted the IADC guidelines on debris mitigation domestically and require that the guidelines be observed both by governmental and by non-governmental launch and satellite operators. National enforcement of the IADC guidelines is also primarily through the national process of authorization and continuing oversight.

B. National Space Traffic Management

1. National Space Traffic laws and Regulations

Outer space is not sovereign.[20] Air space is sovereign.[21] National air traffic separation rules apply in sovereign airspace. They conform with the ICAO separation rules which apply directly in non-sovereign airspace. However, States maintain national jurisdiction and control over their own space objects in outer space,[22] but not over the space objects of other countries. A defined delimitation of air space from outer space would be a significant benefit in outer space traffic management because the launching states would know when their space objects are in their national sovereign air space and when they enter foreign air space during launch but particularly during the long flat landing trajectory of their space objects. Passing though the sovereign air space of other states has to be carefully coordinated. [23] Some countries, like Australia, have domestic laws that define space above 100 kilometers as constituting non-sovereign outer space in which they do not assume

[18] www.iadc-online.org See S. Mirmina, Reducing the Proliferation of Orbital Debris: Alternatives to a Legally Binding Instrument, 99 Amer. J. Int'l L. 649 (2005)

[19] Id. UN DOC.RES/62/217 (Jan 2008).

[20] Outer Space Treaty, supra n. 1, Art. II

[21] Convention on International Civil Aviation, Art. 1, 15 UNTS 295 (1944) (Chicago Convention).

[22] Outer Space Treaty, supra n. 1, Arts. VI and VIII

[23] Note case of aerial intrusion into USSR air space by Korean Air Lines, see Chan v. Korean Air Lines, 490 U.S. 122 (1989)

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responsibility for traffic separation.[24] Major spacepowers, like the United States, have declined to delimit outer space by international or by national legislation.

National tracking is the main source of information about the location of space objects. The United States constantly, but unilaterally, tracks all space objects regardless of whether they are of US registry of other registry. The US also tracks unregistered space debris and shares that information. Information about the location of both registered and unregistered space objects is used to calculate probability of possible collisions. For example, recently when a debris object was calculated to be on a collision course with the International Space Station (ISS), the European Automated Transfer Vehicle was used to place the ISS in a lower orbit in order to avoid the debris. [25]

The national states, pursuant to the Outer Space Treaty, Art VI, are obligated to authorize and exercise continuing oversight over activities of private operators in outer space. This is done though national licensing of launches and of spaceports. Operators must show that they are safe operators and that their launch vehicles and payloads are safe enough to navigate in outer space. Not only do the operators have to prove the safety of their space vehicles, but also that they are able to navigate safely. States have one great incentive to insure the safety and navigability of authorized space activities: That is to preclude activities that may cause state liability under the Liability Convention.

2.National Jurisdiction and Control.

Space vehicles, including astronauts on board, while in outer space are subject to the jurisdiction and control of the state on whose registry the space vehicle is carried. Therefore, the state of registry can and does direct the space objects on its registry to operate in accordance with its domestic laws and international obligations. US Space vehicles are built to NASA safety specifications. NASA subjects astronauts to very extensive physical examinations and trains them for specific tasks. The astronauts are also subject to the astronauts code of conduct. The ISS Agreement, Art 11, provides that each ISS partner state shall provide only qualified personnel to serve as crew members. ISS flight assignments are made by special agreements. The partner states agree to establish a code of conduct for the ISS crew. A partner state must approve the code of conduct before it can provide crew members. Each member state must ensure that its crew members observe the crew code of conduct. [26]

The US FAA requires private space vehicles and payloads to comply with specified safety standards. The personnel of suborbital space flights must be qualified pilots who passed medical examinations. They must receive FAA specified training before they are

[24] Australian Space Activities Act, Section 8. See excellent review of Australian legislation in R. Lee, The Australian Legal & Regulatory Framework for Space Launches, (2004/05 ed.)

[25] www.esa.int/SPECIALS/operations/SEM640SAKF_0

[26] International Space Station Agreement, Art 11, www.nasa.gov The states using the International Space Station(ISS) have by separate agreement stipulated how to exercise jurisdiction and control over the jointly operated ISS.

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permitted to pilot suborbital space vehicle. The training is intended to protect the health and safety of the public whether on Earth or traveling in space. [27]

III. Current Trends in Outer Space Traffic Management

A. Analogies to International Sea, Road, Rail and Air Traffic

Road, rail, sea and air traffic is by necessity extensively regulated. Such regulations resulted in huge improvement in road, rail, maritime and aviation safety. There are international treaties on road traffic.[28] One need only think of congested city traffic in Glasgow or New York. Accidents such as the sinking of the Titanic, the maritime collision of the Andrea Doria with the Stockholm led to new international regulation of maritime traffic.[29] The collision of two planes, one a passenger plane and the other a military plane over the Grand Canyon in the United States led to the creation of the US Federal Aviation Agency and to improved international air traffic rules in ICAO. These analogies to other modes of transportation do not fit very well to outer space traffic because the other modes of traffic assume that all the moving objects can be directed and can maneuver. Different traffic rules are required for outer space objects.

The most rudimentary air traffic separation scheme is for each operator to see and be seen. To put it bluntly: that is still the traffic separation scheme for outer space. This separation system works as long as outer space is so vast. But when outer space is crowded with space objects, then this rudimentary system is inadequate. This system does not work properly when most of the objects in outer space are incapable being maneuvered. Non-functional outer space debris causes the see and be seen traffic management scheme to fail. Basically nothing much can be done about uncontrolled outer space debris except to minimize future debris. What remains then is the possibility of better traffic management of the space objects that can maneuver and change course.

B. Military Outer Space Objects

Unilateral claims of authority to deploy military space objects in outer space cause the problems of space traffic management to escalate. Uncoordinated intentional or unintentional approaches to space objects of other states may create a danger of military confrontation in outer space. Military engagements in outer space would cause intense debris accumulation and would disrupt civilian uses of outer space. Nuclear war in outer space would be disastrous for future uses of outer space. Unilateral exertion of authority in outer space by China in 2007 to shoot down one of its own 'dead' satellites greatly added to the volume of outer space debris. US claims in its 2006 Presidential policy statement

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[27] Commercial Space Launch Act, 49 USC 70101. See excellent article by Timothy Hughes and Esta Rosenberg, 'Space Travel Law (and Politics): The Evolution of the Commercial Space Launch Amendments of 2004, 31 J. Space L. 1 (2005).

[28] Convention on Road Traffic, 125 UNTS 22 (1949)

[29] Convention on International Regulations for Preventing Collisions at Sea, 28 UST 3459 (1972), International Convention for the Safety of Life at Sea, 536 UNTS 27 (1965).

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to act unilaterally,[30] that is, to do whatever it considers necessary for national security objectives, followed by the 2007 shoot-down of a non-functional reconnaissance space object, also affected outer space traffic. These and similar claims have increased vulnerability of outer space traffic and called into question their safety and security. The danger of accidental and even intentional collisions leading to claims that sovereign rights have been violated, led to apprehensions of aggressive activities in outer space. Such apprehensions were confirmed in 2008 by then-Secretary of the US Air Force, Michael Wynne, saying that outer space is expected to be a future field of military engagements. Outer space "will shape the American way of warfare well into the 21st Century." [31] Weaponization of outer space and military activities in outer space could restrict access to, egress from, and traffic in outer space.

C. Current Efforts at Transparency of Military and Civilian Outer Space Traffic

Competition of the military space objects of friendly and competing space powers in the 'outer space commons' is dangerous. The tendency to claim and assert unilateral authority to do whatever is in the interest of their national security creates a possibility of military confrontations among the space powers. Some of those confrontations may be accidental for lack of information about the locations and intentions of competing space powers, but some confrontations may be deliberate. Second, increasingly assertive private commercial operators need assurance that they can do business in outer space. [32] Third, private operators may be performing military tasks and can be considered military objectives. Fourth, some military and commercial space operations are indistinguishable; they are dual service space objects, such as GNSS satellites.

Possible conflicts in space traffic have resulted in proposals for maximum transparency of all outer space traffic in order to avoid both accidental and deliberate collisions in outer space. The Stimson Center has put forward draft guidelines for outer space navigation proposing greater transparency of military uses of outer space and urging reduced probability of accidental collisions of military satellites in outer space. The proposed traffic rules are well within the framework of the Outer Space Treaty. [33] The proposal has

[30] US National Space Policy Statement, Oct 6, 2006, www.spaceref.com/news/views.html.
[31] Michael Wynne, Secretary of the US Air Force, Crafting the Next Generation of Military Space, Space News, June 2, 2008, at 19.

[32] P. Larsen, Guidelines for Military Activities in Outer Space, supra n. 8.
[33] Supra n. 8. Stimson Center model code provides: 1. States shall not simulate attacks and shall avoid maneuvers that increase the risk of collision. 2. States shall not use directed energy devices, such as lasers to impair satellites in outer space. They shall not use anti-satellite weapons or space weapons to impair a satellite. 3. States shall follow the IADC debris mitigation rules. 4. States shall keep each other informed about launches and legitimate approaches to each other's satellites. 5. States shall adopt ITU's international traffic management regulations and recommendations. 6. States shall permit verification. 7. States may establish caution zones in order to avoid collision; and States shall maintain mandatory communication systems and engage in consultations to resolve problems. The main purpose is to establish transparency of all space traffic activities so as to create predictability and safety.

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started a discussion of and a search for the common ground rules that all states can live with. The proposal can be modified to suit the needs of the countries involved. The result could be space traffic guidelines for simple rules of the road, providing advance notice to identify space activities so that collisions can be avoided. The objective would be to create more certainty, predictability and safety of space flights. Ultimately the traffic rules could reduce the danger of war in outer space

The concept of transparency of location and of movements can be applied not only to accidental and warlike military encounters in outer space; transparency of space traffic maneuvers can also serve the needs of civilian space operators who need to coexist with the military satellites. In pursuit of transparency, a process of coordination and information has begun. A joint government-space industry commercial Satcom mission assurance working group was formed in 2003 to improve communication between the US Department of Defense (DOD) and the commercial satellite operators. The working group is chaired by high level DOD officials (Secretary of the US Air Force) and civilian leaders of the space industry (the President of INTELSAT). The working group is meeting " to begin hammering out basic guidelines, or rules of the road, for space operations." The goal is to discuss fundamentals: how to track debris and how to exchange information. The military and the civilian authorities must initially develop common terminology for sharing traffic data, such as satellite positions. The parties participating in the working group acknowledge that outer space, in particular GSO, is becoming crowded. They are finding the discussions to be fruitful. Communications between the two classes of operators are becoming clearer. The consequence of the military-industry dialogue is that the US Defense Department is making a major effort to teach "senior military leaders about the need for guidelines to bring transparency and predictability to the U.S. and allied space operations.[34] DOD's position is that" China's January 2007 antisatellite test sparked interest in the idea and the Pentagon's recent destruction by missile of a failed spy satellite helped demonstrate the benefits for a space power of communicating its actions and intentions to the world to lessen the likelihood of misunderstanding." [35]

In the same vein, Michael Vickers, the DOD Assistant Secretary of Defense for Special Operations, Low-intensity Conflict and Interdependent Capabilities informed the US Congress on Feb. 27, 2008, that DOD is interested in development of space operating guidelines. DOD "seeks to promote compliance with existing legal regimes, acceptance of international debris mitigation guidelines and development of additional voluntary guidelines for safe and responsible space operation."[36] DOD acknowledges that the military-space industry coordination of traffic in space will improve conditions for space commerce. It will also lead to greater safety, protection and military security in outer space. Knowledgeable commentators believe that the prospective improvement in outer space traffic management "could serve as a foundation for better orbital data sharing

[34] C. Clark, Industry, Pentagon Eye Operating Guidelines, Space News, March 10, 2008, at 5.
[35] Id.
[36] Id.

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between the United States and other spacefaring governments - something that will become critical as space gets increasingly crowded." Theresa Hitchens, director of the Center for Defense Information stated that "space situational awareness is critical to any strategy for keeping space assets safe."[37]

Focus on a kind of space traffic management that the stakeholders, from practical experience, conclude is required, is realistic. Such traffic management may result only in minimal order in space, but it is what the stakeholders find they need and can accept. This is constructive movement away from previous policy claim of unilateral freedom of action in space, claim of right to deny such freedom to adversaries, combined with US policy view opposing new international space regimes [38] The new policy initiative is moving in the direction of recognition of the benefits and indeed the need for international co-operation among governments and the space industry. From a US point of view, such co-operation "will be required to ensure the level of space situational awareness (SSA) needed to protect U.S. and the rest of the world's orbital assets." Consequently governments are now discussing potential data sharing plans in order to create a socalled "Neigborhood Watch" network. "While nearly everyone agrees on the need for better data sharing to increase transparency in space, to avoid collisions and monitor debris, the question of how that will be done is as yet unclear." The US Air Force CFE tracking program [39] is being revised to allow for the greater transparency. The commercial satellite industry is working independently on its own data collection program using not only the US Air Force data but also their own operator data. The objective is to create a new independent voluntary but trustworthy industry collection of traffic data.[40]

Because of the inherently international nature of outer space traffic, there will have to be international cooperation among those parties generating data for greater transparency. Therefore space traffic data collection and traffic management must naturally involve all the spacepowers. [41] Towards that purpose, ESA proposes to organize European tracking resources in order to create an independent European organization for surveillance and data collection that will be made available to both military and civilian users. Furthermore, ESA wants to create a voluntary outer space code of conduct for outer space activities.[42]

CONCLUSION

There is growing realization among all the satellite operators that space situational awareness is essential and that it requires transparency of outer space traffic. The operators are beginning to acknowledge that they

[37] Id.
[38] US National Space Policy Statement, Oct 6, 2006, supra n. 30.

[39] T. Hitchens, 'BuildingTransparency in Space', Space News, 28 July, 2008, at 19.
[40] Id.
[41] Rouge, Interview with Director, DOD National Space Office, Space News, June 30, 2008, at 12
[42] DeSelding, France to Keep Pushing for Ambitious New EU Space Policy, Space News, July 7, 2008, at 7.

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must be willing to exchange information about the location of their space objects so that they can 'see' other space objects and themselves be 'seen' and thus be avoided. To avoid accidental military confrontations, the locations of military space objects also need to be disclosed. The DOD Director of the National Security Space Office is right that monitoring of locations can best be done through international cooperation in order to get a full picture of all moving space objects. Unilateral monitoring is not sufficient. Some international organizational structure is necessary for independent monitoring and communication. The unilateral space tracking organizations that now monitor space objects, can coordinate directly with each other the way the GNSS providers began coordination to establish GNSS interoperability. Prof. Aoki correctly concludes that "it seems more important to reach the pertinent gentlemen's agreement among like-minded countries."[43] The international coordination would eventually widen and could involve international organizations able to set standards.[44] Using again the GNSS experience, such standard-setting could involve the COPUOS. It would not be difficult to extend COPUOS functions the way the COPUOS mandate was extended to include GNSS.[45]

Finally, stakeholders agree that outer space traffic safety is the key objective. Single focus on safety can lead to minimal traffic order in outer space. Combination of the outer space traffic management objective with the objective of disarmament would greatly enlarge the issue of space traffic management, place talks in the different forum of the Conference on Disarmament, and burden space traffic management with national security concerns. It is preferable to resolve these issues one at a time.

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[43] S. Aoki, supra n. 4

[44] The AIA Report, supra n. 4, contains several recommendations for standards, including rules of the road, orbits, safety and navigation standards.

[45] See International Committee on Global Navigation Satellite Systems (ISG) http://www.unoosa.org/oosa/en/sap/gnss/icg.html