Dottorato di ricerca in Ordine internazionale e diritti umani, Sapienza, Università di Roma - Intercenter, Università di Messina

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Ordenamiento Jurídico Internacional y Derechos Humanos
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Gli Speciali

Dicembre 2018

Le nuove frontiere del diritto dello spazio

A cura di
Lina Panella - Francesca Pellegrino

www.rivistaoidu.net

Rivista telematica - ISSN 2284-3531
Registrazione al Tribunale di Roma n. 46/2014 del 10 marzo 2014

ORDINE INTERNAZIONALE E DIRITTI UMANI

Gli Speciali

Diretti da CLAUDIO ZANGHÌ e LINA PANELLA

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INDICE-SOMMARIO

Dottorato di ricerca in Ordine internazionale e diritti umani, Sapienza, Università di Roma - Intercenter, Università di Messina

Ordine internazionale e diritti umani

International Legal Order and Human Rights
Ordenamiento Jurídico Internacional y Derechos Humanos
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EDITORIALE

L'*équipe* di studiosi del diritto internazionale e della protezione dei diritti dell'uomo che collabora con la rivista *Ordine internazionale e diritti umani*, riunisce spesso gruppi di ricerca per lavorare insieme su diversi temi. A volte, il gruppo di ricerca raggiunge risultati apprezzabili con il contributo di tutti i partecipanti. La Rivista, ritenendo di dover assumere ogni iniziativa utile per divulgare la conoscenza della ricerca, ha deciso di dar inizio ad una nuova collana, *Gli Speciali*, pubblicando, sempre *on line*, numeri unici che riuniscono in unico volume i risultati del gruppo di ricerca.

Inauguriamo questa nuova collana con lo Speciale su *Le nuove frontiere del diritto dello spazio*, che pubblica i risultati raggiunti da diversi studiosi che hanno partecipato alla ricerca.

La Direzione

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FRANCESCA PELLEGRINO*

INTRODUZIONE

Il presente numero speciale della rivista *Ordine internazionale e diritti umani* raccoglie i contributi di valenti studiosi, italiani e stranieri, alla ricerca dal titolo *Le nuove frontiere del diritto dello spazio*, condotta da docenti dei Dipartimenti di Giurisprudenza e di Scienze Politiche e Giuridiche dell'Università di Messina, in collaborazione con il CUST (Centro Universitario di Studi sui Trasporti) Euromed e con il Centro Internazionale di Ricerca e Studi Sociologici Penali e Penitenziari.

L'attenzione dell'Ateneo peloritano verso le problematiche giuridiche afferenti il diritto aerospaziale non è nuova, ma affonda le sue radici in un lontano passato: basti solo ricordare che già negli anni '30 era attivo l'insegnamento di Diritto aeronautico nella Facoltà di Giurisprudenza e che dal 31 ottobre al 3 novembre1960 si tenne a Taormina il Primo Convegno Nazionale di Diritto cosmico, su iniziativa del Prof. Salvatore Pugliatti. Più di recente, nel 1992, l'Università ha ospitato la prima edizione dell'*ECSL Summer Course on Space Law and Policy* dell'ESA e nel 2019 vi si terrà il XXVIII *Summer Course*.

La ricerca giuridica sulle nuove frontiere dello spazio prende le mosse dall'esigenza di ricostruire un quadro completo della normativa vigente in materia, evidenziando le lacune esistenti, sia a livello internazionale che europeo, e mettendo in luce le problematiche più attuali.

Lo studio contempla contributi riguardanti sia temi di carattere generale sia approfondimenti specialistici. Nello specifico, rispettando l'ordine alfabetico degli autori, il Prof. Jacques Arnould, storico e teologo presso il *Centre National d'Études Spatiales* (CNES) di Parigi, si è occupato del tema affascinante dell'etica nelle attività spaziali; il Prof. Kristiaan Bernauw, docente di *Transport Insurance Law* all'Università di Ghent (Belgio), si è occupato degli aspetti giuridici della materia assicurativa in campo aerospaziale; il Dott. Pierfrancesco Breccia, dottorando di ricerca presso la Sapienza Università di Roma, si è occupato delle nuove tecnologie ed il fenomeno del *weaponisation* dello spazio; il Dott. Roberto Di Carlo, *Aviation Expert* e già Direttore *Operations Safety & Quality* di ENAV, ha messo in luce il regime applicabile al turismo spaziale; il Prof. Juan Manuel Faramiñán Gilbert, dell'Università di Jaén (Spagna), ha focalizzato l'attenzione sui profili giuridici riguardanti la stazione spaziale internazionale; i rapporti tra diritto aerospaziale e *governance* è

* Ordinario di Diritto della navigazione, Università degli studi di Messina

stato oggetto del significativo contributo del Prof. Sergio Marchisio, Ordinario di Diritto internazionale presso la Sapienza Università di Roma; la Prof.ssa Adele Marino, Ricercatrice di Diritto della navigazione presso l'Università di Messina, si è occupata del turismo spaziale e dei voli suborbitali; il Prof. Pablo Mendes de Leon, Professore di *Air and Space Law* e Direttore dell'*International Institute of Air and Space Law* dell'Università di Leiden (Paesi Bassi), ha trattato il tema cruciale della responsabilità (*liability and responsibility*) in materia spaziale; il Prof. Michele Messina, Ricercatore Senior di Diritto dell'Unione europea presso l'Università di Messina, si è occupato degli sviluppi futuri del rapporto tra Unione europea ed Agenzia spaziale europea; mentre, la Prof.ssa Carmen Munõz-Rodríguez, dell'Università di Jaén (Spagna), ha trattato la politica spaziale europea prevista dal Trattato di Lisbona e la *Space Strategy for Europe*; la materia assicurativa in campo aerospaziale è stato affrontata, quanto agli aspetti del mercato, dal Dott. Benito Pagnanelli, *broker* assicurativo della *Pagnanelli Risk Solutions* di Londra, uno dei massimi esperti al mondo del settore, recentemente scomparso; infine, la Prof.ssa Francesca Pellegrino, Ordinario di Diritto della navigazione nell'Università di Messina, si è occupata degli aspetti giuridici relativi ai detriti spaziali, evidenziando la mancanza di una specifica regolamentazione internazionale in materia.

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JACQUES ARNOULD*

POUR SON FUTUR, L'ESPACE A BESOIN D'ÉTHIQUE

SOMMAIRE: 1. Introduction. – 2. Une brève histoire de l'éthique spatiale. – 3. La naissance du *NewSpace*. – 4. De nouveaux défis pour le droit spatial. – 5. De la nécessité d'une interrogation éthique. – 6. Et demain?

1. *Introduction*

Parce qu'il est doté d'une conscience et d'un imaginaire, *Homo sapiens* est capable de s'interroger *a priori* comme *a posteriori* sur le sens, les conditions et les conséquences de ses actions et de ses comportements. Cette capacité est à la fois l'origine et la condition de l'éthique ou plutôt, je me permets de le répéter et de le souligner, de l'interrogation éthique. Pourquoi cette insistance? Parce qu'il serait dommage et même préjudiciable de réduire la démarche éthique à la seule élaboration d'une règle, d'un code, d'une loi et, surtout, à leur seul respect. Parce qu'il serait dommage et préjudiciable de la réduire à la seule question, pourtant communément entendue: «Est-il éthique de faire ceci ou de pratiquer cela?». Réduire l'éthique à un processus d'autorisation et d'interdiction, de contrôle et de jugement ne constituerait pas seulement une erreur de définition, mais également une erreur majeure de stratégie, j'entends la meilleure manière d'empêcher nos sociétés de s'interroger sur elles-mêmes, sur leurs responsabilités envers les membres des dites sociétés, à cause d'une tendance excessive à légiférer, au point de perdre la conscience et la vision de leurs comportements.

Les activités spatiales, depuis leur effective naissance le 4 octobre 1957, ne peuvent ni ne doivent échapper à de telles interrogations; la démarche éthique qui leur est désormais associée est donc née en même temps qu'elles, mais son développement a ensuite pris du temps avant d'acquérir une reconnaissance officielle, au sein de la communauté spatiale. L'émergence de nouveaux acteurs, le plus souvent américains, semble ouvrir un nouveau chapitre de l'histoire des activités spatiales, en revisitant des concepts anciens, en introduisant de nouvelles perspectives: les juristes n'ont pas tardé à prendre conscience des défis posés par les projets en cours ou simplement déclarés des acteurs du *New Space*. Mais la ré-

* Centre National d'Études Spatiales, CNES, Paris.

flexion juridique, déjà entamée, ne peut être conduite sans une réflexion, une interrogation éthique, qui ne craignent pas de s'engager dans une mise en question de certaines notions aujourd'hui sinon admises par tous les acteurs spatiaux, du moins reconnues et défendues par plusieurs d'entre eux. De ces réflexions pourront être tirées quelques enseignements pour préparer l'avenir.

2. *Une brève histoire de l'éthique spatiale*

L'idée d'interroger le sens, les moyens et les conséquences des activités spatiales est née avec ces dernières. En 1960, trois ans après le lancement du premier *spoutnik* par les Soviétiques et un an avant le vol de Youri Gagarine, l'Allemand Walter Pons publie un ouvrage intitulé: *Steht uns der Himmel offen ?* – Le ciel nous est-il ouvert ?[1]. Cet ouvrage est sans doute l'une des premières réflexions philosophiques menées à propos de l'entreprise astronautique, une fois celle-ci devenue réalité. À la question qui sert de titre à ce livre, son auteur répond: «Nous ne connaîtrons pas vraiment le monde, si nous ne nous connaissons pas d'abord nous-mêmes.» Dans son célèbre discours du 12 septembre 1962, à Rice University, à Houston, John F. Kennedy le souligne déjà: «Whether it [space science] will become a force for good or ill depends on man»[2]. La même année, l'astronome Bernard Lovell publie un ouvrage intitulé *The Exploration of Outer Space*[3]; le dernier chapitre est consacré à «Quelques réflexions sur l'éthique et le cosmos». Derrière cette formule, le savant anglais s'interroge sur la possibilité d'une vie ailleurs que sur Terre, sur la pollution de l'espace extra-atmosphérique et celle des planètes vers lesquelles les Terriens commencent à envoyer des sondes. Il conclut son livre par une note d'optimisme: la course à la Lune et, plus généralement, la compétition spatiale dans laquelle sont en train de se lancer Américains et Soviétiques constituent d'excellentes occasions de dévier les budgets militaires des deux grandes puissances vers des activités moins belliqueuses … Pons en 1960, Lovell en 1962: ces deux penseurs ont tenu, chacun à leur manière, à poser la question éthique, voire même déontologique, en voyant la naissance et le développement extrêmement rapide des techniques astronautiques. Ils ont perçu que celles-ci allaient offrir et offraient déjà aux humains de nouveaux moyens dont il convenait de se demander quelle place et quelle finalité leur accorder. Mais l'époque n'était pas encore favorable à une prise de conscience plus largement partagée.

Vingt ans plus tard, en août 1982, a lieu à Vienne, la deuxième conférence UNISPACE, chargée de poursuivre la réflexion internationale en matière de politique et de droit de l'espace; plusieurs délégations expriment leurs inquiétudes et leurs attentes: l'espace sera-t-il mis au service des pays en voie de développement? Que penser de la part si grande des budgets spatiaux dédiée aux activités militaires, malgré les engagements pris par les nations dans le premier traité de l'espace élaboré en 1967 en matière d'arsenalisation de l'espace?

L'année suivante, l'UNESCO charge V. S. Vereschtin, vice-président du Conseil «Intercosmos» de l'Académie des sciences de l'Union soviétique, de préparer une table ronde sur le sujet de la coopération internationale dans l'espace. «Preserving space as a haven of

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[1] W. PONS, *Steht uns der Himmel offen? Entropie-Ektropie-Ethik. Ein Beitrag zur Philosophie des Weltraumzeitalters*, Wiesbaden, Krausskopf Verlag, 1960.
[2] *Public Papers of the Presidents of the United States*, 1962, vol. 1, p. 669 s.
[3] B. LOVELL, *The Exploration of Outer Space*, New York, 1962.

peace and cooperation between the world's nations, and not allowing humanity to get accustomed to the idea that militarization of space is supposedly inevitable, écrit Vereschtin, is one of the chief objectives of law and ethics at the present time». La table ronde a lieu le 16 décembre 1983, sous la forme d'une téléconférence réunissant six intervenants originaires de quatre continents. Malgré le succès du vol américano-soviétique *Apollo-Soyouz*, grande est alors la crainte de voir bafouer les grands principes de l'utilisation de l'espace posés par le traité de l'espace, en particulier le principe de l'usage exclusivement pacifique des activités spatiales. Est discutée la nécessité d'un principe général de gouvernance.

Pertinente dans sa perspective, riche par son contenu, cette rencontre n'a eu aucune suite concrète immédiate, au sein de l'UNESCO; il faudra ensuite attendre près de vingt ans pour que l'organisme onusien s'intéresse à nouveau à l'espace. Mais l'initiative de décembre 1983 a peut-être inspiré la rencontre qui s'est tenue à Casablanca en mars 1984, sous l'égide de l'Académie du royaume du Maroc et le titre suivant: «De la déontologie de la conquête spatiale». À parcourir les actes de cette manifestation, comment ne pas être frappé par la lucidité des participants? Si la plupart d'entre eux se montrent encore inquiets de la menace d'une militarisation toujours plus grande de l'espace, ils n'en oublient pas pour autant les autres défis lancés par les activités spatiales. À côté de ceux qui relèvent de la maîtrise technique (l'encombrement des orbites et la prolifération des débris, la pollution causée par les lanceurs, etc.), sont évoqués des dossiers juridiques et diplomatiques (quelle souveraineté? quel partage des données?). Les participants aux travaux de Casablanca reconnaissent que l'un des principaux enjeux n'est pas tant de préciser ou de rappeler l'esprit de Vienne, la lettre des accords internationaux déjà élaborés et signés, mais de les mettre en pratique, autrement dit d'en élaborer une déontologie explicite et de la faire appliquer. Comment réussir ce tour de force, alors même qu'aucune coercition ne peut être envisagée, mais seulement le recours à la bonne volonté? Au cours de cette rencontre, il est aussi question des conséquences de l'usage des moyens spatiaux sur les cultures, sur leur diffusion ou au contraire sur leur isolement, voire leur disparition; plus généralement, est-il possible de penser et de prétendre que l'espace a déjà permis et peut encore permettre de véritables innovations dans le domaine socioculturel?

Ainsi, au début des années 1980, la communauté spatiale internationale est traversée par le souci d'une interrogation éthique et déontologique, en partie dans la perspective ouverte par les travaux juridiques: la conférence UNISPACE II à Vienne, la téléconférence de l'UNESCO à Paris, la rencontre de Casablanca peuvent être considérées comme les étapes successives d'une prise de conscience qui n'est en rien restée à un niveau superficiel mais a plutôt permis de préciser les axes principaux, les perspectives essentielles d'une éthique spatiale à construire. Malheureusement, hormis des discours et les actes publiés par l'institution marocaine, rien n'est issu et demeuré de ces trois initiatives. Il faut encore attendre une quinzaine d'années encore pour que l'éthique retrouve une place plus conséquente au sein de la communauté spatiale.

«At the initiative of the Director-General of UNESCO, Mr Federico Mayor, and acting on a proposal by the Director-General of the European Space Agency (ESA), Mr Antonio Rodotá, a new working group was set up to consider the ethics of outer space in December 1998 on the basis of a partnership between UNESCO and ESA». C'est en ces termes que le rapport publié par l'UNESCO en juillet 2000, sous le titre *The Ethics of Space Policy*, explique l'origine du renouveau d'intérêt du monde spatial pour l'éthique: une proposition de l'agence spatiale européenne et une initiative de l'UNESCO. Coordonné par le professeur Alain Pompidou, le groupe de travail a pour mission d'identifier «the difficulties

and fears, opportunities and promises associated with the conquest of space, while providing the necessary explanations in the clearest and most comprehensive manner possible, taking account of the needs of the populations in their specific socio-cultural context». De ce rapport, je retiendrai une triple définition de l'espace et une absence remarquée. L'espace est présenté comme une dimension [a dimension], autrement dit un lieu, un environnement; comme un outil [a tool], grâce en particulier aux satellites d'observation, de communication; enfin, comme une perception [a perception], celle qu'en a le public, par l'intermédiaire des médias. L'absence remarquée est celle des activités militaires. Suite à ce rapport, l'UNESCO crée au sein de sa World Commission on the Ethics of Scientific Knowledge and Technology (COMEST) une sous-commission consacrée à l'espace extra-atmosphérique. Celle-ci a mené plusieurs actions, le plus souvent avec le soutien de l'ESA: rapports, conférences, etc.; depuis 2005, elle paraît être entrée en léthargie, sans doute par un effet de redondance ou de concurrence avec un autre organisme onusien, le COPUOS (Committee on the Peaceful Uses of Outer Space).

À la même époque, le CNES (Centre national d'études spatiales) entreprend une démarche analogue. Au début de l'année 1999, Gérard Brachet, le directeur général de l'agence spatiale française, confie à un groupe d'ingénieurs le soin d'ouvrir le chantier de l'éthique spatiale; moins de trois ans plus tard, en octobre 2001, un livre est publié pour offrir les fruits de leur réflexion: *La Seconde Chance d'Icare*. Six mois auparavant, la direction du CNES a créé un poste d'expert éthique, avec la mission de poursuivre les travaux entamés par ce groupe d'agents du CNES.

L'éthique paraît avoir pris pied dans le monde spatial: des instances comme le COPUOS y ont consacré des séminaires; les conférences organisées par l'International Astronautical Federation (IAF), par l'International Academy of Astronautics (IAA) ou encore le Committee on Space Research (COSPAR) accueillent des communications sur la thématique de l'espace et de l'éthique; l'International Space University (ISU), basée à Strasbourg (France) honore sa dimension interculturelle et interdisciplinaire en ouvrant son école d'été et son master aux interrogations éthiques; les études confiées à l'European Science Foundation (ESF) par l'European Space Policy Institute (ESPI) sur l'avenir des activités spatiales intègrent elles aussi ce nouveau champ. Pour autant, jusqu'à ce jour, aucune autre agence spatiale que le CNES n'a désigné des personnes ou une équipe en charge de la dimension éthique de leurs activités. L'éthique reste encore, pour l'espace, une frontière à franchir. Et si le NewSpace lui en offrait l'occasion?

3. *La naissance du* NewSpace

NewSpace. C'est le terme communément utilisé par les professionnels de l'espace et les médias pour désigner ce que Jean-Yves Le Gall décrit comme «la révolution que connaît le secteur spatial, portée par l'innovation au service des applications». Et l'actuel président du CNES poursuit: cette révolution «pourrait bien avoir une conséquence inattendue: la formidable accélération de l'exploration martienne. Envisagée il y a encore six mois pour 2040-2050, la mission habitée vers Mars est en train de se rapprocher à une vitesse vertigineuse, puisque ses promoteurs nous parlent à présent de 2030, voire de 2025! La raison? Les bénéfices apportés par la spectaculaire diminution du coût des satellites et des lancements, rendue possible par la multiplication des projets et l'augmentation des cadences. Et

ce qui n'était qu'un concept, l'envoi vers Mars d'un vaisseau suffisamment grand pour permettre à quatre ou six personnes de séjourner deux ans dans l'espace, est en train de devenir un projet et bientôt une réalité». Que ces lignes aient été rédigées dans l'éditorial d'une revue du CNES consacrée à l'exploration de la planète rouge ne suffit pas à expliquer le constat et l'analyse de Jean-Yves Le Gall; qu'un des principaux responsables européens, réputé pour son expérience et sa prudence, les pose aussi publiquement et clairement, avant de conclure que «pour l'humanité toute entière, [la conquête de Mars] est en train de devenir La nouvelle frontière»[4] tend à confirmer qu'il est bien en train de se passer quelque chose de nouveau en matière d'entreprise spatiale.

L'histoire du *NewSpace* reste encore à écrire, même si les biographies de ses principaux acteurs commencent à être publiées. Il est courant et parfaitement justifié de présenter le *NewSpace* comme un ensemble d'entreprises qui ont profité ou sont nées de l'initiative d'investisseurs privés, majoritairement anglo-saxons, dont plusieurs ont bâti leur fortune dans le domaine du numérique, celui auquel est accolé l'acronyme de GAFA (pour désigner les géants les plus connus, Google, Apple, Facebook et Amazon). Les sommes investies sont impressionnantes, en même temps qu'à la hauteur et à l'image du pouvoir que possèdent aujourd'hui les GAFA: en 2015, 21 milliardaires et plus de cinquante sociétés d'investissement auraient ainsi injecté 1,8 milliards de dollars dans ces nouveaux champs de l'entreprise spatiale, soit un montant supérieur à celui des quinze années précédentes! En janvier 2015, SpaceX annonce avoir reçu de Google et du fond d'investissement Fidelity la somme d'un milliard de dollars pour développer une plate-forme d'accès à Internet via les satellites. Mais l'éclat aveuglant des chiffres, que les effets d'annonce adroitement contrôlés ne font qu'accentuer, risque de voiler la complexité de la galaxie, de la nébuleuse qu'est le *NewSpace* dont les frontières, les zones d'influence ne sont pas aisées à tracer. Et les *stars*, les étoiles brillantes, emblématiques qui en occupent et en constituent les pôles d'attraction et d'animation ne doivent pas faire oublier les astres, les satellites plus modestes: plus de huit cents entreprises, la plupart américaines, sont identifiées comme appartenant au *NewSpace*. Sans oublier les tâcherons, *afficionados*, supporteurs prêts à tous les sacrifices pour participer à la nouvelle aventure de l'espace.

À première vue, le schéma est simple: des entrepreneurs qui ont réussi dans le domaine du numérique, bref le monde des GAFA, investissent leur fortune personnelle dans l'industrie spatiale, et prétendent ainsi faire mentir le «bon mot» selon lequel, pour gagner un million de dollars, il suffit d'en investir dix dans l'espace … Leurs noms et leurs parcours sont connus: Paul Allen, qui a soutenu le projet SpaceShipOne, est le co-fondateur de Microsoft avec Bill Gates ; Jeff Bezos, le créateur de Blue Origin, est le fondateur, l'actionnaire majoritaire et le président exécutif d'Amazon; Elon Musk, le créateur de SpaceX mais aussi de Tesla Motors, a fait fortune en revendant ses parts de PayPal à eBay; Richard Branson a créé la société Virgin Galactic dédiée au tourisme spatial suborbital au sein de son groupe Virgin; Robert Bigelow, qui possède la chaîne d'hôtels Budget Suite of America, a décidé de créer et de gérer des habitats dans l'espace, à partir d'une technologie de modules gonflables. Sans être des entrepreneurs au sens strict, des investisseurs appartiennent à cette galaxie; ils viennent par exemple de Google (Sergueï Brin, Larry Page et Eric Schmidt), de Microsoft (comme Charles Simonyi qui a créé Suite Office).

Leur premier objectif est l'environnement immédiat de la Terre. Qu'il s'agisse d'offrir les sensations de l'apesanteur et la vue de la Terre à 100 km d'altitude au cours d'un vol su-

[4] J.-Y. LE GALL, «Éditorial», *CNES Mag*, juillet-août 2016, p. 5.

borbital (Virgin Galactic, Blue Origin), d'assurer la desserte de la station spatiale internationale (SpaceX) ou d'installer une constellation de satellites dédiée aux connections Internet (OneWeb), le premier défi à relever est donc celui d'accéder à l'espace à un coût compatible avec les finalités et les contraintes d'entreprises privées à but commercial. Il ne suffit pas pour cela d'échapper aux contraintes administratives et politiques auxquelles les organisations publiques sont soumises; il faut aussi mettre en œuvre de nouveaux modes de gestion des programmes et de management des équipes.

Moins immédiat apparaît le deuxième objectif du *NewSpace*: celui de relancer la conquête de l'espace. Moins immédiat peut-être, mais non pas absent: en octobre 2016, lors de la conférence annuelle de la communauté astronautique à Guadalajara, Musk a présenté son propre programme d'accès et, en filigrane, de colonisation de Mars.

Car le *NewSpace* ne manque pas d'une vision ou, plus exactement peut-être, de visionnaires: plusieurs de ses acteurs, Musk et Bezos en tête, expliquent s'y être engagés non seulement pour (continuer à) y faire fortune, mais aussi pour accomplir un projet, parfois un rêve de jeunesse, celui d'explorer l'espace. Et ils cherchent à le réaliser avec un esprit sensiblement différent de celui qui prédomine dans le secteur spatial «traditionnel».

4. *De nouveaux défis pour le droit spatial*

Aujourd'hui, les principales activités du *NewSpace* s'inscrivent sans difficulté apparente dans le cadre du droit spatial international, avec d'autant plus de facilité et de nécessité qu'elles sont le fruit d'accords entre le public et le privé; la desserte de l'ISS, la station spatiale internationale, en est l'exemple le plus évident. Il n'en sera très certainement pas de même dans un avenir parfois proche, lorsque parviendront à maturité les projets actuellement en préparation.

Je laisserai ici de côté le tourisme suborbital qui, de facto, relève davantage du droit aérien et seulement de manière secondaire le droit spatial, puisqu'aucun engin utilisé par cette activité ne sera capable de rester dans le domaine spatial. Ce dossier est entre les mains des juristes des administrations et instances aériennes nationales et internationales depuis au moins 2004, lorsque le Ansari X-Prize a été remporté par l'équipe du SpaceShipOne, menée par Burt Rutan et financée par Paul Allen.

Possèdent un caractère véritablement spatial les premières réalisations et les projets qui ont pour objectif les orbites terrestres (lanceurs et constellations), les voyages interplanétaires (en particulier avec la planète Mars pour destination) et l'exploitation des ressources spatiales (par exemple celle des astéroïdes). Ces trois types d'activités concernent directement le droit spatial, son évolution et son application, en particulier pour trois thématiques: les débris spatiaux, les contaminations, l'appropriation.

Mis en scène de manière dramatique par le film *Gravity*, le dossier des débris spatiaux est pris au sérieux par les acteurs du spatial depuis plusieurs décennies, même si l'évaluation et l'évolution des risques courus par les engins qui gravitent autour de la Terre du fait de la prolifération de ces débris sont encore abondamment débattues. Pour autant, sans qu'elles atteignent encore le niveau des contraintes juridiques, des recommandations ont d'ores et déjà été émises par la communauté spatiale elle-même afin de maîtriser et, si possible, de

réduire la population des débris circumterrestres[5]. Leur efficacité repose sur les capacités de surveillance de l'espace, grâce à des moyens optiques et radar; elles doivent impérativement être accompagnées de mesures de protection des engins spatiaux et de recherches dans le domaine de la récupération des plus «gros» débris. Dans quelle mesure et jusqu'où les entreprises du *NewSpace* s'attacheront-elles à suivre ces recommandations, à mettre en œuvre la prudence qui devient peu à peu celle des agences spatiales, à travers le monde? Certes, dans l'espace circumterrestre, ceux qui produisent des débris aujourd'hui peuvent en être les victimes demain; mais cette «justice» ou plutôt cette menace est-elle suffisante pour imposer à tous prudence et bonne conduite? Sachant que les projets de constellation comportent parfois autant de satellites que le nombre de satellites actuellement en usage autour de la Terre, la question est loin d'être anodine (la société OneWeb prévoit de lancer 650 satellites à partir de 2022)! Elle conduit à s'interroger sur l'état actuel du droit spatial en matière de gestion de débris, de son application, de la possibilité de contraindre les différents acteurs de prendre au sérieux ces risques[6] et de suivre les recommandations déjà en vigueur ou celles à venir. Quelles contraintes convient-il de mettre en place dès lors que les impératifs économiques entrent en concurrence avec ceux de sécurité, de précaution, de protection?

Le danger de contamination planétaire est connu et étudié depuis longtemps: les astronautes des missions *Apollo* ont été soumis à une procédure de quarantaine, après avoir séjourné à la surface de la Lune. Le souci est d'éviter la contamination d'autres planètes en y posant des engins, voire des humains, venus de la Terre, aussi bien que celle de la Terre en ramenant des échantillons extraterrestres. Aujourd'hui, le niveau de précaution à respecter est évalué par le COSPAR (Committee on Space Research), à partir des connaissances acquises sur la sensibilité des environnements extraterrestres, de la possibilité d'y trouver des formes de vie, du niveau possible de stérilisation des engins d'exploration, etc. Quel que soit la faisabilité des projets actuels d'exploration avancés par les acteurs du NewSpace (MarsOne, projet martien de SpaceX), ils ne prennent pas en compte, au moins théoriquement, ces mesures de protection: la colonisation passe avant l'exploration scientifique, pour le dire d'une phrase. Que penser d'un tel choix stratégique et, surtout, quels seraient les moyens d'aller à son encontre, sans pour autant aboutir à une «sanctuarisation» des planètes? L'imprécision du corpus juridique en la matière (le neuvième article du traité de l'espace de 1967 invite seulement à «éviter les effets préjudiciables de leur contamination ainsi que les modifications nocives du milieu terrestre résultant de l'introduction de substances extraterrestres»), le manque d'assurance de son application et même son impossibilité dans le cas des vols habités ne sont guère encourageants en matière de protection planétaire, si l'avenir s'écrivait comme aujourd'hui l'entendent les acteurs du *NewSpace*.

La perspective d'exploiter les ressources de l'espace est quasiment née avec l'entreprise spatiale; aujourd'hui, elle est plus particulièrement honorée dans les projets de plusieurs entreprises du *NewSpace* qui vantent l'exceptionnelle richesse des astéroïdes en métaux dont notre planète commence à manquer ou qui cherchent des moyens d'assurer le ravitaillement des vaisseaux spatiaux sans devoir recourir aux ressources terrestres et dépenser la coûteuse énergie nécessaire à vaincre la gravité. Mais de telles activités peuvent-elles être envisagées dans le respect du principe de non-appropriation qui est l'un des piliers du traité de l'espace ou dans celui des notions de bien commun, de patrimoine de

[5] C. BONNAL, *Pollution spatiale: l'état d'urgence*, Paris, 2016.

[6] La collision entre les satellites Iridium-33 et Cosmos-2251 aurait peut-être pu être évitée si les responsables d'Iridium-33 avaient pris au sérieux l'alerte reçue des instances de surveillance de l'espace.

l'humanité? Après les initiatives américaine et luxembourgeoise qui visent à soutenir de telles entreprises spatiales sur leur territoire respectif, la question a perdu son caractère de science-fiction pour devenir une question disputée par les spécialistes du droit spatial; une occasion de contredire ceux qui prétendent que les juristes sont voués à courir derrière les progrès des sciences et des techniques pour tenter de les canaliser, de les contraindre, sans jamais pouvoir les «rattraper». Le droit de l'espace, dans son état et sa dynamique actuels, possède-t-il les moyens de répondre à cette interrogation? Devra-t-il, pour l'occasion, évoluer jusque dans ses propres fondements? Sur ce sujet comme sur d'autres, le *NewSpace* pourrait servir d'incitation à prendre plus au sérieux ce que j'ai introduit comme une voie d'interrogation, celle de l'éthique.

5. *De la nécessité d'une interrogation éthique*

Aux enjeux que je viens d'évoquer et à propos desquels une réflexion éthique pourrait apporter une intéressante contribution, je voudrais ajouter deux autres thèmes qui, s'ils ne sont pas totalement indépendants de la démarche juridique, exigent toutefois une réflexion préalable qui appartient au champ de la philosophie, de l'éthique. Je pense à la manière d'appréhender et de gérer le risque, à celle de prendre conscience et à mettre en œuvre les responsabilités individuelles et collectives qui peuvent être associées aux nouvelles ou aux futures technologies.

Associée intimement à l'appréhension que l'être humain a de lui-même, au sein de la réalité matérielle et temporelle, l'idée de risque emprunte une voie de compréhension, d'appréhension et de gestion particulières dans la pensée moderne, ne serait-ce que du fait de la naissance des probabilités; l'exploration spatiale s'inscrit dans cette perspective moderne[7]. En évitant de verser dans la caricature, la gestion du risque par les agences spatiales, avant tout dans le cadre des vols habités, peut probablement être résumée dans le mot attribué à Gene Kranz, le directeur des vols des missions *Apollo*, par le film *Apollo XIII*: «Failure is not an option». Kranz a accepté cette paternité a posteriori, puisqu'il a fait de cette phrase le titre de son autobiographie. Pour le dire autrement, il paraît évident que l'opinion publique ne semble pas prête à accepter aujourd'hui le même niveau de risque pour les astronautes des programmes nationaux que celui accepté par les astronautes qui foulèrent le sol lunaire. Dès lors que penser des propos de Musk sur le même sujet du risque et de l'échec? «Failure is an option here. If things are not failing, you are not innovating enough». Ou encore, à propos des vols habités vers Mars et de la colonisation de la planète rouge: «It's dangerous and probably people will die – and they'll know that. And then they'll pave the way, and ultimately it will be very safe to go to Mars, and it will be very comfortable. But that will be many years in the future». Réduire cette différence de «philosophie» du risque au seul rapport public/privé est trop facile et surtout insuffisant; nombreux sont les sociologues à étudier l'actuel paradoxe entre la revendication sociale généralisée pour toujours plus de sécurité et la pratique d'activités ou de comportements à hauts risques, qu'ils relèvent du sport ou de la consommation de substances. À cette situation paradoxale, l'espace ajoute un enjeu particulier, celui de l'exploration, autrement dit d'un défi qui ne se réduit pas seulement à l'exploit personnel, mais concerne aussi l'ensemble de l'espèce hu-

[7] Cf. J. ARNOULD, *Le rire d'Icare. Le risque et l'aventure spatiale*, Paris, 2013.

maine; le droit de l'espace déclare à juste titre les astronautes «envoyés de l'humanité». Entre l'esprit d'entreprise nord-américain qui considère que l'échec appartient à l'apprentissage, qui admet que penser grand (*thinking big*) c'est affronter l'échec, et l'ouverture des vols spatiaux (et, dans un premier temps, suborbitaux) à des clients en nombre croissant (sans pour autant et avant longtemps atteindre le nombre et la fréquence propres au trafic aérien), la réflexion éthique (pourquoi? comment? avec quelles conséquences?) paraît donc s'imposer à ce secteur du *NewSpace*.

À première vue, le thème de la responsabilité peut sembler trop vaste pour être raisonnablement et efficacement aborder; je voudrais le faire ici par le biais de l'usage des données satellitaires. À côté de la question de la sensibilité sociale au développement de constellations de satellites à très haute résolution et à haute répétabilité (en particulier, vis-à-vis de la possible atteinte à la vie privée), doit être mise en perspective de l'émergence de ce marché des images satellitaires par des entreprises privées l'initiative de plusieurs agences spatiales qui est la charte *Espace et Catastrophes majeures*. Les signataires de cette charte, aujourd'hui une douzaine d'organismes à travers le monde, s'engagent à fournir dans les plus brefs délais et gratuitement les images satellitaires des régions touchées par un tremblement de terre, des inondations, un accident industriel, etc. En janvier 2017, la charte avait été déclenchée à plus de 500 reprises depuis sa création[8]. Une manière d'aider les populations touchées par des catastrophes et un bel exemple d'une utilisation de l'espace au bénéfice de tous, dans l'esprit du traité de 1967, qui s'appuie sur le développement et le maintien de moyens spatiaux publics. Si le *NewSpace* et son esprit d'initiative privée devaient véritablement se développer, que deviendrait cette charte? À travers cet exemple, je veux souligner comment le *NewSpace* mais aussi toutes les activités spatiales en général concernent désormais la responsabilité, individuelle et collective, des humains les uns par rapport aux autres[9].

6. *Et demain?*

L'éthique, aimait répéter l'un de ses promoteurs au CNES, n'est pas une manière de freiner, d'handicaper les initiatives, les activités humaines, spatiales en particulier; l'éthique, au contraire, est une façon de préparer l'avenir. Je suis convaincu de la justesse de cette idée ... tout comme je suis convaincu que mes collègues du CNES pratiquaient l'interrogation éthique, bien avant la création d'un poste d'expert éthique. Il «suffit» de leur offrir davantage d'occasions pour une telle pratique.

Avec le *NewSpace*, nous le savons, s'écrit d'ores et déjà un nouveau chapitre de la conquête de l'espace et ce quelle qu'en soit la suite. Il exige qu'une réflexion éthique s'élabore à son sujet, pour en rappeler la finalité, pour en étudier les moyens, pour en préparer les conséquences. La tâche peut rebuter les acteurs spatiaux, davantage peut-être pour son étrangeté que pour sa difficulté; elle doit pourtant être menée. C'est la grandeur de l'être humain, *Homo sapiens*, que de pouvoir s'interroger sur ce qu'il est, devrait être ou voudrait être; il lui revient d'être à la hauteur.

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[8] Le 26 juillet 2001, la Charte a été activée pour la onzième fois de son histoire, suite à l'éruption de l'Etna: le village de Nicolosi était en effet menacé par les coulées de lave.
[9] Cf. J. ARNOULD, *La Terre d'un clic. Du bon usage des satellites*, Paris, 2010.

ABSTRACT: *Space needs ethics in its future*

The advent of NewSpace is writing a new chapter in the conquest of space.

The entry into this sector of new operators, especially Americans, opens new perspectives. Lawyers have started to become aware of the new challenges posed in various projects, but legal reflection cannot be conducted without an ethical consideration. This ethical reflection must be elaborated to recall the purpose of NewSpace, to study the means, and to prepare for the consequences. This task may repel potential space actors, perhaps more for its non-relevance (according to some) than for its difficulty; however, it must be carried out. Lessons can be taken from ethical reflection for future developments.

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SPACE INSURANCE: LEGAL ASPECTS

1. *Introduction*

The topic of space insurance (e.g. such of its aspects as the types of cover etc.) has been amply addressed in the past. Commercial space activities, like space tourism and space mining, may raise new insurance issues in the future.

This paper intends to summarily focus on a few current issues and specific characteristics of space insurance.

Space risk insurance poses a few qualification, classification and localization problems.

It also presents a number of peculiar features and offers special formulas, that warrant some further attention.

This analysis will be from a European law perspective.

For comparison, it is recalled that aviation insurance gradually emancipated from the marine insurance regime, to be acknowledged as a distinct insurance class in its own right[1].

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[1] K. POSNER, T. MARLAND and P. CHRYSTAL, *Margo on Aviation Insurance*, London, 2014, p. 14 s., 2.08-2.10; EUROPE ECONOMICS, *Different forms of cooperation between insurance companies and their respective impact on competition, Studies on issues pertaining to the insurance production process with regard to the application of the Insurance Block Exemption*

On the assumption that the regimes cannot be harmonized across the modes, the same development seems justified as between space insurance and aviation insurance.

2. *Space Insurance Concept*

2.1. *The issue*

Space insurance raises a qualification question, that is in several respects similar to other traffic and transport modes.

Firstly, some activities and related infrastructure (manufacturing, (space)port[2] services, handling, maintenance, refuelling, remote control, traffic control, navigation aid, etc.) are inherent to the (marine, air, space) traffic or transport mode, but are land based.

Secondly, a (sea, air, space) craft may to a certain extent be amphibious or multimodal in that it operates in different mediums (on land, in the air, at sea, in space). The spacecraft may, before launch or after landing, travel overland or on the sea surface and, in the initial launch stage or after re-entry in the atmosphere, traverse the airspace.

The demarcation problem between aviation insurance and space insurance is similar to that between land insurance and aviation insurance. During certain parts of its trajectory a spacecraft may also travel through the air space just like in some instances of its operation an aircraft may also move on the ground.

Thirdly, space is the void that exists between celestial bodies. A spacecraft may land, berth and dock on a celestial body. A(n orbital) space station (such as Skylab, International Space Station (ISS), etc.), that floats in space, differs from a moon based station, that sits on solid ground. Strictly speaking, the latter ought to be qualified as a land risk.

2.2. *Relevance*

The relevance of the qualification or demarcation lies both on the public and private insurance law level.

The insurance licensing and supervision legislation/regulation may differ according to the insurance class, that is based on the traffic/transport mode (land, air, space) (cfr. infra).

The extent to which the insurance contract law is mandatory, may also depend on the insurance class. In some insurance classes (generally land insurance), there may be no or little party autonomy so as to freely tailor the insurance contract.

2.3. *Qualification Criterion*

The modal qualification of the risks related to space activity may be based on various criteria, e.g. the spatialist as opposed to the functionalist approach[3].

The spatialist approach is based on the (physical) location of the risk: the type of medium in which the craft evolves, is paramount.

Regulation (IBER), Brussels, European Commission Directorate-General for Competition, 2016, p. 146.

[2] Cosmodrome.

[3] G. ODUNTAN, *The Never Ending Dispute: Legal Theories on the Spatial Demarcation Boundary Plane between Airspace and Outer Space*, in *Hertf. Law Jour.*, 2003, p. 64 ss.

The functionalist approach is based on the nature or the intent of the operation, irrespective of its location.

For the sake of inspiration, it may be interesting to examine the similar problem in legal relationships other than the insurance contract.

In the context of a contract of carriage e.g., for lack of a uniform (the same for all transport/traffic modes) or a *sui generis* (specific for multimodal[4] operations) regime, the choice of the applicable regime on the multimodal transport contract may be based on two systems: either (i) the regime of the predominant mode is applied to the ancillary mode («absorption» theory according to the maxim «*accessorium sequitur principale*») or (ii) the regimes of the respective component modes («combination» or «distribution» or «network» theory, applying the chameleon rule according to which the regime changes with the successive modes).

Both the *sui generis* regime and the absorption theory reflect a functionalist approach.

In an extra-contractual position, for the sake of traffic safety regulation e.g., the spatialist approach seems more appropriate: the craft must observe the traffic rules of the medium in which it evolves (e.g. COLREGs[5] rule 18 for a seaplane on the water).

Once space operations become less experimental and more commercial and therefore less exceptional and more routine, the segregation of air and space traffic via the designation of exclusive use restricted airspace for the purpose of launch and re-entry of space craft, may not be possible any more[6].

For land based port activities/operations the spatialist approach, that in the context of aviation distinguishes e.g. the «land side» from the «air side», does not solve the problem.

The demarcation between airspace and outer space, based on altitude, is not clear-cut as there is overlap between the lowest possible altitude for orbital flight and the highest possible altitude for aerodynamic flight (cfr. the «Karman line»).

In the functionalist approach the nature of the activity practiced or the type of craft operated, irrespective of their location, determine the nature of the risk and thus the regime of the insurance cover.

It is also worthwhile to examine whether inspiration by analogy *mutatis mutandis* could be drawn from the demarcation between marine and non-marine (land) insurance by the British Marine Insurance Act 1906 (MIA).

Art. 1 MIA defines marine insurance as the cover against marine losses, i.e. the losses incident to the «marine adventure».

As per art. 3 MIA the «marine adventure» means exposure of the ship, the goods, the freight and third party liability to «maritime perils» or «perils of the sea», viz. the perils consequent on or incidental to the navigation of the sea: this means arising from the action of the sea or occurring during the course of a sea voyage. Per art. 12 of the Rules for Construction of the Policy[7] the *ejusdem generis* provision in art. 3 MIA, after the list of examples of perils of the sea, is restricted to perils consequent or incidental to the navigation of the sea.

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[4] Cfr. E. HARDY IVAMY, *Chalmer's Marine Insurance Act 1906*, London, 1993, p. 3 s., who draws the parallel between the multimodal insurance cover and the multimodal transport operation.

[5] International Regulations for Preventing Collisions at Sea, 1972.

[6] R. JAKHU, T. SGOBBA and P. DEMPSEY (eds), *The Need for an Integrated Regulatory Regime for Aviation and Space: ICAO for Space?*, Vienna, 2011.

[7] First Schedule to the Marine Insurance Act 1906.

Even if the term «perils of the sea» is not restricted to «on the sea»[8], this legislation tends towards a spatialist approach.

Addressing the case of transit (mixed sea and land) risks, art. 2, n. 1, MIA allows to extend by contract the marine insurance contract regime to other modes incidental[9] to the maritime operation. Art. 2, n. 2, MIA extends by virtue of the law itself the MIA regime to the shipbuilding and launching risks, but also to the insurance of «adventures analogous to a marine adventure». The construction of the latter term however gives rise to uncertainty: also risks of other modes (road, air, ...)? Other maritime activities and businesses, onshore (wharfingers/harbourmasters, ports, marinas, docks, container terminals, ship builders and repairers, boat dealers, terminal operators, stevedores)? And offshore (deepwater drilling platforms, subsea infrastructures, oil rigs fixed to the sea bed, oil wells and pipelines)[10]?

According to some, there is still doubt under English law as to whether e.g. mobile offshore drilling barges come fully within the ambit of the UK Marine Insurance Act of 1906, which may therefore create uncertainties on important issues such as policy warranties.

According to others the title of Marine insurance is somewhat misleading as it does also cover transportation by land and air, but due to the origins of Insurance with the Greek and Roman trade through the establishment of overseas trading routes in Asia and the Americas and the establishment of Lloyds of London, the term Marine Insurance has remained as various other forms of transport have evolved. And the view was also expressed that marine insurance includes onshore and offshore exposed property (container terminals, ports, oil platforms, pipelines)[11].

Art. 2, n. 2, acknowledges that the marine insurance contract law may deviate from the general insurance contract law. Although fundamentally based on the same original principles of commercial insurance, the marine insurance contract law (codified in the MIA 1906) and the non-marine insurance contract law indeed present substantial differences in some respects[12].

The French insurance contract law contains a specific section dedicated to space insurance (art. 176-5 *Code des Assurances*). It governs every insurance contract that covers the risks relating to the third party liability flowing from a space operation («tout contrat d'assurance qui a pour objet de garantir les risques relatifs à la responsabilité civile au titre d'une opération spatiale» (art. 171-1, 3° *Code des Assurances*).

This legislation tends towards a functionalist approach.

3. *Space Risk Classification and Localisation*

3.1. *Space insurance class?*

The insurance supervision legislation does not acknowledge a space insurance class. Consequently space insurance comes under the residual insurance classes.

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[8] Cfr. E. HARDY IVAMY, *Marine Insurance*, London, 1985, p. 145.

[9] It implies the application of the «*accessorium sequitur principale*» rule.

[10] R. RUTHERFORD, *Maritime Insurance for Offshore Risks: Current Policy Forms, Industry Problems, and Recent Decisions*, in *Louisiana Law Review*, 1981, p. 817.

[11] https://www.rakinsurance.com/en/marine-insurance.

[12] M. CLARKE, *Marine Insurance System in Common Law Countries, Status and Problems*, in *MarIus, Scandinavian Institute of Maritime Law Yearbook,* Oslo, 1998, nr. 4. https://www.bmla.org.uk/annual_report/rep_marine_clark.htm; J. ŁOPUSKI, *Maritime law in the second half of the 20th century. Selected articles*, Torun, 2008, p. 327.

The qualification as a «large risk» depends on the insurance class. In turn the qualification as a large risk may determine the applicable regime of supervision, conflict of laws, jurisdiction, party autonomy in the contractual relationship, etc.

According to art. 13(27) Solvency II Directive, a cargo risk (class 7) is a *de plano* (i.e. unconditional) large risk; property (hull) (classes 8 and 9), third party liability (class 13) and business interruption (class 16) however are conditional large risks (i.e. depending on the policyholder size (exceeding certain thresholds of employment, turnover, balance-sheet total).

3.2. *Space risk location*

For the same purposes as mentioned above in 3.1. the geographic location (in the sense of political territory) of the space risk is relevant.

Here again art. 13, n. 13, of the Solvency II Directive defines the member state in which the risk is situated as: (a) for real estate: the physical location (b) for vehicles: the registration state (c) for travel cover: the place of policy issuance and (d) for the residual cases: the place of the policy holder's residence or establishment.

In the latter three cases the risk location is based on a legal fiction.

4. *Conflict of Laws*

4.1. *Substantive Law*

According to the Rome I Regulation[13] for the insurance of large risks there is party autonomy in the choice of the applicable national law (art. 7, n. 2).

For lack of expression of such choice, the default regime designates the national law of the Member State, where the insurer is established (art. 7, n. 2).

In case of a compulsory insurance cover, the national law imposing the insurance obligation prevails over the national law of the risk location (art. 7, n. 4).

4.1.1. *U.K. law*

The leading position of the London insurance market in space insurance warrants some digression on the incidence of the U.K. Insurance Act 2015 (effective 12 August 2016) that applies to all commercial (i.e. other than consumer) insurance contracts governed by U.K. law. The amendments introduced by the Insurance Act 2015 are applicable but not limited to the Marine Insurance Act 1906.

Follows the essence of a few (not all) of the relevant changes.

4.1.1.1. *Duty of disclosure*

The prospective policy holder is henceforth under a duty to make a fair presentation to the insurer of the characteristics of the risk: a reasonable (what the policy holder is as-

[13] Regulation (EC) n. 593/2008 of the European Parliament and of the Council of 17 June 2008 *on the law applicable to contractual obligations (Rome I).*

sumed to know) duty to reveal material (that affect the risk assessment) circumstances of the risk.

In case of unintentional omission, the former remedy of simple and unconditional forfeiture of cover as a penalty for the breach of defaulting on the duty of disclosure is now replaced by a graduated, proportionate sanction, according to the insurer's hypothetical attitude if he had been correctly informed: if the insurer would not have underwritten the risk, he is exonerated; if the insurer would have stipulated different terms, the cover is adapted accordingly; if the insurer would have charged a higher premium, the claim is reduced commensurately.

4.1.2. *Warranties*

As opposed to the former regime, the breach of an insurance warranty will no longer entail the automatic forfeiture of cover, if the non-compliance was irrelevant for the occurrence of the actual loss.

4.1.3. *Contracting out*

The insurance contract partners may contract out of most parts of the new regime as introduced by the Insurance Act 2015, provided the transparency precept is observed so as to achieve the customer's informed consent: the policy holder must be put on notice about a contract term that is less advantageous for the insured than the default regime as per the Act.

4.1.4. *Direct action right*

The Insurance Act 2015 effected the entry into force of the Third Parties (Rights against Insurers) Act 2010, that introduces the direct action right of the third party, who suffered loss, to proceed against the third party liability insurer of an insolvent insured defendant.

It creates an exception to the «pay to be paid» rule, that is based on the privity of contract principle.

4.2. *Jurisdiction*

The Brussels I-bis Regulation[14] in general offers a choice of several fora (insurer's seat/branch, insured's residence) (art. 11). Actions with respect to real estate and liability insurance cover must be brought in the court of the place of loss (art. 12). For disputes on large risk insurance cover, party autonomy is granted (art. 15, n. 5, and 16, n. 5).

Furthermore the third party liability insurer may be joined in the victim's action against the insured (art. 13).

Finally the validity of an arbitration clause is made subject to the applicable substantive national law (art. 1, lett. d).

[14] Regulation (EU) n. 1215/2012 of the European Parliament and of the Council of 12 December 2012 *on jurisdiction and the recognition and enforcement of judgments in civil and commercial matters (recast)*.

5. *Third Party liability insurance cover*

5.1. *Liability regime and loss settlement procedure*

It is recalled that the Outer Space Treaty[15] (art. VII), and its further elaboration in the Space Liability Convention[16] (art. II and III), set the principle of the launching state liability for damage caused by space objects *vis-à-vis* third parties, who are nationals of other states. The regime does not apply to damage caused by a space object to the own nationals of the launching state or to foreign nationals participating in the operation of the space object (art. VII Space Liability Convention).

For damage thus caused on the surface of the earth or to aircraft in flight, the (state) liability is absolute (art. II Space Liability Convention) and for full compensation (art. XII Space Liability Convention) of all types of loss (art. I a Space Liability Convention).

For damage caused elsewhere than on the surface of the earth by a space object to another space object or its persons or property on board, the liability is fault based (art. III Space Liability Convention).

The launching state means: either (i) the state that launches itself the space object or (ii) procures its launching or (iii) from whose territory or facility the launch takes place (art. Ic Space Liability Convention).

Procedurally a state may institute a claim for compensation on behalf of its nationals (natural or legal persons) who have suffered the loss, against the launching state (art. VIII, 1 Space Liability Convention), either through diplomatic channels (art. IX) or for lack of a timely settlement via a Claims Commission (art. XIV) or else in the regular courts and tribunals of the launching state (art. XI, n. 2).

The Space Liability Convention (art. VIII and IX) addresses the liability for damage caused by space objects as a state-to-state matter[17]. This regime is symptomatic for an era when private interests and in particular the position of the third party liability insurer in space activities were not yet fully acknowledged and when one of the two signatory countries with space-faring capability, was a collectivist state.

The following questions on this system arise:

(i) Does the Space Liability Convention waive the launching state's sovereign immunity (cfr. the maxim «the king can do no wrong»)? There seems little doubt that in the cases contemplated by the express provisions of art. II and III of the Space Liability Convention, signatory states cannot invoke the defence of sovereign immunity based on their national law[18].

(ii) Does the Space Liability Convention provide the sole cause of action and

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[15] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (1967) (Outer Space Treaty).

[16] Convention on international liability for damage caused by space objects (1972) (Space Liability Convention).

[17] T. GEHRING and M. JACHTENFUCHS, *Liability for Transboundary Environmental Damage Towards a General Liability Regime*?, in *Eur. Jour. Int. Law,* 1993, p. 102.

[18] R. BENDER, *Space Transport Liability: National and International Aspects*, The Hague, 1995, p. 54 and 328; J. BOSCO, *The United States Government as Defendant – One Example of the Need for a Uniform Liability Regime to Govern Outer Space and Space-Related Activities*, in *Pepperdine Law Review*, 1988, p. 590; for a nuanced position: see B. ABRAMS, *First Contact: Establishing Jurisdiction Over Activities In Outer Space*, in *Ga. J. Int'l and Comp. L.*, 2013, p. 819.

exclusive remedy, so that state law-based claims are pre-empted by the Convention, thus barring alternative recourse under the applicable national law? As the forfeiture of a right is never presumed, for lack of an express[19] provision to that effect, the Space Liability Convention does not preclude recourse under domestic law of a jurisdiction[20]. The common domestic regime may of course be less beneficial than the Convention regime for the claimant, e.g. for lack of a launching state liability by virtue of the law, in terms of onus of proof, in terms of limitation of liability, because of the sovereign immunity defence, etc.

(iii) Does the Space Liability Convention channel[21] the liability towards the launching state, thus immunizing all others involved in the space operation? For the same reason as above under (ii), the answer is negative.

(iv) Does the state-to-state claims settlement procedure of the Space Liability Convention bar the institution of a direct action by the victim itself through the judiciary channels. Certainly a claim against the state under de Space Liability Convention can only be brought in accordance with the procedure of the Convention, i.e. via representation by the concerned state[22], so that victims have no standing to bring themselves a claim against a foreign government[23].

A claim outside the ambit of the Convention (based on another cause of action, according to domestic law (cfr. (ii)) could however be brought against a private operator and against the foreign state by the victims themselves.

These questions are relevant in the context of the compulsory third party liability insurance cover and (in some legal systems) its concomitant direct action right.

Whereas a third party liability insurance cover by its very nature only guarantees liabilities incurred by the insured, it is not answerable in instances where the insured state enjoys sovereign immunity and where an insured stakeholder in the space activity, other than the state, may invoke immunity based on the channelled nature of the liability.

On the other hand in case a third party liability insurance cover generates a direct action right, it creates an exception to the state-to-state claims settlement procedure (cfr. 5.2. below).

5.2. *Third Party Liability Insurance Cover and Direct Action Right*

The state liability rule explains the motives for national legislation on licensing conditions, insurance requirements and risk allocation and indemnification precepts for space activities.

In this respect, national law of signatory countries to the Space Liability Convention generally requires the space operator to take out third party liability insurance cover (or to provide other financial guarantee). Sometimes it even requires to include the launching

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[19] For an example of an express provision to that effect: art. III, 4 International Convention on Civil Liability for Oil Pollution Damage, 1992 (CLC 92).

[20] P. DEMPSEY, *Liability for damage caused by space objects under international and national law*, in *Ann. Air Space Law*, 2011, p. 336.

[21] Legal channelling of liability renders one particular entity liable for an event, thereby dismissing other parties involved from liability for that event. For and example: art. III, n. 4, CLC 92.

[22] T. MASSON-ZWAAN and S. FREELAND, *Between heaven and earth: The legal challenges of human space travel*, in *Acta Astronautica*, 2010, p. 1598 ss., and p. 1604.

[23] D. FISHER, *Injury to Rights of Personality Caused by Satellite Programme Contents. Prospects of Relief under the Law of Outer Space*, in *Scandinavian Studies in Law*, 2000, p. 428.

state as an additional insured in this cover[24].

Also national mandatory contract law on launch service agreements often (i) reserves the state's right of recourse against the actual party to blame for the loss for the purpose of recovering its disbursement[25] and (ii) contains risk allocation provisions by imposing the stipulation of liability cross-waiver clauses between and among the stakeholders involved in the space activities (launch site, launcher, manufacturers of launch vehicles, spacecraft and satellite owner/operator, etc.).

If the applicable national insurance contract law provides for a direct action right[26] against the third party liability insurer and in particular in case the state's liability is also covered by this insurance, such a direct action right opens a parallel path to claim compensation.

For lack of a channelled liability regime, there does not seem to be any impediment for the exercise by the victim of its direct action right against the third party liability insurer.

Obiter, it could be argued that if a supranational instrument were to channel the liability (*quod non in casu*) (cfr. *supra*) and at the same time to provide itself for a direct action right against the third party liability insurer[27] (*quod non in casu*), the direct action right prevails as a specific exception to the general rule (according to the maxim «lex specialis generali derogat»).

5.3. Dominus litis *in third party loss settlement*

The combination of the rule of the launching state liability and the private third party liability insurance cover (cfr. supra nr. 5.2.) raises a few interesting questions.

An allegedly liable insured person may have an interest in conflict with his third party liability insurer: for motives of personal or commercial relationship or reputation, the insured may prefer the compensation over the challenge of the victim's claim. In addition to the reputational character of the motive, in the case of state liability it may also be of a political nature. Those motives may give rise to «without prejudice» and «ex-gratia» payments in case liability is not firmly established.

Since the loss settlement takes place at the expense of the insurer, there is a moral hazard that the insured (*in casu* the state) may accept liability too leniently[28] and compensate too generously.

This is why in most legal systems an express provision in the law (as illustrated by art. 14:104 (2)[29] of the PEICL) or a contract stipulation[30] reserves the insurer's right to handle

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[24] E.g. in the United States as per the Commercial Space Launch Act of 1994, 51 USC §50914(a)(4); also in Australia: see respectively P. DEMPSEY, *Liability for damage,* cit., p. 352, 354 and 357 and R. MARGO, cit., p. 423, nr. 21.36.

[25] E.g. in Belgian law: art. 15 Act of 17 September 2005 on the launch, the flight operations or guidance of space objects; see also P. DEMPSEY, *Liability for damage,* cit., p. 351 s.

[26] Cfr. art. 15:101 Principles of European Insurance Contract Law (PEICL): see J. BASEDOW, J. BIRDS, M. CLARKE, H. COUSY, H. HEISS, *Project Group* «*Restatement of European Insurance Contract Law*» (eds.), *Principles of European Insurance Contract Law (PEICL)*, Munchen, 2009. The PEICL reflect fairly well the regime in most national bodies of law; cfr. also art. L175-11 French *Code des Assurances*, etc.

[27] Cfr. e.g. art. VII, n. 8, CLC 92.

[28] In a strict liability regime contributory negligence of the victim offers a defence and even an absolute liability regime does not avoid defences based on e.g. (lack of) causation.

[29] According to art. 14:104 (2) PEICL the third party liability insurer is not bound by an agreement between the victim and the policyholder or the insured.

[30] E.g. the French *Code des Assurances* acknowledges the third party liability insurer's option to reserve the right

the proceedings and his decision power in the claims settlement.

When the state liability for events involving a spacecraft is insured, the insurer generally stipulates that the insured launching state shall have the right to settle a claim «reasonably» and following consultation and with the agreement of the insurers[31].

Such clauses present some resemblance with the «lead» («follow the leader», «follow the settlement», «follow the fortunes» and «claims control») clauses in the relationship between respectively co-insurers mutually and re-insurers and their insurers, that define the conditions for the loss settlement by the leader respectively the insurer to bind the other insurers, respectively the re-insurer.

The loss settlement by the state without the approval or at least the involvement of the third party liability insurer, thus denying the insurer to express his arguments and remarks on the basis and extent of liability, could not bind the insurer, lest infringing his fundamental right of defence as guaranteed by art. 6 of the European Convention on Human Rights and Fundamental Freedoms of 4 November 1950.

6. *Peculiar Features and characteristics*

A number of characteristics of space risks explain their specificities.

Firstly the high cost of the devices and their operation[32].

Secondly the relative inaccessibility in orbit of the devices in case of a mishap.

Thirdly the sensitive nature of space technology because of its confidentiality, both from a commercial point of view (intellectual property, trade secret) and from a national security point of view.

6.1. *Limited competition*

The competition amongst space insurers is limited, for only a select group of insurers is able and eligible to provide the space insurance cover, due to specialisation (expertise and know-how), confidentiality, size of the risks, etc.

6.1.1. *Concentration*

The few space insurers control a large market share; the ensuing oligopolistic situation creates the risk of a dominant position and thus anticompetitive conduct of incumbents via the exercise of market power, i.e. the ability to raise prices significantly above marginal cost and make abnormally high profits without inducing further competitive entry.

However the concentration[33] has not reached a critical degree[34] so as to raise competition or market failure concerns.

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to handle the proceedings (art. L176-1 *juncto* art. L175-12): the so-called «clause de direction du procès».

[31] MARGO, cit., p. 427, nr. 21.43.

[32] A satellite costing around US $200 million and its launch costing around US $100 million.

[33] M. ALTUNTAS and J. RAUCH, *Concentration and financial stability in the property-liability insurance sector: global evidence*, in *The Journal of Risk Finance*, 2017, Issue 3.

[34] According to the Herfindahl-Hirschman Index.

6.1.2. *Co-insurance: cartel*

Because of the high value of the risks ($300 to 600m) and the limited market capacity ($500 to 750m) co-insurance (either or not in institutionalized pools or consortia) is almost meant to be the appropriate formula for space insurance. No single insurer has the resources to retain a space risk all by itself.

Since co-insurance by its very nature creates a cartel issue[35], it is stressed that the Insurance Block Exemption Regulation (IBER) 267/2010 on co-insurance pools expires on 31 March 2017.

Also standard policy conditions developed by the insurance industry create a cartel situation and the IBER 358/2003, granting exemption from the cartel ban, has expired on 31 March 2010.

Since that time, the insurance service providers must assess themselves the compatibility of their joint development of standard policy conditions with the competition precepts under art. 101, n. 1, and n. 3, TFEU.

6.2. *Constructive total loss*

In space hull insurance cover, in case of damage, malfunctioning or reduced capability of the device, constructive total loss is generally defined as loss of (only) 75% of the satellite lifetime performance, e.g. expressed in «transponder years» (the number of transponders multiplied with the design operational lifetime).

This extensive definition of constructive total loss is explained by the relative inaccessibility and irretrievability of the satellite for the purpose of repair.

6.3. *Abandonment and salvage*

The U.K. Marine Insurance Act 1906 (art. 61-63) for marine insurance and the French *Code des Assurances* (art. L172-24 and art. L172-27) for both aviation insurance (art. L175-26) and marine insurance (art. L173-13) acknowledge the possibility of abandonment.

Abandonment entails the transfer to the insurer of the property right of the subject matter insured in case of a (constructive) total loss.

The ownership transfer to a national of another state however does not entail the liability transfer from the launching state to the registration state.

Insurers may have the option to take title to the spacecraft in the event of a total loss, although licensing regulations, export controls and contractual intellectual property restrictions in most jurisdictions make this an impractical option for insurers[36].

If the transfer of title is not possible and should the spacecraft still generate some revenues in spite of being a (constructive) total loss as defined by the policy, the insurer is

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[35] EUROPE ECONOMICS, *Different forms of cooperation between insurance companies and their respective impact on competition, Studies on issues pertaining to the insurance production process with regard to the application of the Insurance Block Exemption Regulation (IBER)*, Brussels, European Commission Directorate-General for Competition, 2016, p. 121-122; Cfr. also EU Commission 20 December 1989, *O.J.L.*, 1990 no. L 13/34 –TEKO.

[36] K. POSNER, T. MARLAND and P. CHRYSTAL, *Margo on Aviation Insurance*, London, 2014, p. 420, nr. 21.27; K. HÖRL, *Legal aspects of risks involved in commercial space activities*, Montreal, 2003, http://digitool.library.mcgill.ca/thesisfile19485.pdf, p. 154.

entitled to this income under the principle of salvage. However due to the scarcity of the ITU[37] allocated slots, it may be more cost-effective to replace the crippled satellite by a fully performing one.

Salvage of inoperative satellites has already been demonstrated. In 1984 the space shuttle Discovery[38] recovered two disabled communication satellites, Palapa B-2 and Weststar VI.

The satellites were returned to Earth for refurbishment and re-use. Before the satellites could be recovered, however, the owners of the satellites, their insurers and the NASA legal staff had to spend considerable time negotiating and drafting agreements to transfer title to the satellites to the insurers and to clarify the rights and responsibilities of the parties

6.4. *Limited duty of disclosure*

The space insurance policy holder's duty of disclosure is limited as he can divulge only certain information to the insurer. The secrecy precept with respect to classified information of overriding public interest inspired by national security, prevails over the insurance based duty of disclosure. Disclosure of classified information of national interest is often criminally sanctioned as high treason[39]. In an insurance contract law system that sanctions only guilty[40] non-observance of the duty of disclosure, the legal duty of secrecy removes the wrongful nature of the omission in that case.

6.5. *Dispute resolution by arbitration*

To an even greater extent than other large risk policies, space risk insurance contracts contain an arbitration clause for the purpose of dispute resolution, thus offering the benefit of confidentiality[41].

7. *Peculiar Formulas & Clauses*

Space insurance presents a few atypical formulas and applies peculiar clauses.

7.1. *«First Dollar Coverage»*

First Dollar Coverage is an insurance plan without deductible (zero deductible or no deductible policy). The («own risk») insurance deductible is a risk sharing technique between the insured and the insurer used as a tool to counter the so-called «moral hazard», the insured's reduced diligence inspired by the insurance cover.

Deductibles are however seldom applied in space insurance[42]. This practice of no de-

[37] International Telecommunication Union.
[38] However after the termination of the space shuttle programme, this opportunity has become theoretical.
[39] Cfr. e.g. art. 116 and 118 Belgian Criminal Code.
[40] Cfr. art. 2:102 (5) PEICL.
[41] MARGO, cit., p. 420.
[42] MARGO, cit., p. 420.

ductible formula may be explained by several factors. On the one hand carefully designed «due diligence» clauses exempt the insurer from cover in case of negligence on the side of the insured. On the other hand the limited accessibility in orbit of the device, reduces or even bars the opportunities of (positive or negative) impact on the risk by the insured after launch. Also the traditionally high premium rate (up to 20% of the insured value), possibly combined with a premium rate adjustment (decrease) in case no claims are lodged during the period of cover, creates an incentive for diligent conduct with the insured.

7.2. *«Performance Incentive Payment»* insurance

The performance incentive payment insurance covers the manufacturer for the difference between the agreed and the collected sales price due to not meeting warranties (viz. the satellite service performance and lifetime).

Manufacturers may participate in the system risk of a given satellite throughout its lifetime, either via penalty (payback to the customer in case of a malfunction) or incentive schemes (a portion of the contract price is withheld and paid by the customer in instalments spread over the satellite's design lifetime).

The «incentive payment insurance» essentially is a performance guarantee cover and therefore gets very close to being uninsurable due to the «moral hazard» obstacle and the entrepreneurial[43] nature of the risk. The insurance cover of a business risk would turn the insurer into a silent business partner, which is not his function.

Expert evaluation of the risk, the contracts and specifications and due diligence commitments by the insured may render such cover possible for underwriters.

7.3. *Reciprocal liability waivers of stakeholders*

Another unconventional practice is the reciprocal or cross-waiver of claims («hold harmless» pact) by all participants in the satellite contractual chain of manufacture and launch services.

Each participant accepts his own risk of property damage or loss and agrees to be responsible for injury, damage or loss suffered by its employees.

It avoids interparty litigation.

However such arrangements bar the property insurers from exercising their subrogatory right of recourse after having indemnified their insureds for the loss. Insurers note and acknowledge the liability waivers and contractually agree to forsake their right of recourse against the party responsible for the damage caused after indemnification of their insured for the loss.

This waiver of recourse is atypical since the insurer's subrogation right is one of the cornerstones of insurance law (cfr. e.g. art. 79 U.K. Marine Insurance Act 1906).

The drawback of such liability immunity is again the moral hazard.

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[43] The entrepreneurial or business risk is the risk of loss so closely tied to an insured's way of doing business that it is considered not to be an appropriate subject of insurance coverage; such risks are typically addressed as overhead (i.e., the cost of the loss is included in the price of the business's products or services) or as a subject for loss control. The cost of replacing a defective product or redoing defective work is a classic «business risk», and therefore is excluded from most liability policies.

8. *Conclusion*

In view of the impending commercial space activity, space insurance ought to be recognized as an insurance class, next to marine and aviation (or aerospace) insurance.

As the space activity reaches the age of maturity and private (as opposed to state) operations become a common practice, a revision of the liability regime at the supranational level in the international conventions with attention for the position of the private operator and his third party liability insurer is warranted.

ABSTRACT**:** *Space Insurance: Legal Aspects*

The paper intends to focus on several current issues and specific characteristics of space insurance.

Space risk insurance poses some qualification, classification and localization issues.

It should be remembered that aviation insurance gradually broke away from the marine insurance regime, to be finally acknowledged as a distinct insurance class in its own right. It can be argued, at the same level, that regimes cannot truly be harmonized across the modes, and therefore, the author sees the separation of the space insurance and aviation insurance markets.

In view of impending commercial space activity, space insurance ought to be recognized as an insurance class, next to marine and aviation (or aerospace) insurance.

As space activity reaches the age of maturity and private (as opposed to state) operations become a common practice, a revision of the liability regime at the supranational level in the international conventions, with attention on the position of private operators and third party liability insurers, is warranted.

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NEW TECHNOLOGIES AND THE "WEAPONIZATION" IN OUTER SPACE

1. *Introduction*

Over the last 50 years, space activities have increased in both number and importance. Nowadays, it is clear enough that the militarization of space is occurring. New capabilities and weapon systems are being developed and the possibility of an arms race in outer space is now an issue that all countries must consider. Fifty years ago, on 27 January 1967, the Outer Space Treaty was opened for signature. It regulates many aspects pertaining the access and the use of outer space, the space exploration and international cooperation as well as the militarization of celestial bodies. In particular, the Outer Space Treaty establishes the principles of peaceful uses and free exploration of outer space, bans the placement and stationing of nuclear weapons in orbit or on celestial bodies, requires States to avoid contamination of outer space, and makes States responsible for their activities in space and liable for damages. Although the Outer Space Treaty expressly prohibits weapons of mass destruction in outer space, it does not contain such explicit language regarding other weapons.

2. *Technological developments and military uses in outer space*

The capabilities of accessing outer space increased after the technological development efforts made before and after the II World War. The development of missile technology, which started with the launch of the "V 2" by Nazi Germany, was a

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determining factor. The most technologically advanced States have always used satellites for military purposes, given their important strategic role both to guarantee national security and in the case of war operations.

The traditional view of security has been for long expressed in terms of military power, aimed at defending national survival and physical protection of the state's territory[1]. However, this vision has changed from the second half of the twentieth century and mainly from the end of the Cold War. Indeed, the new challenges posed by the technological development led to an expansion of the territorial context of security[2]. The exploration, use and exploitation of spaces beyond national jurisdictions resulted in a reconsideration of the concept of security extending it to different areas such as maritime, the Arctic, the Antarctic, the outer space and to even the so-called cyber space. Nowadays, space activities are an operational priority to such an extent that it is an indispensable condition for facing future wars[3].

Since the beginning of the space age, the United Nations gave significant importance to the promotion of international cooperation in outer space. In 1958 the UN General Assembly adopts its first resolution related to outer space, established an *ad hoc* Committee to deal with the increase of space activities and providing an adequate legal framework and recognized the need to avoid the expansion of conflicts in this new environment[4]. On 12 December 1959, this committee became a permanent body called Committee on the Peaceful Uses of Outer Space (COPUOS) with a specific structure of two sub-committees, one dealing with legal matters, the Legal Sub-Committee, and the other addressing technical issues, the Technical Scientific Sub-Committee[5]. It has been within the COPUOS that the five treaties governing space activities have been codified. With regard to the regulation of military activities the rules contained in the treaties seem to be not sufficiently exhaustive to face the new challenges.

Since the beginning the practice of States shows that the activities carried out in outer space have always had military aspects[6]. In this regard, already in 1968 during the I Conference on the exploration and peaceful uses of outer space (UNISPACE I) highlighted the need to avoid an arms race in space and the outbreak of an armed conflict[7]. Notwithstanding the international efforts in these decades, the practice of States in carrying out space activities is still close linked with military purposes. The "weaponization" of space includes the placing of space weapons or system in outer space with the possibility of offensive uses. Examples include the placing of orbital or suborbital satellites with the intention of attacking enemy satellites, using ground-based direct ascent missiles to attack space assets (ASAT), jamming signals sent from enemy satellites, using lasers to

[1] In his work entitled Collective Security under International Law, Hans Kelsen limited the scope to «[...] the protection of men against the use of force by other men», still offering a concept closely linked to the protection of the national territory from threats and external attacks, always recognized as the supreme raison d'être of states. N. HITOSHI, *The Expanded Conception of Security and International Law: Challenges to the UN Collective Security System*, in *Amsterdam Law Forum*, Vol. 3, No. 3, 2011, p. 16 ss.

[2] M. LACHS, *Thoughts on Science, Technology and World Law*, in *Am. Jour. Int. Law*, 1992, p. 673 ss.

[3] D. STEPHENS, *Increasing Militarization of Space and Normative Responses*, in R. RAO, V. GOPALAKRISHNAN, K. ABHIJEET (eds.) *Recent Developments in Space Law*, Singapore, 2017, p. 92 ss.

[4] UNGA Resolution 1348 (XIII), Question of the Peaceful of Outer Space, 13 December 1958.

[5] S. MARCHISIO, *The Evolutionary Stages of the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space* (*COPUOS*), in *Jour. Sp. Law*, 2005, p. 219 ss.

[6] S. FREELAND, *Peaceful Purposes? Governing the Military Uses of Outer Space*, in *Eur. Jour. Law Ref.*, 2016, p. 35.

[7] UN Doc. A/7285, New York, 1968 - http://www.unoosa.org/pdf/gadocs/A_7285E.pdf

incapacitate enemy satellites, plasma attacks, orbital ballistic missiles, and satellite attacks on Earth targets[8]. These activities are on going and the tests of ASAT conducted by China and the United States are very well known. It is also believed that China is developing other space weapons with the launch of the Aolong-1 spacecraft on a Long March 7 rocket. China claims that the Aolong-1 is tasked with cleaning up space junk and collecting man-made debris in space. However, other reports suggest that the spacecraft, equipped with a robotic arm, is a dual-use ASAT weapon[9]. Other examples are from the United States and the mysterious American spy satellite which took a fly-by of the International Space Station[10]. In addition, North Korea and Iran have been developing their space programs for ensuring their access to outer space; however, these programs have both been criticized as a way for covering the development of ballistic missile programs on Earth and for outer space.

Although States seem to share a general plea to avoid conflicts in outer space and maintain the current status quo, the international community is increasingly recognizing the need to prevent an arms race. The United States, Russia and China, possess significant military space technology and have developed policies and attitudes about military uses in outer space[11]. Moreover, a growing number of States and other space actors is expected to develop new capabilities for military reasons.

3. *The general legal framework*

It is well known that the conventional rules governing States activities in outer space are contained in the five United Nations treaties adopted between 1967 and 1979[12]. The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (OST) and the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement) are the two instruments containing specific provisions that limits the use of outer space for military purposes, while the others contain provisions that have only an indirect impact[13].

The OST[14], so far ratified by 105 States[15], provides a series of general principles aimed at limiting the military uses of space. These establish, inter alia, that exploration and use of outer space should be carried out for the benefit of and in the interests of all

[8] B.S. KUPLIC, *The Weaponization of Outer Space: Preventing an Extraterrestrial Arms Race*, in *North Carolina Journal of International Law and Commercial Regulation*, 2014, p. 1137 ss.
[9] https://thediplomat.com/2017/01/how-china-is-weaponizing-outer-space/
[10] http://www.thespacereview.com/article/3277/1
[11] P.B. LARSEN, *Outer Space Arms Control: Can the USA, Russia and China Make this Happen*, in *Jour. Conf. Sec. Law*, 2017, p. 1 s.; https://www.ft.com/content/637bf054-8e34-11e5-8be4-3506bf20cc2b
[12] United Nations, International Space Law: United Nations Instruments, 2017, p. 1 s. http://www.unoosa.org/res/oosadoc/data/documents/2017/stspace/stspace61rev_2_0_html/V1605998-ENGLISH.pdf
[13] F. TRONCHETTI, *Legal aspects of the military uses of outer space*, in F. VON DER DUNK, F. TRONCHETTI (eds.) *Handbook of Space Law*, Elgaronline from Edward Elgar Publishing, 2015, p. 334.
[14] S. MARCHISIO, *Il Trattato sullo spazio: passato, presente e futuro*, in *Riv. dir. int.*, 2018, p. 205 ss.
[15] UN Doc. A/AC.105/C.2/2017/CRP.7 Status of international agreements relating to activities in outer space as at 1 January 2017

countries[16]. Furthermore, these activities should be carried out in accordance with international law, including the Charter of the United Nations. The rationale was the concern of many States that outer space would have become a new area of international conflict[17]. The preamble of the OST and its art. IV provide the main references aimed at limiting the military uses[18]. In the first paragraph art. IV forbids to put in orbit around the Earth space 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. In this respect, the OST completes the 1963 Partial Test Ban Treaty (PTBT) which prohibits nuclear experiments in outer space. However, this provision does not prohibit the stationing of any other type of weapon in outer space, such as conventional or even laser weapons, nor is there any explicit prohibition of the launch of nuclear weapons and other weapons of mass destruction from Earth to outer space[19]. Therefore, it provides for a denuclearization regime but not a complete demilitarization of outer space.

In this context, some activities carried out by the States denote the "pitfalls" of art. IV such as the use of ASAT missiles by China and the United States[20]. In 2007, China deliberately destroyed one of its dead meteorological satellites known as Fengyun-1C using a medium-range ballistic missile and it has been the cause of a cloud of potentially dangerous debris in a belt of Earth orbit that is particularly used by states. On the one hand, these actions should be avoided as it has been agreed in the UN Space Debris Mitigation Guidelines[21]. On the other hand, the action has shown the military capabilities and it has been widely condemned by the international community. Since that event, US Defense Department officials have declared that China continues to develop anti-satellite weapons and it has argued that further similar tests have been conducted in 2010, 2013 and 2014.

Contrariwise, the second paragraph of art. IV concerns the use of the Moon and other celestial bodies shall be exclusively for peaceful purposes specifying that no bases, installations or fortifications can be established on celestial bodies. It provides for the full demilitarization of the Moon and other celestial bodies banning the placement and testing of any type of weapons, the establishment of military installations and facilities, and any kind of military manoeuvres. Nevertheless, the use of military personnel and facilities in the context of scientific and peaceful activities is permitted. The absence of any reference to the outer void space shows that the paragraph should apply only to the Moon and to the other celestial bodies. The thesis that the omission of reference to the outer void space have been intentional by the drafters is confirmed in the *traveaux préparatoires*, which confirms that States wanted to remain free to carry out certain space activities for military

[16] Art. I of the OST

[17] B. CHENG, *The Military Use of Outer Space and International Law*, Oxford Scholarship Online, p. 525 ss.

[18] F.A. SNYMAN, *Selected legal challenges relating to the military use of outer space, with specific reference to article IV of the outer space treaty*, in *Potchefstroom Electronic Law Journal*, 2015, p. 488 ss.

[19] R.J. LEE, *The Jus Ad Bellum In Spatialis: The Exact Content and Practical Implications of the Law on the Use of Force In Outer Space*, in *Jour. Sp. Law*, 2003, p. 93 ss.; M. BOURBONNIÈRE, R.J. LEE, *Legality of the Deployment of Conventional Weapons in Earth Orbit: Balancing Space Law and the Law of Armed Conflic*t, in *Eur. Jour. Int. Law*, 2007, p. 873 ss.; C.Q. CHRISTOL, *Missile Launches, Militarization, Weaponization: Security in Space,* Proceedings of the International Institute of Space Law, 2009, p. 99 ss.

[20] J. MAOGOTO, S. FREELAND, *From Star Wars to Space Wars - The Next Strategic Frontier: Paradigms to Anchor Space Security*, in *Air. Sp. Law*, 2008, p. 10 ss.; J. SU, *Use of Outer Space for Peaceful Purposes: Non-militarization, Non-aggression and Prevention of Weaponization*, in *Jour. Sp. Law*, 2010, p. 253 ss.

[21] Guideline 4, UNGA Resolution 62/217 of 22 December 2007.

purposes[22]. Even if a broader application is inferred from the combined effect of the two paragraphs of Article IV, as it has been suggested by some commentators, the practice of States has led to the conclusion that the term peaceful purposes indicate "non-aggressive" rather than "non-military" activities[23].

Significant provisions regarding the military uses in outer space are also contained in the Moon Agreement[24] such as art. 3, par. 2, that expands the prohibition included in art. IV, par. 2, of the Outer Space Treaty. The provisions prohibit any threat or use of force, any hostile act and the threat of hostile act on the Moon. In addition, art. 3, par. 3, goes even beyond what has previously set forth in art. IV of the OST as it bans the placement of objects carrying nuclear weapons or any kind of weapons of mass destruction not only on the Moon, but also in orbits around, or other trajectory to or around. It has to be highlighted that these additional obligations under the Moon Agreement are limited in scope and the agreement has so far received few ratifications[25] compared to the OST. Nonetheless, it establishes the state of the art related to the exploration and use of the Moon with the aim of creating an exclusively peaceful and threat-free environment.

3.1. *The applicability of general international law and the UN Charter*

The legal framework, provided by the UN space treaties, establishes some limitations on the military use of outer space but it still shows several important gaps in various aspects[26]. However, the analysis of the legal framework in outer space should never be confined the UN space treaty solely. While not specifically addressing issues pertaining to outer space activities, other international legal instruments have a direct impact on space activities. Indeed, when considering the rules governing the space activities, art. III of the OST should be taken more into account. From the viewpoint of international law, it is one of the most essential provisions of the OST. It establishes that space law is intrinsically and extensively linked with international law and its other branches, defining their interactions and synergies[27]. Even though one should bear in mind that outer space is characterized by peculiar physical and environmental conditions and every field of international relations is regulated more directly by its *lex specialis*. However, this does not mean that a relevant part of international law is not applicable, such as the norms of customary international law and the general principles of international law[28].

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[22] S. FREELAND, R. JAKHU, *Article IV*, in S. HOBE, B. SCHMIDTT TEDD, K.U. SCHROGL (eds.), *Cologne Commentary on Space Law*, Vol. I, Outer Space Treaty, Carl Heymanns Verlag, Cologne, 2009, p. 69 ss.

[23] I.A. VLASIC, *Space Law and the Military Applications of Space Technology*, in N. JASENTULIYANA (eds.) *Perspectives on International Law*, p. 385 ss.; M.N. SCHMITT, *International Law and Military Operations in Space*, in *Max P. YB. Un. Nat. Law*, 2006, p. 101 ss.

[24] V.S. VERESHCHETIN, *Limiting and Banning Military Uses of Outer Space: Issues of International Law*, in J. MAKARCZYK (eds.) *Essays in International Law in Honour of Judge Manfred Lachs*, 1984, p. 671 ss.

[25] So far, 17 Ratifications, See UN Doc. A/AC.105/C.2/2017/CRP.7 Status of international agreements relating to activities in outer space as at 1 January 2017.

[26] P. JUSHENG, *Addresing the Outer Space Security Issue*, United Nations Conference Report: Building the Architecture for Sustainable Space Security, 2006, p. 61 ss.; A. T. PARK, *Incremental Steps for Achieving Space Security: The Need for a New Way of Thinking to Enhance the Legal Regime for Space*, in *Houston Journal of international law*, 2006, p. 871 ss.

[27] M. LACHS, *The Law of Outer Space*, Leiden, 1972, p. 21 ss.; R. JAKHU, S. FREELAND, *The sources of international space law,* in *Proceedings of the International Institute of Space Law*, 2013, 2014, p. 460 ss.

[28] O. RIBBELINK, *Article III*, in S. HOBE, B. SCHMIDTT TEDD, K.U. SCHROGL (eds.), *Cologne Commentary on Space Law*, Vol. I, *Outer Space Treaty*, Carl Heymanns Verlag, Cologne, 2009, p. 64 ss.

In art. III of the OST, the specific reference to the maintenance of international peace and security highlights the link with the United Nations Charter as an element of particular importance[29]. The prohibition of the threat and use of force established in art. 2, par. 4, of the UN Charter stands for a crucial element in the regulation of international relations and is equally applicable to the use of space as well as the corollary of the inherent right of self-defence established pursuant to art. 51 of the UN Charter[30]. For the purposes of this analysis, a reference should be made also to the Resolution 2625 (XXV) relating to the Declaration on the Principles of International Law concerning Friendly Relations and Co-operation among States in accordance with the Charter of the United Nations, adopted by the General Assembly on 24 October 1970. The Declaration reiterates the basic principles set out in the UN Charter and affirms that States must refrain from any action that could aggravate a crisis situation in such a way as to endanger the maintenance of international peace and security. As a result, States must avoid any military use or activity in space that could pose a threat to international peace and security[31].

In addition to the aforementioned PTBT, one other legal instrument to take into account is the Convention on the Prohibition of Military or Any Other Use of Environmental Modification Techniques (ENMOD)[32]. The ENMOD Convention has 76 States Parties including space powers such as the United States, Russia and China and it might create restrictions on the use of ASAT weapons. The ENMOD prohibits the Parties from conducting military or technical activities in any other hostile manner, of environmental modification that have widespread lasting or severe effects in specific areas, including outer space[33]. In fact, the use of ASAT[34] has a deleterious effect on the space environment as demonstrated by the Chinese case of the 2007 which generated the creation of large amounts of space debris[35].

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[29] T. MARAUHN, *The Use of Force in Outer Space Articles III and IV of the Outer Space Treaty from the Perspective of General International Law*, in S. HOBE, S. FREELAND (Eds.), *In Heaven as on Earth? The Interaction of Public International Law on the Legal Regulation of Outer Space*: 1/2 June 2012, Bonn – Oberkassel, Institute of Air and Space Law of the University of Cologne / Deutsches Zentrum für Luft-und Raumfahrt e.V. German Aerospace Center, 2013, p. 7 ss.

[30] N. RONZITTI, *Problemi giuridici sollevati dalle iniziative in materia di disarmo spaziale*, in F. FRANCIONI, F. POCAR (a cura di) *Il regime internazionale dello spazio*, Milano, 1993, p. 79 ss.

[31] G. ARANGIO RUIZ, *The Normative Role of the General Assembly of the United Nations and the Declaration of Principles of Friendly Relations*, in *Recueil des Cours*, III, 1972, p. 419 ss.

[32] UN Doc. CD/1870, 22 May 2006, Working paper Existing International Legal Instruments and Prevention of the Weaponization of outer space.

[33] However, art. III of the ENMOD expressly authorizes the use of environmental modification techniques for peaceful purposes.

[34] D.A. KOPLOW, *ASAT-isfaction: Customary International Law and the Regulation of Anti-Satellite Weapons*, in *Michigan Journal of International Law*, 2009, p. 1190 ss.

[35] However, the effectiveness of the ENMOD is subject to certain requirements imposed by the Convention itself. The ENMOD applies in a case in which States use military techniques to change the environment against other States. The Chinese ASAT test was not performed during a military confrontation and was not intended to have a hostile effect on a specific state. Therefore, while placing some limits on the use of weapons in space that cause harmful effects on the long-term environment, the ENMOD Convention does not seem able to stop one of the highly perceived threats to the safety of space objects. F. TRONCHETTI, *Legal aspects of the military uses of outer space*, in F. VON DER DUNK, F. TRONCHETTI (eds.) *Handbook of Space Law*, Edward Elgar Publishing, 2015, p. 345.

Nowadays, the extension and application of international law to space activities are strongly debated by scholars as one of the means to fill the existing gaps[36]. In fact, it must be kept in mind that even the existing principles of international humanitarian law, as an integral part of international law, are applicable in theory to the military uses of space[37]. Therefore, on the one hand, an assessment is needed in order to reinforce and specifying the existing legal framework with the aim of discouraging further aggressive military activities in this area; on the other hand, it is necessary to develop clear specific rules and standards that prevent any form of conflict in outer space[38].

3.2. *The debates concerning the Prevention of an Arms Race in Outer Space (Paros)*

The question of the risk of an arms race in outer space has long been debated by the international community in bilateral and multilateral fora. In 1981, Italy on behalf of the Western European and other States introduced a draft resolution to the UNGA first committee entitled "Prevention of an Arms Race in Outer Space" (PAROS)[39]. The main concern was the already underway development of ASAT technologies and the resolution called for the current Conference on Disarmament[40] (CD at that time Commission Disarmament) to «[…] Consider as a matter of priority the question of negotiating effective and verifiable agreements of an arms race in outer space»[41].

This was the beginning of a process called PAROS. It concerns the annual resolutions of the UN General Assembly which, in general, affirm the need to avert a serious danger to international peace and security[42]; recognize that the applicable legal regime does not in itself guarantee PAROS and that it is necessary to consolidate and strengthen this regime; underline the need for further measures with appropriate and effective safeguards to prevent an arms race. At the same time, the initiatives undertaken in the context of the CD which is the most important multilateral forum available to the international community for treaty negotiations on disarmament and non-proliferation[43].

In 1985, the CD reached an agreement on the mandate of an ad hoc committee on PAROS which was maintained until 1994 examining three thematic areas: issues related to the prevention of an arms race in outer space; existing agreements governing space activities and existing proposals and future initiatives on an arms race in Outer Space. Subsequently, discussions were held in the plenary meetings due to the persistent

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36 S. FREELAND, *A natural system of law? Andrew Hayley and the international legal regulation of outer spac*e, in *Jour Sp. Law*, 2013, p. 90 ss.

37 D. STEPHENS, C. STEER, *Conflicts in Space: International Humanitarian Law and its application to space warfare*, in *Ann. Air Space Law*, 2015, p. 1 ss.

38 See in general, I. MARBOE (eds.), *Soft Law in Outer Space. The Function of Non-binding Norms in International Space Law*, Wien-Koln-Graz, Böhlau Verlag, 2012.

39 UNGA Res. A/36/97, 9 December 1981.

40 B. BASELEY-WALKER, *Outer space, Geneva and the Conference on Disarmament: Future directions*, in *Sp. Pol.*, 2012, p. 45 ss.

41 UN Doc. A/RES/36/97C.

42 P. MEYER, *The Judgment of PAROS: How Best to Prevent an Arms Race in Outer Space,* in Simons Papers in Security and Development, No. 19, School for International Studies, Simon Fraser University, Vancouver, March 2012, p. 6.

43 S. MARCHISIO, *L'ONU. Il diritto delle Nazioni Unite*, Bologna, 2012, p. 143 ss.; P.G. ALVES, *Prevention of an Arms Race in Outer Space: A Guide to the Discussions in the Conference on Disarmament,* United Nations Publications, New York, 1991, p. 8 ss.; N. JASENTULIYANA, *The Process of Achieving Effective Arms Control,* in J. DAHLITZ, D. DICKE (eds.), *The International Law of Arms Control and Disarmament*, New York, 1991, p. 179.

obstructive attitude of some States to reach an agreement on the issues covered by the committee and its mandate[44]. In particular, the United States have always maintained that the discussions on PAROS concern a threat that is still non-existent. Furthermore, they have always reiterated that the applicable legal framework should take into account the five UN treaties related to space activities, the UN Charter and other relevant bilateral and multilateral provisions on arms control, customary international law which «[...] provided an equitable, practical, balanced and extensive legal system for ensuring the use of outer space for peaceful purposes […]»[45]. Therefore, in their view there was neither the need for new legally-binding instruments nor a need to revise existing agreements in this respect[46].

Having failed to re-establish the *ad hoc* Committee on PAROS did not reflect the lack of interest in the subject. PAROS have always been an important topic to be taken into consideration for CD's member with the aim to elaborate their respective positions and making progress capable of converging opinions to negotiate a concrete proposal. Following the thematic areas, States considered the clarification of the terminology and definitions as a basis of developing the future legal regime. In this regard, the main issue has been to find out destabilizing actions which are not banned under current international law to make them prohibited[47]. Such category of actions is termed "weaponization of space" in contrast to "military use of space" which is believed to remain permissible. "Weaponization" and militarization of outer space are two terms which are often ambiguously used in CD debates[48]. However, the term "weaponization" of outer space is generally understood to incorporate the introduction of weapons into the outer space environment. Overall, "weaponization" means the deployment of weapons in outer space to attack, destroy and otherwise damage objects in outer space, as well as human beings and objects on the Earth[49]. A definition has not been agreed so far given several difficulties in defining such a term and other terms linked with it like "outer space" and "space weapons" or "weapons in space". Indeed, the issue of defining outer space is a question demarcating the boundary between the outer space and the atmosphere and even more relevant fixing the edge of the sovereignty of States. Since 1959, the topic has been discussed within the COPUOS and by scholars. However, no agreed and shared conclusions have been reached yet[50]. Furthermore, many space technologies have dual-use capacity and in the CD some proposals claimed that in order to be a space weapon an object did not have to be specifically designed and manufactured for that aggressive

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[44] In 1998 the efforts to set up the Ad Hoc Committee on PAROS were again intensified CD/PV.763, 15 May 1997; however, the dominant topic at the CD became the proposal on a fissile material cut-off treaty (FMCT), CD/PV.809, 21 January 1999.

[45] D. WOLTER, *Common Security in Outer Space and International Law*, United Nations, 2006, p. 65. See also CD/1680 10 July 2002 USA: text of the remarks made at an informal conference on Future security in space: commercial, military and arms control trade-offs.

[46] K. S. BLAZEJEWSKI, *Space Weaponization and US-China Relations*, in *Strategic Studies Quarterly*, 2008, p. 33 ss.

[47] D. WOLTER, *Common Security in Outer Space and International Law*, United Nations, 2006, p. 60 ss.
CD/607, CD/OS/WP.3 (5 July 1985) at 1–3; CD/641, supra note 82 at 6–9; CD/716, CD/OS/WP.15, supra note 84 at 4–5; CD/786, supra note 84 at 5; CD/1753 (8 July 2005) at 4–6; CD/1784 (14 June 2006).

[48] CD/716, Op. cit., p. 5 (Canada).

[49] S. FREELAND, *International Law and the Exploration and Use of Outer Space*, in M. AMBRUS, R. RAYFUSE, W. WERNER (eds.) *Risk and the Regulation of Uncertainty in International Law*, Oxford, 2017, p. 77 ss.

[50] G. GÁL, *Space Law*, Leiden, W. Sijthoff, 1969; V. KOPAL, *The Questions of Defining Outer Space*, in *Jour. Sp. Law*, 1980, p. 154 ss.; F. VON DER DUNK, *The Delimitation of Outer Space Revised The Role of National Space Laws in the Delimitation Issue*, in *Proceedings of the Forty-First Colloquium on the Law of Outer Space*, 1998, p. 254 ss.; O. DE OLIVIERA BITTENCOURT NETO, *Defining the Limits of Outer Space for Regulatory Purposes*, Springer, 2015.

purpose, although this view did not prevail[51]. On this point, one of the main debates regard whether a ground-based ballistic missile should be included in space weapons in case they attack, destroy or otherwise damage satellites in outer space as missile defence systems are firmly embedded in national defence strategies. Moreover, apart from the generally recognized dual-use of satellites, there are a variety of "space weapons" including space-mine type satellites, kinetic weapons to be launched by ballistic missiles or fighters into the target orbit, and from-space-to-hit-the-target satellites[52].

In the CD, the debate then focused on the existence or absence of an arms race in outer space and the status of the current legal regime. While the majority of delegations were of the opinion that the current regime is not appropriate for the purposes of PAROS[53], some states such as the United States have stated that the provisions of the OST and the UN Charter, in particular the combination of art. 2, par. 4, and art. 51 provide balanced and extensive guarantees and that their application ensures a sufficient legal framework within PAROS[54].

Last but not least, discussions have pointed out the identification of the legal instruments suitable for ensuring PAROS. There have been proposals of non-binding nature whereas other initiatives identified the necessity of a new binding instruments. The latter, in particular, have always found the opposition of those States that currently claim that the weaponization in outer space does not exist yet[55].

3.3. *The general content of PAROS discussions and recent initiatives*

In general, the discussions within the CD produced nine[56] proposals for the de-weaponization which are oriented towards two distinct methodological approaches: on the one hand, some of them aimed at modifying art. IV, par. 1, of the OST in order to extend its scope from the prohibition of weapons of mass destruction to any other type of weapons in space. On the other hand, other initiatives pointed out the adoption of a new independent treaty[57]. Overall, it is important to note that in all proposals the common prohibited actions are the tests, the deployment or use in space of any weapon against objects in space or on Earth.

The most recent treaty proposal has been presented jointly by Russia and China in a draft entitled "Treaty on Prevention of the Placement of Weapons in the Outer Space the Threat or the Use of the Force against Outer Space Objects" (PPWT). The first draft was

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[51] CD/1179 22 May 2006, p. 2 s.

[52] CD/1784, 14 June 2006, Canada WG, A Gap Analysis of Existing international constraint on weapons and activities applicable to the prevention of an arms race in outer space Agenda Item of the Conference of Disarmament, p. 1 ss.

[53] CD/1271, 24 August 1994, p. 7.

[54] CD/726 (19 August 1986) p. 3 ss.; CD/787 (28 August 1987) p. 162 ss.; CD/833 (25April 1988) at 3–7; CD/954 (24 August 1989) at 4–9; CD/1034 (16 August 1990) at 3–9; CD/1105 (23 August 1991) at 5–8 CD/1271, 24 August 1994, p. 7

[55] S. AOKI, *Law and military uses of outer space*, in R. JAKHU, P. S. DEMPSEY (eds.), *Routledge Handbook of Space Law*, Taylor and Francis, 2016, p. 209.

[56] *Ibid.*, p. 210; See also CD/INF.50, 23 June 2006, Basic Documents of the Conference on Disarmament related to the Prevention of an Arms Race in Outer Space - prepared by the Secretariat; CD/INF.50/Add.1, 1 February 2007, Basic Documents of the Conference on Disarmament related to the Prevention of an Arms Race in Outer Space - prepared by the Secretariat, Addendum;

[57] CD/274 (7 April 1982). This proposal was submitted to the UNGA in 1981 as UN Doc. A/36/192 (20 August 1981); CD/1679 (28 June 2002).

presented in 2007 and the last version has been proposed in 2014 following the observations during the following years.

Overall, the final draft of the PPWT prohibits the States Parties to place any weapon in outer space; resort to the threat or use of force against space objects; engaging in external space activities inconsistent with the aims and purposes of the PPWT; assisting or inducing other states and international governmental organizations as well as non-governmental organizations and entities to participate in activities inconsistent with the aims and purposes of the PPWT[58]. Among the reservations made by States, the main concerns the definition of space objects contained in the draft treaty. Indeed, this wording excludes terrestrially-based ballistic missiles from prohibited weapons, although ASAT is one of the main topics of discussion in PAROS. The latter, as well as other ambiguities of the PPWT raised strong criticisms that did not allow the opening of negotiations[59]. Many States have expressed strong opposition to accepting binding legally instruments on this matter, particularly the United States. Moreover, an aspect that complicates the negotiation of a binding treaty is the absence of concrete tools for the verification[60] of the objects launched which are able to determine if those objects can be classified or not as a weapon[61]. As outlined above, in the CD there have been also other proposals that called for the development of no legally binding instruments. They include, for example, working papers on the importance and value of transparency and confidence-building measures (TCBMs) in outer space (CD/1815)[62]. The adoption of these instruments has been supported by the UNGA which welcomed efforts to make political commitments, for example in the form of unilateral declarations, bilateral agreements or through a multilateral code of conduct to encourage «[...] actions in, and the peaceful use of, outer space»[63]. For this reason, the UNGA requested the creation of a Group of Governmental Experts (GGE) on TCBMs in outer space activities that States have welcomed as a pragmatic way to advance international dialogue[64]. One concrete proposal of TCBMs that emerged was the European Union draft of a non-binding International Code of Conduct for Outer Space Activities (ICoC). The latest draft, dated 2014[65], was intended to be the subject of negotiations in 2015 in a meeting consisted of representatives from over 100 countries in New York[66]. The

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58 F. TRONCHETTI, L. HAO, *The 2014 updated Draft PPWT: Hitting the spot or missing the mark?*, in *Sp. Pol.*, 2015, p. 38 ss.

59 R. JAKHU, J. PELTON, *Global Space Governance: An International Study* (Eds), Springer International Publishing, p. 288.

60 F.R. CLEMINSON, P. GASPARINI ALVES, *Space Weapons Verification: A Brief Appraisal*, in S. SUR (eds.), *Verification of Disarmament or Limitation of Armaments: Instruments, Negotiations, Proposals*, Geneva, 1992, p. 177; CD/1781 22 may 2006, Verification Aspects of PAROS, p. 1 ss.; CD/1785, 21 June 2006, Space Based Verification: Paxsat a then and development since, p. 1 ss.

61 J. SU, *Towards an Effective and Adequately Verifiable PPWT*, in *Sp. Pol.*, 2010, p. 152 ss.; M. LISTNER, *The 2014 PPWT: a new draft but with the same and different problems*, http://www.thespacereview.com/article/2575/1

62 It is interesting to note that China and Russia have also actively promoted the adoption of TCBMs for outer space. For example, in 2006 they presented working paper on *Transparency and confidence-building measures in outer space activities and the prevention of weapons positioning in space*. CD/1778 (22 May 2006).

63 UNGA Res. A/RES/65/80

64 *Ibid.*, The GGE convened three sessions in 2012 and 2013 and submitted its consensus report in UN Doc. A/68/189.

65http://www.eeas.europa.eu/archives/docs/nonproliferationanddisarmament/pdf/space_code_conduct_draft_vers_31-march-2014_en.pdf.

66 But the specific proposal we are referring to was first conceived in an informal paper circulated by Italy on March 15, 2007 within the CD in Geneva. The document was entitled Food for Thought on a Possible Comprehensive Code of Conduct for Space Objects and linked to the issue of the Prevention of an Arms

substantive aspect of the ICoC rely on a systematic approach which covers all the dimensions of the outer space activities. It applies to military as well as civil operations in outer space and is based on the principle of "no harmful interference" against space objects[67]. As it has been observed, the ICoC «[…] while not dealing with the placement of weapons in space, addresses clear political commitments regarding the security in outer space, such as the commitment to refrain from destroying space objects in orbit creating long living debris and from ASAT experiments; […] it restates the principle of the prohibition of the threat or use of force in space and its corollary, the principle of self-defense: it does not limit itself to cover "peaceful" activities, as some States suggest, with the intent of watering down the scope of the Code»[68]. The ICoC and PPWT refer to the inherent right of States to individual or collective self-defence as recognized in the UN Charter, and the responsibility of States to refrain from the threat or use of force so that it may also be a strong indicator that military use of space has been well established under existing international law[69].

The ICoC contains also general principles such as the freedom of all States to access, to explore, and to use outer space for peaceful purposes; the responsibility of States to take all appropriate measures and cooperate in good faith to avoid harmful interference in space activities; the responsibility of all States to promote the peaceful exploration and use of space, and to prevent space from becoming an area of conflict. In addition, it lays out various cooperating mechanisms among subscribing States.

In 2015, the multilateral negotiations of the ICoC confirmed the common sharing of the importance and validity of this instrument, but few States have expressed the need of more involvement, inclusiveness and transparency in the drafting process[70]. However, the ICoC did not fail to make a valuable contribution to the dialogue and the exchange of opinions, placing itself as an important reference point as a shared basis for the start of new negotiations. Indeed, during the 59th session of the COPUOS, the EU declared its willingness to pursue the development of a code of conduct for space activities[71].

4. *Conclusions*

The "weaponization" of outer space and the prevention of conflicts in this environment are subjects deeply discussed in the international community. On the one hand, the weaknesses of the legal framework established by the five UN treaties can be covered enough by the application of international law, including the UN Charter, to space activities as established by art. III of the OST. On the other hand, it has been highlighted

Race in Outer Space (PAROS). See, in general, AJEY LELE (eds.), *Decoding the International Code of Conduct for Outer Space Activities*, Petangon Security International, 2012.

67 S. MARCHISIO, *The Legal Dimension of the Sustainability of Outer Space Activities: The Draft Code of Conduct on Outer Space Activities*, in *Proceedings of the International Institute of Space Law*, 2012, Vol. 55, 2013, p. 3 ss.

68 S. MARCHISIO, *Security in Space: Issues at Stake*, in *Sp. Pol.*, 2015, p. 67 ss.

69 S. AOKI, *Law and military uses of outer space*, in R. JAKHU, P. S. DEMPSEY (Eds), *Routledge Handbook of Space Law*, Taylor and Francis, 2016, p. 210.

70 Chair's Summary, Multilateral Negotiations on an International Code of Conduct for Outer Space Activities, New York, 27-31 July 2015, online: PaperSmart <https://papersmart.unmeetings.org/media2/7650931/chairs-summary-corrected-1-.pdf>

71 UN Doc. A/AC.105/1113, p. 8.

that the issues surrounding the "weaponization" of outer space present several features, such as the fact that many space technologies have dual-use capacity, making it difficult for States to distinguish between defensive and offensive preparations or conventional and space weapons. However, it is in the interest of all countries to reach an agreement that prevents the "weaponization" of outer space, due to the uncertainty in the legal framework and the rapidly advancing technologies.

In 2017, the UNGA resolution entitled *Further practical measures for the prevention of an arms race in outer space*[72], while recalling the need to agree on and implement at its earliest opportunity a balanced and comprehensive program of work in the CD, request UN Secretary General to establish a GGE in order to consider and make recommendations on substantial elements of an international legally binding instrument on the prevention of an arms race in outer space, including, inter alia, on the prevention of the placement of weapons in outer space. Even though it will be hard to undertake the standstill in the CD, the initiatives of ICoC and PPWT demonstrate the interest of States to deal with the issues. These proposals provide the basis for promoting the development of negotiations capable of satisfying the common interests through greater inclusiveness and participation of the various actors involved. Notwithstanding, a more traditional approach resulting in hard law, States are more oriented towards the negotiation of non-binding instruments such as the ICoC[73]. These tools should not be underestimated because they provide, in any case, guidelines or standards of conduct that can influence the actions of the States and constitute an indispensable function for the development of an adequate legal framework. Especially, as it has been recently underlined by the United States[74], while not replacing the issues of verification, States acknowledge that no legally binding codes and TCBMs may function as a start to a step-by-step approach on preventing an arms race in outer space[75]. The path to develop any new kind of instruments should start from the achievements reached so far. In addition, the application of the rules and principles arising out from international law should be more analysed, although with the necessary care of the outer space features. In this sense, these achievements, especially those emerged from the ICoC drafting process, cannot be underestimated by the international community and by the future works of a GGE on the theme of PAROS.

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72 UN Doc. A/RES/72/250

73 P. MEYER, *The CD and PAROS: A Short History*, UNIDIR Resources, Ideas for Peace and Security (April 2011), http://www.unidir.org/files/publications/pdfs/the-conference-on-disarmament-and-the-prevention-of-an-arms-race-in-outer-space-370.pdf

74 See in general CD/2078, 15 September 2016, Submission of the United States to the Conference on Disarmament: "Implementing the Recommendations of the Report (A/68/189*) of the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities to Enhance Stability in Outer Space". In the document it has been highlighted that «[…] the United States is convinced that outer space challenges confronting the international community can be addressed through practical, near-term initiatives. Outer space transparency and confidence-building measures (TCBMs) offer a pragmatic, voluntary approach to addressing near-term concerns for outer space security […]», p. 2.

75 S. MARCHISIO, *The Legal Dimension of the Sustainability of Outer Space Activities: The Draft Code of Conduct on Outer Space Activities*, in *Proceedings of the International Institute of Space Law*, 2012, Vol. 55, 2013, p. 3 ss.

ABSTRACT: *New Technologies and the* Weaponization *in Outer Space*

The *weaponization* of outer space and the prevention of conflicts in this environment are subjects deeply discussed in the international community. On the one hand, the weaknesses of the legal framework established by the five UN treaties can be covered enough by the application of international law, including the UN Charter, to space activities as established by art. III of the Outer Space Treaty. On the other hand, it has been highlighted that the issues surrounding the *weaponization* of outer space present several features, such as the fact that many space technologies have dual-use capacity, making it difficult for States to distinguish between defensive and offensive preparations or conventional and space weapons. However, it is in the interest of all countries to reach an agreement that prevents the *weaponization* of outer space, due to the uncertainty in the legal framework and the rapidly advancing technologies. Notwithstanding, a more traditional approach resulting in hard law, States are more oriented towards the negotiation of non-binding instruments. These tools should not be underestimated because they provide, in any case, guidelines or standards of conduct that can influence the actions of the States and constitute an indispensable function for the development of an adequate legal framework.

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THE REGIME APPLICABLE TO SPACE TOURISM TRIPS: THE DREAM OF A RELIABLE INTEGRATED AIR/SPACE TRAFFIC MANAGEMENT; THE POINT OF VIEW OF A FORMER AIR TRAFFIC CONTROLLER

1. *Introduction*

What is the meaning of "Space Tourism"? There are different possible definitions of "space tourism". Here, according to ESA position, the term is used to mean commercial suborbital flights by privately funded and/or privately operated vehicles and the associated technology development driven by the space tourism market.

As Commercial Space Transportation (CST) becomes an international business, it requires landing opportunities all over the world. Hence the integration of space vehicles in the airspace/air traffic management system is an important topic that cannot be avoided.

There are comparable traffic regimes that can help us?

In international common spaces, such as the high seas – and outer space – no territorial jurisdiction applies. Only personal jurisdiction does. When rules such as traffic management are concerned, this system is far from being efficient. It is the reason why on the high seas, the exclusivity of the flag state is likely to be overruled by an extension of the territorial jurisdiction of one state as in the case of the airspace above the Tyrrhenian sea where ICAO has mandated Italy for air traffic services provision outside territorial waters. This solution may not be acceptable for space activities as there is no territorial jurisdiction involved. These difficulties should be taken into consideration if and when a space traffic management regime enters into force. Maybe interesting elements could come from the Law of the Sea as oceans and outer space do have the common basic elements of extra-

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territorial applications.

Commercial aerospace operations are a reality and several companies are already carrying out flight trials and will be carrying the first passengers and freight in the very near future. The commercial development of more vehicles is underway. This situation appears similar to the present stage in the development of Unmanned Aerial System (UAS) where technological advances took place at a far faster pace than envisaged leading to a fragmented regulatory and operational situation which is still not resolved at the present time.

2. *A Risky New Mode of Transportation*

With space tourism, the birth of space travel, we are adding a new mode of transportation to the existing multi-modal system (truck, rail, water, pipeline, air) with average speed many times higher than fastest commercial aircraft. Commercial space is the only mode of transportation that cannot get to its functional environment, outer space, without going through that of a different mode: aviation and the airspace traffic management system.

With regard to the above said interaction between Space Vehicle Operation (SVO) and regular air traffic, two phases of space flight have to be considered: Launch and Reentry. During both phases, separation between aircraft and the space vehicle, including its potential hazard areas in case of malfunctions, have to be assured. Most of the typical launch and re-entry flight trajectories require only relatively small size of restricted airspace surrounding the launch and landing sites to remain clear of the space vehicle (whereas the size and shape of the restricted airspace is dependent on the applied launch and re-entry procedure). Those kinds of restrictions have to be in place over the duration of the launch or re-entry operational window and cover a vertical area from the surface to an unlimited altitude. In addition to that, a much larger portion of airspace has to be managed regarding the risk of falling debris from an in-flight explosion or a breakup event. The resulting fragments can cover a relatively large area, depending on the velocity and altitude of the vehicle during its disintegration. As small particles can cause severe damage to flying aircraft, precautionary measures have to be taken to protect air traffic participants from such catastrophic events. The possible distribution of debris following vehicle disintegration has to be calculated along the predicted flight trajectory, resulting into sequence of overlapping hazard areas. The size of each hazard area depends on the actual state vector (including altitude and velocity) of the space vehicle as well as its intended maneuvering and several environmental conditions as the wind forecast. Those areas then can be cleared from other traffic during the actual launch or re-entry operation. The segregation of airspaces on the other hand has to be limited to a minimum in size and time, considering the need for an efficient and economic joint operation of space and air traffic vehicles. Adequate information management for all stakeholders within the air traffic system alongside efficient procedures for planning and executing space operations in close cooperation with air traffic management therefore is essential. In Europe the interfaces between space and air traffic management have not been considered so far.

3. *An Inevitable Traffic Conflict?*

When space traffic becomes routine, there's going to be significant conflict between commercial air traffic and space traffic. Right now, orbital launches are infrequent - about 70 per year around the world. So if there is, say, a SpaceX Falcon 9 launch scheduled from Kennedy Space Center, the «Special Use Airspace» is activated and plane traffic is barred from the area for hours to accommodate it.

Thinking 5 to 7 years into the future, with space tourism carriers like Virgin Galactic and XCOR planning multiple suborbital flights per day, and orbital flyers like SpaceX, Sierra Nevada, and Bigelow sending people and material into orbit, the skies will be getting crowded. The suborbital «up-and-down» space tourism flights offered by carriers like Virgin Galactic and XCOR may number anywhere from several hundred to multiple thousands a year – from zero today. Airline passengers will be less than thrilled to accept a lengthy delay so a billionaire can hang out in a «space hotel». Also, airlines lose money from delays, or from re-routing around special-use airspace, requiring extra fuel burn.

Let now consider the implications of the operation of commercial aerospace vehicles within the existing Air Traffic Management system and if the ATM system can safely include the integration of commercial aerospace vehicles into the existing system without a significant change in both the operational practices and technological standards of air traffic control. In other words it is feasible extending todays ATM system to encompass Space Traffic Management? More importantly that existing Target Levels of Safety (TLS) are not compromised and are maintained or improved in line with future system requirements.

The existing operations of aerospace vehicles are carried out in segregated airspace but is this a long term solution for the development of the industry?

Modern commercial airliners typically operate at maximum altitudes of 13 km with exceptions (notably the ex Concorde) operating up to 60,000 ft (18 km). To accommodate the provision of Air Traffic Services the airspace is divided into Flight Information Regions (FIRs) defined as «An airspace of defined dimensions within which flight information service and alerting service are provided». These FIRs are sometimes limited to a maximum altitude (commonly 66,000 feet, FL 660) or in many cases are described as «unlimited» altitude as in the case of Italy. This raises the question as to what is the operational status of this portion of 'airspace' above the area of everyday air traffic operations.

The problem of delimitation of the boundary between airspace and outer space also raises questions and the issue is far from finding a common solution and is subject to extensive legal debate within the UNCOPUOS Legal Sub Committee. It has been suggested that 100 km (the Karman line) is the beginning of outer space but this has never been fully accepted as this is, in effect, determining a national boundary. Therefore the area of applicability of the existing Air Traffic Management system is uncertain. For the area above «airspace» no legal requirements yet exist for a «Space Traffic Management» system.

4. *ATM/CNS*

The existing Air Traffic Management technology is still centred around the human

Air Traffic Control Officer (ATCO). Automated system support for the ATCO has been introduced gradually during the past 40 years but, in general, the system still relies to a great extent on human decision making.

There are three main technical components in supporting the ATM system: Communications, Navigation and Surveillance. These have been evolving over a number of years and developed to take into account technological advances in aircraft construction and operations.

These three basic components are supplemented by system functionality which can provide various support functions enabling the ATCO to have a representation of the present and future traffic situation, supplemented by alert functions.

In addition, equipment fitted into aircraft to provide information to the ground surveillance system is also utilized to give pilots information on other suitably equipped aircraft that may pose a threat to them. This is known as the Traffic Collision Avoidance System (TCAS). Crucially ICAO mandate the carriage of such equipment for aircraft with a maximum take-off mass of over 5,700 kg or authorised to carry more than 19 passengers.

Air Traffic Control operating procedures have also evolved over the years from a procedural basis (where aircraft are separated by time, distance and level without the use of a surveillance system) to a system in which separation standards can be reduced by utilising more advanced technology (radar, ADS-B, etc.).

5. *Aircraft or Rockets?*

As Aerospace Transportation developments continue it is envisaged that aerospace vehicles could in the near future be used to regularly transport people and freight from point-to-point on the surface of the earth through airspace and outer space.

Traditionally space vehicles have been designed as rocket launch which requires limited lateral airspace restrictions. However many of the new generation sub-orbital space vehicles are designed, at least for part of their operation, as aircraft i. e. «any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface». The USA space shuttle was an example of this type of operation as it was launched as a rocket but returned to earth with aircraft characteristics.

As technology has advanced the concept of different types of space launch vehicles other than the traditional rocket launch system are being exploited which are likely to lead to significantly reduced launch costs. These concepts include launches from «mother» aircraft, high altitude launch station and «traditional operations» from airports. The first company to commence operations, Virgin Galactic with SpaceShipTwo, successfully completed its powered tests during April of 2013 and the first farepaying passenger flight is likely to occur within the near future. SpaceShipTwo is launched from a purpose built aircraft WhiteKnightTwo and flies the return leg as a glider.

The above said definition of an aircraft excludes rockets and capsules therefore the scope of interest for this paper is limited to winged vehicles which can be seen to be Sub-orbital Aeroplanes. If this is the case then Sub-orbital aeroplane operations, deriving support from the atmosphere for the largest part of their flight, are considered as aircraft and therefore the legal framework of ICAO also applies to these vehicles.

In addition to sub-orbital flights some aerospace vehicles intended to operate in

earth's orbit are becoming more similar to aircraft and may be considered, at least for a portion of their flight, as an aircraft.

6. *A Common Regulatory Framework Needed*

This then raises the question that, if they are aircraft operating in the legal framework of ICAO what operating procedures and technical requirements will be mandated for such operations and how will this fit into our existing ATM system?

These differing approaches to space launch technology will require radically different management than exists today.

To date most space launch operations have taken place in segregated airspace, in many cases in areas of low population or near the ocean. Future operations will take place at inland locations and as they grow in frequency will need to be integrated into the existing ATM system and, indeed, existing airports. Achieving a safe and efficient integration of suborbital operations into non-segregated airspace will require close coordination between numerous bodies and should seek to achieve a common regulatory framework.

A variety of launch licensing systems have been (or are being) put in place by countries, they establish only system requirements and target levels of safety for ground personnel and for uninvolved public without differentiating between manned and unmanned systems except that in the former case no flight termination system is required for dangerous deviations from the flight path. This poses unknown risks on one side for the aerospace vehicle and its passengers, and on the other side for aircraft in its vicinity should a failure occur.

In the event of a catastrophic failure or, indeed, even the return to earth of space debris, there is an increased risk to aircraft as they are vulnerable to being hit by debris. The space shuttle Columbia re-entry breakup spread a wide trail of debris over major air traffic routes in the United States and raised safety issues with the possibility of an aircraft being hit by debris.

At present the number of launches of sub-orbital aerospace vehicles is limited and can be enabled by the use of segregated airspace and case by case flight authorisations. As previously stated some Civil Aviation National Authorities have developed (or are developing) their national regulations and operational procedures which are not necessarily aligned and, in some cases may be contradictory. This is resulting in fragmentation of the system. The need for a common regulatory and operational framework is becoming more pressing.

7. *Target Level of Safety*

As stated previously, no legal requirements exist for management of space traffic. In addition there are no global regulations relating to traffic management between aircraft and space flights. In some national space legislation there exist some procedures intending to ensure safe operations of space activities and separation assurance. However these procedures were not developed for providing an integrated Air Traffic Management system.

If the sub-orbital aerospace industry is to grow segregated operations cannot be the

long term solution. However, to integrate into the existing ATM system will require the development of a new regulatory, operational and technical framework. This must ensure not only the safety of the sub-orbital passengers but also of the other users of the ATM system.

The establishment of TLS for aviation in general has historically been influenced by the requirement of airworthiness authorities to establish quantified targets upon the contribution made by aircraft systems to aircraft accidents. Current TLS vary a lot in terms of scope. Related applicability to the setting of safety minima and to the safety assessment of changes to the ATM system is therefore limited. Assumptions and related limitations (Route structure, assumed aircraft density, type, assumed phases of flight, etc.) related to each specific TLS are not always clear or well understood by the whole aviation community. There is a need to adopt a total aviation system perspective, top down, which would be complementary to existing practices while still enabling them to be put in context. Given the current and anticipated future increase in the volume of air traffic over the next few decades, there is a growing concern that simply maintaining the current accident rate (in terms of flight hour) for existing air traffic operations will lead to an unacceptable increase in the number of incidents and accidents. If we now introduce additional variables such as aerospace vehicle operations into an integrated system there is a potential that the current accident rate may increase. This will have significant detrimental consequences for civil air transport operations. It is therefore considered essential to achieve a decrease in the overall accident rate sufficient to offset the effect of rising traffic levels. This will require all contributors to the overall aviation risk, including aerospace vehicle operations, to decrease their contribution. This fact, in turn, raises the issue of the existing target level of safety being presently achieved (or planned, 1 in 1 million as a hypothetical) by aerospace operators. Establishment of a target level of safety encompasses the complete ATM System which includes all aspects, operating procedures, technical equipment and human factors which together support the safe and expeditious management of civil air traffic. The integrated operation of aerospace vehicles has not been included in this process.

8. *Separation Standards*

Existing separations standards and operating procedures are based upon a number of factors including the height, speed and equipment of the aircraft in question. In the case of sub-orbital aerospace vehicles these will be significantly different than what we have today. If we are to achieve acceptable TLS many of these separation standards and procedures will require to be revised or new ones developed.

Many Flight Information Regions especially in Europe are small and based upon national boundaries for political purposes. Existing aircraft remain in these areas for a very short time. Sub-orbital operations will be carried out at much higher airspeeds than existing aircraft operations and, therefore, will remain in the airspace for potentially only a few seconds. Suborbital flights will reach speeds of 2.300 mph (3.700 km), enter space at roughly 62 miles (100 km) above the surface of the earth, and then glide back down. Blocking out space dynamically will also help in the event of a spacecraft making an emergency landing, or in the worst-case, suffering a catastrophic explosion. In the event of an emergency landing or explosion, mission control could block out more space immediately. If it would take 20 minutes for the debris to come down to the area airplanes might be, you can react by re-

routing the airplanes around it.

Existing lateral and longitudinal separation standards are based upon the TLS required to be met and the likelihood of an aircraft straying from its intended position in the lateral, longitudinal and vertical dimensional planes. In the case of sub-orbital operations existing separation standards are likely not to be sufficient.

The predictability of the ballistic trajectory will be extremely important as the future ATM system will be largely based upon 4D predicted trajectories.

The route network structure (especially in congested areas such as Europe) is defined on ground-based navigation aids and Performance Based Navigation. It is unlikely that this network will support Sub-orbital operations.

Many Sub-orbital vehicle operations are based upon an air launch of the aerospace vehicle from a mother aircraft. How are the separations standards going to be applied in this case?

Controller radar vectoring and speed adjustments, especially in the vicinity of airports, is still required to provide an efficient sequence of arriving and departing aircraft. Vectoring techniques for existing traditional aircraft may not be suitable for Sub-orbital operations.

Aerospace vehicles returning to earth for landing may also require priority landing as many designs apply a non-powered approach. The vehicle will have one opportunity to land as a «go around» is not an option. This has safety implications in the event that the approach is disrupted. In addition, the aerospace vehicles are likely to be operating at higher speeds than existing aircraft and also to be less maneuverable introducing potential safety issues. In addition, this would raise issues regarding the efficient use of available airspace and airport capacity.

Existing control procedures often require information/input from the equipment onboard the aircraft. This equipment is weight consuming and in many cases requires to have considerable redundancy capabilities. Sub-orbital operations are weight constrained and may not be able to be fitted with the appropriate equipment.

Surveillance data update rate. The existing surveillance update rate and accuracy influence the separation standards to be applied within a particular airspace. Will the standards be suitable for suborbital operations at extremely high speeds and altitude.

Datalink and voice communications will need to be assessed for compatibility with Sub-orbital vehicle operations as will the navigation capability that these vehicles will be expected to meet.

9. *Aerospaceports, Suborbital Flights and ICAO*

Space ports have traditionally be developed as sites for rocket launching but are now increasingly being designed with runways to accommodate Sub-orbital aeroplanes. ICAO provides design criteria for airports in Annex 14. It is uncertain is this criteria is applied at all space ports under construction or planned.

Many future operators of Sub-orbital airplanes are planning to operate from existing airports. This will raise a number of issues about Runway length and characteristics, Taxiway layout, Landing aid facilities, Passenger handling, Dangerous goods, Fire fighting facilities.

It is clear that the International Civil Aviation Organization (ICAO) is charged with coordinating and regulating international air travel. However the contracting States have complete and exclusive sovereignty over the airspace above their territory. Many Sub-orbital vehicles will fall within the definition of an aircraft by deriving support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface. Therefore falling under the remit of ICAO while they are operating in airspace.

The vertical extent of airspace and the boundary with outer space is unclear. In addition in many parts of the world the ATM system is fragmented. This is not an optimal situation for Sub-orbital operations.

ICAO has planned, in the form of Aviation System Block Upgrades, for future developments of the Air Traffic Management system which have not taken into account Sub-orbital operations. There are a number of questions both technical and operational relating to the operation of Suborbital vehicles in the existing ATM system.

Sub-orbital operations will have different characteristics and requirements than existing aircraft operations and will require to be integrated into the existing Air Traffic Management system and airports at some stage in the future.

Safety is paramount and airline passengers expect safety standards to be maintained or improved in the future. Sub-orbital safety standards will be expected to have no negative impact on the safety of other aircraft. Passengers on board the Sub-orbital vehicle will increasingly demand higher standards of safety than is presently proved. Target levels of safety will need to be established for Sub-orbital operations.

10. *SESAR – SWIM: a Possible Way of Integration*

The Single European Sky ATM Research Programme (SESAR) is preparing the implementation of a new ATM system in Europe. The requirements are defined by the concept of the Shared and Reference Business Trajectory as well as System Wide Information Management (SWIM) a sort of «intranet» of ATM. Space vehicle operations are associated with the requested need for submitting a Mishap Investigation Plan (MIP), containing responding and reporting procedures referring to possible re-entry or launch incidents or accidents. This leads to the submission of an Emergency Response Plan (ERP), addressing information procedures about a planned Reusable Launch Vehicle (RLV) mission of the airspace alerting and emergency services in the areas of Emergency Detection and Response Organization. SESAR can supply the necessary assets for implementing space operations seamlessly into the European ATS. Therefore the concepts and ideas of SESAR have to be followed. In this context, the necessity for the submission of an Emergency Response Plan (ERP), addressing information procedures on Emergency Detection has to be addressed. This includes information relay between the CST vehicle operator and the Traffic Flow Management (TFM). Further-on, the emergency detection has to be followed by a Response Organization. As most CST will operate globally and missions may need to be aborted anywhere around the earth, a global alerting function has to include segregated foci of the involved response organizations, from international down to regional or even local reaction units.

The objective is to efficiently utilize the limited capacity of European airspace through innovative techniques and operational procedures while improving the safety and

environmental impact of air transport considerably. The SES schemes for the creation of the Single European Sky regulations include, among others, the provision of air navigation services, the organization and use of airspace and interoperability of ATM systems. The coordinated management of air traffic and situation-specific response is based on information exchange between all stakeholders in this system. It will be implemented by the concept of SWIM which integrates for example also Controller-Pilot Data Link Communication (CPDLC) and other communication systems. In addition to the architecture of SWIM, the interoperability requirements for SWIM-compliant ATM systems are of great importance.

It will identify potential areas in which the existing system will require to be changed and/or upgraded to accommodate aerospace technology. That's why European ATCOs say that Space Vehicles have to learn to SWIM.

11. *A Desirable ICAO Role*

ICAO is an established United Nations body which is already functioning and is already designated responsible for setting standards and regulations for aviation safety. It is the obvious body to take on responsibility for Sub-orbital operations within the airspace.

Rather than develop specific regulations for Sub-orbital operations, existing Annexes and Documents may be revised complementing existing rules to capture the specific features of Sub-orbital vehicles. This «soft» approach allows new technologies to be accommodated and minimizes effort and risk while giving a sufficient framework for investment in Sub-orbital vehicle development.

As an initial step information and guidance material should be developed under the auspices of ICAO. Revision of Annexes can then be carried out over a period of time to ensure that the new industry is not constrained. However the clear objective should be to meet existing certification and operational standards.

Discussion should be commenced to consider airspace above what is commonly utilized today as similar to that over the high seas in order to avoid the fragmented system that exists in many locations today and which is not compatible with Sub-orbital operations.

I'd like to take the opportunity of this International Colloquium to launch a couple of suggestions.

Sicily has not yet established an aerospace cluster i.e. an industrial district as local, homogeneous productive system, featuring a strong concentration of industrial companies, mainly of small and medium dimensions, with a high level of production specialisation, together with Universities, R&D centers, airports. First task is to foster the following idea.

In Sicily there is a military coastal airport, Trapani, with some minor adjustments, is an excellent candidate as a spaceport. It is necessary to discuss with Italian Air Force, Airgest, regional authorities to present such idea to the Transportation Minister.

From a geographical point of view the Western Sicilian territory appears to be perfect for space activities: it is surrounded by sea, has open land spaces, a low population density and at is far from congested air traffic Terminal Area (Rome TMA). In fact since the end of sixties a Stratospheric Ballons Launch Site, titled Luigi Broglio, was established at Trapani Milo airport, just a few miles apart from Trapani-Birgi airport. Birgi is located 13 kms from

the city of Trapani, on the Mediterranean shore. Has normally fine weather with sun and little wind.

The airport with two runways of 2.690 mt length is strategically located on the north shore of the Sicily strait and is ideal for a dual military-civil aerospaceport playing the role of important node of the developing spaceports network as a gate to Italy, Southern Europe and the Mediterranean countries.

ABSTRACT: *The Regime Applicable To Space Tourism Trips: The Dream Of A Reliable Integrated Air/Space Traffic Management; The Point Of View Of A Former Air Traffic Controller*

Space tourism is but the threshold step in the commercial development of privately financed and built space transportation systems. It has opened the door to a new era of scheduled commercial space flight. More and more spacecraft are flying through airspace which is still not subject to any Air Traffic Controller; thus putting both aircraft and spacecraft in danger with the chance for mid-air collision between them increasing. Considering this situation, there is an urgency for the establishment of an effective integrated Aerospace Traffic Management. Integration between air and space traffic management must be established in order to ensure safety and effectiveness for future space flight. From the operations point of view SESAR project can supply the necessary assets (SWIM – System Wide Information Management) for implementing space operations seamlessly into the European Air Traffic Control. On the regulatory side it can be noted that there's not a common framework because both the existing regimes of Air Law and of Space Law were developed at a time when the technology for Earth-to-Earth aerospace movements did not yet exist. Thus, there is not yet a unified or integrated regime of Aerospace Law, and there appears to be much overlap and inconsistency between the regimes of Air Law and Space Law. The International Civil Aviation Organization regime, with a great deal of experience in the aviation field, could become the most practical and realistic solution, making ICAO's navigation and safety standards applicable to both sub-orbital and traditional flights. It would be difficult to justify replication of the able and detailed work already done by the ICAO on issues such as safety, navigation, security, and liability, at least with respect to flights in the Earth's atmosphere. It can be argued that ICAO already has jurisdiction over the portion of a spaceflight that takes place within the atmosphere if it is operating within ICAO's definition of an aircraft (i.e., utilizing aerodynamic lift, as does a reusable winged launch vehicle during reentry and landing).

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THE INTERNATIONAL SPACE STATION: LEGAL REFLECTIONS

The legal problems involved with the permanently manned International Space Station (ISS), especially when this architectonic complex in orbit is manned, pose a significant challenge for the jurist.

As Lafferranderie indicated[1], the international space station is decided as both a technical and legal concept. It is exactly this binomial that determines the conceptual complexity of spacecraft. The jurist must perform in an area where technological modes draw the line of legislative conduct, and therefore legal creation is conditional on those technical influences. The advance of aerospace science determines the new courses, which Space Law of must follow.

The first question that arises is, why is it necessary to build a space station? Without doubt it concerns an aspiration born almost parallel to the onset of the "conquest of space", as its construction represents a "point of support" in space, from where it is possible to have a bird's eye view of the unknown. As Ruiz de Gopegui pointed out[2], the initial stage of the space age has concluded and now it is time to try to reap the rewards from space, and it can be said that this was the origin of interest in space stations.

A space station is a small operations base located in outer space, designed so that man can work under less precarious conditions than those experienced by men in space until today, in the cramped capsules of the first stage of the Space Age.

It is necessary to take into account the change in mentality that took place during those

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[1] G. LAFFERRANDERIE, *Les accords relatifs à la station spatiale internationale. Analyse et commentaire*, in *Rev. gén. dr. int. pub.*, 1989, p. 317 ss., 344; and, ID., *How to 'entrench' the regulation of human activities in space*, in *Sp. Pol.*, 2001, p. 77 ss., where the Author affirms that: «Manking – prompted by a few space powers, or simply world powers – has started to build a huge near-Earth Meccano infrastructure, known for the time being as the International Space Station. The objectives, as set out in the two Inter-Gouvernmental Agreements concluded in 1988 and 1998, leave no room for doubt as to its essential significance for mankind: it will symbolise the radiant outlook for the human race, and so on and so forth».

[2] L. RUIZ DE GOPEGUI, *Hombres en el espacio. Pasado, presente y futuro.* (Men in Space, Past, Present & Future), Madrid, 1996, p. 123 s.

initial years of the conquest of space, as the exploration of space and its use endeavoured to overcome the individualist and merely state activities in order to reach wider channels thus creating a common operation, that is of an international nature. In this way, astronauts of different nationalities would be sent to space, to work together on a permanent basis on an international space station, using financial resources from different States participating in the project without this implying any claim of national appropriation.

It became apparent that together with political action it was necessary to determine the legal framework, within which this type of co-operation would develop, which undoubtedly must be that of International Law and in particular Space Law, without posing an obstacle. So that each participating State may be ready to embark on an examination of their domestic law in order to identify those areas in need of modification or extension and to search for legislative coherence between domestic law and agreements reached by the Member States regarding this matter in the international plan[3].

The space station, in its different aspects, again highlights the shortcomings or loopholes that exist in international law when regulating the space activities of the States. Together with one of the already classic lacunae of Space Law, which is the lack of definition of outer space whose most direct consequence is the problem of delimiting this space, the notion that most directly affects the legal classification of the space station is the definition of space object.

This ambiguity with regard to the notion of space object poses serious problems when cataloguing it[4]. The same Conventions adopted within the United Nations, in the framework of which Space Law has been codified, vague, and as indicated, decidedly ambiguous terminology is used. Such as for example, the Treaty on *Principles that must govern the activities of the States on matters of exploration and use of outer space, including the Moon and other celestial bodies, the* so-called *Space Treaty*, does not offer any solution to the definition that concerns us. In fact, its articles make reference to the *object* launched into space without further semantic or legal considerations, and this concept also remains sketchy in other Agreements, such as the cases of the *Treaty on International Liability for damages caused by space objects* or, the *Treaty on the Licensing of objects launched into outer space.*

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[3] *Ibidem*, p. 124. As the author points out, space stations act as small-scale laboratories, within which a team of three to five cosmonauts or astronauts can live for certain periods of time, between one week and five months, when previously it was not possible to do so beyond a fortnight. They can also work carefully, use extremely advanced scientific instruments and take advantage of the existence of microgravity. The most suitable place to position these stations is the Earth's low-altitude orbit, between 200 and 600km, for the maximum reduction of energy necessary for lift-off and in order to remain relatively close to the natural refuge of Earth.

[4] J.M DE FARAMIÑÁN GILBERT, *Analisi giuridica del concetto di oggetto aerospaziale (nella prospettiva normativa e dottrinale spagnola)*, in *Minutes, The Foreign Doctrine. International Conference: The Legal Regulation of Aerospace Transportation Craft*, Rome 1997, University of Rome "La Sapienza". See also, J.M DE FARAMIÑÁN GILBERT, *Legal analysis on the concept of aerospace (from Spanish legislation and doctrine)*, in *Rev. esp. der. int.,* 1997, p. 333 s., it is unsettling to observe, that in article VIII of the 1967 Space Treaty (*Principios*), when discussing the ownership of the object launched into space, although the concept of space object is extended, it does not limit it legally, when it states that as well as the object itself «the objects carried or constructed on a celestial body are also included together with the constitutive elements, remaining complete whilst these objects or elements are in outer space or on a celestial body and when they return to earth». Or in the case of the 1972 Treaty, (*Liability*...), where it might seem that in article I section d) there is the pretension of defining the space object, which from a legal perspective is erroneous, given that it is limited to consider, in a descriptive and vague form, certain elements of the object on stating that «the expression "space object" equally designates the constitutive elements of a space object, as well as its launch and corresponding the elements of this». With regard to the 1976 Treaty, (*Licensing*...) its art. 1 section b), is as laconic as the previous ones as it contributes nothing new to the obscurity of the supposed previous definition.

From the moment space became a place where experiments could be carried out and therefore a growing medium for the development of science, the States have placed greater interest in its use and exploration. In this sense, due to its characteristics, the manned Space Station can become a space laboratory of singular and suitable opportunities in order to open up new fields to scientific discovery through experiments in micro-gravity states.

Next to the Soviet experience, pioneers in this field with the placement in orbit of the MIR station[5], which concerns a purely national experiment, with visits of an exceptional nature from other States interested in participating specifically and temporarily in the experiment of cohabitation on a manned Space Station or carrying out certain types of experiments, until now there had been little possibility of putting a Station in orbit under the agreement of various States[6].

It was the invitation from the President of the United States to their "friends & allies", in 1984 that set this new project in motion to construct an International Civil Space Station, manned and of a permanent nature. Several years of negotiations led to the signing of an Intergovernmental Agreement (IGA) signed in Washington between the United States, Canada, Japan and the European Space Agency (ESA). With the collapse of the Berlin Wall, the United States proposed the idea of adding Russia to the programme who, on the one hand, in spite of the economic crisis wished to continue with the space research within the group of States involved in the use and exploration of space and on the other hand, take advantage of its unquestionable experience in Space Stations, as mentioned above.

The belief was that the experience of the Russian Federation, in space flights with human beings and on long-term missions and especially the accomplishments of the MIR Space Station, would considerably improve the capacity of the International Space Station. Whereby after intense negotiations between the four founding members, Russia was invited formally on December 6, 1993 to join the programme, with its government accepting one week later.

Returning to the beginning, when in 1988, after arduous negotiations the Agreements were signed that would set the International Space Station in motion, different types of texts were consented.

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[5] The USSR developed basically three programmes related to space stations, awarding special importance to the study of human behaviour in long stays in space, something which has allowed them to carry out deeper research into space medicine than other space powers. The *Soyuz* programme is actually a perfected micro-station, as it was originally designed as a space shuttle to transport cosmonauts to space stations, and it is still nowadays employed with such a function. Despite the fatal accident of the *Soyuz 1* in 1967, it is a spacecraft prototype of which other units have been built. Nevertheless, it is the *Salyut* and *MIR* programmes which constitute inhabited space stations in their own right. The *MIR* space station had a new system at its disposal with six tethers which served as linking elements for the assembly of the permanent living modules, which, due to their characteristics, allowed the joining of the *Soyuz* or the *Progress* as modules which present their own energy supply system and manoeuvring capacity. Let us take into account the accident which took place on June 25th, 1997, when the cargo spacecraft *Progress* crashed into the *Spektr* module, dehermetizing it and causing a depressurization of the module, and how on August 23rd, 1997, American astronaut Michael Foale awaited the *Soyuz TM 26* spacecraft and its two Russian cosmonauts, Pável Vinográdov and Anatoli Soloviov, while they attempted to reconnect the solar panels and to enter the *Spektr* module with the aim of detecting the failure. During these operations, a general depressurization took place, affecting the whole station and forcing the cosmonauts to carry out an emergency exit, abandon the station, and return to Earth.

[6] From 1961 onwards, when during the Kennedy administration a man is placed on the Moon within the *Apollo* Programme, the presence of human beings in space exploration becomes a feasible reality. During the decade of the sixties, NASA's office of manned space flights developed seven projects, the fourth of which corresponded to the manned space station. The NASA reached agreements with industrial groups, as was the case of Douglas Aircraft, which designed the M.O.R.L. ("Manned Orbital Research Laboratory") Project.

On the one hand, the Intergovernmental Agreement (IGA)[7] signed on September 29 1988 by the four founding members, with the special characteristic that each ESA State signed individually. This Agreement established the basic principles of co-operation, development, operation and use of the Space Station, leaving the interpretation and application of these principles in the hands of the Co-operation Organisations.

This led to the signing of the Memoranda of Understanding (MOU), signed by NASA and each Agency or Co-operation Organisation party to the IGA, and in turn, subordinate to these Memoranda, NASA will be able to sign Implementing Agreement (IA) with the Co-operation Organisations.

The Intergovernmental Agreement (IGA) is governed by International Law, as stated in article 2, first paragraph: «the Space Station will be developed, operated and used in accordance with International Law». Although it legally links all member States, its scope within the domestic law of each of them varies according to the constitutional systems of each State. That is, for example, for the United States the IGA is not considered as a treaty in accordance with Constitutional Law of this country, but as an Executive Agreement approved by presidential decision and not submitted for the ratification of the Senate, therefore, it is much more limited in its integration in domestic law. For European countries, however, it constitutes a proper agreement and its subsequent ratification and publication in the Official State Gazettes of the European Members involves its immediate integration in domestic law and with a hierarchy above the law.

The European representatives had postulated the need to sign a treaty or international agreement that would determine long-term co-operation and that would have sufficient executive power within the domestic law of the parties concerned and the same legal value for the European States and the other members and for the United States, given the previous bad experience with the Spacelab project. Whereby, the IGA raises concerns regarding the legal safety limits and as has been highlighted so well, «this imbalance at the level of incorporation of the IGA regulations in the national laws of the signatory countries can bring about significant consequences, in particular, regarding the use of the Space Station, the rights and obligations of the users and members».

On the other hand, the launch of the project is in the hands of the Co-operation Organisations who undertake the tasks of co-operation regarding the Space Station in accordance with the stipulations of the IGA and the respective Memoranda of Understanding between NASA and the different Agencies or the Japanese Government, as well as the agreements between NASA and other co-operation organisations in the application of that stipulated in the MOU that give rise to the Implementing Agreements.

The hierarchy between these different legal instruments is established "in passing" in the second paragraph *in fine* of article 4 of the IGA, when it is indicated that the MOU will be subject to the IGA and in turn, the Implementing Agreements will be subject to and compatible with the MOU. Furthermore, given that the Co-operation Organisations carry out the development of the project and basic legal instruments of these are the Memoranda of Understanding between NASA and the rest of the agencies or the government of Japan, the MOU are given a position of pre-eminence, and furthermore an executive instrument such as the Implementing Agreements is made to depend on that stipulated in the MOU.

These three legal instruments, the IGA, the MOU and the IA, have endeavoured to create a "true association" between the member States and have entrusted the task of

[7] G. LAFFERRANDERIE, *La station spatiale, Droit de l'espace. Aspects récents*, Paris, 1988, p. 148 ss.

carrying this out to its Agencies and Co-operation Organisations. In this way giving rise to a new concept of international co-operation that endeavours to place a, permanently manned, civil Space Station in the Earth's orbit.

But perhaps the most important change came from Russia that joined the project in 1993, after an invitation to participate. From the legal point of view the IGA and the MOU, which had been signed previously, constitute "closed" instruments, given that neither included adhesion clauses. Therefore, it was necessary to reach a new agreement, which was formalised on January 29, 1998 in Washington at the presence of fifteen Member States, giving rise to the adoption of a new Intergovernmental Agreement (IGA) and four new Memoranda of understanding (MOU) between the Co-operation Organisations. Although, in truth, the same legal structure of the previous system is maintained in the three legal levels already cited[8].

As indicated in art. 1, par. 2, of the IGA, «the associates will combine their efforts under the directive role of the United States», and later it adds that «the United States and Russia, making use of their extensive experience on manned space flights, will produce elements that will serve as a base of the Space Station», highlighting the presence of the Russian Federation in the Project. This article determines the pre-eminence of the United States and Russia in relation with the other Member States, which in accordance with art. 26 of the IGA even leads them to the establishment of a special validity regime for the IGA between these two States, which unlike the remaining States may consent to the coming into effect of the IGA before the other parties. Also as Bourely points out[9], «it appears to be totally irrefutable that there is no similar measure between the American and Russian contributions on one part, and that of the other members on the other part» as «they contribute the elements that will serves as the base of the Space Station».

It seems indubitable that in the scope of Space Law legal creation is subordinate to the advances of technology; however, this does not prevent the realisation of considerable legal effort in order to set the parameters within which the advances in space matters must be dealt with. Especially when this discipline presents a series of loopholes that must be closed, in due time, such as the lack of definition of outer space, the ambiguities in the notion of the space object, or the actual legal classification of the Space Station.

As I have already had the chance to point out in this work, life on the International Space Station (ISS) gives rise to a "mini-society" phenomenon and as such, its development must be regulated by law. Although at present, the License State of each module exercises jurisdiction and control over it, when the time comes this will not impede the possibility of establishing a uniform and defined regime in the framework of an international treaty between the parties involved, in relation with the activities to be developed on the Space Station. In the same way the creation of an International Board for this, which would become the essential body for managing a control mechanism that regulates the just scope of the co-operation model of the Station based on the concept of a "true association". And without room for doubt, what a specific regulation needs, which could be included at the time in the aforementioned hypothetical international treaty, or in

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[8] As has been pointed out by G. LAFFERRANDERIE, *Aspects juridiques de la station spatiale,* in *Annales de l'Université des Sciences Sociales de Toulouse,* 1988, p. 173 ss., European orbital infrastructure is made up of four elements, namely, *Ariane 5, Hermès, Columbus, DRS*. In the case of the *Columbus* module built by ESA in order to be installed in the *Alfa* station, it is a laboratory to work in space with a structure similar to that of the *Spacelab.*

[9] M. BOURELY, *La révision des accords sur la Station spatiale internationale*, in *Ann. fr. droit int.*, 1998, p. 589 ss.

a specific international agreement, is the matter referring to intellectual property regarding discoveries or inventions carried out within or on the Space Station.

Life on the Station for the crew must be regulated in a detailed manner with the drafting of a Code of Conduct that controls the behaviour of a multinational team. Without disregarding important matters such as criminal liability that may arise due to unlawful conduct in orbit or the requirements to extradite an astronaut that has committed a crime, as well as the necessary licenses related with the placing in orbit and running of the Space Station or the customs and immigration laws of the individual concerned.

All this reveals the complexity that surrounds the legal devices applicable to this manned spacecraft, which the jurist and in particular the advertising executive cannot and must not overlook.

ABSTRACT: *The International Space Station: Legal Reflections*

The legal problems involved with the permanently manned International Space Station (ISS) pose a significant challenge for the jurist. Life on the International Space Station (ISS) gives rise to a "mini-society" phenomenon and as such, its development must be regulated by law. Although at present, the License State of each module exercises jurisdiction and control over it, when the time comes this will not impede the possibility of establishing a uniform and defined regime in the framework of an international treaty between the parties involved, in relation with the activities to be developed on the Space Station. The creation of an International Board for this would become the essential body for managing a control mechanism that regulates the just scope of the co-operation model of the Station based on the concept of a "true association". Life on the Station for the crew must be regulated in a detailed manner with the drafting of a Code of Conduct that controls the behaviour of a multinational team, without disregarding important matters such as criminal liability that may arise due to unlawful conduct in orbit or the requirements to extradite an astronaut that has committed a crime, as well as the necessary licenses related with the placing in orbit and running of the Space Station or the customs and immigration laws of the individual concerned.

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SETTING THE SCENE: SPACE LAW AND GOVERNANCE

1. *Introduction*

This article analyses the *status* of art of space law, and, in this sense, deals with the main features of the specific area of research dealing with legal and regulatory matters concerning outer space and related fields. In the last years, legal studies concerning outer space activities have grown worldwide and a vast number of scholars and researchers have focussed their interests in the normative aspects of the outer space activities. In general, we can certainly say that space law has gained its own scientific autonomy, even if this autonomy is not duly reflected in the universities curricula. There are two main lists that give an idea of the multi-coloured world of space law as a legal discipline: the information concerning the teaching of space law in Europe published by the European Centre for Space Law (ECSL) and the directory of Space Law educational opportunities prepared by the Office for Outer Space Affairs of the United Nations (OOSA).

Moreover, the teaching of space law is not broadly extended in Europe and worldwide. This is a clear sign that our discipline has not yet assumed a strong scientific autonomy. With few exceptions, it is generally understood that space law is a part of public international law or of a broader course on air and space law. Public international lawyers deal generally with space law in a very speedy manner. Why? Because normally international law courses are devoted to the general legal features and institutions of the international community of States, without entering into details concerning specialized sectors. Among the specialized sectors, space law seems the most esoteric.

I can give one clear evidence of the marginal role of space law in the context of the

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legal studies. International space law is a subject to which the Hague Academy of International Law, the prestigious institution inaugurated in 1923, has devoted, since its origin, nine courses. In 1964, the Judge Manfred Lachs, whose scientific work is very closely linked to the development of this branch of law, by opening his course entitled «The International Law of Outer Space» wondered whether it was legitimated to consider the law of outer space as belonging to the realm of exotics of law. However, the learned jurist replied to this question in the following terms: «I could take shelter behind the great authorities who have preceded me and have contributed to the rich literature on this very subject»[1]. Before Lachs, the Italian lawyer Rolando Quadri, for instance, gave a remarkable course in 1959, and, after him, in 1978, the Russian professor Guennady Zhukov taught on the «Tendences contemporaines du développement du droit spatial international»[2]. In total, as I said, nine courses, the last one in 1983, given by professor Stephen Gorove on the topic of «International space law in perspective: some major issues, trends and alternatives»[3].

After forty years, in 2016, I was called to the Hague Academy, to give a special course on «Les activités spatiales internationales entre droit public et droit privé»[4]. During this period of time, space law has profoundly evolved to reflect the evolution in the practice of space applications. However, the basic principles have not changed[5].

Moreover, one point is clear. Space law is not a self-contained regime[6]. It is clearly stated in art. III of the 1967 Outer Space Treaty that: «International Law, including the Charter of the United Nations, applies to outer space and celestial bodies». In other words, international law applies to space activities without any restriction. International law as a whole is the legal context in which international space law has born, has developed and is currently applied. This, of course, does not exclude a fresh assessment of the state of art of the legal regulation of outer space activities before the growing challenges posed by the technological evolution and the new tendencies of the space industry and applications (mega constellations of mini-satellites, space resources exploitation, sub-orbital flights, spaceports and so on)

The opportunity to do so will be UNISPACE+50, the event that will mark in 2018 the fiftieth anniversary of the first world conference on space at the level of the United Nations (UNISPACE I, 1968). The United Nations Committee on the Peaceful Uses of Outer Space (COPUOS), in adopting the agenda for this event at its 59th session, agreed to a thematic priority on the legal regime of outer space and global space governance to be dealt with.

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[1] M. LACHS, *The International Law of Outer Space*, in *Collected Courses of the Hague Academy of International Law-Recueil des Cours de l'Académie de La Haye*, Volume 113, Leiden-Boston, 1964, p. 7 ss. On the contribution of Manfred Lachs see M. LACHS, *The Law of Outer Space. An Experience in Contemporary Law-Making*, Leiden-Boston, 2010, reissued on the occasion of the 50th anniversary of the International Institute of Space Law.

[2] R. QUADRI, *Droit international cosmique*, in *Collected Courses of the Hague Academy of International Law-Recueil des Cours de l'Académie de La Haye,* Volume 98, Leiden-Boston, 1959; G. P. ZHUKOV, *Tendances contemporaines du développement du droit spatial international*, in *Collected Courses of the Hague Academy of International Law-Recueil des Cours de l'Académie de La Haye*, Volume 161, Leiden-Boston, 1978. See also S. MARCHISIO, *Rolando Quadri*, in S. Hobe (ed.), *Pioneers of Space Law*, Leiden-Boston, 2013, p. 151 ss.

[3] S. GOROVE, *International space law in perspective: some major issues, trends and alternatives*, in *Collected Courses of the Hague Academy of International Law-Recueil des Cours de l'Académie de La Haye,* Volume 181, Leiden-Boston, 1983.

[4] To be published soon on the *Collected Courses of the Hague Academy of International Law.*

[5] S. HOBE, B. SCHMIDT-TEDD, K. U. SCHROGL (eds.), *Cologne Commentary on Space Law. Vol. I*, Cologne, 2010.

[6] S. MARCHISIO, *The ITU Regulatory System: a Self-Contained Regime or a Part of International Law?*, in G. PENENT (ed.), *Governing the Geostationary Orbit. Orbital Slots and Spectrum Use in an Era of Interference*, IFRI, Paris, 2014, pp. 73 ss.

Thematic priority 2 is very broad and encompasses many aspects. Among them, I would mention the current and future trends and challenges to the progressive development of space law; the assessment of the state of affairs of the United Nations treaties on outer space and of other relevant international instruments, such as principles, resolutions and guidelines governing space activities, and the identification of areas that may require additional regulation[7].

2. *Setting the scene. The legal framework*

Addressing space law and space governance means referring simultaneously to two different but interconnected concepts. "Space law and space governance" are indeed the two sides of the same coin. Firstly, there is a normative or substantial level of governance, through space law as a *corpus* of rules and key legal principles that address behaviours in outer space; secondly, we have a structural level of governance, an institutional framework capable of applying, revising if necessary, adapting the rules, and monitor their compliance. The expression "international space governance" (ISG) means in fact the whole of organizations, institutions, political instruments, mechanisms, legal rules and procedures that govern space activities at the international level[8].

In its turn, space law is a concise notion that refers to all the rules aiming at regulating the activities of States and other subjects, including private operators, in outer space. Space law includes international law as well as national legislation applicable to space activities[9]. These rules belong to different legal systems, international law as well as national legal orders, on the one hand, and to different branches of law, public or private, on the other hand.

In the past, the legal discipline of space activities was characterized mainly by its nature of public law, both international and national. State's interests were, and still are, influential factors that determine the public law nature of space law, and the peremptory nature of the relevant applicable rules. Even the governmental intervention to organize a market of space products or services, including empowering private operators, is a matter regulated, within the internal legal systems, under the aegis of public law.

It is also true that, with the commercialization of space activities, space law has had the tendency to appeal more and more to private and commercial law. This has affected particularly the law of space contracts, the law of contractual liability, the right to intellectual property, insurance law and the modes of financing space activities and securing loans for space projects[10]. However, the origin, and the basis, of current space law are rooted in international law, to which I will refer.

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[7] A/AC.105/2016/CRP.3, *UNISPACE+50: Thematic Priorities and the Way Ahead Towards 2018. Note by the Secretariat*, 8 June 2016.

[8] For a similar debate in the environmental field, see the works of the Preparatory Committee of the United Nations Conference on Sustainable Development (RIO+20).

[9] For an overview of national space legislation see S. HOBE, B. SCHMIDT-TEDD, K. U. SCHROGL (eds.), *'Project 2001 Plus' - Global and European Challenges for Air and Space Law at the Edge of the 21st Century*, Cologne, 2006; R. S. JAKHU (eds.), *National regulation of space activities*, Springer, Dordrecht-Heidelberg, 2010.

[10] L. RAVILLON, *Droit des activités spatiales, Adaptation aux phénomènes de commercialisation et de privatisation*, Paris, 2004. See also P. ACHILLEAS (eds.), *Droit de l'espace – télécommunications, observation, navigation, défense, exploration*, Bruxelles, 2009.

3. *International rules governing space activities*

As I have said, space law has known a process of hybridization, becoming more and more multidisciplinary.

I do not refer to the interdisciplinary character of space law, which means that space law was based from the beginning upon scientific concepts and processes (launch, debris, satellites and so on). This concept is self-evident, because the body of space law has grown from the necessity of creating new norms to govern the expanding use of space science and technology in improving functions and providing new services on the Earth. Thus, some basic scientific knowledge is necessary to better understand the ratio of space law norms.

What I would like to stress is that from a certain point onward space law has lost is predominant international character, becoming a body of rules belonging to different legal systems: no more exclusively international law, but also regional law (think about the contribution of the European Union, ESA or APSCO) and national law, both public and private. This is actually the peculiar multidisciplinary character of space law.

An important piece of space law is national space law. It is impossible to define space law without including in it the norms of domestic law that govern the space activities of States and private entities[11]. Most of them are the direct consequence of the treaties that the States parties to them have accepted. In fact, a well-established rule of general international law, codified in arts. 26 and 27 of the 1969 Vienna Convention on the Law of Treaties, establishes that States must perform in good faith treaties in force binding upon them and that they may not invoke the provisions of their internal law as justification for their failure to perform them. Although the way in which international law applies within a State is a matter regulated by the law of that State, the outcome affects the State's position in international law. In particular, international law requires that States fulfil their obligations and they will be held responsible if they do not. It is also true, on the other hand, that often international treaties are not fully self-executing and they may require implementing and complementing national legislation.

So, how to define space law considering all these developments? My answer is as broadest as possible. Space law, without any adjective, has grown as a composite and specialized body of law, both of international and national nature, which deals with space activities at large. Its evolution shows that any lawyer who would like to approach it must be open minded and ready to consider the interactions among different legal systems with a multidisciplinary methodology[12].

In this perspective, there are three main reasons that justify a legal assessment of the *status* of art with regard to space law and governance.

Firstly, because outer space activities are essential to the life of humankind on Earth. Space applications provide a practical contribution to the daily lives of millions of people, and could be used even more in the interest of humanity and in particular of the less favoured countries. Two billion people worldwide do not have access to telephone

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[11] For an overview of national space legislation see S. HOBE, B. SCHMIDT-TEDD, K. U. SCHROGL (eds.), *'Project 2001 Plus' - Global and European Challenges for Air and Space Law at the Edge of the 21st Century*, Cologne, 2006; R. S. JAKHU (ed.), *National regulation of space activities*, Dordrecht-Heidelberg, 2010.

[12] See F. VON DER DUNK, F. TRONCHETTI (eds.), *Handbook of Space Law*, Cheltenham-Northampton, 2015.

coverage.

Space law is of paramount importance to provide the necessary basis for States, particularly developing countries, to meet development goals and address the challenges to sustainable development.

Still, space applications help us in a better understanding of the environmental challenges, particularly those related to climate change and management of natural resources, and the consequences of disasters[13]. During the recent earthquake, which struck central Italy, satellite images have been used to help emergency aid organisations, while scientists have begun to map surface deformations caused by the earthquake, studying data from the Sentinel-1 satellite mission and other space borne radar missions.

The second reason is that space activities have an increasing economic relevance. I make reference not only to the traditional sectors, such as satellite communications, Earth observation, meteorology and satellite navigation, but also to the emergence of new activities, such as suborbital flights, constellations of small satellites and the exploitation of natural resources of celestial bodies. The needs are still immense, promising several years of strong economic growth.

No doubt that the certainty and predictability of space law and an efficient system of governance will facilitate these developments. When law and legal norms are obscure or unreliable, the legal system might inhibit commercial transactions.

The third reason has to do with the primary goal of space law, which is to ensure a rational and responsible approach to the exploration and use of outer space for the benefit and in the interest of humankind. The function of space law is to maintain order and co-ordinate behaviour and relations among the subjects, public and private, involved in space activities. Every entity carrying out activities in outer space must generally behave in a fashion that does not breach legal rules or hamper the rights of other subjects.

In this context, we should recognize the invaluable role played by the existing international treaties on outer space, adopted by the UN General Assembly, especially the 1967 Treaty on the Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies. The basic regulation of public law on space activities continues to be rooted in the UN space treaties adopted between 1967 and 1979 by the UN General Assembly and its COPUOS[14].

As it is well known, the OST and the other treaties affect not only public, but also private activities in outer space. The main States' obligations in this field are the international responsibility for national activities in outer space, the obligation of authorize, and continuously supervise private activities; the obligation to repair damages caused by space objects and the obligation to register objects launched into outer space or beyond.

In particular, Art. VI of the Treaty gives the clear perception that public law maintains a prominent position. In fact, this provision departs from the ordinary regime of responsibility in international law, where States do not respond for the conducts of private persons.

Yet, another feature of the UN space treaties is the importance they give to the

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[13] S. MARCHISIO, *Contractual Issues and Economic Considerations. Prevention of Natural Disasters: Space and Environments Law at the Crossroad*, in *Proceedings of the International Conference "Natural Disasters and the Role of Satellite Remote-Sensing: Economic and Legal Considerations*, Tunis 26-28 Avril 2005, ECSL & CRTEAN , 2006, p. 59 ss.

[14] S. MARCHISIO, *The Evolutionary Stages of the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS)*, in *Jour. Sp. Law*, 2005, p. 219 ss.

principle of international cooperation. The OST sets the basis for the international cooperation in outer space activities for the benefit of humanity and contains several references to the need of sharing the results of scientific research in outer space. The Declaration of Principles on international cooperation adopted by the General Assembly in 1996, reinforces this framework by stating that international cooperation should be carried out with particular attention to developing countries' needs, and the need to «facilitate the exchange of expertise and technology between States on a mutually acceptable basis»[15].

The principle of international cooperation is a general principle, which has to be specified in the legal instruments of treaty law[16].

Thus, we can affirm that under the legal framework of the UN treaties, the use of outer space by States, international organizations and private entities has flourished over time.

4. *Role and importance of space law in the governance of outer space activities*

Since then, space activities have evolved. Firstly, the liberalization of telecommunications promoted a global market for communication services by satellite fully competitive, to the benefit of consumers and service providers. At the same time, existing intergovernmental satellite organizations were fully privatized. Later on, we have witnessed the emergence of new applications with high socio-economic impact in the areas of Earth observation, satellite navigation and the gradual transition to the information society.

The latest evolution goes even beyond marketing, since it seems in the process of determining a structural change in the traditional space industry. The new private companies engaging in space are innovative, have flexible organizations focused on new technologies, and are willing to take risks. New launches programs are considered, such as satellite constellation projects with thousands of small satellites that want to facilitate access to space through the reduction of costs and the acceleration of production.

The UN treaties dealing with activities in outer space have been concluded before the advent of commercial activities in outer space and in a political context that has significantly changed. Following several commentators, these treaties no longer seem to provide for an adequate framework to address the complex relations that have resulted from the rapid growth of commercial activities in outer space. They argue that there is an increasing number of substantive concerns that cannot be satisfactorily resolved in the current institutional framework[17].

The substantive concerns relate, for example, to the attribution of liability to States for damage caused by commercial activities; the identification of the launching state and the launching authority for the purposes of the UN Conventions[18]. In addition, these

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[15] See United Nations General Assembly Resolution 51/122 of 13 December 1996, *Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries.*

[16] M. SHAW, *International Law*, 6th ed., Cambridge, 2008, p. 34. On the general principles of international law, see S. MARCHISIO, *Corso di diritto internazionale*, Torino, 2014, p. 141 ss.

[17] M. J. LISTNER, *It's time to rethink international space law*, http://www.thespacereview.com/article/381/1

[18] S. MARCHISIO, *International Legal Regime on Outer Space: Liability Convention and Registration Convention*, in *Meeting International Responsibilities and Addressing Domestic Needs. Proceedings of the United Nations/Nigeria Workshop on Space Law*, UN Publications, Vienna, 2006, p. 18 ss.

concerns relate to emerging issues, such as the handling of space debris, the regulation of space tourism and suborbital flights and the possible effects of large constellations deployments on the current and future orbital debris environment, on possible risks imposed on other space missions during the operation and disposal of such constellations.

There are plans also for rendering commercial repair services to satellites in-orbit, but there are no regulations in place to cover commercial rendezvous and proximity operations. Through the construction and operation of the International Space Station, regulations have been established concerning governmental spacecraft conducting such kind of operations with other governmental spacecraft, as well as governmental spacecraft conducting rendezvous and proximity operations with commercial spacecraft.

In this context, one wonders if space law, as it has consolidated so far, is able to face the new challenges.

5. *Issues of interpretation or re-interpretations of the treaties*

This is not a new issue. Already on the occasion of the 30th anniversary of the OST, the ECSL published a book of essays named "Outlook on Space Law over the next 30 years" where the main issue was the following: «What would the OST look like today if it had to be drafted afresh to accommodate trends in present and future space activities?» The conclusion recognized that particular provisions of the Treaty were poorly drafted or rather obscure, and required further interpretation[19]. Nowadays, the assessments are often more severe about the inadequacy of the OST to face new challenges, mainly in matters regarding security in outer space. It has been said that «this Treaty is as wildly insufficient today as it was then […] It rather romantically establishes basic principles related to the peaceful uses of outer space. The semantics allow for plenty of wiggle room. Modern space legislation is desperately needed»[20]. While these judgments seem to be excessive, there are real issues of interpretation or re-interpretation.

The need to reinterpret the Treaty is emphasized mainly where the traditional interpretation could increase the private sector requirements, as in the case of the principles of non-appropriation of space natural resources, the responsibility for damage caused by space objects or the obligation to register small satellites.

The principle of non-appropriation, contained in Art. II of the OST, declares that outer space, including the Moon and other celestial bodies, may not be subject to national appropriation by claim of sovereignty or by means of use or occupation, or by any other means. As outer and celestial bodies are subject to the regime of *res communis omnium*, there is no room for claims of national sovereignty.

The point, which raises issues of interpretation, is whether the prohibition covering the sovereignty claims on outer space and celestial bodies, which is addressed to States, also covers the possible acquisition of rights on these resources by individuals on the basis of the domestic law of the State that authorizes the activities associated with the recovery of these resources.

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[19] G. LAFFERRANDERIE, D. CROWTHER (eds.) *Outlook on Space Law Over the Next 30 Years: Essays Published for the 30th Anniversary of the Outer Space Treaty*, The Hague-London-Boston, 1997.

[20] D. ADAMS, *Space Standoff: The Next Cold War is Already Playing out Right Above our Heads*, http://www.digitaltrends.com/cool-tech/weaponized-satellites-and-the-cold-war-in-space.

The position paper on space resource mining adopted by consensus by the IISL Board of Directors on 20 December 2015 states that, I quote, «in view of the absence of a clear prohibition of the taking of resources in the Outer Space Treaty (OST) one can conclude that the use of space resources is permitted. Viewed from this perspective, the new United States Act (The 2015 Commercial Space Launch Competitiveness Act) is a possible interpretation of the Outer Space Treaty. Whether and to what extent this interpretation is shared by other States remains to be seen»[21].

Considering that unilateral actions and interpretations by means of national legislation are relevant pieces of practice subsequent to the conclusion of a treaty, I believe that an international dialogue on this matter is highly desirable.

In this perspective, I mention that an international working group was established in The Hague in December 2014 to identify the basic elements of an international legal framework for activities related to space resources. At the same time, the COPUOS LSC decided, at its last session, to include a single item for discussion on the agenda of the next session titled "General exchange of views on potential legal models for activities in exploration, exploitation and utilization of space resources"[22].

Clarifications concerning the interpretation of several other notions contained in the OST are also needed. With regard to the concept of "national" activity in outer space, in Art. VI, the practice of States shows that without a rigid definition in the Treaty of 1967, States are free to interpret the concept of national activities in a broader sense, which includes not only activities carried out by nationals, but also activities carried out from their territory by foreigners. Another aspect concerns the identification of the appropriate state, that is to say, the State has an obligation to authorize and supervise continuously the national activities of private entities in outer space. Not to speak of the notion of "space object". Other uncertainties regard the notions of "damage" and "fault" under the LIAB Convention.

Now, in matter of interpretation of the treaties, as well as their revision and amendment, there is a limitation affecting the COPUOS, which has no authority to deliberate on such aspects of space law and governance. The amendment and interpretation of the UN space treaties can only be agreed upon by the States parties to a treaty and this authority relies in the meetings of the parties. Nothing precludes of course the convening of such meetings, which has never occurred since the entry into force of the OST.

The other way is that the COPUOS Legal Sub-Committee (LSC) discuss and adopt resolutions taking stock of the practice in certain fields connected to the treaties, as it did in the past, with a view to recommend solutions to the member States, but specifying at the same time that nothing in the resolutions constituted an authoritative interpretation or a proposed amendment to the treaties[23].

In fact, treaties, including the UN space treaties, are not just dry parchments. They are instruments for providing stability to their parties and to fulfil the purposes which they embody. They can therefore change over time, must adapt to new situations, evolve

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[21] Full text of the position paper available online at http://www.iislweb.org/docs/SpaceResourceMining.pdf.
[22] UN General Assembly, A/AC.105/1113, *Report of the Legal Subcommittee on its Fifty-Fifth Session, held in Vienna from 4 to 15 April 2016*, 2016, p. 37.
[23] See UN General Assembly Resolution 59/115 of 10 December 2004, *Application of the Concept of the "Launching State"*; UN General Assembly Resolution 62/101 of 17 December 2007, *Recommendations on Enhancing the Practice of States and International Intergovernmental Organizations in Registering Space Objects*.

according to the social needs of the international community and can sometimes fall into obsolescence.

The general question of "treaties in time" reflects the tension between the requirements of stability and change in the law[24]. It is generally the purpose of a treaty to provide stability in the face of evolving circumstances. On the other hand, legal systems must also leave room for the consideration of subsequent developments in order to ensure meaningful respect for the agreement of the parties and the identification of its limits. It is in the interest of the security of treaty relations that such conditions should be well defined. The 1997 judgment of the International Court of Justice in the *Gabčikovo-Nagymaros* case provides a good example of how the law of treaties operates in relation to subsequent developments which may affect the meaning of a treaty[25].

In national law, the most important subsequent developments after the enactment of a law, or the conclusion of a contract, are amendments by the legislature or by the parties to the contract, and evolutive interpretations by courts. In international law, the situation is more complicated. Different sources, in particular treaty and customary law, are subject to different rules and mechanisms; moreover, they interact with each other[26].

In the case of customary law, subsequent developments are, in principle, part of and not different from the process of formation of customary law itself. However, the role of customary law has been always very limited in this branch of international law, which is space law.

In this perspective, I think that it is a good choice to involve the COPUOS LSC in the consideration of the role of customary law with regard to the regulation of space activities. The set of questions provided by the Chair of the Working Group on the Status and Application of the Five United Nations Treaties on Outer Space, taking into account the UNISPACE+50 process, includes precisely a question which relates to identification of the role of customary law within the UN treaties on outer space.

On the other hand, we cannot rely on evolutionary interpretations by courts, because there were no cases until now brought to the attention of international tribunals for their settlement. We have no judiciary decisions by the ICJ on disputes relating to outer space activities.

6. *Role of non-binding instruments*

Thus, we have to rely mainly in subsequent practice to the treaties and, in particular, to these important pieces of practice that are the non-legally binding instruments adopted at the international level[27]. Many commentators focus on the issue of the legal nature of these instruments and see them as a departure from the rule of law. They argue that the adoption of such kind of normative instruments has damaged the legitimacy and effectiveness of

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[24] See R. MOLOO, *Changing Times, Changing Obligations? The Interpretation of Treaties over Time*, in *Proceedings of the Annual Meeting of the American Society of International Law*, Vol. 106, 2012, p. 261 ss.

[25] See *Gabčikovo-Nagymaros Project* (Hungary/Slovakia), Judgment, ICJ Reports, 1997.

[26] See in general S. HOBE, S. FREELAND (eds.), *In Heaven as on Earth? The Interaction of Public International Law on the Legal Regulation of Outer Space*, 1/2 June 2012, Bonn - Oberkassel Institute of Air and Space Law of the University of Cologne / Deutsches Zentrum fü Luft-und Raumfahrt e.V. German Aerospace Center, 2013.

[27] S. MARCHISIO, *Security in Space: Issues at Stake*, in *Sp. Pol.*, 2015, p. 67 ss.

international space law[28]. I do not share this opinion.

Now, it is true that over the last years, States have relied increasingly on non-binding agreements to govern space activities, and this practice is yet consolidating[29]. The fact is that there is an increasing number of substantive concerns that cannot be satisfactorily resolved in the current institutional framework or that cannot be covered by binding instruments in a short time. Non-legally binding frameworks may respond to a broad range of regulatory concerns. While non-binding, they represent the firm expectation of responsible behaviour from the participating States, reflecting the values and aspirations of the group that accepted them. Furthermore, as I said, they are "subsequent practice" to treaties in force and in this perspective they play a paramount role in the interpretation of these treaties, as it is spelled out in the Vienna Convention on the law of treaties[30].

Substantive concerns addressed through non-legally binding instruments relate mainly to critical nuisances issues. I would mention, in particular, initiatives such as the measures recommended by the Group of Governmental Experts on Transparency and Confidence Building Measures in Outer Space Activities (GGE) in its 2013 report[31]. In the same line, we can also mention other initiatives implementing at the multilateral level the recommendations of the GGE, such as the draft International Code of conduct on outer space proposed by the European Union[32].

Lastly, let me say a few words on the institutional aspects of the space governance. Here, the COPUOS should be recognized as the "anchor institution". A functioning space governance system requires a governance structure mutually supportive with space law. The COPUOS, as a standing committee of the UNGA, is the international forum for the development of draft normative instruments, such as treaties, principles and guidelines governing activities in outer space.

In saying that, I admit that other options, already discussed in the past, seem to be largely inadequate within the current situation and not worthy to be taken again into consideration. I refer to the adoption of an autonomous institutional arrangement envisaging the establishment of a new framework for the governance of outer space activities, or to the creation of a treaty body or o the negotiation of a comprehensive convention on space law.

In conclusion, the great value and importance of the law of outer space lies in the recognition that it would be much more advantageous to accept the rule of law, to place confidence in the law and its machinery than allow the free play of force.

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[28] In general terms see J. KLABBERS, *The Undesirability of Soft Law*, in *Nord. Jour. Int. Law*, 1998, p. 381 ss.

[29] See I. MARBOE (ed.), *Soft Law in Outer Space. The Function of Non-Binding Norms in International Space Law*, Wien-Köln-Graz, 2012.

[30] Convention on the law of treaties (with annex). 23 May 1969, Art. 31, 3(b), General rule of interpretation, *UN Treaty Series*, 1980, p. 340.

[31] See *Report of the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities*, Doc. A/68/189, 29 July 2013. See also the UN General Assembly Resolution 68/50 of 5 December 2013, *Transparency and Confidence-Building Measures in Outer Space Activities*, encouraging Member States to review and implement the proposed TCBMs.

[32] S. MARCHISIO, *Nandasiri Jasentuliyana Keynote Lecture: the Draft Code of Conduct in Outer Space Activities*, in *Proceedings of the International Institute for Space Law 2012*, The Hague, 2013, p. 3 ss.

ABSTRACT: *Setting the Scene: Space Law and Governance*

Over the last years, States have relied increasingly on non-binding agreements to govern space activities, and this practice is yet consolidating. There is an increasing number of substantive concerns that cannot be satisfactorily resolved in the current institutional framework or that cannot be covered by binding instruments in a short time. Non-legally binding frameworks may respond to a broad range of regulatory concerns. While non-binding, they represent the firm expectation of responsible behaviour from the participating States, reflecting the values and aspirations of the group that accepted them. On the institutional aspects of the space governance, the COPUOS should be recognized as the "anchor institution". A functioning space governance system requires a governance structure mutually supportive with space law. The COPUOS, as a standing committee of the UNGA, is the international forum for the development of draft normative instruments, such as treaties, principles and guidelines governing activities in outer space.

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SPACE PLANE E VOLI SUBORBITALI

SOMMARIO: 1. Innovazione e sostenibilità nel trasporto suborbitale. – 2. Il volo suborbitale. – 3. Caratteristiche del mezzo per il volo suborbitale. – 4. Lo *space plane*: aeromobile o oggetto spaziale? – 5. Problematiche del volo suborbitale.

1. *Innovazione e sostenibilità nel trasporto suborbitale*

In passato solo militari, scienziati ed esperti potevano esplorare il cosmo per questioni connesse alle rispettive attività lavorative e di ricerca. In tempi più recenti le meraviglie dell'universo sono state osservate da facoltosi miliardari, disposti a pagare il prezzo, elevatissimo, richiesto per soddisfare questa curiosità[1]. Tali esperienze saranno presto accessibili anche ad una cerchia più ampia di fortunati, i quali potranno provare la sensazione dell'assenza di gravità, o l'emozione di osservare il panorama del globo da altitudini altrimenti inaccessibili.

Il grande interesse per questo settore ha spinto le imprese private, americane oltre che italiane ad investire ingenti capitali per progettare e costruire veicoli suborbitali, caratterizzati da sofisticatissime tecnologie.

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[1] La prima forma di «turismo spaziale» risale al 2001 quando un industriale americano, Dennis Tito è stato portato presso la stazione spaziale internazionale dalla navetta russa *Soyuz*. Nel 2002 la stessa navetta ha condotto un altro turista pagante, il sudafricano Mark Shuttleworth, nella stazione spaziale internazionale. Per una ricostruzione dettagliata dei viaggi effettuati da turitisti dello spazio e delle problematiche connesse è possibile consultare G. CATALANO SGROSSO, *Astronauti e turismo spaziale*, in *Studi in Onore di Umberto Leanza*, III, Napoli, 2008, p. 1545; P. ATREY, *Space Tourism – Future industry*, in *Current Developments In Air And Space Law,* Delhi, 2012, p. 419, spec. p. 422, 423. Sullo *space tourism* v. anche A. GÁLVEZ, G. NAJA-CORBIN, *Space tourism*, *ESA's View on Private Suborbital Spaceflight*, in *ESA Bul.* n. 135, Parigi, Agosto 2008, p. 19; W. PEETERS, *From Suborbital Space Tourism to Commercial Personal Spaceflight*, in *Acta astr.*, 2010, p. 1625 ss.; F. G. VON DER DUNK, *Space Tourism, Private Space flight and the Law: Key Aspects*, in *Sp. Pol.*, 2011, p. 147; Y. CHANG, *The First Decade of Commercial Space Tourism*, *ibidem*, 2015, p. 79; A. FORGANNI, *The Potential of Space Tourism for Space Popularization: an Opportunity for the EU Space Policy?*, in *Sp. Pol.*, 2017, p. 48.

Si ritiene che in un futuro non lontano anche persone non ricchissime ma benestanti potranno godere queste opportunità, in tal modo aprendo, nel medio lungo periodo, nuove frontiere al turismo di massa[2].

Da queste sommarie informazioni si comprendono le potenzialità della *space economy,* al punto che la Comunicazione della Commissione europea sulla «strategia spaziale per l'Europa», COM 2016(705) approvata il 26.10.2016, rileva che «lo spazio è importante […]», poiché «occupa oggi il secondo posto al mondo per ampiezza del bilancio pubblico […], con strutture e programmi che coinvolgono diversi paesi europei».

Uno dei decisivi passi per la realizzazione di tale strategia può individuarsi nella proposta di regolamento COM (2018) 447 def., volta a gettare le basi di un programma spaziale integrato che coinvolga tutte le azioni dell'U. E. onde fornire un «quadro coerente per gli investimenti futuri, offrendo più visibilità e flessibilità … [per] introdurre nuovi servizi orientati alle attività spaziali a vantaggio di tutti i cittadini dell'UE»[3].

Una significativa *tranche* del comparto è il trasporto commerciale suborbitale, che consente di svolgere operazioni di volo ben al di sopra delle quote ove si spostano gli aeromobili tradizionali. Anche per questo il nuovo mercato dell'aviazione ha ormai assunto la suggestiva denominazione, «*NewSpace*».

Se questi voli avranno successo si stima un impatto importante tanto per il settore spaziale, quanto per quello aeronautico, soprattutto per i voli c.d. supersonici[4], che impiegheranno tecnologie sofisticate con ampi margini di sostenibilità in termini di riduzioni delle distanze e di emissioni inquinanti, comprese (soprattutto) quelle rumorose.

L'Italia non intende rimanere indietro in questa sfida e pare orientata ad investire, in ragione delle importanti ricadute, in tale innovativo settore per la crescita del Paese: in tal quadro ha instaurato una solida collaborazione con il governo degli Stati Uniti, attuata tramite ratifica di accordi di cooperazione nell'esplorazione ed utilizzazione dello spazio extra-atmosferico per scopi pacifici.

L'Enac, ossia la massima autorità nazionale in campo aeronautico, ha così firmato a

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[2] Il *commercial space transportation* potrebbe rivelarsi, a breve, un comparto destinato ad una clientela di *elite*, ma non si esclude che le auspicate migliorie possano contribuire ad abbassare i costi si da consentire, gradualmente, ad altre fasce di utenti, l'impiego di veicoli suborbitali. Così come avvenuto per il trasporto aereo con aeromobili, inizialmente modalità di trasporto rivoluzionaria riservata a classi di reddito privilegiate, ai giorni nostri trasporto per gli spostamenti di persone appartenenti a tutte le classi sociali. E nessuno dubita che il viaggio aereo si sia ormai trasformato in un trasporto di massa, alternativo al treno e ai veicoli su gomma, grazie anche alla politica di alcuni vettori aerei *low cost*. La diffusione del *low cost* ha segnato una svolta decisiva per il mercato del trasporto aereo, con notevoli incrementi di traffico tanto da indurre i vettori ad aprire il mercato anche ai viaggi intercontinentali, sia verso gli Stati Uniti e il vicino Medioriente, sia addirittura verso l'estremo Oriente e l'Oceania. Per approfondimenti in dottrina, sul trasporto aereo *low cost*, cfr. AA. VV. (a cura di), M. DEIANA, *Profili giuridici del trasporto aereo* low cost, Atti del V Congresso Internazionale di Diritto Aeronautico, Cagliari, 2013; G. PRUNEDDU, *Le compagnie* low cost *tra disciplina dei servizi aerei e tutela dell'utente*, Roma, 2017.

[3] Così la proposta di Regolamento del Parlamento Europeo del Consiglio del 6 giugno 2018 *che istituisce il programma spaziale dell'Unione e l'Agenzia dell'Unione europea per il programma spaziale e che abroga i regolamenti (UE) n. 912/2010, (UE) n. 1285/2013 e (UE) n. 377/2014 e la decisione n. 541/2014/UE*, COM (2018) 447.

[4] Gli aerei spaziali, come il *Concorde* o le recenti evoluzioni di questa macchina, i c.d. superveloci sono mezzi in grado di coprire in circa tre ore la distanza tra Londra e New York e sembra che possano entrare in servizio a partire dal 2021. Per approfondimenti cfr. U. LA TORRE, M. V. PETIT LAVALL, *Studio preparatorio alla modifica degli articoli 25 e 26 del nuovo proyecto de código aeronáutico latino americano*, in *Dir. maritt.*, 2017, 935, che li considerano alla stregua di evoluti aeromobili, pur manifestando qualche dubbio circa la loro esatta nozione (se ricadente o meno in quella di *Aircraft*, ai sensi degli *Annex* 6 e 7 della convenzione di Chicago), poiché sia pur limitatamente ad una brevissima *tranches* del viaggio, si spostano oltre il limite dell'atmosfera.

Washington, il 12 marzo 2014, un *Memorandum of cooperation in the development of commercial space transportation* con FAA (*Federal Aviation Administration)* per lo sviluppo del trasporto commerciale sub spaziale, accordo rinnovato nel giugno del 2016, ed esteso anche all'Agenzia spaziale italiana.

Per analizzare i complessi aspetti che il volo suborbitale implica, occorre preliminarmente delinearne i tratti caratterizzanti.

2. *Il volo suborbitale*

Soltanto pochi veicoli, in fase di avanzata sperimentazione, sono oggi in grado di raggiungere un'altezza superiore ai 100 km sul livello del mare. Questa altitudine, nota come la linea di Kármán, segna idealmente il confine tra l'atmosfera e lo spazio esterno e corrisponde, approssimativamente, al punto in cui un velivolo con una velocità tale da sostentarsi con la portanza dell'atmosfera terrestre inizia a volare molto più velocemente.

Tra i vari spazioplani, capaci di portare passeggeri nello spazio, uno tra i più reclamizzati e, ad oggi, collaudati, è lo *SpaceShipTwo*. Costruito dalla *Virgin Group* si compone di un veicolo madre, *White Knight Two*, e di una navetta, *SpaceShipTwo*, detta anche «nave figlia» per il volo suborbitale, dotata di motore a razzo ibrido.

La navetta può ospitare fino a otto persone (due piloti e sei passeggeri) e resta incorporata al velivolo-madre *WhiteKnightTwo*[5] fino a circa 15.000 metri di altitudine; raggiunto l'apogeo si stacca e, grazie all'energia propulsiva impressa dal razzo di cui è dotata, si eleva ancor più in alto ed in modo autonomo nello spazio sino a raggiungere, in circa 70 secondi, la quota programmata, ossia 110 km in altezza, ben 10 km oltre la linea di Karman, per poi rientrare in volo planato verso una struttura dedicata, denominata «spazioporto», ove ha già fatto ritorno la nave madre.

Nelle fasi di volo in cui si supera la linea di Karman sarà possibile osservare dalla navetta la curvatura della Terra, il buio dello spazio e sarà percepibile l'assenza di gravità.

Per comprendere le potenzialità di tale settore basti considerare che, la FAA *Federal Aviation Administration*, stima che entro il 2021, circa 16500 persone potrebbero provare l'ebrezza del viaggio suborbitale.

L'utilizzo di tali nuovi mezzi di trasporto pone delicate questioni allo studioso del diritto della navigazione. Il primo quesito verte sull'inquadramento giuridico dei nuovi appa-

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[5] Il *WhiteKnightTwo* è un velivolo a quattro motori a reazione con doppia fusoliera e ala principale, composta da un unico pezzo in carbonio. La struttura a doppio braccio presenta un'area spaziosa centrale per l'attacco tra le due fusoliere dello *space ship two,* che ad un'altitudine di circa 50000 piedi si potrà staccare per iniziare il suo viaggio. Il primo volo risale all'agosto del 2002. Il velivolo è stato progettato e realizzato dalla *Spaceship Company*, una *joint venture* fra la *Scaled Composites* (la compagnia aeronautica dell'ingegnere Burt Rutan) e la *Virgin Group* del magnate Richard Branson, nell'ambito del programma *Tier One.* Nell'aprile 2018 è stato completato con successo il volo di prova della *Space Ship Two Vss Unity*. La navetta è partita dallo *space port* del *Mojave* in California attaccata al *WhiteKnightTwo* raggiungendo circa 14000 metri di quota. Dopo alcuni secondi la *VSS unity* ha accesso i motori per raggiungere la quota di oltre 25000 metri di altezza, prima di iniziare le manovre di discesa, quando i piloti hanno aperto il sofisticato sistema alare, progettato dopo il tragico incidente del 2014. Tale nuovo sistema permette un rientro presso lo *space port* della navetta figlia in modo affidabile, come un vero e proprio aereo comune. Più di recente, il 13 dicembre 2018 la *VSS unity* ha effettuato con successo un ulteriore volo di prova raggiungendo l'altitudine di circa 51,4 miglia superando le 50 miglia limite che gli Stati Uniti riconoscono come demarcazione per lo spazio.

rati: ovvero se lo s*paceplane* ricada nel *genus* «aeromobile», oppure sia da considerare un «oggetto spaziale». Più complessa, come vedremo, è la risposta, che richiede precisazioni ulteriori sul veicolo suborbitale.

3. *Caratteristiche del mezzo per il volo suborbitale*

Il primo punto da affrontare è stabilire se tali apparati destinati al viaggio suborbitale rientrino nella definizione di aeromobile, secondo la disciplina internazionale uniforme degli annessi 6 e 7 dell'Icao[6]. Su tali basi si dovrà, successivamente verificarne la loro possibile assimilazione alla nozione di aeromobile.

Atteso che sono in grado di navigare nello spazio aereo e forse di trasportare, questi veicoli paiono ricadere nel novero degli *Aircraft*. Tuttavia una più attenta riflessione induce ad una certa prudenza, poiché appare innegabile che l'identificazione, è tutt'altro che perfetta.

La prima differenza si coglie osservando che il comune aeromobile (*manned*, ossia con equipaggio a bordo) è una struttura formata da un corpo unico ed inscindibile. La «macchina» (così richiamata dall'art. 743 c. nav. e dagli *Annex* 6 e 7 alla Convenzione di Chicago col termine *machine*) risulta dall'aggregazione di varie parti tra loro assemblate, e gli elementi che la compongono (ali, carrello ed elica, oltre allo stesso apparato propulsore ecc.) sono sostituibili sul piano fisico oltre che giuridico, pur se organicamente aggregate e tra loro collegate per costituire un unico bene.

Si tratta di una «cosa composita», formata da parti suscettibili di esistenza indipendente, organicamente assemblate come un *unicum* che aggrega il complesso.

Se sono questi i caratteri per così dire preminenti e forse imprescindibili dell'aeromobile tradizionale non può certo negarsi che veicoli di recente fabbricazione non rispondano più tanto a questi criteri.

A ben vedere si potrebbe rilevare che il parametro dell'unitarietà del *corpus* non è più pacifico: basti pensare alle innovazioni apportate dall'avionica con gli UAV.

I mezzi aerei a pilotaggio remoto scindono la dicotomia aeromobile in esercizio/equipaggio, al punto da far cadere l'assunto secondo il quale è impensabile un aeromobile in esercizio senza un equipaggio a bordo. Come è noto, infatti, l'apparecchio per il pilotaggio remoto si scompone in due distinti elementi connessi. Il *flight vehicle* è il mezzo aereo privo di cabina di pilotaggio, mentre la direzione del volo avviene tramite collegamento *data link* con la *control station* ubicata a distanza, talvolta a migliaia di km. Da essa il *pilot* dirige, in una situazione di isolamento sensoriale, il volo.

Per l'assenza di comando a bordo, gli apparecchi a pilotaggio remoto (UAV) sono assimilati, dall'art. 743 c. nav., comma 2, mediante la formula «sono altresì considerati […]» all'aeromobile convenzionale.

Per tali mezzi, anche l'Icao, per fugare ogni dubbio, ha ribadito che essi sono a tutti gli effetti aeromobili[7].

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[6] Gli Annessi 6 *Operation of Aircraft - part III - International Operations – Helicopters* e 7 *Aircraft Nationality and Registration Marks* alla Convenzione di Chicago del 1944 definiscono l'aeromobile come «Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface».

[7] Già nel 1944, l'art. 8 della Convenzione di Chicago aveva previsto che «No aircraft capable of being flown

Se è possibile individuare una qualche similitudine tra spazioplano ed UAV poiché entrambi non sono formati da un corpo unico, come l'aeromobile, lo spazioplano presenta peculiari caratteristiche tali da richiedere ulteriori approfondimenti.

4. *Lo* spaceplane: *aeromobile o oggetto spaziale?*

Lo *spaceplane,* prima di iniziare il volo, è una struttura singola e si presenta come un aeromobile moderno, apparentemente tradizionale. Rimane un solo corpo per una *tranche* della navigazione aerea, ossia fino all'altezza di circa 15000 metri. Raggiunta tale quota si scompone in due veicoli, la nave madre e la *unit space*, caratterizzate, ognuna, da autonomia strutturale e funzionale.

Ciascuna di esse dispone di un proprio equipaggio a bordo: decollano insieme da una base e giungono in quota sotto la direzione del comandante del *White Knight Two*, rispetto al quale l'equipaggio della navicella, compreso il personale di condotta, si trova in posizione gerarchicamente subordinata, dovendo attenersi alle disposizioni impartite dal comando della nave madre.

Ad avvenuta separazione, nave madre ed equipaggio, esaurito il loro compito, rientrano nello spazioporto.

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without a pilot shall be flown without a pilot over the territory of a contracting State without special authorization by that State and in accordance with the terms of such authorization». Nel *Manual for Remotely Piloted Aircraft Systems* (RPAS), doc 10019, AN/507 del 2015, (par. 1.2.4), l'Icao ha precisato che gli apparecchi senza pilota, controllati o autonomi, esistevano già ai tempi della prima guerra mondiale, in particolare si dispone che «Remotely controlled and uncontrolled (autonomous) aircraft were already in existence at the time of the First World War, operated by both civil and military entities. "Aircraft flown without a pilot" therefore refers to the situation where there is no pilot on board the aircraft. The Eleventh Air Navigation Conference (ANConf/11), Montréal, 22 September to 3 October 2003) endorsed the global air traffic management (ATM) operational concept which contains the following text: "[a]n unmanned aerial vehicle is a pilotless aircraft, in the sense of Article 8 of the Convention on International Civil Aviation, which is flown without a pilot in-command on-board and is either remotely and fully controlled from another place (ground, another aircraft, space) or programmed and fully autonomous». Sugli aeromobili a pilotaggio remoto cfr. U. LA TORRE, *Gli U.A.V.: mezzi aerei senza pilota*, in R. TRANQUILLI-LEALI, E. G. ROSAFIO (a cura di), *Sicurezza, navigazione e trasporto*, Milano, 2008, p. 93; ID., *La navigazione degli UAV: un'occasione di riflessione sull'art. 965 c. nav. in tema di danni a terzi sulla superficie*, in *Riv. dir. nav.,* 2012, p. 553; A. MASUTTI, *Prospettive di regolamentazione dell'uso dei velivoli senza pilota (UAV) nello spazio aereo comune*, in *Dir. trasp.*, 2007, p. 783 SS.; ID., *Proposals for the Regulation of Unmanned Air Vehicle Use in Common Airspace*, in *Air & Space Law*, 2009, p. 1 ss.; B. FRANCHI, *Aeromobili senza pilota (UAV): inquadramento giuridico e profili di responsabilità, I parte*, in *Resp. civ. prev.*, 2010, p. 732 ss.; ID., *Aeromobili senza pilota (UAV): inquadramento giuridico e profili di responsabilità, II* parte, *ibidem*, 2010, p. 1213 ss.; E. G. ROSAFIO, *Considerazioni sui mezzi aerei a pilotaggio remoto e sul regolamento Enac*, *Riv. dir. nav.*, 2014, p. 788 ss.; A. L. M. SIA, *Profili attuali della disciplina giuridica dei mezzi aerei a pilotaggio remoto e il regolamento dell'Ente nazionale dell'aviazione civile italiana (ENAC)*, in *Dir. trasp.*, 2014, p. 743 ss.; A. ZAMPONE, *Riflessioni in materia di responsabilità nell'esercizio di remotely-piloted aircraft system (RPAS)*, in *Dir. trasp.*, 2015, p. 63 ss.; A. ANTONINI, *Le future sfide del diritto aeronautico: nuovi aeroporti, nuovi aeromobili*, in *Dir. trasp.*, 2015, p. 739 ss.; M. F. MORSELLO, *Aspectos Jurídicos Principales De Las Aeronaves Sin Piloto*, in M. C. MAYORGA TOLEDANO (a cura di), *Nuevos Enfoques Del Derecho Aeronáutico Y Espacial. XXXVIII Jornadas Latino Americanas De Derecho Aeronáutico Y Del Espacio*, Madrid, 2015, p. 513 ss.; C. SEVERONI, *La disciplina normativa attuale degli aeromobili a pilotaggio remoto*, in *Dir. trasp.*, 2016, p. 65 ss.; A. L. M. SIA, *Las operaciones aéreas con pilotaje remoto: ¿un nuevo riesgo aeronáutico?*, in M. O. FOLCHI (a cura di), *XXXIX Jornadas Latino-Americanas de Derecho Aeronáutico y Espacial*, Buenos Aires, 2016, p. 391 ss.; U. LA TORRE, M. V. PETIT LAVALL, *Studio preparatorio alla modifica degli articoli 25 e 26 del nuovo proyecto de código aeronáutico latino americano*, cit., 935.

L'unità figlia, invece, con il suo equipaggio e i passeggeri, alla programmata altitudine avvia i motori ed inizia il volo fino a raggiungere lo spazio suborbitale ad una velocità tre volte e mezzo quella del suono. Da tale momento, la navicella diviene indipendente, con la conseguenza che il pilota non deve più interfacciarsi con il comandante dell'unità madre, ma dovrà adempiere alla direzione nautica, impartire ordini all'equipaggio e salvaguardare la comunità viaggiante.

La presenza di un mezzo agganciato ad un altro, che funge da motrice per formare una *res* composta, non è una novità nelle *transport operation*[8].

Nel caso del veicolo per il volo suborbitale la «*res composita*» si presenta tuttavia come un *quid* diverso rispetto ai singoli elementi che compongono veicolo madre e figlio. Il primo consente allo *shipspace* di raggiungere la quota prestabilita e sposta entità diverse dal suo stesso corpo con equipaggio a bordo, muovendosi grazie alle reazioni dell'aria. Tali caratteristiche sono comuni a quelle dell'aeromobile *tout court*, e in linea con la definizione di *Aircraft* secondo gli Annessi Icao.

Per le sue caratteristiche tecniche, da solo, lo *Shipspace* non è in grado né di alzarsi da terra, né di raggiungere l'altezza di 15000 metri: fino a tale quota è una *res* inerme agganciata ad un'altra.

Su questi basi, resta da capire se lo *spaceplane* debba essere inquadrato nel novero degli aeromobili, ovvero come oggetto spaziale. La dottrina ha osservato che il progresso scientifico e tecnologico pongono all'interprete la necessità di accertare la natura di tali mezzi[9].

La normativa internazionale sul diritto extraatmosferico[10] non contiene una nozione di «oggetto spaziale», inteso semplicemente alla stregua di un bene lanciato nello spazio.

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[8] Basti pensare al treno, costituito dal locomotore e dai vagoni. Questi ultimi hanno autonomia strutturale, non funzionale, poiché, sganciati dal locomotore, che eroga l'energia necessaria allo spostamento nello spazio, sono incapaci di muoversi e trasportare. Anche l'autoarticolato è un veicolo stradale formato dalla motrice e dal carro, definito dalla dottrina come un «complesso unico circolante», così U. LA TORRE, *Riflessioni sul contratto rimorchio*, in *Scritti in onore di Francesco Berlingeri*, I, numero speciale del *Dir. maritt.*, 2010, p. 665.

[9] Il problema sorge soprattutto per gli aerei spaziali o *shuttle* che secondo l'A. devono essere considerati «ambivalenti cioè contemporaneamente aerei e cosmici», U. LEANZA, voce *Spazio extra-atmosferico*, in *Dig. disc. pubbl.,* Torino, 1999, p. 663. Anche la recente proposta di regolamento del Parlamento europeo e del Consiglio che istituisce il programma spaziale dell'Unione e l'Agenzia dell'Unione europea per il programma spaziale e che abroga i regolamenti (UE) n. 912/2010, (UE) n. 1285/2013 e (UE) n. 377/2014 e la decisione n. 541/2014/UE (COM 218/447), all'art. 2 definisce «oggetto spaziale» qualsiasi oggetto artificiale nello spazio extra atmosferico.

[10] La disciplina del diritto dello spazio è contenuta nel «Trattato sulle norme per l'esplorazione e l'utilizzazione, da parte degli Stati, dello spazio extra-atmosferico, compresi la luna e gli altri corpi celesti», concluso a Washington, Londra e Mosca il 27 gennaio 1967, ed entrato in vigore con l'adesione e la ratifica della maggioranza degli Stati, il 10 ottobre 1967. I principi del Trattato sullo spazio sono stati ripresi in accordi successivi, quali 1) l'accordo per il salvataggio degli astronauti, il ritorno degli astronauti e la restituzione degli oggetti inviati nello spazio extra-atmosferico, adottato a Londra, Mosca e Washington il 22 aprile 1968 ed entrato in vigore il 3 dicembre 1968; 2) la convenzione sulla responsabilità internazionale per i danni causati da oggetti spaziali, adottata a Londra, Mosca e Washington il 29 marzo 1972 ed entrata in vigore il 1° settembre 1972; 3) la convenzione sull'immatricolazione degli oggetti lanciati nello spazio extra-atmosferico, del 12 novembre 1974, entrata in vigore il 15 settembre 1976; 4) l'accordo che regola le attività degli Stati sulla Luna e sugli altri corpi celesti, meglio noto come Trattato sulla Luna o accordo sulla Luna, aperto alla firma il 18 dicembre 1979, entrato in vigore l'11 luglio 1984. Per un esame dei diversi Trattati v. tra gli altri T. BALLARINO, S. BUSTI, *Diritto aeronautico e spaziale*, Milano, 1988, p. 144 ss.; E. BACK IMPALLOMENI, *Spazio aereo e spazio extra-atmosferico*, in *Enc. dir.*, XLIII, 1990, Milano, p. 258; F. STIPO, *La definizione del concetto giuridico di spazio cosmico*, in *Giur. mer.*, 2000, p. 1118; F. DURANTE, *Diritto spaziale*, in *Enc. dir.*, agg. VI, Milano, 2002, p. 345; O. FERRAIOLO, *Il Trattato «incompiuto». L'accordo sulla Luna del 1979 e altre norme internazionali rilevanti per l'uso delle risorse naturali nello spazio esterno*, in L. PANELLA, E. SPATAFORA (a cura di), *Studi in onore di*

La stessa convenzione multilaterale «sull'immatricolazione degli oggetti lanciati nello spazio extra-atmosferico»[11], firmata a New York il 12 novembre 1974, si limita ad enunciare all'art. I, lett. b) che l'«oggetto spaziale» designa anche i suoi elementi costitutivi, nonché il suo vettore e gli stadi del medesimo. Il testo uniforme prevede poi l'obbligo, per gli Stati di lancio, di immatricolare gli oggetti spaziali destinati ad attività operative, mediante l'iscrizione in apposito registro.

In mancanza di una definzione normativa, che sgombri il campo da ambiguità ed equivoci, la dottrina ha prospettato varie tesi e l'approccio che appare maggiormente percorribile, è quello «di carattere pragmatico e funzionale, in base al quale possono considerarsi oggetti spaziali tutti quegli oggetti lanciati o presenti nello spazio cosmico, eccetto i corpi celesti, tramite i quali avvengono l'esplorazione e l'uso dello spazio extra-atmosferico»[12].

Pertanto, lo *ship plane,* secondo alcuni studiosi potrebbe ricadere, in conformità ad una stretta interpretazione della nozione di aeromobile dettata dagli Annessi Icao, nella definizione di «oggetto spaziale» poiché «non è più supportato nell'atmosfera mediante reazione con l'aria»[13]. Altri autori hanno invece valutato irrilevante la circostanza che il sostentamento avvenga, o meno, mediante reazione dell'aria.

La dottrina che ha approfondito, con argomentazioni lungimiranti, già nella seconda metà del secolo scorso, il tema aveva posto in evidenza che la qualifica di aeromobile non può circoscriversi al riferimento alle reazioni con l'atmosfera, poiché, argomentando alla luce di tale visione, considerata restrittiva, «si dovrebbe coprire solo la sfera di volo tradizionale»[14].

Claudio Zanghì, IV, *Diritto dello spazio e Miscellanea*, Torino, 2011, p. 51 ss.; S. MARCHISIO, *L'accordo sugli astronauti del 1968: tempo di revisione*, *ibidem*, p. 67; S. MAGNOSI, *2009* Space Odissey: *Spunti dal caso della collisione satellitare Russia-Stati Uniti del 10 febbraio 2009*, in *Giureta*, 2009; M. E. DE MAESTRI, *La responsabilità civile e le attività spaziali*, in *Dir. comm. int.*, 2015, p. 945.

[11] L'Italia ha aderito con la l. 12 luglio 2005 n. 153 alla convenzione sull'immatricolazione degli oggetti lanciati nello spazio extra-atmosferico, adottata con la risoluzione dell'Assemblea Generale delle Nazioni Unite n. 3235 (XXIX) ed entrata in vigore il 15 settembre 1976. La l. n. 153 del 2005 affida il compito di curare l'istituzione e la custodia del Registro nazionale degli oggetti lanciati nello spazio all'Agenzia spaziale italiana che deve altresì effettuare le eventuali annotazioni che discendono dall'applicazione della convenzione. Sul registro, cfr. N. BINI, *L'istituzione del Registro nazionale degli oggetti lanciati nello Spazio. Elementi di novità e prospettive*, in A. F. BIAGINI, M. BIZZARRI (a cura di) *Spazio. Scenari di collaborazione, note di diritto internazionale*, Bagno a Ripoli, 2013, 39 ss.

[12] Così U. LEANZA, *Spazio extra-atmosferico*, in *Dig. disc. pub.*, Torino, 1999, 412.

[13] S. REVERSO, *La responsabilità del vettore di voli spaziali turistici,* in *Dir. trasp.*, 2015, p. 123, secondo cui la navetta figlia «potrebbe considerarsi alla stregua di un oggetto spaziale vero e proprio, almeno nel senso che il suo unico scopo è quello di raggiungere lo spazio». Dello stesso orientamento S. HOBE, *Legal Aspect of Space Tourism,* in *Nebr. Law Rev.,* 2007, p. 439 secondo cui, se l'attività del turismo spaziale sarà costruita sul modello dello *SpaceShipOne,* occorre considerare il velivolo prima della disaggregazione come un aeromobile, dopo la separazione raggiunta l'altitudine al di sopra del perigeo dovrà essere qualificato come un oggetto spaziale e sottoposto alla disciplina sulla navigazione cosmica: «Therefore, the suborbital vehicle after separation can be classified as a space object and space law should apply to the suborbital vehicle after separation from the aircraft» (S. HOBE, *op. ult. cit.*).

[14] Così L.M. BENTIVOGLIO, *Problemi giuridici dei trasporti spaziali suborbitali*, in *Annali dell'istituto di diritto aeronautico*, vol. 2, 1970-1971, p. 52, ove si legge che «l'aeromobile di oggi e del prossimo futuro tende sempre più ad avvicinarsi al modello della capsula spaziale, pur seguendo una traiettoria di volo balistico […] ad arco-orbitale. E l'evoluzione del traffico aereo […] segnerà il passaggio dall'aeronautica alla celonautica […] usando un metro di valutazione funzionale dei fenomeni giuridici, si tratta semplicemente di aggiornare le categorie qualificanti di cui si dispone. Possiamo quindi tener ferma la nozione tipica di trasporto aereo nel senso di: trasferimento di persone e/o cose da un luogo all'altro attuato mediante aeromobile. Ma per aeromobile […]

A ciò si aggiunga che un'attenta lettura della definizione di *Aircraft*, secondo gli Annessi Icao 6 e 7, non pare escludere tale veicolo dal *genus* aeromobile, poiché la norma definitoria utilizza il termine *can*.

La definizione di *Aircraft* dell'Icao così recita: «Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface».

La parola *machine*, preceduta dall'avverbio *any*, significa che non rilevano tipo, forma, materiale costruttivo, conformazione ed altro dell'aggregazione strutturale. A ciò si aggiunga che la formula del legislatore uniforme utilizza il verbo *can*, che significa «posso», ovvero «sono in grado di».

L'espressione, così tradotta, pare sottintendere alla possibilità, o se si preferisce all'eventualità che l'*Aircraft* sia una macchina «[…] that can derive support in the atmosphere […]»: ciò, tuttavia, non necessariamente implica che «deve», così escludendo altre possibili opzioni. Ne discende che l'aeromobile, può derivare supporto, ma potrebbe anche *non* derivare supporto dall'atmosfera, senza nulla togliere, ad altre macchine, di rientrare in quella nozione.

Lo *ship plane*, ossia la navicella che ospita i passeggeri per il volo suborbitale, da quando si stacca, sotto il comando del pilota non più subordinato al comandante della nave madre, si configura alla stregua di *any machine*, destinata al trasporto di persone, capace di volare e trasportare.

Certo, si potrebbe obiettare che il trasporto, nella sua accezione più consolidata ed incontrovertibile, dal punto di vista tecnico giuridico, implica il trasferimento di persone (o cose), arg. *ex* art. 1678 c.c. «da un luogo ad un altro». Ma è stato efficacemente sottolineato dalla dottrina che il viaggio circolare non esula dalla definizione di trasporto in senso tecnico giuridico[15].

Inoltre l'*Aircraft/spazioplano* non muta la sua natura, e rimane sempre eguale a se stesso allorquando raggiunge un'altezza suborbitale, né cessa di essere tale quando si trova in fase di manovra sulla pista di rullaggio o si sposta nelle aree di parcheggio. Di certo non si possono negare le differenze con gli aeromobili tradizionali: tuttavia i velivoli suborbitali fino ad ora progettati, sembrano più vicini all'*aircraft*, piuttosto che all'oggetto spaziale.

Per avvalorare la tesi che tali mezzi non debbano considerarsi come oggetti spaziali, basti considerare il tipo di licenza rilasciato finora dalla *FAA,* ente che ha sperimentato maggiormente tali veicoli ed ha incominciato ad elaborare una normativa *ad hoc*.

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dovremo intendere ogni mezzo o veicolo atto al trasporto ed idoneo alla locomozione nello spazio a tre dimensioni al di sopra della superficie terrestre». In tale senso anche l'orientamento più recente di B. I. SCOTT, *The regulation of personal injuries in international carriage by suborbital vehicles under air law*, in *The aviation and space Journal*, 2014, 2, p. 23, che sostiene «It has been shown that some suborbital vehicles, such as SpaceShipTwo, function as an aircraft for a portion of its journey and can consequently be defined as an aircraft. A vehicle does not cease to be an aircraft the moment it stops deriving support, such as when it is being taxied, parked or if it has crashed. (…) It seems apparent that suborbital vehicles can be classified as both aircraft and space objects. For this reason, international air law can be applicable throughout the vehicle's journey. There is a growing trend to treat these activities as an extension of aviation, but there will need to be extra legal steps taken in order to determine which body of law will apply. Therefore, it is possible for air law to govern personal injuries during suborbital activities».

[15] In dottrina cfr. G. ROMANELLI, *Il trasporto aereo di persone*, Padova, 1965, p. 5 s. il quale ammette che il volo circolare ricade pur sempre nel concetto di trasporto, poiché non necessariamente lo spostamento implica che, al termine di esso, le *res* o le *persone* trasferite nello spazio debbano trovarsi in un luogo diverso da quello di partenza. Per un'analisi approfondita sulla nozione di trasporto, cfr. U. LA TORRE, *La definizione del contratto di trasporto*, Napoli, 2000, p. 249 ss., che sembra avallare questa tesi.

Infatti lo *Space Ship One* è stato classificato dall'*Office of Commercial Space Transportation* come *Reusable Launch Vehicle* (RLV), ovvero come veicolo progettato per essere lanciato più volte e per ritornare intatto sulla terra (§ 401.5 *definition,* del *United States code Chapter III - Commercial Space Transportation, Federal Aviation Administration, Department of Transportation*) e, a riprova della sua possibile assimilazione all'*aircraft*, non è stato mai registrato tra gli oggetti spaziali da iscrivere nel *Register of Space Objects*.

L'Icao nel *working paper* della 175th sessione del Consiglio del 10 marzo 2010 sul *concept of sub-orbital flight* ha precisato, riguardo allo *SpaceShipOne,* che tale veicolo presenta per la maggiore parte del volo i requisiti dell'aeromobile e alcuni caratteri del razzo. Tuttavia, se in un futuro, tali veicoli suborbitali verranno considerati prevalentemente come *aircraft,* dovranno avere tutte le certificazioni previste dalla Convenzione di Chicago per la navigazione aerea internazionale.

Peraltro anche Easa ed Enac che non hanno escluso una loro competenza per la regolamentazione di tali mezzi, paiono orientate a considerare aeromobile lo *spaceplane*.

5. *Problematiche del volo suborbitale*

Ulteriori questioni, strettamente connesse all'utilizzo di tali mezzi di trasporto, si aprono poi al giurista.

Se questi mezzi possono essere considerati come aeromobili, occorrerà chiarire i problemi legati alla fase operativa del volo suborbitale e alla sua disciplina, ovvero se essa rientra nel novero degli istituti tradizionali del diritto aeronautico oppure nella disciplina internazionale sul diritto dello spazio. La dottrina ha, infatti, messo in luce che le «sovrapposizioni dei due regimi operativi sono una realtà evidentissima che richiede a livello internazionale e nei singoli stati»[16] un aggiornamento e adeguamento sia della Convenzione di Chicago che della normativa del regime internazionale aerospaziale.

Altro dubbio aperto è relativo alla normativa da applicare al personale di volo. L'attuale disciplina tecnica dettata per i piloti (e per il personale di cabina) degli aeromobili dovrà subire variazioni e/o adattamenti per il personale di volo di apparati che si spostano oltre il limite dell'atmosfera. Si dovrà inoltre chiarire se la qualifica di astronauta possa essere riconosciuta anche a coloro che partecipano ad un volo, come componenti dell'equipaggio o soltanto come turisti[17].

Per i soggetti a bordo imbarcati dietro corrispettivo, si pone inoltre la questione se devono considerarsi passeggeri, ovvero se le particolari sollecitazioni cui sono sottoposti,

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[16] Così M. SPADA, *Sicurezza nello spazio aereo e suborbitale: riassetto del sistema di Chicago e dell'I.C.A.O.*, in *Studi in onore di Claudio Zanghì*, cit., p. 84. L'A., a conclusione del suo saggio, evidenzia come «oggi l'operatività aerospaziale non viene integrata nell'ambiente aeronautico, quantunque motivi di ordine tecnico e operativo suggeriscano la obiettiva necessità di un adeguato coordinamento da affidare con consenso internazionale ad una organizzazione configurata nell'ambito della stessa ICAO» (*op. ult. cit.*, p. 102).

[17] La dottrina si è domandata, infatti, se alle persone che «non siano astronauti professionisti si estenda la tutela derivante dall'obbligo di assistenza, salvataggio e ritorno in caso di pericolo o di emergenza» così come previsto dall'Accordo sugli astronauti del 1968. In tal senso S. MARCHISIO, *L'Accordo sugli astronauti del 1968: tempo di revisione*, in L. PANELLA, E. SPATAFORA (a cura di), *Studi in onore di Claudio Zanghì*, cit., p. 77. L'A. pone alcune delicate questioni che devono essere affrontate in considerazione dello sviluppo del *tourism space,* tra cui se «la qualifica si astronauta debba comportare, in caso di assistenza e salvataggio, un diritto di precedenza rispetto agli altri partecipanti al volo, o turisti spaziali».

tali da richiedere adeguate precauzioni (visite mediche, test di adattamento alla fatica, all'assenza di forza di gravità ecc.) per non compromettere la loro salute ed arrecare pregiudizio alla spedizione, non ne determini una diversa qualificazione, ovvero più semplicemente una più dettagliata disciplina[18].

La disciplina adottata negli Stati Uniti contenuta nel *Commercial Space Launch Act 1984*, più volte modificato, adottato dalla *Federal Aviation Administration*, al chapter 400, nella parte definitoria, distingue infatti tra *Crew* e *Space flight participant*.

I primi, in quanto membri dell'equipaggio, sono legati da un rapporto di lavoro con l'esercente e svolgono a bordo la propria prestazione lavorativa, mentre i secondi sono soggetti diversi da coloro i quali si trovano a bordo per erogare l'attività lavorativa verso la quale sono tenuti nei confronti dell'esercente dello *spaceplane* «carried aboard a launch vehicle or reentry vehicle» (§401.5).

Secondo questa normativa la *FAA* deve autorizzare e regolamentare lanci e rientri dei veicoli che volano nello spazio cosmico, effettuati negli Stati Uniti o da cittadini statunitensi, purché tali attività non pregiudichino la salute e la sicurezza pubblica e la politica estera degli Stati Uniti[19].

La normativa statunitense prevede, infatti, nel *Commercial Space Launch Act* parte 460 *(Human Space Flight Requirement)* la necessità di fornire una formazione specifica per i *flight participant* ed un obbligo di informazione chiara e comprensibile da parte degli operatori sui «risks of the launch and reentry, including the safety record of the launch or reentry vehicle type»[20].

L'infrastruttura utilizzata per l'involo e l'atterraggio degli spazioplani, i c.d. «spazio porto»[21], è incerto se ricada o meno nel *genus* aerodromo, ovvero, se le peculiarità degli apparati che da tali installazioni operano, impongono una diversa configurazione giuridica di tali luoghi.

Peraltro, pare opportuno rilevare, che la necessità di un corretto inquadramento dello spazio porto, lungi da rappresentare una questione di ordine teorico, si pone con una certa urgenza per il nostro Paese. L'Italia, infatti, in previsione di un importante ritorno economico ha avviato delle azioni per lo sviluppo della *space economy*. Si allude alle recenti notizie di cronaca dalle quali si evince che l'aeroporto Le Grottaglie di Taranto è stato designato come primo spazioporto italiano, che dovrà ospitare, a partire dal 2020, voli suborbitali.

Tale individuazione si deve al lavoro dell'Agenzia spaziale italiana, Enac, Ministero

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[18] La questione può essere solo accennata ma tali passeggeri sembrano essere assimilabili più a cultori di particolari attività sportive, che necessitano di speciali certificazioni che richiedono precise attitudini psicofisiche.

[19] La dottrina ha osservato che la normativa adottata negli USA mira ad «aprire immediatamente al popolo statunitense la via dello spazio, favorendo le iniziative di industrie private considerate guide di politiche di investimenti finanziari e ispiratrici di normative per l'esercizio operativo del settore. Il provvedimento pone espressamente l'accento sul principio del conseguimento di elevata sicurezza per le iniziative commerciali di volo umano nello spazio», così, M. SPADA, *Sicurezza nello spazio aereo e suborbitale: riassetto del sistema di Chicago e dell'ICAO*, in *Studi in onore di Claudio Zanghì*, cit., p. 98. Per un approfondimento cfr. *Commercialization Of Space Commercial Space Launch Amendments Act Of 2004*, in *Harv. J. L. & Tech.*, 2004, 17, p. 619 ss.

[20] Il paragrafo 460.51 rubricato *Space flight participant training*, precisa che «An operator must train each space flight participant before flight on how to respond to emergency situations, including smoke, fire, loss of cabin pressure, and emergency exit».

[21] Per un approfondimento sulla normativa degli *space port* negli Stati Uniti, cfr. K. M. WEIDLAW, *Commercial Spaceport Development: The Role of Domestic and International Space Law and Regulations, paper for 57th International Astronautical Congress*, Valencia, 2005; M. C. MINEIRO, *Law and Regulation Governing U.S. Commercial Spaceports: Licensing, Liability, and Legal Challenges*, in *Jour. Air Law Comm.*, 2008, p. 759 ss.

delle Infrastrutture e trasporti, Aeroporti di Puglia e Politecnico di Bari, dopo l'accordo firmato a dicembre 2017 tra la Altec di Torino[22] e la *Virgin Galactic*.

La sfida sull'utilizzo di tali mezzi lascia presagire la redazione di una normativa *ad hoc*, sul piano del diritto internazionale, che appare necessaria per i risvolti, specialmente ma non solo in tema di responsabilità ed assicurazione. Potrebbe rilevarsi necessario inoltre adeguare la gestione dei flussi del traffico aereo, in ragione della possibile interferenza dei voli suborbitali con il tradizionale traffico aereo[23].

In considerazione di ciò l'Enac, autorità di regolazione nel settore dell'aviazione civile, è stata incaricata dal Ministero delle infrastrutture e dei trasporti, di stabilire un quadro di riferimento comune per lo sviluppo di regole per il trasporto suborbitale. Il 20 luglio 2016 l'ENAC ha infatti reso noto un documento, elaborato da un gruppo di esperti, «A Regulatory Policy for the Prospective Commercial Space Transportation Certification and Operations», il cui fine è anche quello di delineare indirizzi ed azioni da intraprendersi per rendere possibile lo svolgimento di voli spaziali suborbitali in partenza dal nostro paese.

La scienza e la tecnica prospettano oggi all'attenzione del giurista nuovi affascinanti scenari e sollevano interessanti questioni che richiedono di essere regolate. Illustre dottrina, nella presentazione degli Atti del I convengo nazionale di diritto cosmico, svoltosi alla fine degli anni '60, aveva con una visione lungimirante hanno messo in luce che «il cammino del progresso non può essere sbarrato; all'uomo non sarà mai, non potrà mai essere preclusa la via della conoscenza. Piuttosto devono essere coraggiosamente e lealmente affrontati e risolti i problemi che dalla ricerca e dalla conoscenza derivano»[24]. Ma ciò nella consapevolezza che il progresso scientifico viaggia ad una velocità incommensurabilmente più rapida rispetto all'attività del giurista. Questi dovrà tradurre in termini giuridici i progressi tecnologici, ma allorquando tale opera di riordino sembrerà conclusa, le categorie giuridiche elaborate potrebbero rivelarsi già obsolete.

ABSTRACT: *Space plane and Sub-orbital flights*

Scientific and technological progress opens the way for the use of new vehicles for transport that can reach sub-orbital heights.

Private companies are investigating the possibility of using sub-orbital vehicles with advanced technologies to be used for commercial purposes and, in particular, for that sector of the market, called space tourism.

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[22] L'ALTEC (*Aerospace Logistics Technology Engineering Company*) è una società pubblico-privata partecipata da *Thales Alenia Space* Italia e dall'Agenzia spaziale italiana (ASI). L'Azienda, dal 2001, è un centro di eccellenza nazionale per la fornitura di livello internazionale, di servizi ingegneristici e logistici a supporto delle operazioni e dell'utilizzazione della Stazione Spaziale Internazionale, di altre infrastrutture orbitanti e missioni per l'esplorazione spaziale.

[23] La dottrina negli anni 60 aveva evidenziato che «il diritto dello spazio e il diritto della navigazione – anche se devono rimanere distinti (e l'opportunità di mantenere o meno la distinzione sarà in relazione agli sviluppi pratici e tecnici della navigazione aerea e di quella spaziale) – appaiono comunque destinati sia ad influenzarsi a vicenda, sia ad avere quanto meno alcuni punti di regolamentazione in comune» così G. ROMANELLI, *Aspetti giuridici dei voli spaziali e riflessi sulla disciplina della navigazione aerea*, in *Riv. trim. dir. proc. civ.*, 1961, p. 894.

[24] Così S. PUGLIATTI, *Per un convegno di diritto cosmico*, in *Atti del I convegno nazionale di diritto cosmico*, Milano, 1963, p. 4. L'Autore ha, in altro saggio, sostenuto che «Gli uomini non sono disposti a rinunciare a valersi delle applicazioni tecnologiche delle proprie ricerche scientifiche [...]. Hanno sempre pagato, e sempre hanno ritenuto, fatta l'esperienza, che qualunque prezzo è nulla rispetto al risultato» S. PUGLIATTI, *La limitazione della responsabilità civile,* in *Resp. civ.,* II, Milano, 1968, p. 73, spec. p. 111.

The experimentation of these types of vehicles and their possible commercial use poses new interesting questions that lawyers must face.

Can suborbital flight be considered space activity? Or should it be considered under aeronautical law? Is a spaceplane a space object or an aircraft? What are the protections for passengers? If, as it seems, a spaceport of departure is built in Italy, which international and national air navigation rules will apply, if any?

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PABLO MENDES DE LEON*

RESPONSIBILITY AND LIABILITY OF THE EU UNDER INTERNATIONAL AIR AND SPACE LAW

1. *The involvement of the EU with space activities*

Since the 1990s, the EU has established and implemented European space programmes, including the Galileo and Copernicus programmes. The Galileo programme is carried out under EU Regulation 1285/2013 which was adopted pursuant to art. 172 of the Treaty on the Functioning of the European Union (TFEU). The first four satellites were launched in 2011 and 2012 on behalf ESA from the European spaceport in Kourou, French Guyana. Other satellites are being launched on behalf of the Union using the same facilities.

The Copernicus programme has been drawn up under EU Regulation 377/2014[1]. Fifteen observation missions will be launched into outer space to provide information in the fields of environment and security. The first satellite was launched in April 2014 on behalf of ESA. The second was launched from the same location in June 2015, and the third was launched from Plesetsk, Russia in February 2016.

The next sections will identify the development of international space law, and discuss the concepts of responsibility and liability of, in particular, international organisations under international law. Special attention will be paid to the position of international organisations, and the EU, under international space law, and other branches of international law, especially in terms of responsibility and liability. The last section

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[1] It was adopted pursuant to art. 189 of the TFEU.

contains conclusions.

2. *Responsibility and liability of international organisations under general International Law*

International organisations can be held responsible for their acts and liable for the damage caused by these acts under international law. This section will explain the state of international law by discussing cases in which such organisations can be held responsible and liable.

Under the draft Articles of the International Law Commission (ILC) on the *Responsibility of International Organizations* (ILC Draft Articles)[2], such organisations can be held responsible for an «internationally wrongful act» if that act is attributable to that organisation under international law, and constitutes a breach of an international obligation of that organization[3]. An international organisation breaches an international obligation when an act of that organisation «is not in conformity with what is required of it by that obligation, regardless of the origin or character of the obligation concerned»[4]. In such instances, the responsible international organisation is liable for the consequences of that act and must make full reparation for the injury including any damage, whether material or moral, caused by its internationally wrongful act[5]. Under the ILC Draft Articles a Member State may be held responsible for the wrongful act of an international organisation.

Thus, from an institutional and operational perspective the State(s) must be closely involved with the act carried out by the international organization[6]. The analogy between States and international organisations is also reflected in the Draft art. 4 pursuant to which an act of an organ, or official, of an international organisation shall be considered an act of the organisation under international law, «whatever position the organ, official or person holds in the structure of the organisation.» This article can be seen as a corollary of the provision that an organisation cannot justify its non-compliance with international rules by referring to its internal rules[7] – and, hence, neither rules pertaining to its internal structures or division of competencies among institutions forming the international organisation.

Because the EU meets the conditions of an international organisation under the ILC Draft Articles, it is bound by international law, consequent upon which it cannot defend itself by referring to internal rules justifying its conduct or to its institutions on whose

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[2] Defined as «an organization established by a treaty or other instrument governed by international law and possessing its own international legal personality»; *see*, art. 2, lett. (a), at: http://legal.un.org/ilc/texts/instruments/english/draft_articles/9_11_2011.pdf.

[3] See, art. 3 in conjunction with art. 4.

[4] See, art. 10.

[5] See, art. 31.

[6] See, arts. 5, 25, 26, 27 and 29.

[7] See, art. 27 of the Vienna Convention on the Law of Treaties (1969): art. 27 Internal law and observance of treaties: «A party may not invoke the provisions of its internal law as justification for its failure to perform a treaty. This rule is without prejudice to article 46». As to art. 46 which may impact the position of the EU as to which see the discussion in section 4.3 regarding the EU's position in the UNCLOS convention: 1. «A State may not invoke the fact that its consent to be bound by a treaty has been expressed in violation of a provision of its internal law regarding competence to conclude treaties as invalidating its consent unless that violation was manifest and concerned a rule of its internal law of fundamental importance. 2. A violation is manifest if it would be objectively evident to any State conducting itself in the matter in accordance with normal practice and in good faith.»

behalf it acts. Thus, it cannot be excluded that damage caused by satellites owned by the EU constitutes a breach of an international obligation, but this conclusion must be underpinned by the facts of the case and the governing regime which is the specific regime of international space law which will be further discussed in the next section.

3. *Space law as a new chapter of International Law*

3.1. *The coming into being of International space law*

The law governing outer space has been established by the global community assembled in the United Nations. The beginning of this law making process on the use and exploration of outer space started with the Declaration of Legal Principles in 1963 in which UN States, «inspired by the great prospects opening up before mankind as a result of man's entry into outer spaces», solemnly confirmed nine principles which formed the principal provisions and objectives of the documents on outer space law to which reference is made below[8].

The Member States of the United Nations declared in univocal terms that their governments would respect the principles laid down in this Declaration. The said Principles formed the basis of the provisions laid down in the outer space treaties which will be referred to below while the Declaration should be viewed within the framework of a wider phenomenon reflecting a trend toward dispensing with traditional forms of more formal decision making in international relations[9]. After this first stage in the development of space law, a new stage of law-making was reached that finally would constitute the *Corpus Iuris Spatialis* consisting of five international space law conventions as to which see below.

3.2. *The* Corpus Iuris Spatialis

The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies of 1967, hereinafter referred to as the Outer Space Treaty or OST, was designed as a basic international law instrument in this field. However, it appeared that specific questions had to be elaborated by other instruments of international law.

Hence, the Agreement on the Rescue of Astronauts, Return of Astronauts and Return of Objects launched into Outer Space (Rescue Agreement) was drawn up in 1968, and entered into force in the same year, and the Convention on International Liability for Damage Caused by Space Objects in 1972, also referred to as the "Liability Convention", which entered into force in 1973. Although at that time outer space was being explored and used by a limited number of States, non-active States also participated in the creation of these instruments of international space law.

In 1975 the Convention on Registration of Objects Launched into Outer Space (Registration Convention) was concluded which entered into force in 1976. This was followed by the creation of the Agreement Governing the Activities of States on the Moon

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[8] *Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space*, Resolution 1962 (XVIII) adopted at the 1280th plenary meeting of the General Assembly of the UN, of 13 December 1963, available at: http://www.oosa.unvienna.org/oosa/SpaceLaw/gares/html/gares_18_1962.html.

[9] See, M. LACHS, *The Law of Outer Space: An experience in Contemporary Law-Making*, Leiden, 2010.

and Other Celestial Bodies (Moon Agreement), which was adopted by the UN General Assembly in December 1979 and entered into force in July 1984. Only thirteen States have ratified it, whilst the big space powers Russia, US, UK, France and China have not.

In light of lack of space, and in order to keep the focus on the principal questions which are asked in this essay, the next sections will deal with the main provisions of the Outer Space Treaty (1967) and the Liability Convention (1972) respectively. The other treaties, international agreements, declarations and principles mentioned above will not be further addressed.

3.3. *The Outer Space Treaty (OST) (1967)*

The Outer Space Treaty forms the cornerstone of international space law as it contains basic principles. They constitute the environment within which responsibility and liability provisions must be interpreted and implemented.

The exploration and use of outer space including the moon and other celestial bodies should be carried out «for the benefit and in the interest of all countries and shall be the province of all mankind», whereas outer space, including the moon and other celestial bodies, should be free for exploration and use by all States[10].

Importantly, outer space may not be made subject to national appropriation by claims of sovereignty, by means of use or occupation, or by any other means[11]. States parties to the OST must carry out these activities 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[12]. The explicit recognition of international law and the promotion of international cooperation[13] are considered to be vital for the establishment of a genuine international legal regime for the use of outer space for the benefit of all mankind. However, the extension of international law to outer space should be seen as a first step forming the basis for the establishment of specific rules which already have or will become necessary in the future[14].

Under the OST, States are internationally liable for the activities carried out in outer space[15]. That liability is attached to the launching State as to which see the next section.

Hundred and three States, including twenty seven EU States, that is, all of them except for Latvia, are a party to it. International organisations, hence, including the EU, cannot become a party to it, and cannot make a Declaration of Acceptance pursuant to which they can be bound by provisions of this convention. This is different for the 'Convention on international liability for damage caused by space objects' of 1972, henceforth referred to as the Liability Convention as to which see, again, the next section.

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[10] See, art. I.
[11] See, art. II.
[12] See, art. III.
[13] See, art. IX.
[14] See, M. LACHS, *The new horizon of international law*, in T.L. MASSON, S. HOBE (eds), *The Law of Outer Space*, Leiden, 2010, p. 11 ss.
[15] See, art. VII: «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».

3.4. *The Liability Convention (1972)*

The Liability Convention elaborates the principles drawn up in art. VII of the Outer Space Treaty. If a State or an international organisation has suffered damage, it can address a claim to the "launching State" for compensation. As States are the principal actors under space law, individuals cannot claim on a personal title but the State of their nationality or residence must do so via diplomatic channels.

The Liability Convention is based on an "absolute liability" regime for damage caused by the space object launched by a State on the surface of the earth or to aircraft flight, and on "fault liability" for damage sustained in orbit. Absolute liability differs from risk or strict liability, which arises when the said causal link between the State or person who produces the damage and the injured person is established[16]. Under the concept of absolute liability, liability arises as soon as the conditions of the treaty, in this case the Liability Convention, have been fulfilled. If there are several "launching States", they are jointly and severally liable.

In short, the Liability Convention (1969) introduces definitions for damage caused by space activities and identifies those "launching States" that could be absolutely liable for such damage and the mechanisms for such claims. This convention also provides for procedures for the settlement of claims for damages. Again, these provisions have not been tested in practice.

The Liability Convention has never been invoked in a court case, and hence its provisions have never tested in judicial proceedings, which is not uncommon in space law.

Under the Liability Convention, international organisations complying with the provisions of this convention can make a "Declaration of Acceptance" in which case they are bound by specified provisions of this convention, pursuant to the procedures mentioned there[17].

Ninety two States are a party to this convention. These include the major space powers such as the USA, Russia, China, India, Japan, France, the UK, Canada and Germany who have also ratified the Outer Space Treaty (1969). As far as the 28 Member

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[16] See, B. CHENG, *A Reply to Charges of Having Inter Alia Misused the Term Absolute Liability in Relation to the 1966 Montreal Inter-Carrier Agreement in my Plea for an Integrated System of Aviation Liability*, in *Ann. Air Space Law*, 1981, p. 7 ss.

[17] See, art. XXII: «In this Convention, with the exception of Articles XXIV to XXVII, references to States shall be deemed to apply to any international intergovernmental organisation which conducts space activities if the organisation declares its acceptance of the rights and obligations provided for in this Convention and if a majority of the States members of the organisation are States Parties to this Convention and to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies. States members of any such organisation which are States Parties to this Convention shall take all appropriate steps to ensure that the organisation makes a declaration in accordance with the preceding paragraph. If an international intergovernmental organisation is liable for damage by virtue of the provisions of this Convention, that organisation and those of its members which are States Parties to this Convention shall be jointly and severally liable; provided, however, that: any claim for compensation in respect of such damage shall be first presented to the organisation; only where the organisation has not paid, within a period of six months, any sum agreed or determined to be due as compensation for such damage, may the claimant State invoke the liability of the members which are States Parties to this Convention for the payment of that sum. Any claim, pursuant to the provisions of this Convention, for compensation in respect of damage caused to an organisation which has made a declaration in accordance with paragraph 1 of this Article shall be presented by a State member of the organisation which is a State Party to this Convention».

States of the EU are concerned, Latvia is the only EU Member State that has not ratified or signed any of the treaties[18].

Three international, that is, European intergovernmental organisations, to wit EUMETSAT, EUTELSAT-IGO and the European Space Agency (ESA), have signed Declarations of Acceptance of the rights and obligations under the above space law treaties, including the above Liability Convention, except for those laid down in the Outer Space Treaty, which does not permit it, as to which see below[19]. The EU has not, or not yet, signed such a Declaration.

4. *The participation of the EU to international conventions*

4.1. *The* status *of the EU in the UN*

The *status* of the EU has been upgraded under the General Assembly (GA) Resolution A/65/L.64/Rev.1 of 3 May 2011. Under it, the Union's senior representatives such as the President and the EU's first High Representative of the Union for Foreign Affairs and Security policy are entitled to present statements on behalf of the Union, and shall be invited to participate in the general debate of the GA, and permitted to have communication channels with the various UN bodies. The above resolution indicates that the EU's status under general international law has been enhanced, at least formally.

4.2. *The* status *of the EU in the Food and Agricultural Organisation (FAO)*

The EU became a Member of the FAO as early as 1991, the first UN organisation admitting the – then – EC as such. Under art. II of the FAO Constitution, «any regional economic integration organization» (REIO) meeting the criteria of the Constitution can be admitted as a Member. Those criteria pertain to the following:

- The REIO must be constituted by sovereign States;
- A majority of which must be FAO Members;
- To which the Member States «have transferred competences over a range of matters within the purview of the organization, including the authority to make decisions binding on its Member States in respect of those matters», while specifying which matters are covered by the competence of the REIO;
- The REIO may «exercise … a number of votes equal to the number of Member States which are entitled to vote in a meeting on matters within its competence»;
- Submission of a Declaration «made in a formal instrument that it will accept the obligations of the Constitution as in force at the time of admission» upon an application made to the Director General of the FAO who must transmit it to the Member States for decision[20].

Ever since, the EU has actively contributed to the work of the FAO as evidenced by

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[18] See, Strategy & Presentation about a *Study on the Regulatory Framework Conditions for the Economic Development of Space Products and Services Addressing "Space Law" Issues such as Authorisation, Registration, Liability and the Obligation of Insurance of Space Activities* (2015).

[19] Source: www.unoosa.org/pdf/limited/c2/AC105_C2_2015_CRP08E.pdf.

[20] See, Article II in conjunction with Rule XIX on Admission of Additional Member Nations and Associate Members.

agreements on cooperation which have been concluded between the two organizations[21]. Practice shows that this framework for membership and cooperation functions well[22].

4.3. *The UN Conference on the Law of the Sea (UNCLOS) (1982)*

UNCLOS entered into force on 16 November 1994 and has – per today – 168 parties, including the European Union and all of its Member States, and Palestine. It is often referred to as the "Constitution of the Oceans".

The – then – EEC had successfully negotiated its status as a Contracting Party UNCLOS. The Union was entitled to sign this convention, which is subject to ratification or accession by States and «formal confirmation or of accession» by international organisations in accordance with Annex IX. An international organisation is defined as «An intergovernmental organization constituted by States to which its Member States have transferred competence over matters governed by this Convention, including the competence to enter into treaties in respect of those matters»[23].

The language used in these provisions refer to the EU's exclusive and shared competencies over the matters governed by UNCLOS (1982) which is a matter of EU law rather than international law. However, the division of powers between the EU and its Member States has implications for relations with third States and, with that, international law. Again, it is sufficient that, again, an unqualified majority of the international organization's Member States have ratified or acceded to the Convention, which is similar to the provisions of the space law treaties referred to above.

Other provisions of Annex IX regulate the transfer of powers from the Member States to the international organisations and the implications thereof for the responsibility for matters governed by the Convention. The international organisation is obliged to continuously inform the other States of its exclusive or shared competencies whereas the international organisation and its Member States are liable for failure to comply with this obligation. Thus, the EU made these Declarations explaining the fields of exclusive competencies and shared competencies. Since its first Declaration made in 1998[24], this list has not been amended.

While UNCLOS proceeds from the competency of either the EU or its Member States on the basis of the information they have provided to other parties, uncertainty about this division of competencies may result in joint responsibility for infringement of the UNCLOS in relation to third Parties. In its Decision of 2 April of 2015, the International Tribunal for the Law of the Sea has confirmed that third States may request an international organization or its Member States which are parties to the Convention, for questions regarding the division of competencies. Failure to do so may result in joint and several liabilities of the international organisation and the Member States[25].

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[21] See, European Commission, *Strategic Partnership between the Commission of the European Communities and the Food and Agriculture Organisation in the Field of Development and Humanitarian Affairs*, available at: http://eeas.europa.eu/delegations/rome/documents/eu_united_nations/fao_ec_working_doc_final_en.pdf.

[22] See, http://www.eeas.europa.eu/delegations/rome/eu_united_nations/work_with_fao/ec_status_fao/index_en.htm.

[23] See, art. 1 of Annex IX.

[24] See, Council Decision 98/392, available at http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.1998.179.01.0001.01.ENG.

[25] See, *Request for an Advisory Opinion Submitted by the Sub Regional Fisheries Commission*, Advisory Opinion of 2 April 2015, available at: https://www.itlos.org/ fileadmin/itlos/documents/cases/case_no.21/advisory_opinion/C21_AdvOp_02.04.pdf. See, also, E. PAASIVIRTA, *The European Union and the United Nations Convention on the Law of the Sea*, in *Fordh. Int. Law Jour.*, 2015, p. 1047 ss.

Practically all of the provisions of UNCLOS (1992) apply to international organisations in case the conditions on transfer of competencies are met. These include rules on State responsibility for the protection of the marine environment, State liability for damages caused by unlawful seizure of vessels and unlawful enforcement measure imposed on such vessels. Importantly, liability relates to "acts of States" such as unlawful enforcement and unlawful seizure of craft, that is, ships, and not to the operation of those craft, as is the case under the Convention on *International Liability for Damage Caused by Space Objects* (1971) which is discussed in the next section.

It is also stated that «The provisions of this Convention regarding responsibility and liability for damage are without prejudice to the application of further rules regarding responsibility and liability under international law».

So far, there is no case law explaining this provision.

Again, special rules regulate ratification and denouncement of this Convention and dispute settlement in case of accession by international organisations.

The EU is not a Member of the International Maritime Organisation (IMO) and it is not expected that it will be admitted as such in the near future.

4.4. *The* status *of the EU under aviation law*

Where UNCLOS is referred to as the "Constitution of the Oceans", the Chicago Convention on international civil aviation of 1944 can be termed as the constitution of international civil aviation. States are the predominant actors under international air law when it comes to responsibility, that is, for safety, security and environmental protection. Liability is a different matter as to which see below.

International organisations cannot become a party to the Chicago Convention, and this is not likely to change. Hence, the question of submission of a Declaration does not arise as only States can become a party to the International Civil Aviation Organization (ICAO) which was set up by the Chicago Convention. At present, 192 States including all of its 28 Member States are a party to this convention which are and must be UN Members[26].

The EU has an *ad hoc* observer *status* in various bodies of ICAO, whereas it has concluded a Memorandum of Understanding with ICAO on aviation security.

State liability for damage arising out of "acts of State" is not confirmed in the same fashion as in UNLOS (1982) but may, in very exceptional cases, be based on national law. Otherwise, States may rely on sovereign immunity in case of accidents caused by aircraft which fall under their responsibility or supervision. The operators of the air transport service, that is, airlines, are liable for damage when an accident occurs as evidenced by the Warsaw Convention of 1929 as variously amended[27] and the Montreal Convention of 1999[28]. This is different under space law which proceeds from "reversed immunity" as to which see section 5 below.

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[26] See, Articles 92 and 93 of this convention which is available at http://www.icao.int/publications/Documents/7300_orig.pdf.

[27] See, *Convention for the Unification of Certain Rules Relating to International Carriage by Air* (1929).

[28] See, *Convention for the Unification of Certain Rules for International Carriage by Air* (1999).

5. *Conclusions*

While States are the principal actors and the bearers of rights and duties under international space law, other actors, including international organisations and private corporations, are increasingly active in outer space. International space law only marginally addresses the above development, and does not sufficiently take it into account despite its practical relevance.

The position of the EU, operating satellites as indicated in the first section, is not clearly defined in light of the provisions of, to begin with, the Outer Space Treaty and the Liability Convention, as the EU has not or at least not yet made a Declaration of Acceptance under the latter convention, explaining its responsibilities and liabilities in this regard.

Consequently, international agreements between launching States and licenses granted to private corporations under national space law are filling gaps in order to regulate in the first place the liability for the damages occasioned by space activities if they are carried out by more than one State, in cooperation with private corporations.

Lessons may also be learned from other branches of law, for instance, international air law which departs from an opposite direction, that is, it imposes liability on the operators of the craft. As noted above, this is different for the operators of the craft undertaking activities in outer space, that is, satellites, where liability is attached to the State launching them. Thus, as compared with air law, and other branches of law, space law is exceptionally founded on what could be termed as "reversed immunity".

Indeed, airlines may also be closely linked to States in which they are incorporated, to be compared with the "launching State", under international space law. However, States have preferred to set up a liability regime pursuant to which airlines, and not the States, are liable for the damages they caused to passengers and cargo. As variously said, international space law does not make the operators, but the States which launched, or procured the launching, liable for the damages they produced.

Moreover, the participation of international organisations in space programs has added another complication to the attribution of shared liability among the international organisation(s) and the participating States[29], as illustrated by the Galileo programme of the EU. It seems to us that the complexity, the global nature and the high costs involved with the safe and efficient performance of space activities calls for more legal clarity in particular on the sharing of liability between the parties involved.

It would be advisable to harmonise national space acts between States involved in space activities. In this respect the European Union might instigate its Member States to start harmonisation which is the more compelling since the Treaty on the Functioning of the EU confirms competence of the EU for space activities[30].

ABSTRACT: *Responsibility and Liability of the EU under International Air and Space Law*

The development of the global society and the international legal order has been articulated in the context of the exploration and use of outer space by mankind. Multiple

[29] See, P.M.J. MENDES DE LEON, H.L. VAN TRAA, *International Space Law*, in A. NOLLKAEMPER, I. PLAKOKEFALOS (eds.), *The Practice of Shared Responsibility in International Law*, Cambridge, 2017, p. 453 ss.
[30] See, art. 189 TFEU.

actors including States, international organisations and private entities operate interactively possibly resulting into injurious consequences such as environmental damages, including the production of space debris, and the malfunctioning of signals transmitted via satellites. Such operations are carried out by governmental and non-governmental actors, and international organisations, including, the EU, and may be governed by special responsibility and liability regimes which will be briefly discussed in the next sections.

This essay discusses principal aspects of international space law in terms of responsibility and liability, with special reference to the position of intergovernmental organisations under various branches of international law, while referring to the role of the EU in respect of the use and management of satellites. It draws parallels and marks differences between these fields of law, while noting that both are part of international law.

It will be concluded that the position of the EU, as the owner of satellites, could be legally more articulated under international space law even if the tools which space law provides for this purpose are limited. Hence, lessons should be learned from those other branches of international law whereas national regulations including licensing conditions and contracts between the concerned undertakings can play a supplementary role.

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QUALI FUTURI RAPPORTI TRA UNIONE EUROPEA E AGENZIA SPAZIALE EUROPEA (ESA)?

SOMMARIO: 1. Introduzione. – 2. L'evoluzione della competenza dell'Unione europea in materia spaziale. – 3. I rapporti tra Unione europea e Agenzia spaziale europea (ESA). – 4. Le diverse soluzioni disponibili per i futuri rapporti tra UE ed ESA. – 5. Considerazioni conclusive.

1. *Introduzione*

Nell'ultimo decennio, l'Unione europea ha assunto un ruolo di crescente rilievo nell'ambito spaziale. Tale ruolo è andato di pari passo con le relazioni sempre più strette con l'Agenzia spaziale europea (ESA) ed i suoi Stati membri, gli altri due principali protagonisti della politica spaziale europea. In questo contesto, la Commissione europea ha affidato all'ESA alcune importanti responsabilità relative all'attuazione di specifici programmi spaziali UE[1]. Il consolidarsi di un rapporto sempre più stretto con l'ESA consentirebbe degli ulteriori sviluppi nella divisione dei loro compiti. L'ESA è un'agenzia internazionale cui va riconosciuto il merito di numerosi successi registratisi in Europa negli ultimi quattro decenni. Grazie alle sue attività, e a quelle degli Stati membri attraverso i programmi spaziali

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[1] A titolo esemplificativo, possono citarsi il programma GMES (*Global Monitoring for Environment and Security*), presentato congiuntamente da Commissione europea ed ESA nel 2001, con lo scopo di fornire, sotto il controllo dell'UE, servizi informativi che consentano l'accesso a dati e informazioni precisi in materia ambientale e di sicurezza rispondenti alle esigenze di un'ampia utenza. Il più recente programma Copernicus, che ha sostituito il GMES, e con cui la Commissione delega all'ESA una serie di compiti, tra cui il coordinamento tecnico della componente spaziale del programma Copernicus, la gestione dei fondi assegnati e l'assicurazione del monitoraggio e del controllo. Si veda, il regolamento n. 377/2014 del Parlamento europeo e del Consiglio del 3 aprile 2014 *che istituisce il programma Copernicus e che abroga il regolamento 911/2010*, in *GUUE* L 122 del 24 aprile 2014, p. 44. Il programma EGNOS (*European Geostationary Navigation Overlay Service*), basato su un accordo tripartito fra UE, ESA e Eurocontrol, concernente lo sviluppo di un sistema globale di navigazione via satellite, in cui l'ESA è chiamata ad occuparsi degli aspetti tecnici, mentre l'UE individua le esigenze degli utenti e garantisce lo stabilimento del sistema.

nazionali, l'Europa dispone ormai di una solida base industriale e tecnologica ed è considerata un *partner* affidabile nei programmi internazionali. L'Unione europea conta molto sull'eccellenza tecnica dell'ESA, alla quale delega gran parte del suo bilancio spaziale, in misura tale che oggi il contributo UE all'ESA è uno dei più importanti[2].

Il fatto che lo spazio sia divenuto oggetto di una delle politiche dell'Unione europea, la crescente importanza dei programmi spaziali UE e la sua dipendenza dalla competenza tecnica dell'ESA non si sono tuttavia ancora tradotti in un'evoluzione definitiva della *governance* delle questioni spaziali a livello europeo. L'art. 189 del trattato sul funzionamento dell'Unione europea (TFUE), dopo la riforma di Lisbona del 2007, prevede espressamente che l'Unione instauri tutti i collegamenti utili con l'ESA al fine di portare avanti la loro efficace cooperazione.

L'obiettivo del presente contributo è evidenziare l'evoluzione dei rapporti tra Unione europea ed ESA dopo l'inclusione, con il trattato di Lisbona, della materia spaziale tra le competenze dell'Unione, non potendo non riscontrare, però, allo stesso tempo, la mancanza di volontà politica, soprattutto da parte degli Stati membri dell'ESA e dell'ESA stessa, di far evolvere tali rapporti in senso unitario, ossia verso la creazione di un'unica entità responsabile delle politiche spaziali a livello continentale, magari sotto l'egida dell'Unione europea.

La prima parte del contributo si occuperà dell'evoluzione della politica spaziale in ambito UE, analizzando, nella seconda parte, anche i rapporti con l'ESA prima e dopo l'entrata in vigore del trattato di Lisbona, concludendo, infine, con l'analisi delle diverse soluzioni sui futuri rapporti tra UE ed ESA avanzate soprattutto dalla Commissione europea[3], sulla base delle criticità esistenti soprattutto dal punto di vista strutturale.

2. *L'evoluzione della competenza dell'Unione europea in materia spaziale*

I trattati istitutivi delle Comunità europee non contemplavano in alcun modo una competenza in materia spaziale. Il primo tentativo, a livello istituzionale, di guidare l'azione degli Stati membri in tale ambito, sempre nell'ottica di un'azione coerente con le altre politiche comunitarie e senza turbare l'originario riparto di competenze contenuto nei trattati istitutivi, è rappresentato da due atti di *soft law*, consistenti in due risoluzioni del Parlamento europeo[4]. L'Atto Unico europeo introduce uno specifico titolo dedicato a ricerca e sviluppo tecnologico, poi modificato con il trattato di Maastricht, non prevedendo però alcun trasferimento di competenze e limitandosi a prevedere un'azione complementare delle isti-

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[2] Attualmente, una parte cospicua del bilancio UE in materia spaziale, circa il 75%, è devoluta all'ESA, mentre il 20% dei fondi gestiti dall'ESA origina dal bilancio dell'Unione. Conseguentemente, l'UE oggi è il maggior contribuente dell'ESA e l'ammontare del bilancio UE devoluto ad essa nei prossimi anni eccederà i contributi individuali di tutti gli Stati parte dell'ESA. Si veda, Report from the Commission, *Progress report on establishing appropriate relations between the European Union and the European Space Agency (ESA)*, del 6 febbraio 2014, COM(2014) 56 final, p. 3.

[3] Ci si riferisce, in particolare, al già ricordato *Report* della Commissione del 2014, con cui è stato dato seguito alla Comunicazione della Commissione al Consiglio e al Parlamento europeo, sull'*Istituzione di adeguate relazioni tra l'Unione europea e l'Agenzia spaziale europea*, del 14 novembre 2012, COM(2012) 671 final.

[4] Si veda, la Risoluzione del Parlamento europeo del 25 maggio 1979 sulla *partecipazione comunitaria alla ricerca spaziale*, in *GUCE*, Serie C 127, p. 79; e, la Risoluzione del Parlamento europeo del 17 settembre 1981 sulla *politica spaziale dell'Europa*, in *GUCE*, Serie C 260, p. 81.

tuzioni ad integrazione delle azioni intraprese dagli Stati membri. È stato tuttavia con il trattato di Lisbona che lo spazio è stato inserito fra le politiche perseguite dall'UE, seppur quale ambito di intervento trasversale, che interessa molteplici settori di attività, acquistando però autonomia nel momento in cui riceve espressa menzione quale settore a sé stante[5]. Tuttavia, il settore in oggetto non sembra aver acquisito l'auspicata autonomia visto che le attività in ambito spaziale devono essere ricollegate alla ricerca scientifica. Infatti, gli obiettivi della politica spaziale europea oggi sembrano aggiungersi ad altri previsti in via generale dall'art. 189 TFUE, il cui par. 1 sembra legare l'elaborazione di una politica spaziale europea da parte dell'UE all'obiettivo dell'Unione stessa di «favorire il progresso tecnico e scientifico, la competitività industriale e l'attuazione delle sue politiche». Una tale formulazione dell'art. 189 TFUE ha indotto parte della dottrina a ritenere la politica spaziale come in un certo senso "asservita" alle altre politiche europee ivi previste, sottolineando, allo stesso tempo, però, una certa trasversalità tra le stesse[6], non necessariamente riconducibile ad un rapporto di subordinazione.

L'art. 4, par. 3, TFUE, fa rientrare la politica spaziale fra le materie di competenza concorrente tra Unione e Stati membri, con la fondamentale precisazione che l'azione UE in questo specifico settore, così come in quelli della ricerca e dello sviluppo tecnologico, è limitata alla definizione e attuazione di programmi spaziali e che l'esercizio di tale competenza non può avere l'effetto di impedire agli Stati membri di esercitare la propria, a differenza quindi di quanto accade di regola nei rapporti tra UE e Stati membri in materie di competenza concorrente. L'Unione detiene così in materia spaziale una competenza concorrente sui generis, parallela e simmetrica rispetto a quella statale, che permane in capo agli Stati membri anche dopo l'esercizio delle competenze da parte delle istituzioni dell'Unione, non verificandosi così quel c.d. assorbimento ed esaurimento delle competenze nazionali in quelle UE[7]. Le sfere di competenza nazionale ed europea operano quindi su piani differenti, senza interferire ma integrandosi e coordinandosi tra loro[8]. Ciò comporta, in buona sostanza, che le istituzioni europee, pur svolgendo un ruolo rilevante, non possono condizionare in maniera esaustiva le politiche degli Stati membri in materia[9]. In ogni caso, il riparto di competenze tra UE e paesi membri deve essere letto alla luce del principio di leale collaborazione, ossia l'obbligo imposto a tutte le istituzioni nazionali ed europee di agire conformemente al ruolo assegnatogli dal trattato, ed in particolare agli Stati membri di adottare

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[5] Una parte della dottrina si è interrogata su quanto fosse davvero necessaria una tale espressa menzione, concludendo però in senso affermativo in termini di attribuzione di dignità al settore dello spazio nel quadro delle politiche UE, sebbene l'allora Comunità europea aveva da tempo posto in essere azioni concrete in materia aerospaziale. Si veda, M.C. MUÑOZ-RODRIGUEZ, *El Tratado de Lisboa: la acentuación de los limites estatales a la política espacial europea*, in *El Tratado de Lisboa: la salida de la crisis constitucional (jornadas de la Asociacion Española de Profesores de Derecho Internacional – AEPIDRI – Madrid 17, 18 Dicembre 2007)*, 2008 Iustel, p. 309 ss.

[6] Si veda, M.E. DE MAESTRI, *Commento all'articolo 189 TFUE*, in F. POCAR, M.C. BARUFFI, *Commentario breve ai trattati dell'Unione europea*[2], Padova, 2014, p. 1101 ss., 1102.

[7] Gli Stati membri UE, in fase di negoziazione del trattato di Lisbona, hanno voluto espressamente tutelarsi dalla possibilità che in tale specifico ambito di competenza concorrente con l'Unione potesse applicarsi il principio della *preemption*, previsto all'art. 2, par. 2, TFUE.

[8] Non si tratterebbe, quindi, di una competenza concorrente "preminente" ma "parallela", poiché non si hanno rapporti gerarchici o applicazioni del principio del primato, ma semmai la presenza di un mero coordinamento o una generica influenza rispetto alle politiche nazionali.

[9] A tal proposito, occorre sottolineare che l'art. 189, par. 2, TFUE, nel prevedere la base giuridica per l'adozione di programmi spaziali europei mediante atti adottati con procedura legislativa ordinaria, esclude espressamente che tali atti possano prevedere un'armonizzazione delle disposizioni legislative e regolamentari degli Stati membri.

tutte le misure atte a garantire la portata e l'efficacia del diritto UE, ossia i mezzi idonei a realizzare e non compromettere gli obiettivi previsti dal trattato, attraverso continua consultazione e collaborazione.

La materia spaziale è stata da sempre caratterizzata dalla ricerca di una base giuridica atta a legittimare l'intervento delle istituzioni UE in materia. Tuttavia, nei confronti dello spazio è stata adottata una visione ristretta e frammentaria, in un settore, invece, che è per definizione di ben più ampio respiro. Infatti, come si è accennato, lo spazio è stato sempre percepito come un settore non a sé stante ma rientrante all'interno di materie già regolamentate dall'UE[10]. È stato con un documento di lavoro del 1999 che la Commissione europea, preso atto del ruolo predominante degli Stati Uniti d'America in materia di tecnologia spaziale, ha sottolineato il forte bisogno di indipendenza dell'Europa, la quale però, ci si rese conto molto presto, come si avrà modo di trattare nel prossimo paragrafo, non poteva prescindere da solidi rapporti tra la CE/UE e l'ESA.

3. *I rapporti tra Unione europea e Agenzia Spaziale Europea (ESA)*

L'ESA, istituita nel 1975, conta 20 Stati membri[11], non tutti coincidenti con quelli dell'UE, cui si aggiungono il Canada, che prende parte ad alcuni progetti attraverso un accordo di cooperazione, nonché Estonia, Slovenia e Ungheria, membri UE ma che partecipano all'ESA in qualità di *European Cooperating States*. In sostanza, quindi, non tutti i paesi membri UE sono membri dell'ESA e viceversa.

Fino all'istituzione dell'Agenzia Spaziale Europea (ESA) nel 1975[12], la cooperazione tra Stati europei in ambito spaziale non aveva sortito risultati concreti. La stessa ESA, seppur creata con l'obiettivo di dar luogo ad una politica spaziale europea, essendo nata formalmente al di fuori delle allora Comunità europee, ha continuato a svilupparsi al di fuori del processo d'integrazione europea, anche se parallelamente[13]. Infatti, furono senza dubbio più le istituzioni dell'Unione, che non gli Stati membri dell'ESA, a spingere per l'attivazione di fattive iniziative di cooperazione nel settore spaziale. In particolare, il Parlamento europeo ha avuto un ruolo fondamentale a sostegno delle iniziative della Commissione per lo sviluppo della politica spaziale dell'UE, nello specifico condizionando l'agenda legislativa nella direzione del passaggio da una politica spaziale europea su base intergovernativa ad una politica sovranazionale dell'Unione.

Il processo di raggiungimento di una produttiva cooperazione tra UE ed ESA è stato lento e difficoltoso, in ragione dei differenti obiettivi di partenza, ossia dirigismo e politica

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[10] Le prime comunicazioni della Commissione in materia spaziale erano strettamente connesse con altre politiche europee, in particolare con le telecomunicazioni, la navigazione satellitare e l'osservazione terrestre. Si vedano, a tal riguardo, la comunicazione della Commissione del 26 luglio 1988, COM (1988) 417 definitivo; la comunicazione della Commissione del 23 settembre 1992, COM (1992) 360 definitivo; la comunicazione della Commissione del 4 dicembre 1996, COM (1996) 617 definitivo; la comunicazione della Commissione del 24 settembre 1997, COM (1997) 466 definitivo.

[11] Austria, Belgio, Danimarca, Finlandia, Francia, Germania, Grecia, Irlanda, Italia, Lussemburgo, Olanda, Norvegia, Polonia, Portogallo, Regno Unito, Repubblica ceca, Romania, Spagna, Svezia e Svizzera.

[12] L'ESA ha sostanzialmente sostituito due organizzazioni preesistenti, l'ELDO (Organizzazione europea per lo sviluppo e la costruzione dei vettori spaziali) e l'ESRO (Organizzazione europea di ricerca spaziale), entrambe istituite nel 1962.

[13] Si veda, C. ZANGHÌ, *Cooperazione spaziale europea e normativa comunitaria*, in *Riv. dir. eur.*, 1992, p. 527 ss.

del "giusto ritorno" propri dell'ESA, e liberismo, mercato aperto, libero ed in concorrenza, propri dell'UE. A partire dagli anni 90, si è manifestata a più riprese da parte delle istituzioni europee l'esigenza di rafforzare la sinergia e migliorare la complementarità tra l'allora CE e l'ESA, pur nel rispetto delle rispettive competenze[14]. È stato nel 2000 che, su invito del Consiglio, la Commissione ha elaborato, insieme all'ESA, un documento strategico che perseguiva tre obiettivi principali, imperniati: sul consolidamento delle basi delle attività spaziali, mantenendo un accesso indipendente ed economicamente sostenibile allo spazio; sull'approfondimento delle conoscenze scientifiche per una migliore comprensione del pianeta; e sui vantaggi per i mercati e la società grazie allo sfruttamento orientato alla domanda delle competenze tecniche della comunità spaziale[15]. Il consolidamento della cooperazione tra le due organizzazioni si è avuto con la risoluzione del Consiglio sulla strategia spaziale europea del 16 novembre del 2000[16], in cui la Commissione è stata invitata ad istituire, in cooperazione con l'ESA, una *task force* congiunta con il compito di approfondire la strategia spaziale europea e di formulare proposte per la sua esecuzione. Proprio in virtù della crescente collaborazione tra UE ed ESA, il direttore generale di quest'ultima decise di interrogare un gruppo di esperti indipendenti sul ruolo che la stessa potesse rivestire nell'attuazione della politica spaziale europea. Il risultato di tali lavori è contenuto nel c.d. "rapporto Bildt" del 2000, in cui si auspicava che l'ESA diventasse l'Agenzia spaziale dell'UE, con l'incarico di attuare la politica spaziale sulla base di quanto stabilito dalle istituzioni europee competenti[17]. Com'era facilmente immaginabile, probabilmente allora più di ora, i risultati del "rapporto Bildt" non suscitarono particolari entusiasmi, soprattutto in ambienti ESA. A seguito, invece, delle indicazioni fornite nel 2002 dalla *task force* Commissione-ESA, l'allora CE e l'ESA, il 25 novembre 2003, firmarono a Bruxelles un Accordo quadro[18] di cooperazione in numerosi settori di attività, al fine di raggiungere due obiettivi: lo sviluppo coerente e progressivo di una politica spaziale europea comune e la costituzione di una base comune efficiente che sostenga la mutua cooperazione tra ESA e UE, pur nel rispetto delle strutture istituzionali e operative di entrambe. Nonostante tali progressi compiuti, la cooperazione tra l'ESA e l'UE è rimasta circoscritta a singoli progetti, e sebbene fosse stato previsto anche un Consiglio misto UE-ESA[19], non si è mai avuta una netta distinzione e ripartizione di competenze tra le due organizzazioni.

Le stesse azioni fondanti la politica spaziale europea, delineate nella comunicazione della Commissione del 26 maggio 2007, sulla politica spaziale europea, erano costituite da

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[14] Si veda, la Comunicazione della Commissione europea su *l'industria aerospaziale europea: rispondere alla sfida globale*, COM (1997) 466 definitivo del 24 settembre 1997; la risoluzione del Consiglio sul *rafforzamento della sinergia fra l'Agenzia spaziale europea e la CE*, del 22 giugno 1998, in *GUCE*, Serie C 224; la risoluzione del Consiglio *sullo sviluppo di una strategia spaziale coerente*, del 2 dicembre 1999, in *GUCE*, Serie C 375.

[15] Si veda, la Comunicazione della Commissione su *l'Europa e lo spazio: comincia un nuovo capitolo*, COM (2000) 597 definitivo del 27 settembre 2000.

[16] In *GUCE*, Serie C 371

[17] In particolare, ci si riferisce ai possibili orientamenti del Consiglio europeo. Infatti, occorre ricordare che, a partire dal 2004, il Consiglio europeo aveva inaugurato delle riunioni dedicate alla discussione dei punti salienti dell'allora futura politica spaziale europea. Si veda, F. SINISCALCHI, *Commento all'articolo 189 TFUE*, in C. CURTI GIALDINO, *Codice dell'Unione europea operativo*, Napoli, 2012, p. 1451 ss.

[18] L'Accordo quadro CE/ESA, negoziato dalla Commissione, è stato successivamente approvato, a nome dell'allora Comunità, dal Consiglio con la Decisione del 29 aprile 2004 *concernente la conclusione dell'accordo quadro tra la Comunità europea e l'Agenzia spaziale europea*, in *GUUE* del 6 agosto 2004, L 261, p. 63.

[19] In particolare, l'articolo 8 dell'Accordo quadro prevede che il coordinamento e la facilitazione delle attività cooperative devono compiersi attraverso riunioni periodiche congiunte e concomitanti del Consiglio UE e del Consiglio ESA a livello ministeriale, dando vita al c.d. "Consiglio spazio".

un documento congiunto di Commissione e Direttore generale ESA[20]. Infatti, sebbene lo sviluppo di una politica spaziale fosse considerata una scelta strategica affinché l'UE assumesse un ruolo di leader globale in settori economicamente rilevanti, gli elevati costi e gli alti fattori di rischio connessi a tali attività hanno determinato un accrescimento del coordinamento delle attività e dei programmi tra UE, ESA ed i loro Stati membri. In questa prospettiva, l'accordo quadro CE/UE-ESA ha costituito una base solida per i meccanismi di coordinamento fra azioni intergovernative ed europee presenti e future.

Con l'entrata in vigore del trattato di Lisbona, il ruolo dell'ESA nell'elaborazione e nell'attuazione di una politica spaziale europea è stato riconosciuto dal già citato art. 189 TFUE, il cui par. 3 menziona la necessità per l'UE di instaurare un'attività sinergica con l'ESA. È importante notare, però, come la formulazione di tale disposizione sia piuttosto generica, visto che si limita a prevedere che: «L'Unione instaura tutti i collegamenti utili con l'Agenzia spaziale europea», lasciando così aperta la possibilità di futuri sviluppi, sia nel senso di un inserimento dell'ESA nel quadro istituzionale europeo, come agenzia spaziale dell'UE, sia anche nel senso di un'adesione dell'UE all'agenzia internazionale, senza la necessità di dover modificare i trattati dell'Unione[21].

4. *Le diverse soluzioni disponibili per i futuri rapporti tra UE ed ESA*

La crescente importanza dei programmi spaziali europei e la dipendenza dell'UE dalle competenze tecniche dell'ESA non si sono tradotte, nel corso degli anni, in un'evoluzione della *governance* spaziale a livello europeo. Nel novembre del 2012, sia la Commissione europea sia il Consiglio ESA a livello ministeriale si erano preposti di delineare possibili percorsi per le relazioni dell'UE con l'ESA al fine di portare avanti la loro efficace cooperazione.

Per quanto riguarda l'Unione, la Commissione europea, attraverso la già ricordata Comunicazione del 2012, aveva identificato cinque ostacoli strutturali nelle relazioni UE/ESA[22]. Un primo ostacolo, secondo la Commissione, sarebbe costituito dalla discordanza tra le norme finanziarie. Infatti, la gestione dei finanziamenti UE da parte dell'ESA risulta ancora abbastanza complessa, poiché l'Unione e l'ESA operano in base a norme diverse in materia che devono necessariamente coesistere. I programmi dell'ESA, nella maggior parte dei casi, sono finanziati dalle partecipazioni degli Stati membri e perseguono l'obiettivo del ritorno geografico. Le norme UE, invece, richiedono il rispetto del principio rigoroso dell'offerta economicamente più vantaggiosa, la quale si applica anche ai casi di attuazione dei programmi UE da parte dell'ESA[23]. Tali differenze normative hanno dato e

[20] Si veda, COM (2007) 212 definitivo del 26 maggio 2007. Oltre che la presente comunicazione, occorre ricordare il Libro verde della Commissione del 21 gennaio 2003, sul futuro a medio e lungo termine dell'uso dello spazio a vantaggio dell'Europa, ed il Libro bianco dell'11 novembre 2003, in cui si sottolineava che la politica spaziale europea doveva essere attuata nell'ambito di un programma spaziale pluriennale aggiornato periodicamente.

[21] Si veda, M.E. DE MAESTRI, *Commento all'articolo 189 TFUE*, cit., p. 1106.

[22] Si veda, la Comunicazione della Commissione al Consiglio e al Parlamento europeo, sull'*Istituzione di adeguate relazioni tra l'Unione europea e l'Agenzia spaziale europea*, del 14 novembre 2012, COM(2012) 671 final.

[23] A questo proposito, l'Accordo quadro CE/ESA del 2004 prevede espressamente, all'art. 5, par. 3, che: «Any financial contribution made by one Party in accordance with a specific arrangement shall be governed

danno luogo a difficoltà soprattutto quando i programmi sono finanziati attraverso partecipazioni miste dell'ESA e dell'UE, aggravando così i tempi di adozione delle decisioni, e rendendo i programmi ed il loro impatto meno efficaci.

Un secondo ostacolo sarebbe costituito dalla composizione asimmetrica delle due organizzazioni. Attualmente, infatti, sono 17 i membri dell'UE che fanno parte dell'ESA, mentre sono membri di quest'ultima anche Norvegia e Svizzera, che non fanno parte dell'UE. Inoltre, il sistema di voto prevalente nel Consiglio dell'ESA, per quanto riguarda le decisioni fondamentali come il lancio di satelliti, è l'unanimità, conferendo ai membri dell'ESA che non fanno parte dell'UE un'influenza sproporzionata su questioni che possono avere ripercussioni sull'UE. Allo stesso tempo, però, l'Unione non può imporre ai membri dell'ESA che non fanno parte della stessa Unione alcun dovere di fedeltà ai programmi UE. L'asimmetria concernente la composizione delle due organizzazioni oggi può sembrare meno problematica rispetto al primo ostacolo, tuttavia, maggiori questioni sembrano porsi per il futuro, nella misura in cui la collaborazione tra l'UE e l'ESA andrà intensificandosi.

Tale problema riguardante la composizione è direttamente collegato al terzo ostacolo strutturale, consistente in evidenti asimmetrie in materia di sicurezza e difesa. Il trattato di Lisbona, con l'istituzione del Servizio europeo per l'azione esterna[24], ha potenziato la competenza dell'UE in materia di sicurezza e di difesa. Le infrastrutture spaziali sono spesso utilizzate per scopi civili e di difesa. L'Unione, per contribuire agli obiettivi della politica di sicurezza e di difesa comune, dovrà intensificare e rafforzare i legami e le sinergie tra la dimensione civile e quella della difesa nel settore spaziale, e la collaborazione tra gli Stati membri e l'ESA è essenziale a questo fine. Tuttavia, le relazioni tra l'UE e l'ESA sono complicate dal fatto che quest'ultima conta tra i suoi membri Stati che non fanno parte dell'UE, rappresentando ciò un problema evidente sia in termini generali, come si è già avuto modo di vedere, sia in termini più specifici, quando si tratta di problematiche ben più gravi legate alla sicurezza e della difesa. In particolare, la potenziale vendita di tecnologie sensibili a paesi terzi potrebbe porre dei problemi strategici di sicurezza per l'UE.

Il quarto ostacolo strutturale è costituito dall'assenza di meccanismi di coordinamento delle politiche. Infatti, le attività spaziali dell'ESA non dispongono di meccanismi strutturali che assicurino un costante collegamento e coordinamento con l'elaborazione delle più generali politiche dell'UE. Lo stesso accordo quadro UE/ESA del 2003, nonostante la sua ampia portata, non prevede specifici meccanismi al riguardo. Alcune forme di coordinamento e cooperazione sono concordate nel corso di negoziati a livello di singoli programmi, non esistendo quindi un meccanismo formale a livello politico che garantisca la coerenza delle iniziative intraprese dall'ESA con le politiche dell'Unione.

Infine, il quinto ostacolo strutturale nelle relazioni UE/ESA è costituito dall'assenza di responsabilità politica e finanziaria dell'ESA e la conseguente asimmetria con l'UE a tal riguardo. Infatti, l'ESA, in quanto agenzia europea a carattere internazionale, non ha alcun legame formale con il Parlamento europeo, privandola quindi del rapporto diretto con i cittadini di cui beneficia ogni politica dell'UE. La Commissione europea, infatti, ai sensi dell'art. 317, del TFUE, dà esecuzione al bilancio ed è responsabile dinanzi al Parlamento

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by the financial provisions applicable to that Party. Under no circumstances shall the European Community be bound to apply the rule of "geographical distribution" contained in the ESA Convention.»

[24] L'art. 27, par. 3, del TUE, prevede che l'Alto rappresentante dell'Unione per gli affari esteri e la politica di sicurezza, nell'esecuzione delle sue funzioni, si avvale di un servizio europeo per l'azione esterna, che lavora in collaborazione con i servizi diplomatici degli Stati membri.

europeo ed al Consiglio per ogni ritardo accumulato nell'applicazione dei programmi UE. La responsabilità in capo alla sola Commissione riduce però allo stesso tempo l'incentivo per l'ESA di portare a termine i programmi, soprattutto quelli co-finanziati, entro i tempi ed i costi preventivati.

Fin dalla ricordata comunicazione del 2012, la Commissione europea auspicava che, in stretta collaborazione con l'ESA, si sarebbe potuto provvedere a presentare agli Stati membri una serie di opzioni possibili per ravvicinare gli evidenziati ostacoli strutturali. Tali possibili opzioni consisterebbero nel considerare di migliorare la cooperazione tra l'UE e l'ESA nell'ambito dello *status quo*, di porre l'ESA sotto l'autorità dell'UE in qualità di organizzazione intergovernativa (seguendo il modello dell'Agenzia europea per la difesa), o di trasformare l'ESA in un'agenzia dell'UE (secondo il modello delle attuali agenzie di regolamentazione o decentrate).

L'analisi delle possibili opzioni evidenziate dalla Commissione europea, tuttavia, non può non prendere l'avvio dalla posizione base, ossia il permanere dello *status quo*[25]. Una tale opzione manterrebbe immutate le relazioni tra UE e ESA, riconducendole all'accordo quadro del 2004. Le due organizzazioni rimarrebbero due entità separate senza meccanismi efficienti che possano assicurare una maggior coerenza e coordinamento tra loro. L'Unione continuerebbe a finanziare, o a co-finanziare con l'ESA, alcuni programmi spaziali la cui esecuzione però verrebbe delegata all'ESA. Tali programmi saranno sviluppati in base a specifici accordi negoziati *ad hoc*, i cui obiettivi sono determinati seguendo i quadri istituzionali UE ed ESA rispettivamente.

La seconda opzione consisterebbe nel migliorare la cooperazione tra UE ed ESA nell'ambito dello *status quo*. Così facendo, le due organizzazioni rimarrebbero due entità separate sebbene l'interfaccia e i rapporti tra loro sarebbero adattati da alcuni emendamenti all'esistente accordo quadro UE/ESA del 2004 e da un miglioramento degli accordi delegati. Gli obiettivi politici e delle missioni sarebbero determinati congiuntamente da UE ed ESA, insieme al loro coordinamento, assicurato da un nuovo accordo quadro. Quest'ultimo sarebbe adottato dal Consiglio dell'ESA e dal Consiglio UE, con l'approvazione del Parlamento europeo. Per l'esecuzione dei programmi, il nuovo accordo quadro disporrebbe nuovi meccanismi di coordinamento in cui l'ESA continuerebbe a sviluppare internamente le capacità di gestire le differenze tra i due regimi finanziari, lavorando ad un progressivo allineamento dei sistemi di contabilità e delle procedure interne di controllo e di audit a quelle corrispondenti dell'UE.

La terza opzione consisterebbe nello stabilire una struttura programmatica dedicata esclusivamente alla gestione dei programmi UE, creando un c.d. "pilastro UE"[26]. Nel definire una tale opzione è necessario adottare un approccio piuttosto pragmatico, che prenda l'avvio dalle problematiche che intende risolvere per esaminare gli strumenti giuridici ne-

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[25] In realtà, vi sarebbe un'ulteriore opzione che non è stata presa in considerazione dalla Commissione europea, in cui l'UE diverrebbe un membro dell'ESA allo stesso modo in cui l'Unione è un membro dell'Organizzazione mondiale del commercio. Una tale opzione è chiaramente supportata da coloro che ritengono che l'ESA debba rimanere la pietra angolare della politica spaziale europea, sebbene sembri irrealistico secondo molti osservatori del sistema politico UE. Si veda, S. HOBE, *Prospects for a European Space Administration*, in *Sp. Pol.*, 2004, p. 26 ss.

[26] La Commissione europea non fa riferimento ad una definizione preesistente di "pilastro UE"/ESA, sebbene in alcune comunicazioni rivolte al Parlamento europeo ha affermato che tale pilastro costituirebbe un passo in avanti verso una maggiore efficienza operativa, una maggiore simmetria in materia di difesa e sicurezza, coordinamento e responsabilità politiche, creando un ambiente e delle condizioni sempre più vicine a quelle previste dall'ordinamento UE.

cessari a definirne i contorni. A questo riguardo, si ritiene essenziale che il "pilastro UE" sia concepito per operare nel rispetto delle norme dell'Unione. Una tale costruzione permetterebbe di risolvere la problematica della discordanza tra le norme finanziarie dell'Unione e dell'ESA. Conseguentemente, agire all'interno di un "pilastro UE", quindi all'interno di un ambiente simile a quello UE, non farebbe sorgere le eventuali problematiche legate alla composizione asimmetrica delle due organizzazioni. Infatti, il c.d. "pilastro UE" sarebbe ospitato all'interno dell'ESA, anche sotto il profilo logistico, condividendo alcuni servizi comuni al "pilastro UE" e all'intergovernativa ESA. La creazione di un "pilastro UE" all'interno dell'ESA non produrrebbe alcun effetto sull'attuale funzionamento dei dipartimenti rimanenti dell'ESA intergovernativa. Una tale opzione necessiterebbe di un'analisi più approfondita degli aspetti giuridici e istituzionali, in particolare con riguardo alla responsabilità politica. L'approccio pragmatico cui si è fatto riferimento dovrebbe operare nel pieno rispetto delle norme finanziarie applicabili ed in particolare dei principi di bilancio previsti nel regolamento finanziario[27].

La quarta opzione consisterebbe invece nel trasformare l'ESA in un'agenzia dell'Unione, mantenendo però allo stesso tempo alcuni dei caratteri intergovernativi dell'ESA, come programmi opzionali differenti da quelli UE finanziati direttamente dagli Stati membri al di fuori del bilancio dell'Unione. Tale agenzia avrebbe così una base giuridica nel diritto UE e opererebbe ai sensi di quest'ultimo ordinamento giuridico.

Le quattro opzioni avanzate dalla Commissione europea ai fini della risoluzione dei limiti strutturali nelle attuali relazioni tra UE ed ESA presentano differenti criticità legate all'efficacia ed ai costi associati alla loro applicazione; laddove per efficacia si intende l'idoneità delle singole opzioni ad affrontare e risolvere le problematiche strutturali e le inefficienze operative attualmente presenti, nonché i risparmi generati in termini di spese per il personale e di impatto sui tempi di adozione delle decisioni, mentre per costi si intendono quelli associati alla facilità e celerità di applicazione degli adeguamenti giuridici necessari. In base a tali criticità, è possibile procedere ad una classificazione delle differenti opzioni descritte.

In termini di idoneità a risolvere gli evidenziati limiti strutturali da parte delle differenti opzioni, è abbastanza chiaro che la prima costituisca la soluzione meno efficace. Infatti, il mantenimento dello *status quo* perpetrerebbe le attuali inefficienze alla base delle proposte di riforma dei rapporti tra UE ed ESA. La seconda opzione risolverebbe solo in parte le attuali problematiche rinviando la loro soluzione ad un momento successivo attraverso un progressivo allineamento dei due sistemi mediante degli emendamenti all'esistente accordo quadro del 2004. Sono indubbiamente le opzioni tre e quattro che risolvono in gran parte gli attuali limiti strutturali nei rapporti tra UE ed ESA, con la quarta opzione che li risolverebbe completamente. Infatti, sia la previsione di un "pilastro UE" all'interno dell'ESA, sia, *a fortiori*, la trasformazione dell'ESA in un'agenzia UE a tutti gli effetti risolverebbero quasi del tutto gli ostacoli strutturali citati.

L'analisi delle differenti opzioni in base agli specifici ostacoli strutturali evidenziati, induce a ritenere che la discordanza tra le norme finanziarie risulterebbe quasi interamente risolta con le opzioni tre e quattro, mentre l'opzione due allevierebbe solamente tale disallineamento, subordinandolo pur sempre a future riforme degli attuali rapporti. Allo stesso modo, le due asimmetrie riscontrate, con riguardo alla composizione delle due organizza-

[27] Regolamento n. 966/2012 del Parlamento europeo e del Consiglio del 26 ottobre 2012 *sulle norme finanziarie applicabili al bilancio generale dell'Unione*, in *GUUE* L 298.

zioni e in materia di sicurezza e difesa, sono quasi totalmente risolte sia nel caso in cui l'ESA si trasformi in un'agenzia UE sia nel caso in cui si crei un "pilastro UE" all'interno dell'ESA, mentre le auspicate maggiori sinergie e cooperazioni all'interno dello *status quo* della seconda opzione risolverebbero solo parzialmente gli specifici ostacoli strutturali in questione. Per quanto concerne l'assenza di meccanismi di coordinamento delle politiche, questa risulterebbe del tutto colmata dalla quarta opzione e solo in gran parte dalle opzioni tre e due. Infatti, il coordinamento politico e l'allineamento degli obiettivi di politica industriale cresceranno con il ravvicinamento tra ESA e UE, mentre i meccanismi decisionali rimarranno problematici a meno che l'ESA non si trasformi un'agenzia dell'Unione.

Con riguardo agli adeguamenti giuridici necessari all'applicazione delle diverse opzioni prospettate, eccezion fatta per la prima che non necessiterebbe di alcun adeguamento, la seconda opzione sembrerebbe essere relativamente di semplice applicazione, visto che richiederebbe dei meri emendamenti all'attuale accordo quadro UE/ESA del 2004 o la conclusione di un nuovo accordo quadro. La terza opzione, secondo quanto affermato dalla stessa Commissione europea[28], necessiterebbe dell'adozione di un atto legislativo UE che contenga, da una parte, la disciplina delle funzioni assegnate al "pilastro UE", la sua struttura, i requisiti finanziari soggetti ad una dettagliata analisi quantitativa costi-benefici ed una valutazione delle complesse implicazioni istituzionali e giuridiche dell'opzione in questione e, dall'altra, possibilmente le modifiche necessarie al quadro giuridico dell'ESA. La quarta opzione sembrerebbe presentare maggiori difficoltà sotto il profilo degli adeguamenti giuridici. In tale ipotesi, infatti, l'ESA cesserebbe di esistere come organizzazione intergovernativa e si renderebbe necessaria la creazione di un'agenzia UE, con la conseguente adozione delle rilevanti normative in materia di personale ed in materia finanziaria, ivi comprese possibili normative transitorie. Proprio in funzione delle non semplici procedure di esecuzione e di un altrettanto difficile consenso politico da raggiungere nel prossimo futuro, l'opzione in questione è da considerarsi la meno percorribile dal punto di vista della sua fattibilità.

Le stesse posizioni appena descritte erano peraltro già state espresse nel *report* dell'ESA sullo *status* delle relazioni ESA/UE presentato al Consiglio ESA del dicembre 2013, in cui venivano descritti quali scenari evolutivi più promettenti quelli concernenti un *"Improved Status quo"* e quello riguardante una *"EU Chamber"*, non molto dissimili, quindi, dalle opzioni 2 e 3 già accennate e presenti nel più volte citato *report* della Commissione del febbraio 2014, con cui la stessa Commissione dava seguito alla Comunicazione del novembre 2012 sull'istituzione di adeguate relazioni tra l'UE e l'ESA.

Nonostante tali buone intenzioni, però, lo stesso Consiglio ESA riunitosi a livello ministeriale a Lussemburgo il 2 dicembre 2014, ha adottato, *inter alia*, una risoluzione sull'evoluzione dell'agenzia, il cui capitolo V, sull'evoluzione delle relazioni tra ESA e Unione europea, ha riconosciuto ed ha preso atto della volontà degli Stati membri dell'ESA di mantenere lo *status* dell'ESA quale organizzazione spaziale indipendente ed intergovernativa, che eserciti il proprio ruolo nel quadro dell'applicazione dei programmi decisi e finanziati dagli Stati membri e condotti per loro conto. Allo stesso tempo, il Consiglio ESA ha riconosciuto i benefici di una *partnership* duratura e proficua tra la stessa agenzia e l'UE nella definizione ed applicazione congiunta della politica spaziale europea, insieme ai rispettivi Stati membri, attraverso un approccio dinamico e graduale fedele all'accordo quadro del

[28] Si veda, *Report from the Commission*, *Progress report on establishing appropriate relations between the European Union and the European Space Agency (ESA)*, del 6 febbraio 2014, COM(2014) 56 final, p. 7.

2004. Nella stessa risoluzione del 2014, il Consiglio ESA ha anche espresso la necessità di rinnovare la *partnership* affidabile e sostenibile tra l'ESA e l'UE affinché possa facilitarsi l'applicazione e l'evoluzione della politica spaziale congiuntamente elaborata.

La risoluzione del Consiglio ESA riunitosi a livello ministeriale a Lucerna l'1 ed il 2 dicembre 2016 non è stata di tono diverso. Infatti, ancora una volta, il Consiglio ESA ha auspicato un rafforzamento della cooperazione tra ESA e UE, ma pur sempre ai sensi dell'accordo quadro del 2004, al fine di raggiungere obiettivi comuni e programmi a beneficio dei cittadini europei, sottolineando l'importanza di stabilire accordi per una cooperazione sostenibile e reciprocamente benefica che tenga conto, però, delle differenze tra l'ESA e l'Unione europea.

5. *Considerazioni conclusive*

In considerazione delle diverse ipotesi avanzate dal *report* della Commissione europea del 2014 e delle persistenti resistenze dell'ESA e dei suoi Stati membri nei confronti di una convergenza totale della politica spaziale europea all'interno dell'UE, la soluzione compromissoria maggiormente percorribile in termini di efficacia e facilità di applicazione, per lo sviluppo delle relazioni tra UE ed ESA, è costituita dalla creazione di un'entità dedicata all'interno dell'ESA. Il vantaggio di tale opzione è quello di preservare la struttura intergovernativa dell'ESA, fortemente sostenuta dal Consiglio dell'agenzia, creando allo stesso tempo un quadro adeguato che gestisca le risorse finanziarie messe a disposizione dall'Unione.

La soluzione compromissoria presente nel *report* della Commissione europea del 2014, ragionevolmente caldeggiata anche nel presente scritto, tuttavia, non è molto distante dalla proposta avanzata dal Ministro della politica scientifica del Regno del Belgio, Paul Magnette, in occasione del Consiglio ESA riunitosi a livello ministeriale a Napoli il 20 e 21 novembre 2012. Secondo il governo belga, infatti, il futuro rafforzamento delle sinergie tra UE ed ESA dovrebbe fondarsi sulla coerenza e la complementarità delle operazioni tra le due entità. Un tale disegno consterebbe di due fasi temporali, una prima, di breve periodo, dovrebbe far sì che l'ESA costituisca l'Agenzia spaziale per l'Unione europea, in cui l'ESA sarebbe la sola agenzia europea per la ricerca e lo sviluppo, per la tecnologia e lo sviluppo dei sistemi spaziali, mettendo le sue competenze e le sue infrastrutture al servizio dell'UE e delle sue politiche. Una seconda fase, di medio periodo (secondo il governo belga a partire dal primo gennaio 2021), dovrebbe prevedere che l'ESA divenisse l'Agenzia spaziale dell'Unione europea, attraverso un modello di agenzia UE *sui generis*, che le permettesse di continuare a lavorare con tutti gli attuali Stati membri dell'ESA, preservandone la cultura e le caratteristiche che ne hanno sancito il successo in questi anni, a partire da quelle disposizioni che promuovono investimenti, da parte dei suoi Stati membri, nella ricerca e nello sviluppo, nella tecnologia e lo sviluppo di infrastrutture spaziali. In buona sostanza, quindi, la proposta del governo belga del 2012 non prevedeva la trasformazione dell'ESA né in una direzione generale della Commissione né in un'agenzia decentrata dell'UE. L'applicazione di tale proposta, dal punto di vista dell'UE, implicherebbe l'adozione di misure necessarie affinché l'ESA costituisca in via sistematica l'agenzia per lo sviluppo e l'applicazione dei programmi spaziali operativi dell'Unione. A livello ESA, invece, bisognerebbe individuare dei modi di gestione e di controllo appropriati per i programmi delegati dall'UE, creando concretamente, all'interno

dell'ESA, accanto alle attività obbligatorie e ai programmi opzionali, una terza categoria di programmi attraverso un insieme di disposizioni armonizzate che permettano di condurre tali programmi conformemente alle regole attualmente vigenti nell'UE.

Nonostante i continui auspici nei confronti di una convergenza strutturale delle relazioni tra UE ed ESA, in verità recentemente neanche così tanto frequenti come nel passato, il percorso verso una tale realizzazione sembra piuttosto tortuoso. L'ESA, e soprattutto i suoi Stati membri, difficilmente saranno disposti a rinunciare, come hanno già espresso più volte, alla loro sovranità a vantaggio dell'Unione europea. Peraltro, come si è avuto modo di evidenziare, anche gli Stati membri UE non hanno riconosciuto una competenza piena all'Unione in materia di politiche spaziali, assegnandole una competenza concorrente *sui generis*, parallela e simmetrica a quella degli Stati membri.

L'unica soluzione realistica per le future relazioni istituzionali tra UE ed ESA, a fronte comunque delle continue iniziative e strategie comuni per lo sviluppo operativo di una politica spaziale europea integrata sembra così essere quella compromissoria indicata come terza opzione nel report della Commissione europea del 2014, che prevede la creazione di un "pilastro UE" all'interno dell'ESA; non molto dissimile, peraltro dalla proposta avanzata dal ministro belga Magnette qualche anno prima.

ABSTRACT: *Which Future relationship between the European Union and the European Space Agency (ESA)?*

In the last ten years or so, the European Union has taken an increasing role in space matters. Such role has been characterised by a closer relation with the European Space Agency (ESA) and its member states, the other two main actors of European space policy. The consolidation of an increasingly close relationship with ESA will ensure further developments in burden-sharing between the latter and the EU. EU Space programmes, and its dependence from ESA's technical skills, have nevertheless not turned into a definitive evolution of European space governance. Following the entry into force of the Lisbon Treaty, Art. 189 TFEU expressly provides that the Union establishes all the important connections with the ESA in order to carry out their efficient cooperation. Notwithstanding the introduction of such legal basis, the present contribution shows how there is nevetherless a substantial lack of political will, most importantly from ESA's member states and ESA itself, towards the creation of a single European entity, responsible for space policy in the continent, under the umbrella of the EU.

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A SPACE STRATEGY FOR EUROPE

SUMMARY: 1. Introduction. – 2. The European Space Policy in the Lisbon Treaty. – 3. The communication *Towards a Space Strategy for the European Union that Benefits its Citizens* (2011). – 4. The communication *Space Strategy for Europe* (2016). – 5. Conclusion.

1. *Introduction*

Space activities have been successfully developed over 40 years in Europe in the framework of the European Space Agency (hereinafter ESA)[1]. The mission of this European International Organization is «to shape the development of Europe's space capability and ensure that investment in space continues to deliver benefits to the citizens of Europe and the world»[2].

In the case of the European Union (hereinafter EU), is it a European Organization for the space? Before 2007, this question would have a negative answer as the European Communities Treaties did not have a specific legal basis for space. Nevertheless, some actions and decisions were adopted with references to other articles of the European Community Treaty related (industry, transport, research and technological development…)[3]. The EU could have this competence conferred on it by the 2004 Constitutional Treaty, however it did not come into force. At last, the 2007 Lisbon Treaty

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1 Convention for the establishment of a European Space Agency (CSE/CS (73) 19, rev. 7), opened for signature by the Member States of the European Space Conference, from 30 May until 31 December 1975. To date, ESA has 22 Member States: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, The Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland and the United Kingdom. Slovenia is an Associate Member. Canada takes part in some projects under a cooperation agreement. Other States (Bulgaria, Cyprus, Malta, Latvia, Lithuania and Slovakia) have cooperation agreements with ESA. Finally, discussions are under way with Croatia.

2 http://m.esa.int/About_Us/Welcome_to_ESA.

3 For instance, the initial set up of the Galileo Programme since 1999 (http://ec.europa.eu/growth/sectors/space/galileo/documents_en).

creates a legal basis enabling the EU to conduct a European Space Policy[4].

2. *The European Space Policy in the Lisbon Treaty*

After the Lisbon Treaty, art. 4, paras. 1 and 3, of the Treaty on the Functioning of the European Union (hereinafter TFEU)[5] provides as follows: «1. The Union shall share competence with the Member States where the Treaties confer on it a competence which does not relate to the areas referred to in Articles 3 and 6. [...]. 3. In the areas of research, technological development and space, the Union shall have competence to carry out activities, in particular to define and implement programmes; however, the exercise of that competence shall not result in Member States being prevented from exercising theirs. [...].»

Furthermore, the Lisbon Treaty gives to the EU an explicit legal basis to act in the field of a new European policy entitled the European Space Policy (hereinafter ESP) in the art. 189, paras. 1, 2 and 3, TFEU. It reads as follows: «1. To promote scientific and technical progress, industrial competitiveness and the implementation of its policies, the Union shall draw up a European space policy. To this end, it may promote joint initiatives, support research and technological development and coordinate the efforts needed for the exploration and exploitation of space. 2. To contribute to attaining the objectives referred to in paragraph 1, the European Parliament and the Council, acting in accordance with the ordinary legislative procedure, shall establish the necessary measures, which may take the form of a European space programme, excluding any harmonisation of the laws and regulations of the Member States. 3. The Union shall establish any appropriate relations with the European Space Agency. [...]»

So, this new competence is characterized by several elements: *a*) The ESP is not as an independent competence: the ESP is included in the TFEU in its Part III, Title XIX, entitled «Research and Technological Development and Space». It seems reasonable because both policies are "special" shared competences, according to art. 4, par. 3, TFEU; they share the same objective (the scientific and technological progress)[6]; and they have some common content according to the literal texts of arts. 179 and 189 TFEU, space-related documents COM, the Framework Agreement between the European Community and the European Space Agency […][7]. *b*) The ESP is a "pure" shared competence protected from the application of the principle of pre-emption: in the area of space, the EU has competence to carry out activities, in particular to define and implement programmes, however, the exercise of that competence shall not result in Member States being prevented from exercising theirs (art. 4, par. 3, TFEU). However, it should be taken into account that the principles of EU Law, primacy and sincere cooperation, could open the door to the possible application of the "*preemption"* doctrine, if a Member State adopts

[4] Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community, signed at Lisbon, 13 December 2007, OJ C 306, of 17.12.2007 and entered into force on 1 December 2009.

[5] Consolidated version of the TFEU, OJ C 202, of 7.6.2016.

[6] There was also a reference to the space exploration as an objective of the EU in the *travaux préparatoires* of the aborted Constitutional Treaty; afterwards it was deleted. See, M.C. MUÑOZ-RODRÍGUEZ, *El Tratado de Lisboa: la acentuación de los límites estatales a la política espacial europea*, in J. MARTÍN Y PÉREZ DE NANCLARES (Coord.), *El Tratado de Lisboa. La salida de la crisis constitucional*, IUSTEL & AEPDIRI, 2008, p. 312 ss.

[7] See *infra*.

measures putting at risk the uniform application of the acts adopted by the EU in the area concerned[8]. *c*) The ESP is a "pure" shared competence with an extra element**:** the ESP includes the envisaged limit for the «supporting, coordinating or supplementing competences» in the art. 6 TFEU: «… the European Parliament and the Council, …, shall establish the necessary measures, …, excluding any harmonisation of the laws and regulations of the Member States» (art. 189, par. 2, TFEU).

Concerning the content of the ESP, art. 189, par. 1, TFEU only refers to the scientific and technical progress, industrial competitiveness and the implementation of the EU policies as the general objectives of the ESP; furthermore, it refers to promote joint initiatives, to support research and technological development and to coordinate the efforts needed for the exploration and exploitation of space as the general instruments to carry out the ESP.

Consequently, it is necessary to take account other documents in order to know and to understand the content of the ESP. Some of these documents are issued before the Lisbon Treaty, for instance, the documents COM (2005) 208[9], COM (2007) 212[10], the 2003 Framework Agreement between the European Community and the European Space Agency[11] and the orientations of the "Space Council"[12]. The rest of the documents are issued after the Lisbon Treaty, for instance, the documents COM (2011) 152[13] and COM (2016) 705[14], analysed *infra*, or the documents related to the relations between the European Union and the European Space Agency[15].

3. *The communication* Towards a Space Strategy for the European Union that Benefits its Citizens *(2011)*

The document COM (2011) 152 sets out four key objectives: to promote technological and scientific progress; to foster innovation and industrial competitiveness; to ensure that European citizens fully benefit from European space applications; and to

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[8] K. LENAERTS, P. VAN NUFFEL, *Constitutional Law of the European Union*, 2nd ed., London, 2005, p. 99 s.

[9] Communication from the Commission to the Council and the European Parliament of 23 May 2005, *European Space Policy-Preliminary elements*, COM (2005) 208.

[10] Communication from the Commission to the Council and the European Parliament of 26 April 2007, *European Space Policy*, COM (2007) 212.

[11] The Agreement was signed on 25 November 2003, it came into force on 28 May 2004 (OJ L 261, of 6 August 2004). It was renewed in 2008 and in 2012.

[12] The Space Council was established in order to coordinate and facilitate cooperative activities between the European Community and the European Space Agency through their 2003/2004 Framework Agreement. The orientations are decided in the joint and concomitant meetings of the Council of the EU and the Council of ESA, at ministerial level.

[13] Communication from the Commission to the Council, the European Parliament, the European Economic and Social Council Committee and the Committee of the Regions of 4 April 2011, *Towards a Space Strategy for the European Union that benefits its citizens*, COM (2011) 152.

[14] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Council Committee and the Committee of the Regions of 26 October 2016, *Space Strategy for Europe*, COM (2016) 705.

[15] Communication from the Commission to the Council and the European Parliament of 14 November 2012, *Establishing appropriate relations between the European Union and the European Space Agency*, COM (2012) 671, and COM (2014) 56, of 6 February 2014 -*Progress Report*-.

strengthen Europe's role in space at an international level[16].

In addition, it designs four priorities actions to put those objectives into practice[17]: the Galileo and EGNOS Programmes (satellite navigation); the GMES Programme (environment and climate change); the Security and Defence Objectives (secure space); and the space exploration.

The Communication also considers other dimensions: the space as an integral part of the *Europe 2020 Strategy*[18], as the space industry (manufacture, launching and operating, application and services) is a driving force for growth and innovation (generating highly qualified jobs and market opportunities for innovative products and services far beyond the space sector)[19]; the international dimension of the European Union's Space Policy[20], as space endeavours are no longer a matter for individual nations alone and in many cases can only be efficiently achieved by pooling technological and financial capacities; the necessity of a well-structured governance[21], because the EU's increasing involvement in Europe's space policy goes hand in hand with the different protagonists in this area (Member States and ESA); and the adoption of a European Space Programme[22].

4. *The communication* Space Strategy for Europe *(2016)*

As the overall international space context is changing fast, the Commission decides to propose a new space strategy for Europe[23]. The preparation of this strategy includes a comprehensive stakeholders' consultation process from April to July 2016[24].

The European space industry welcomes the revision of the 2011 European Commission's strategic guidelines, due to the global changing context where «the competitiveness of the European space industry, widely recognized, is challenged at the international level with the emergence of disruptive new players and new forms of industrial organization»[25]. Its position paper stresses «the importance of a European independent, reliable, safe and cost-effective capacity to conceive, develop, launch, operate and exploit space systems»[26]; it highlights «how the EU Space Policy shall be conceived as a key tool enabling economic growth and job creation in Europe, fostering its innovation potential, supporting scientific progress and responding to public policies»[27]; and it calls for «further synergies to be developed between space and other EU public policies – in particular security, environment and digital policies – considered to be promising areas of

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[16] Doc. COM (2011) 152, p. 3.
[17] Doc. COM (2011) 152, p. 3 ss.
[18] Doc. COM (2011) 152, p. 8 s.
[19] Under article 189, paragraph 1, TFEU, the EU «shall draw up a European Space Policy» with a view to promoting, *inter alia*, industrial competitiveness in Europe.
[20] Doc. COM (2011) 152, p. 9 s.
[21] Doc. COM (2011) 152, p. 10 ss.
[22] Doc. COM (2011) 152, p. 12.
[23] The Commission makes the announcement in its *Work Programme 2016* in November 2015.
[24] The Synopsis Report is available at: http://ec.europa.eu/growth/tools-databases/newsroom/cf/itemdetail.cfm?item_id=8975&lang=en.
[25] Doc. *A Space Strategy for Europe. Contribution of the European space industry*, ASD-Eurospace, Position Paper, 2016, p. 2.
[26] *Ibid.* p. 2.
[27] *Ibid.* p. 2.

policy development in the long-run»[28].

Finally, in October 2016, the Commission presents the Communication about a new Space Strategy for Europe focused on four strategic goals[29]: to maximise the benefits of space for society and the European Union Economy; to foster a globally competitive and innovative European Space Sector; to reinforce Europe's autonomy in accessing and using space in a secure and safe environment; and to strengthen Europe's role as a global actor and promoting cooperation.

Regarding the first goal[30], the 2016 Commission Communication aims to encourage the uptake of space services & data, to advance the EU space programmes and to meet new user needs[31]. In order to encourage the uptake of space services & data, the Commission proposes several measures:

- To promote the uptake of Copernicus, EGNOS & Galileo solutions in EU policies, where justified and beneficial (including measures to introduce the use of Galileo for mobile phones).
- To facilitate the use of Copernicus data & information by strengthening data dissemination and setting up platform services, promoting interfaces with non-space data & services.
- To stimulate the development of space applications with a greater involvement of new actors from different domains.
- Together with Member States & industry, to promote the efficient and demand-driven use of satellite communications, so as to foster ubiquitous connectivity in all Member States[32].

In order to advance the EU space programmes and meeting new user needs, the Commission proposes the following measures:

- To remain committed to the stability of the EU space programs and prepare the new generations, on a user-driven bases; to continue delivering state-of-the-art services (to explore alternative business models and to take account of technological progress).
- To address emerging needs related, in particular, with climate change/sustainable development & security and defence[33].

Concerning the second goal[34], the 2016 Commission Communication proposes to support research and innovation and development skills (measures: to step up its efforts to support space Research & Development activities, in cooperation with Member States and ESA and to review its strategic approach to boosting the competitiveness of the European Space Sector...)[35]; and to foster entrepreneurship and new business opportunities (measures: to step up support to space entrepreneurs through EU funding programmes to facilitate further financing of investments in the space sector, to engage in a dialogue with the European Investment Bank and European Investment Fund on the support of the investment in the space sector as part of the overall Investment Plan for Europe and to

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[28] *Ibid.* p. 2.
[29] Doc. COM (2016) 705, p. 3.
[30] Doc. COM (2016) 705, p. 3.
[31] Doc. COM (2016) 705, p. 3.
[32] Doc. COM (2016) 705, p. 4.
[33] Doc. COM (2016) 705, p. 5.
[34] Doc. COM (2016) 705, p. 5 s.
[35] Doc. COM (2016) 705, p. 7.

support space start-ups…)[36].

Regarding the third goal[37], the 2016 Commission Communication proposes: to maintain Europe's autonomous access to space (measures: to aggregate demand for launch services to provide visibility to industry and reduce implementation costs, to support research & innovation efforts, to consider ways to support European launch infrastructure facilities and to encourage the development of commercial markets for new space activities)[38]; to ensure access to radio frequency spectrum[39]; to ensure the protection and resilience of critical Europe space infrastructure (measures: to enhance the current EU SST services and consider comprehensive space situational awareness services – space weather, cyber alerts... – and to establish partnerships, particularly with the US...)[40]; and to reinforce the synergies between civil & security's space activities (measures: to propose a Govsatcom initiative to ensure reliable, secured and cost-effective satellite communication services for EU and national public authorities and infrastructure and to strengthen security requirements when developing EU space systems)[41].

Concerning the fourth and last goal[42], the 2016 Commission Communication outlines that Europe's efforts to meet the three strategic goals above will be undermined unless the EU achieves a fourth goal: taking a much stronger role on the world stage. According to that, the Communication proposes different measures: to pursue space dialogues with strategic international partners; to ensure that space policy is duly taken into account in EU export control dialogues with third countries; to use economic diplomacy and trade policy instruments to assist European companies active in global markets and to address societal challenges; and to foster the EU's contribution to international initiatives such as the Group on Earth Observation and CEOS[43]. Furthermore, the Commission, together with the other EU Institutions and Member States, will engage with international partners to promote responsible behaviour in outer space and preserve and protect the space environment for peaceful use by all nations[44].

The EU and the ESA also present a joint statement on a shared vision signed on 26 October 2016 that stressed the need to foster the fruitful existing collaboration between the EU and the ESA[45].

The EU Competitiveness Council meeting[46] takes place on 28-20 November 2016[47].

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[36] Doc. COM (2016) 705, p. 8.
[37] Doc. COM (2016) 705, p. 8.
[38] Doc. COM (2016) 705, p. 9.
[39] Doc. COM (2016) 705, p. 9.
[40] Doc. COM (2016) 705, p. 10.
[41] Doc. COM (2016) 705, p. 10.
[42] Doc. COM (2016) 705, p. 11.
[43] Doc. COM (2016) 705, p. 12.
[44] Doc. COM (2016) 705, p. 12. As the increased human activity in space and the rapid growth of new entrants is testing the UN Conventions on outer space to the limit, including on issues of space traffic management, mining, space debris..., the EU should lead the way in addressing these challenges in line with the UN Conventions related to space (doc. COM (2016) 705, p. 11).
[45]http://m.esa.int/About_Us/Welcome_to_ESA/Joint_statement_on_shared_vision_and_goals_for_the_future_of_Europe_in_space_by_the_EU_and_ESA.
[46] Internal Market, Industry, Research and Space.
[47] Previously, the Slovak Presidency invites the Council (Competitiveness – Space part) on 29 November 2016 to address two questions: «1) To what extent the actions and measures proposed by the Commission in its space strategy for Europe are appropriate to foster the European space economy and to ensure that the benefits of the EU space activities and EU flagship programs, Galileo and Copernicus, and the data they are

The Ministers responsible for space policy welcomes the 2016 European Space Strategy for the coming years and supported its overarching objectives[48]. The Presidency of the Council prepares a Resolution on Space Strategy for Europe for 2017[49].

The EU European Economic and Social Committee welcomes the 2016 European Space Strategy and endorses the proposed guidelines[50]. The EESC encourages the Commission to continue on this path and to set its sights on even more ambitious horizons; it emphasizes that space activities are nowadays part of everyday life of European citizens; it focuses on the crucial role of SMEs as well as on the education and public awareness raising as far as space activities are concerned; it highlights that the data usage should be more ambitious; and it stresses that the mobilization of additional financial resources for new investments as well as the active involvement of all Member States is essential for the success of the Space Strategy.

The European Parliament[51] and the EU Committee of Regions[52] are currently preparing its opinion on a Space Strategy for Europe.

5. *Conclusion*

The development of a European Space Policy is essential for the EU, ESA and Member States due to the strategic value of the outer space and the space activities for the wellbeing of the European society, the economic growth and the achievement of numerous public policies. So, it is necessary to regulate it in the EU Treaties given that the European integration project requires to have specific legal basis for actions and decisions; to have the political legitimacy (e.g. to legitimize the spending of EU funds); and an internal and external symbolic force.

The Treaty of Lisbon has designed very special legal regime for the ESP, reinforcing

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generating reach the citizens and create growth and jobs? How can such measures be matched at national and regional levels to maximise their effect?; and 2) Given the strategic importance of space capacities, to which extent the measures proposed by the Commission contribute to "reinforcing Europe's autonomy in accessing and using space in a secure and safe environment"? In this respect, how to support a competitive European industrial base within Europe and in the global market and with a view to preserving and enhancing the European access to space, the access to the data utilisation as well as the European capacity for critical technologies and systems, the tenets of autonomy?» (doc. 14212/16, of 11.11.2016).

[48] Outcome of the Council Meeting, doc. 14926/16, p. 10: «All delegations agreed on the huge potential to create new business opportunities in the area of space and underlined some of the actions and measures proposed in the strategy that can have a major positive impact in competitiveness and bring tangible benefits to European citizens and companies in terms of economic growth and job creation. Many delegations considered that a top priority in the implementation of the strategy should be to boost the competitiveness of the economy through the exploitation of space data by industry, SMEs and start-ups in Europe, while guaranteeing the broadest possible geographical balance. Close and inclusive cooperation of all relevant players in the field of space was considered a prerequisite for the successful implementation of the strategy. In particular, the partnership between the EU and the ESA was considered to be one of the cornerstones. Given the strategic importance of space capacities, ministers also underlined the need to reinforce Europe's autonomy in accessing and using space in a secure and safe environment».

[49] Doc. 5972/17 (http://data.consilium.europa.eu/doc/document/ST-5972-2017-INIT/en/pdf).

[50] Opinion of the EESC, doc. INT/809, of 30.3.2017.

[51] Procedure 2016/2325 (INI).

[52] http://cor.europa.eu/en/activities/opinions/Pages/opinionfactsheet.aspx?OpinionNumber=CDR6726/2016.

the national limits around this competence (to satisfy the Member States and ESA), but *praxis* proves the necessity of cooperation/integration[53].

After the legal basis is established, the next step is the implementation of the ESP, in which a strategy is essential. However, the economic and financial crisis of the last years in Europe has not been the best context for that and the Communication *Towards A Space Strategy For The European Union That Benefits Its Citizens* (2011) was probably more a declaration of intents than a real strategy.

Fortunately, the Communication *Space Strategy for Europe* (2016) seems to be a real strategy, but it is crucial to put it into practice through programmes on the ground, taking advantage of the envisaged end of the economic and financial crisis in Europe.

ABSTRACT: *A Space Strategy for Europe*

Space activities have been successfully developed over 40 years in Europe in the framework of the European Space Agency. The mission of this European International Organization is «to shape the development of Europe's space capability and ensure that investment in space continues to deliver benefits to the citizens of Europe and the world». The development of a European Space Policy is essential for the EU, ESA and Member States due to the strategic value of the outer space and the space activities for the wellbeing of the European society, the economic growth and the achievement of numerous public policies. The Treaty of Lisbon has designed very special legal regime for the ESP, reinforcing the national limits around this competence (to satisfy the Member States and ESA), but *praxis* proves the necessity of cooperation/integration. The economic and financial crisis of the last years in Europe has not been the best context for that and the Communication *Towards A Space Strategy For The European Union That Benefits Its Citizens* (2011) was probably more a declaration of intents than a real strategy.

[53] About the relationship EU-ESA, there are two Communications from the European Commission: COM(2012)671, of 14.11.2012, *Establishing appropriate relations between the EU and the European Space Agency* and COM(2014)56, of 6.2.2014, *Progress report on establishing appropriate relations between the European Union and the European Space Agency.*

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SPACE INSURANCE: MARKET ASPECTS

SUMMARY: 1. Introduction. – 2. Natural & Man-Made Disasters. – 3 Overview of Space Insurance Market. – 4. Natural Space Threats – 4.1. Space Weather Storms. – 5. Man-Made Threats. – 5.1 Space Debris. – 5.2. Jamming of Space Signals & Cyber Threats. – 6. New Risks For Exploration And Use Of Outer Space. – 7. Conclusions.

1. *Introduction*

The subject of this international colloquium must be considered, from the insurance perspective, within the larger framework of natural and man-made risks and disasters.

Therefore, it makes sense to start from major events which have occurred to date and have heavily impacted the insurance international market and evaluate, with the support of some imagination, what might happen in the future.

Space exploitation and threats, because of their exposure, fall within the category of large risks considered by the Green Paper dated April 2013, issued by the European Commission.

Therefore, my presentation will be somewhat more extensive than the strict subject of this colloquium, which is limited to the risks of the space exploitation. The issue of future space insurance requirements, at its very early stage, is more a subject for speculation and betting than for professional insurance arguments.

When technology and experience generate confidence with insurers, no doubt this new space activity will start attracting interest to the market.

2. *Natural & Man-Made Disasters*

We start our presentation mentioning some features of natural and man-made disasters which have affected the insurance international market. It is understood from SIGMA of

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Swiss Re that total economic losses from natural and man-made disasters in 2016 totaled at least USD 158 billion. This is significantly higher than the USD 94 billion losses in 2015 and was caused by large natural catastrophes, such as earthquakes and floods, according to preliminary *sigma* estimates. Insured losses were also higher in 2016 at around USD 49 billion, compared to USD 37 billion in the previous year. However, the gap between total losses and insured losses in 2016 shows that many events took place in areas where insurance coverage was low. Losses resulting from man-made disasters fell to USD 7 billion from USD 9 billion in 2015. Globally, there were approximately 10 000 victims in disaster events in 2016.

Natural catastrophes accounted for USD 150 billion of the total economic losses in 2016. Insured losses from natural catastrophe events were USD 42 billion in 2016, up from USD 28 billion in 2015, but slightly below the annual average of the previous 10 years (USD 46 billion). Man-made disasters triggered an additional USD 7 billion in insurance claims in 2016.

Natural and man-made catastrophe definitions may vary. Natural catastrophes generally include floods, storms, earthquakes, droughts/wild fires/heat waves, cold waves/frost, hail, tsunamis, and other natural events; man-made disasters are events associated with human activities (also technical disasters): major fires and explosions, aviation and space, shipping disasters, rail disasters, collapse of buildings/and miscellaneous (including terrorism).

In April 2013, a «Green Paper on the insurance of natural and man-made disasters», issued by the EU Commission, classified natural disasters according to events related to earthquakes, tsunami, volcanic eruption, flood, mass movement, storms, cold wave/drought, forest fire, heat wave, in other words, geophysical, hydrological, meteorological, and climatological events. On the other hand, man-made disasters are primarily represented by environmental liability and losses from industrial accidents; third-party nuclear liability; offshore oil and gas operator liability.

In its Green Paper, the European Commission makes it clear that disasters may have such an aggregate exposure that they cannot be covered by the private insurance market even if a disaster insurance pool were setup by the entire International Insurance Market. Therefore, Governments remain the insurer and reinsurer of last resources.

3. *Overview of Space Insurance Market*

Tailor-made covers for satellite launches and in-orbit risks are now common practice. The market capacity is sufficient to insure risks up to US$ 500-600M, for the launch (damages to launcher and satellite), whilst for third party liability the capacity can go up to US$ 1.5 – 2 billion. The economic results are characterized by volatility, which however is balanced in the long run.

The US$ 406M loss paid for an INTELSAT launch failure on February 2013 has been the highest so far. The 23 major losses, which occurred in the years from 2011 to 2015, cost on average between UD$ 150m and UD$ 180m.

4. *Natural Space Threats*

4.1. *Space Weather Storms*

Experts say that a severe solar storm could heavily impact the global economy. We have learned that we could witness, for example, power grid blackouts on a continental scale,

damage to high voltage transformers, radio blackouts, interruption of Global Navigation Satellite Systems services, with consequent economic and human disasters. Compared with the potential impacts of a major man-made disaster expected to be within hundreds of million, we are told that such storm events could generate an impact of many billions in economic value.

Experts advise that, although these extreme magnetic storms are characterized by a «low-frequency», their impact may be «extremely high» and, even worldwide, catastrophic, thus showing how our modern society is easily vulnerable to these phenomena.

From the technical side, the effects of an extreme space weather impact on engineered systems and infrastructure have been widely highlighted by many experts and institutions. Just to mention one, Professor Paul Cannon of the Royal Academy of Engineering concluded his study on the subject saying: «*Don't panic – but do prepare! It will happen one day*» with reference to a future solar super storm event.

The OECD has recently issued a report highlighting critical infrastructure interdependence exposed to major threats including space weather.

In brief, the report underlines that space weather can have technology and economic impacts on satellites in orbit; aircraft; terrestrial high frequency communications; trans-oceanic communications cables; positioning, navigation and timing systems; power grids; and railway networks.

This might generate disturbed services, damaged infrastructure, and cascading effects.

From the Insurance Market there have been some recommendations:

- Raise awareness among governments, industry and the insurance industry.
- Develop cross-border standard operating procedures.
- Enhance power infrastructure to increase resilience.

The attitude of space insurance specialists is to cover loss of, damage to, malfunction or failure of a satellite at launch and in-orbit, but consequential loss, interference, war risks, etc. are excluded.

Currently, satellites exposed to such events include: 1,261 in-orbit; of which 22% for military/government purposes. Those insured are approx. 250 with a US$ 26.5 billion total exposure.

A few cases of solar extreme events on satellites worth mentioning are listed below:

- On March 13th 1989, during a large magnetic storm, power lines were hit by geo-magnetically induced currents (GIC's) from the Hydro Quebec power network, leading to a blackout affecting 6 million people.

- In 1994, significant satellite anomalies occurred on ANIK E1 & E2. These satellites ran out of control and transmissions were interrupted due to a technical hitch caused by magnetic storms.

- In January 1997, the Telstar 401 experienced an abrupt failure of its telemetry and communications due to a so called «magnetic cloud event».

- A large magnetic storm (Halloween storm) in October 2003 caused more than 47 satellites to malfunction, including the total loss of a scientific satellite valued at US$640 million, but no claims were filed with insurers.

- In April 2010, a malfunction of the satellite Galaxy 15 has been attributed to space weather effects.

Claims so far paid by insurers were US$ 142m for ANIK E1 and US$ 132m for Telstar 401.

Looking at the past, from the space insurance perspective, space weather has been per-

ceived as a low concern because of the few claims ascertained due to this risk. However, following these events, experts have been suggested and required to introduce mitigation practices; something has been done, but much remains to understand the risk.

Research funded by UK insurance companies shows that geomagnetic storms pose a statistically significant risk to satellites and that satellite anomalies are more likely to occur for five days or more following the start of a geomagnetic storm. The Lloyd's «Realistic Disaster Scenarios» report dated January 2011, stated that an undetected generic defect in a number of operational satellites could cause significant losses to the insurance market.

5. *Man-Made Threats*

5. 1. *Space Debris*

This has long been an academic issue, but is now a real environmental and risk exposing problem. In fact, high valued operational satellites are exposed to physical and revenue losses for hundreds of millions of dollars. The theoretical total insured exposure for operational satellites is evaluated at around US$26.5 billion. The amount of debris in space is growing very rapidly.

In 2009, the collision of Cosmos 2551 and Iridium 33 reinforced the need to analyze the hazard posed by orbital debris.

We recall that the Korean weather/communications satellite Coms 1 had to be moved in orbit to prevent a collision with the wayward Raduga 1-7.

There are more than 500 defunct satellites, and thousands of smaller pieces in GEO. Between 1961 and 2007 there were some 220 pieces of orbital debris littering GEO per year, but between 2007 and 2015 this has dramatically increased to 1,500 objects per year. NASA projects that there will be 183 collisions in the next 200 years – nearly one per year – if there is no debris mitigation.

Is it realistic to try and find a way to clean up the orbits from debris? The answer should come from governmental institutions and industries.

Two types of insurance are particularly relevant in the context of orbital debris: launch and in-orbit insurance that is intended to protect the owner or operator of the impacted satellite and the third party insurance that addresses the liability of the satellite owner/operator and covers damages to third parties and consequential loss caused by an impact or collision.

At a recent space conference, Mr. Christopher Kunstadter, a renowned space underwriter, stated «Nowadays, space insurance includes coverage for space debris at a marginal cost of $0, … until the first loss occurs». But, if an event occurred and were a big loss to pay, we can imagine that there could be an over-reaction in terms of premium level, cover restrictions and market capacity available.

Historically, the insurance market has considered the debris risk, especially in GEO, to be low in terms of probability of collision with a satellite. However, the likelihood of a collision in GEO is increasing following the development of satellites being deployed in GEO with no natural debris removal mechanism.

More concern and knowledge has been dedicated to collision risk in LEO, where the annual probability of collision of a 1cm size debris with a $10m^2$ satellite has been estimated recently at 0.8%. This represents the largest debris collision hazard anywhere in the earth's orbit.

Needless to say that the determination of the cause and the liabilities following a loss event remains a fundamental issue.

Under international law, the «launching state» has strict liability for accidents «*on the ground*». The launching state has liability to other objects in space, if at fault, and the determination of the fault would need to show violation of standard care and conduct.

In practice, there are no treaties regulating space debris but only non-binding international guidelines.

Insurers expect operators and manufacturers to abide by good neighbour principles and international guidelines. There have been no claims or litigation for space debris yet and insurers generally rely on open source information.

The insurance market would like to see more research on space debris as well as cooperation between agencies and industry to collect and analyze information and disseminate results. Also here, the setting up of international institutions, such as the IADC and SDA, is welcome to help understand and mitigate the risk.

5.2. *Jamming of Space Signals & Cyber Threats*

The world has become increasingly dependent on space-based capabilities and applications, in almost all fields of human activity. However, a new threat to space operators is represented by risk of interference in its various forms. This risk, in the past, received little attention, particularly in insurance, but is now assuming more and more relevance.

The dangers can be unintentional (operator's error, equipment malfunction due to solar flares) or intentional, with a fast growing criminal element.

This type of interference is usually geopolitically motivated, generally easy to locate but difficult to remove without political intervention.

Critical infrastructures such as air-traffic, electricity transmission, emergency services are all under threat; GPS signals are essential for transport, farming and just-in-time manufacturing: these organizations are vulnerable to interference with GPS signals.

Defensive interference can be made typically by jamming TV and radio transmissions (as a means of political censorship of information); offensive interference includes hacking by persons, acts of terrorism/commercial sabotage/war, aiming at destruction or disruption of services or taking control of such systems.

The main risks, including business interruption and loss of revenue, are obviously for satellite operators.

What about insurance against such cyber risks? Currently, space insurance policies specifically exclude electromagnetic and radio frequency interference, malicious or terroristic acts and similar risks. Insurance policies may cover the risk of physical damage to the satellite directly resulting from such interference and from interference coming from the satellite itself.

In terms of hypothetical maximum loss size, could we imagine the impact due to a catastrophic loss for a signal interference to the air navigation system? No, not yet. Liability regimes for damage caused by launches and satellites are regulated by the Liability Convention of 1972, but it does not regulate instances of interference with satellites.

International regulations and telecommunications conventions have provisions designed in the allocation of frequencies to avoid causing harmful interference to others, but they do not provide effective sanctions for any eventual interference. In this uncertain context, universal sanctions against countries or individuals contravening any such regulations are difficult to implement.

The European Union started considering cyber attacks and interferences some years ago. In 2008, it produced a draft International Code of Conduct (COC) for Outer Space Activities, trying also to involve other countries. More recently, 12 August 2013, Directive 2013/40/EU, against cyber-attacks on information systems, was issued.

6. *New Risks For Exploration And Use Of Outer Space*

The extraction of space resources is a new issue which involves primarily governmental, international organizations, legal aspects and, at present, does not attract very much consideration from the insurance market. We must highlight a few points.

From the Outer Space Treaty of 1967 moving on to the 1979 Moon Agreement and the Space Resourced Exploration and Utilisation Act of 2015, it has been shown that they are not following the same stream line, but it is clear that there is a need for a review of the Outer Space Treaty of 1967 signed at a time when only US and Russia were involved in space activities. This is a matter for legal and governmental redefinition.

At present, it seems that the question of "is it legal for private commercial enterprises to extract resources from outer space?" has a consensus on the answer: yes, provided that the private commercial enterprises must be authorized by the respective States, complying with international legislations and do not take any rights on asteroid appropriation.

For insurers this means that if relevant missions are performed by private initiatives, there is for them a new area for business in insuring all the operations to reach the asteroids, to carry out mineral extraction and, then, return to earth.

If these operations are legally performed, is the insurance market ready to cover the risks involved? Let's imagine. Values at risk will be enormous and statistics, obviously, do not exist. Therefore, the first mission/s will not be a matter for insurance but for bets. Later, if technology turns out to be reliable and a few missions are performed, we can believe that part of the risks will start to attract some interest, but to find reliable and professionally sound insurance solutions will take many dozens of years. This is not new because, if we look back, insurance started in the marine field with early ocean navigation carrying merchandise which was protected by money moving two ways between the two parties, i.e. the owner of the merchandise and the better.

7. *Conclusions*

If an unexpected loss event occurred, for example from a solar storm phenomenon, or a cyber attack, this would seriously affect the entire space insurance sector.

A recent Lloyd's report has made an estimate that a solar max event involving the 250 insured satellites in orbit valued at US$ 26,5 billion in total, could generate a 5% average loss, that is to say US$ 1,000 – 1,500 million. Such an unexpected event might seriously endanger the survival of the space insurance market.

The sensationalist press/media companies may generate excess noise about space weather, debris and jamming of signals risks and events like asteroids that fall to earth; however, these risks cannot be underestimated.

Executives of satellite and industrial companies tend to play down the risks involved, but this approach is neither sensible nor healthy.

However, it is useless to stress that insurance is an important but small part of the problem: it can only contribute to mitigate the economic impact of such events. What is fundamental is to increase the awareness of the phenomena and to solicit the attention of Governments and International Institutions who should provide adequate means to favor correct forecasting, prevention, mitigation, and measures to face these natural and human-made events that could hit any country of our globe. If insurers were in a position to better assess their real risks and aggregate global exposures in a single event this could enhance more investments and favor availability of new advanced products, tailor-made to the specific growing insurance requirements.

Initiatives like the setting up of the SPACECAST system to better forecast space weather would be welcome. Best would be to have international institutions for a coordinated monitoring of these phenomena at a worldwide level. Necessary but difficult to achieve!

New risks, such as those deriving from space exploitation and use, must be better regulated and technologically proven before the private space insurance market can take any position on how and within what framework they could be covered. However, it is very difficult to imagine that, due to the extremely high exposure and lack of statistics, these very sophisticated future adventures will be fully covered and a large margin, in my opinion, will remain as bets for a long time.

ABSTRACT: *Space Insurance: Market Aspects*

New frontiers in outer space must be considered from the insurance perspective, and within the larger framework of natural and man-made risks and disasters.

The paper deals with possible risks that may arise due to space exploitation, and which fall within the wider risks as foreseen in the EC Green Paper, April 2013. Losses and damage from, for example, solar phenomena, could be enormous. Unexpected events might seriously endanger the survival of the space insurance market. Executives of satellite and industrial companies tend to play down the risks involved, but this approach is neither sensible nor sound.

Better forecasting and prevention, as far as possible, could mitigate risk calculation. Better assessment approaches would put insurers in a position to aggregate global exposure, thereby favouring availability of innovative advanced products, custom made for the specific growing insurance requirements.

Undoubtedly, coordination between international institutions would be welcome, albeit complex.

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SPACE DEBRIS

SOMMARIO: 1. Il fenomeno dello *space debris*. – 2. La politica spaziale europea. – 3. Le fonti di *soft law* in materia di *space debris*. – 4. Le fonti internazionali in materia spaziale.

1. *Il fenomeno dello* space debris

I detriti spaziali, c.d. *space debris* o *space junk*, non sono frutto di eventi naturali, straordinari e incontrollabili, ma dipendono esclusivamente dall'azione umana. Si tratta, infatti, di frammenti di oggetti spaziali lanciati dall'uomo nello spazio: frammenti di satelliti, sonde, pannelli solari, componenti e attrezzature di razzi, ma anche polvere, vernice, gocce congelate di liquido di raffreddamento dei reattori nucleari ecc.

Sin da quando, nel 1957, ha avuto inizio l'esplorazione dello spazio con il lancio dello *Sputinik 1*[1], è stato abbandonato nello spazio un enorme quantitativo di rottami di razzi e satelliti, che sono rimasti in orbita o sono esplosi a seguito della collisione con altri oggetti.

Gli ultimi decenni hanno visto un forte incremento delle attività spaziali, con un conseguente rapido incremento del numero di rifiuti[2]: si stima che oggi oltre 35 milioni di oggetti siano in orbita e la maggior parte di essi si trovi nell'orbita più bassa, ad un'altitudine compresa tra 600 e 1400 km[3] , oppure nell'orbita geostazionaria[4] , viaggiando a una velocità

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[1] Il 4 ottobre 1957 l'Unione Sovietica lanciò con successo lo *Sputnik 1*, il primo satellite artificiale messo in orbita attorno alla Terra. Questa data segnò l'inizio della corsa allo spazio delle due superpotenze: Unione Sovietica e Stati Uniti. Per un approfondimento, v. P. DOW, *Sputnik revisited: historical perspectives on science reform,* relazione al Symposium «*Reflecting on Sputnik: Linking the Past, Present and Future of Educational Reform*», Washington, Accademia Nazionale delle Scienze, 4 ottobre 1997.

[2] Dal 2007, se ne producono circa 1500 l'anno. Per un quadro del fenomeno v. L. ANCIS, *La delicata problematica dei rifiuti abbandonati nello spazio*, in *Dir. trasp.*, 2016, p. 725.

[3] Un detrito che si trovi in orbita bassa, sino a 200 km di altezza, cade sulla terra in pochi giorni.

[4] Ossia un'orbita circolare ed equatoriale, detta GEO, situata ad un'altezza tale (40.000 km circa) che il periodo di rivoluzione di un satellite che la percorre coincide con il periodo di rotazione della Terra. Oltre 2.000 oggetti sono stati osservati in GEO, ma non sono catalogati, né monitorati.

che può arrivare a superare i 50 chilometri orari. Il fatto che circa il 90% degli oggetti che circolano intorno alla Terra sia costituito da detriti[5] potrebbe rendere molto più pericoloso il lancio in orbita, a bassa quota, di satelliti commerciali o militari.

Quanto alle dimensioni dei *debris*, l'Agenzia spaziale europea (ESA)[6] , stima la presenza di un numero approssimativo di 30.000 residui di lunghezza superiore a dieci centimetri e di oltre un milione di frammenti troppo piccoli per essere tracciati.

Ma a causa delle velocità orbitali, anche un detrito della dimensione di pochi centimetri può seriamente danneggiare o addirittura disattivare un veicolo spaziale operativo, mentre in caso di loro collisioni con oggetti più grandi si possono prevedere rotture catastrofiche, capaci di produrre un notevole quantitativo di *debris*, i quali possono – a loro volta – causare ulteriori collisioni, innescando quella reazione a catena, nota come «sindrome di Kessler»[7]. Secondo uno studio, condotto dall'*Inter-Agency Space Debris Committee* (IADC)[8], l'evoluzione della popolazione detritica è divenuta instabile e imprevedibile proprio a causa del fenomeno dell'«auto-alimentazione», determinata da impatti in orbita.

Il più grave incidente si è verificato nel 2007, quando il satellite cinese *Fengyuan-1C* venne distrutto da un missile lanciato dalla Cina per testare il loro sistema anti-satellite. La collisione produsse più di 3000 frammenti. Il 22 gennaio 2013 un detrito spaziale prodotto dall'esplosione del satellite cinese si scontrò col nano-satellite russo BLITS[9].

Ricordiamo anche la nota collisione avvenuta nel 2009[10] tra due satelliti di telecomunicazione di grandi dimensioni: l'americano *Iridium 33*, e il russo *Cosmos 2251*, in disuso, che si scontrarono a circa 800 chilometri di distanza dalla Terra, all'altezza del Polo Nord, frantumandosi in una miriade di detriti: i primi rilevamenti hanno contato almeno seicento frammenti di taglia superiore ai dieci centimetri.

Alla luce di quanto detto, risulta evidente la pericolosità della caduta sulla terra, in zone ad alta densità abitativa, di detriti spaziali.

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[5] Come riportato dal Comando Strategico degli Stati Uniti (STRATCOM) e dalla Rete di sorveglianza spaziale (SSN).

[6] L'*European Space Agency* (ESA) è un'organizzazione internazionale con sede a Parigi, formata da 22 Stati Membri, istituita con la Convenzione firmata a Parigi il 30 maggio 1975. Oltre alle attività svolte presso l'ESOC (*European Space Operations Centre*), in Germania, per lo sviluppo di un sistema di segnalazione dei detriti, l'ESA conduce ricerche sui rifiuti spaziali presso il centro ESTEC (*European Space Research and Technology Centre*), nei Paesi Bassi. Le attività includono lo sviluppo di rilevatori di impatto, il collaudo di schermi di protezione, la valutazione dei danni da collisione ecc. Per un approfondimento sull'Agenzia, v. V. JAVICOLI, *Il sistema di finanziamento dell'Agenzia Spaziale Europea ESA,* in *La comunità internazionale,* 1996, p. 97 ss.; L. MARINI, *I rapporti tra la politica industriale dell'Agenzia spaziale europea e il diritto comunitario alla luce del principio del giusto ritorno economico*, in *Il Diritto del commercio internazionale,* 1999, p. 921 ss.

[7] Dal nome del ricercatore della NASA, Donald Kessler, che evidenziò il problema alla fine degli anni '70. Cfr. D. KESSLER, *Collisional Cascading: The Limits of Population Growth in Low Earth Orbit. Advances*, in *Space Research*, 1991, 11(12), 63 ss.

[8] Lo studio è stato presentato a febbraio 2013 al Comitato ONU sull'uso pacifico dello spazio *UN COPUOS*.

[9] V. lo studio del *Center for Space Standards and Innovation* (CSSI) di Colorado Springs (USA).

[10] Il 10 febbraio 2009, nel cielo sopra la regione della penisola siberiana di Taimyr, il satellite russo *Kosmos 2251,* del peso di 950 Kg, e quello americano *Iridium 33,* del peso di 560 Kg, si sono scontrati a quota 805 chilometri d'altezza, frantumandosi in una miriade di pezzi. Quello russo era dismesso dal 1995, mentre quello americano era ancora operativo, dopo dodici anni di servizio, per captare e rilanciare segnali per il sistema globale di telecomunicazioni mobili *Iridium*. È possibile che l'incidente sia stato causato da errori di misura di posizione e velocità del satellite in disuso oppure nell'esecuzione dei comandi di guida di *Iridium 33*. Per un approfondimento, v. S. MAGNOSI, *2009 Space Odissey: spunti dal caso della collisione satellitare Russia-Stati Uniti del 10 febbraio 2009*, in *Riv. dir. ec. trasp. amb.*, 2009, p. 45.

2. *La politica spaziale europea*

La responsabilità per i danni causati da *space debris*[11] rappresenta una delle sfide più interessanti in materia di diritto spaziale.

Com'è noto, il settore è prevalentemente regolato dalle norme di diritto internazionale, sebbene un ruolo importante rivesta anche il diritto dell'UE, specie a partire dal Trattato di Lisbona del 2007, che ha attribuito all'Unione la competenza in questo ambito[12]. L'art. 189 TFUE stabilisce infatti che: «al fine di promuovere il progresso tecnico e scientifico, la competitività industriale e l'attuazione delle sue politiche, l'Unione elabora una politica spaziale europea».

Questa disposizione ha fornito la base giuridica per l'adozione di una politica spaziale europea[13]. Non è un caso se già il 26 settembre 2008 il Consiglio dell'UE ha emanato la Risoluzione «Portare avanti la politica spaziale europea»[14] che identifica nell'Agenzia spaziale europea, nell'Unione europea, e nei loro rispettivi Stati membri i tre principale attori della politica *de qua* e dopo qualche mese il Parlamento europeo ha presentato una risoluzione sulla politica spaziale europea, «Come portare lo spazio sulla terra»[15], nella quale lo spazio è stato considerato un bene strategico, di fondamentale importanza per l'indipendenza, la sicurezza e la prosperità dell'Europa.

La politica spaziale europea si fonda su quattro pilastri principali: 1) il programma europeo Copernicus di osservazione della Terra; 2) i programmi satellitari Galileo/EGNOS; 3) l'esplorazione dello spazio; 4) la ricerca spaziale.

Pertanto, per completare il quadro normativo, vanno altresì richiamati i Regolamenti UE nn. 1285/2013 (*Galileo Regulation*)[16] e 377/2014 (*Copernicus Regulation*)[17], nonché l'*Action*

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[11] Cfr. sul tema G. CATALANO SGROSSO, *La responsabilità degli Stati per le attività svolte nello spazio extra-atmosferico,* Padova, 1990, p. 194; L. ANCIS, *Responsabilità per danni causati da* space debris *sulla superficie terrestre,* in *Dir. trasp.,* 2005, p. 913.

[12] M. ORLANDI, *Le competenze dell'Unione europea nel settore dello spazio,* in *Riv. coop. giur.,* 2014, p. 23 ss.

[13] S. MARCHISIO, *L'Europa e la politica spaziale*, in *Affari Esteri,* 2003, p. 641 ss.

[14] Risoluzione del Consiglio 2008/C 268/01, *Taking forward the European Space Policy*, adottata il 29 settembre 2008 (*G.U.U.E.* C 268 del 23 ottobre 2008).

[15] *Resolution on the European space policy: how to bring space down to earth*, del 20 novembre 2008.

[16] Regolamento UE n. 1285/2013 del Parlamento europeo e del Consiglio, dell'11 dicembre 2013, relativo all'attuazione e all'esercizio dei sistemi europei di radionavigazione via satellite e che abroga il regolamento CE n. 876/2002 del Consiglio e il regolamento CE n. 683/2008 del Parlamento europeo e del Consiglio (*G.U.U.E.* L 347 del 20 dicembre 2013). Per un commento v. L. BOTTINELLI, *L'impresa europea di interesse generale: il progetto Galileo*, Intervento al Convegno «*L'impresa europea di interesse generale*», in *Servizi pubblici e appalti,* 2006, 145 ss.; C. INGRATOCI, *Verso un sistema europeo di nuova generazione per la gestione del traffico aereo: l'Impresa comune SESAR* e S. MAGNOSI, *Qualche riflessione* sull'*impiego della tecnologia satellitare nel controllo della circolazione aerea*, in M.P. Rizzo (a cura di), *La gestione del traffico aereo: profili di diritto internazionale, comunitario ed interno,* Milano, 2009, rispettivamente pp. 485 e 281 ss.; ID., *I sistemi satellitari di ausilio alla navigazione aerea. Problematiche giuridiche*, in *Infrastrutture e navigazione: nuovi profili della sicurezza marittima ed aerea,* Roma, 2013, p. 111 ss.; M.E. DE MAESTRI, *La gestione pubblica del «sistema Galileo» e la responsabilità civile: questioni di giurisdizione, immunità e legge applicabile*, in *Dir. mar.,* 2014, p. 288 ss.

[17] Regolamento UE n. 377/2014 del Parlamento europeo e del Consiglio, del 3 aprile 2014, che istituisce il programma *Copernicus* e che abroga il regolamento UE n. 911/2010 (*G.U.U.E.* L 122 del 24 aprile 2014, p. 44). Il programma di osservazione terrestre dell'UE è stato lanciato per assicurare il monitoraggio regolare dei sottosistemi terrestri, dell'atmosfera, degli oceani e delle superfici continentali e per fornire informazioni a

Plan del 2010 per il *Global Navigation* Satellite *System* (GNSS)[18], sui sistemi satellitari europei.

In tale quadro, l'Unione è chiamata ad adottare le misure necessarie a evitare l'inquinamento dello spazio.

Nella Decisione n. 541/2014/UE[19] del Parlamento e del Consiglio, a tal proposito, si sottolinea come «i detriti spaziali sono diventati una minaccia grave per la sicurezza, la protezione e la sostenibilità delle attività spaziali»[20]. I *debris* vengono, in tale contesto, definiti come «qualsiasi oggetto spaziale, compresi i veicoli spaziali o i frammenti ed elementi di questi ultimi, nell'orbita terrestre o che rientrano nell'atmosfera terrestre, che non sono funzionali o non hanno più alcuna finalità specifica, comprese le parti di razzi o di satelliti artificiali o i satelliti artificiali inattivi».

3. *Le fonti di* soft law *in materia di* space debris

Nonostante la rilevanza assunta dal settore spaziale in ambito europeo, rivestono particolare significato in materia le fonti normative di diritto internazionale che disciplinano le relazioni tra gli Stati nell'esplorazione e nell'utilizzo dello spazio extra-atmosferico, inteso come *res communis omnium*[21].

A tal proposito, va anzitutto chiarito che, al di là di taluni importanti documenti di *soft law*, non esiste una normativa internazionale vincolante in tema di protezione dell'ambiente spaziale dall'inquinamento provocato da detriti.

Nel 2002 sono state adottate dal Comitato Inter-Agenzie sui Detriti Spaziali delle «Linee guida»[22] internazionali, non vincolanti, che si occupano anche dello smaltimento post-missione e della prevenzione di collisioni in orbita. Nel 2004 è stato adottato, in ambito ESA[23], un «Codice europeo di condotta sulla mitigazione dei detriti spaziali»[24].

Queste prime raccomandazioni hanno sollecitato la Commissione ONU sull'uso pa-

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sostegno di un'ampia gamma di applicazioni in tema di ambiente e sicurezza. Cfr. sul tema E. CHIAVARELLI, *Satelliti e sicurezza della navigazione aerea*: *aspetti giuridici e ipotesi di responsabilità*, in *Dir. prat. av. civ.,* 1990, p. 383; da ultimo, G. PETRONI, *L'accesso delle Regioni europee ai servizi satellitari*, in *Amm.,* 2016, p. 127 ss.

[18] COM 2010 308 *final* del 16 giugno 2010 «*Action Plan on Global Navigation Satellite System GNSS Applications*». Per un commento, v. A. MASUTTI, *Il progetto Galileo GNSS-Global Navigation Satellite System: garanzie di maggiore sicurezza negli aeroporti europei e relative implicazioni giuridiche*, in G. CAMARDA, M. COTTONE, M. MIGLIAROTTI (a cura di), *La sicurezza negli aeroporti. Problematiche giuridiche ed interdisciplinari,* Atti del Convegno di Milano del 22 aprile 2004, Milano, 2004, p. 99 ss. Per un approfondimento sul sistema GNSS, v. F. STIPO, *Disciplina del «Sistema Globale di Navigazione Satellitare» GNSS,* in *Giur. merito,* 1997, p. 673 ss.; A. MASUTTI, *GNSS: the Basic Principles for a European Legal Framework on TPL in Policy aspects of third party liability in satellite navigation*, in *ESPI, Vienna report 19 july 2009*, Vienna, 2009, p. 37 ss.

[19] Decisione n. 541/2014/UE del Parlamento e del Consiglio del 16 aprile 2014 che istituisce un quadro di sostegno alla sorveglianza dello spazio e al tracciamento (*G.U.U.E.* L 158 del 27 maggio 2014, p. 227).

[20] *Considerando* n. 7.

[21] V. U. LEANZA, *Lo stato dell'arte nel regime giuridico dello spazio cosmico*, in *Riv. dir. nav.*, 2011, p. 653 ss.

[22] INTER-AGENCY SPACE DEBRIS COMMITTEE (IADC), *Space Debris Mitigation Guidelines*, *45th Session of UN-COPUOS Scientific and Technicaaùl Subcommittee,* 2002, modificate nel 2007.

[23] Per un approfondimento, v. R.M. BONNET, V. MANNO, *International Cooperation in Space: The Example of the European Space Agency,* Harvard University Press, Harvard, 1994, par. 3; *European Space Policy and Programs Handbook*, International Business Publications, USA, Washington, 2010, p. 22 ss.

[24] *European Code of Conduct Space Debris Mitigation*, 28 giugno 2004.

cifico dello spazio (COPUOS)[25] ad elaborare le proprie *UN Space Debris Mitigation Guidelines,* approvate dall'Assemblea generale con la Risoluzione 62/217[26] del 2007, basate sulle *practices* esistenti, già sviluppate da varie organizzazioni nazionali e internazionali. Nonostante nel documento si raccomandi agli Stati di implementarle, attraverso opportuni meccanismi nazionali, solo pochi Paesi le hanno effettivamente attuate.

Nel complesso, si tratta di una regolamentazione non solo priva di vincolatività, ma altresì generica e frammentaria. È pertanto auspicabile che – in sede internazionale – si pervenga in tempi brevi alla formulazione di principi relativi alla protezione dell'ambiente spaziale dai danni causati dallo *space debris*, sull'esempio di quelli formulati per regolare l'uso dell'energia nucleare nello spazio[27].

Nelle more, in assenza di regole specifiche vincolanti, è necessario stabilire se la materia possa rientrare comunque nel campo di applicazione delle norme di diritto spaziale internazionale[28].

4. *Le fonti internazionali in materia spaziale*

Gli strumenti giuridici internazionali in materia spaziale – com'è noto – sono: il c.d. «Trattato dello spazio», di Londra, Mosca e Washington, del 10 ottobre 1967[29]; l'Accordo del 22 aprile 1968[30] sul salvataggio degli astronauti[31] e il ritorno di oggetti lanciati nello spazio esterno; la Convenzione del 29 marzo 1972[32] sulla responsabilità internazionale per i danni causati da oggetti spaziali[33]; la Convenzione del 14 gennaio 1975[34]

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[25] *Committee on the Peaceful Uses of Outer Space*, istituita in seno all'ONU nel 1959.

[26] A/RES/62/217 dell'Assemblea Generale dell'ONU del 22 dicembre 2007 «*International cooperation in the peaceful uses of outer space*».

[27] Cfr. sul tema il Trattato per il bando degli esperimenti di armi nucleari nell'atmosfera, nello spazio cosmico e negli spazi subacquei *Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space, and Under Water,* firmato a Mosca il 5 agosto 1963, che vieta gli esperimenti con armi nucleari nell'atmosfera, nello spazio cosmico o sott'acqua, e il Trattato di non proliferazione nucleare, firmato a Londra, Mosca e Washington il 1° luglio 1968, di cui *infra*.

[28] F. DURANTE, *Diritto cosmico*, in *Enc. giur. Treccani*, Roma, 1993; B. CHENG, *Studies in International Space Law*, Oxford, 1997; F. LYALL, P.B. LARSEN, *Space Law. A Treatise*, Surrey, 2009.

[29] Trattato sulle norme per l'esplorazione e l'utilizzazione, da parte degli Stati, dello spazio extra-atmosferico, compresi la luna e gli altri corpi celesti, concluso a Londra, Mosca e Washington il 27 gennaio 1967 (entrato in vigore il 10 ottobre 1967). Cfr. B. CHENG, *Studies in International Space Law*, Clarendon Press Oxford, London, 2004.

[30] Accordo sul salvataggio ed il ricupero dei cosmonauti nonché sulla restituzione degli oggetti lanciati nello spazio extra-atmosferico, concluso a Londra, Mosca e Washington il 22 aprile 1968. C. GOLDA, *Navigazione e attività umana nello spazio,* in *Dir. mar.*, 1993, p. 198 ss.

[31] Sul concetto di astronave, v. C. GOLDA, *Navigazione e attività umana nello spazio: problemi giuridici*, *supra cit.*, p. 198 ss.

[32] P. DE SENA, *Questioni in tema di responsabilità internazionale per attività spaziali,* in *Riv. dir. intern.,* 1990, p. 294 ss.

[33] C. DELLE SEDIE, *Problemi della responsabilità per danni ed assicurativi dei voli dello Space Shuttle*, in *Dir. aer.*, 1983, p. 89 ss.

[34] Ratificata dall'Italia con l. 12 luglio 2005, n. 153 «*Adesione della Repubblica italiana alla Convenzione sull'immatricolazione degli oggetti lanciati nello spazio extra-atmosferico, fatta a New York il 14 gennaio 1975 e sua esecuzione*» (*G.U.* n. 177 del 1° agosto 2005). Per un commento v. L. PANELLA, *La registrazione della stazione spaziale internazionale*, in *Com. int.,* 1991, p. 195 ss.

sull'immatricolazione[35] degli oggetti lanciati nello spazio extra-atmosferico[36]; l'«Accordo sulla Luna» del 18 dicembre 1979[37] che disciplina le attività degli Stati sulla luna e gli altri corpi celesti[38].

Il Trattato del 1967, contenente i principi che governano le attività degli Stati nell'esplorazione e nell'uso dello spazio, inclusi la luna e gli altri corpi celesti, può essere considerato come base giuridica generale in materia di uso dello spazio extra-atmosferico per scopi pacifici[39].

Dal Trattato sullo spazio discende, tra i vari principi fondamentali[40] , un obbligo di non interferenza con le altrui attività, che potrebbe essere disatteso da una «contaminazione dannosa» (art. I). Inoltre, un generico divieto di contaminazione dello spazio e della terra dallo spazio[41] si ricava anche dall'art. IX dello stesso Trattato.

Più incisivo, in un quadro di protezione ambientale, è l'art. VII del citato Accordo del 1979[42], il quale impone agli Stati che esplorano ed utilizzano la luna di evitare alterazioni del

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[35] Sarebbe auspicabile che fosse reso obbligatorio fornire al Segretario generale, per l'iscrizione nel Registro internazionale, oltre ai normali dati richiesti dalla Convenzione, ulteriori utili informazioni sulle «misure preventive prese», atte a non aumentare il *debris* nello spazio.

[36] Sul concetto di spazio extra-atmosferico, v. E. BACK IMPALLOMENI, *Spazio aereo e spazio extra-atmosferico*, in *Enc. dir.*, XLIII, Milano, 1990, p. 258 ss.

[37] Entrato in vigore per le parti ratificanti nel 1984. Per i lavori preparatori v. K. WIEWIOROWSKA, *Implications of the Moon Agreement for the Legal Status of Outer Space*, in *Proceedings of the Twenty-Third Colloquium on the Law of Outer Space*, 1980, p. 83; H. TÜRK, *The Negotiation of the Moon Agreement*, in *Proceedings of the IISL/ECSL Symposium, 48th Session of the UNCOPUOS Legal Subcommittee*, Vienna, 2009, 2010, p. 491. Per un commento, v. N. MAATESCO-MATTE, *The Moon agreement: what future?,* in *Annuaire Dr. Mar. Océan, ADMO,* 1993, p. 345; H. BASHOR, *Interpretation of the Moon Treaty: Recourse to Working Papers and Related International Documents*, in *Ann. Air Space Law*, vol. XXXII, 2007, p. 149; D.E. MARKO, *A Kindler [sic], Gentle Moon Treaty: A Critical Review of the Current Moon Treaty and a Proposed Alternative*, in *Connecticut Journal of International Law*, vol. 10, n. 1, 1994, p. 1; J.-F. MAYENCE, *Some Legal and Factual Considerations about the 1979 UN Moon Agreement,* in *Proceedings of the IISL/ECSL Symposium, 48th Session of the UNCOPUOS Legal Subcommittee*, Vienna, Austria, 2009, p. 501; S. M. WILLIAMS, *The Moon Agreement in the Current Scenarios*, in *Proceedings of the Fifty-Third Colloquium on the Law of Outer Space*, 2010.

[38] M. GESTRI, *Portata e limiti del principio dell'uso pacifico nel diritto dello spazio,* in *Com. int.,* 1989, p. 502 ss.; F.G. VON DER DUNK*, The Moon Agreement and the Prospect of Commercial Exploitation of Lunar Resources*, 32 *Ann. Air Space Law*, 2007, p. 91 ss.; T. GANGALE, *Myths of the Moon Agreement,* in *Proceedings of the AIAA Space 2008 Conference and Exposition*, San Diego, 9-11 September 2008, p. 1 ss.; M. HOFMANN, *Moon and Celestial Bodies*, in *Max Planck Encyclopedia of Public International Law*, Heidelberg-Oxford, 2010; S. LI, *Some Considerations on Establishing an International Regime on Exploration and Use of the Natural Resources of the Moon and Other Celestial Bodies* e F. TANOGUCHI, *A Consideration on an International Regime of the Moon Agreement*, in *Proceedings of the Fifty-Third Colloquium on the Law of Outer Space*, 2010.

[39] N. MAATESCO-MATTE, *Spatialisme ou fonctionnalisme juridique?*, in *Ann. Dr. Mar. Aérien,* VI, 1982, p. 405 ss.*;* P. ACHILLEAS, *Droit de l'espace. Télécommunication – Observation – Navigation – Défense – Exploration*, Bruxelles, 2009; M.T. SRIKANTH, *'Military' and 'Peaceful' Are Synonymous in Light of the Outer Space Treaty"*, in *Indonesian Journ. Int. Law*, 2011, 8:2, 291.

[40] I principi di non-appropriazione, uso pacifico ed equo, esplorazione libera di tutti gli Stati senza alcuna discriminazione, cooperazione internazionale e assistenza reciproca sono la base del diritto spaziale internazionale. Cfr. R.F.A. GOEDHUIS, *The Problems of the Frontiers of Outer Space and Air Space,* 174 *Recueil des Cours*, The Hague, 1982, 390; ID., *The never ending dispute. Delimitation of air space and outer space*, Parigi, 1996, p. 6; M. GERHARD, *Report of the 'Project 2001' Working Group on National Space Legislation*, in K.H. Bockstiegel (a cura di), *'Project 2001' - Legal Framework for the Commercial Use of Outer Space*, Köln, 2002, p. 529; V.S. VERESHCHETIN, *Outer Space*, in *Max Planck Encyclopedia of Public International Law,* Heidelberg-Oxford, 2006.

[41] F*orward contamination and back contamination*, ossia dalla Terra e verso la Terra.

[42] Le ratifiche sono state solo 13.

suo equilibrio, mediante trasformazioni nocive o introduzione di materiali inquinanti.

Tra gli altri principi che discendono dai trattati sullo spazio spicca quello sulla responsabilità per danni causati da oggetti spaziali. In particolare, l'articolo VII del Trattato del 1967 prevede la responsabilità internazionale dello Stato di lancio nei confronti di un altro Stato parte del trattato, per danni causati da un «oggetto spaziale» o suoi componenti sulla terra, nello spazio aereo o nello spazio extra-atmosferico, inclusi la luna e gli altri corpi celesti.

Completa il quadro la citata Convenzione del 1972 sulla responsabilità internazionale[43] che, all'articolo II, afferma «Uno Stato di lancio sarà responsabile per danni causati da un suo oggetto spaziale sulla superficie della Terra o ad un aeromobile in volo».

Ovviamente la connessione causale tra il danno verificatosi e lo Stato di appartenenza dell'oggetto spaziale, da cui i detriti si siano eventualmente staccati, sarà ancora più difficile da dimostrare se il pregiudizio si è verificato molto tempo dopo l'incidente.

Queste disposizioni, inoltre, non chiariscono quali danni sono coperti, né le eventuali cause di esclusione di responsabilità.

Quanto alla natura della State *liability*, si tratta di una responsabilità oggettiva, che trova applicazione a prescindere dai profili di colpa[44], nonché assoluta e rigorosa, volta a garantire il tempestivo e certo risarcimento alle vittime.

Ma non sempre la responsabilità è oggettiva. L'art. III della Convenzione del 1972 prevede la responsabilità per colpa per i danni causati, «al di fuori della superficie della Terra», da collisione tra due oggetti spaziali. In questo caso è necessario dimostrare la colpevolezza dello Stato di lancio per il pregiudizio cagionato ad un oggetto spaziale, oppure a persone o cose presenti a bordo dello stesso.

Se la prova della colpa è già estremamente complessa qualora il danno si verifichi poco dopo l'avvenuto lancio, nel caso in cui il pregiudizio si presenti a distanza di mesi o addirittura di anni, la prova della colpa diventa quasi impossibile.

In tale quadro, sarebbe auspicabile l'adozione di un regime di responsabilità assoluta *strict liability* per tutti i tipi di danni.

Ma il quesito principale è a monte, e riguarda l'applicabilità di questa disciplina a danni causati da detriti spaziali[45].

Al fine di rendere applicabili queste disposizioni allo *space debris* è, infatti, necessario operare un'interpretazione estensiva del concetto tecnico-giuridico di «oggetto spaziale»[46].

In mancanza di una definizione specifica nel Trattato sullo spazio, l'analisi deve essere effettuata alla luce dell'art. I, lett. d, della Convenzione 1972 sulla responsabilità civile, laddove si chiarisce: «l'espressione "oggetto spaziale" designa pure gli elementi costitutivi di un oggetto spaziale, nonché il suo vettore e gli stadi del medesimo»[47].

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[43] Sul tema v. M. PEDRAZZI, *Danni causati da attività spaziali e responsabilità internazionale*, Milano, 1996; ID., *Outer Space, Liability for Damage*, in *Max Planck Encyclopedia of Public International Law,* Heidelberg-Oxford, 2008.

[44] Sul doppio regime: responsabilità oggettiva assoluta e responsabilità per colpa, v. G. CATALANO SGROSSO, *Diritto internazionale dello spazio*, cit., cap. I, par. I.5c.1.

[45] M. SPADA, *Indennizzo per i danni causati da oggetti spaziali*, in *Com. int.,* 1983, p. 699 ss.

[46] Cfr. A. GORBIEL, *Space objects in international law,* in *Dir. aereo,* 1982, p. 81 ss.; S. HOBE, *Spacecraft, Satellites, and Space Objects*, in *Max Planck Encyclopedia of Public International Law*, Heidelberg-Oxford, 2007.

[47] Il razzo vettore o lanciatore missile viene usato per inviare in orbita un satellite e una sonda planetaria, cioè un «veicolo» propulso da un particolare tipo di motori detti razzi o endoreattori. Quasi sempre un vettore è costituito da più «stadi» (2-4) appunto per fornire la spinta soltanto per una parte del viaggio complessivo, con propellente liquido o solido. VEGA è l'ultimo vettore, nato dalla collaborazione europea, un lanciatore a tre

La citata Convenzione sull'immatricolazione degli oggetti lanciati nello spazio extra-atmosferico del 1974 contiene, all'art. I, lett. b, un'identica definizione laddove chiarisce che: «l'espressione «oggetto spaziale» designa pure gli elementi costitutivi di un oggetto spaziale, nonché il suo vettore e gli stadi del medesimo».

Invero, questa definizione non è chiara, né esaustiva perché dice ciò che è «incluso» nel concetto giuridico di oggetto spaziale, senza definirlo[48].

In ogni caso, se l'«oggetto spaziale» è formato – tra l'altro – dagli elementi costitutivi del veicolo, deve ritenersi che vi rientrino anche quelle parti staccatesi dallo stesso, abbandonate o non più utilizzabili.

Ma anche a voler propendere per questa interpretazione estensiva, la disciplina della Convenzione del 1972 sembra comunque inadeguata, anzitutto per l'impossibilità di comprendere in tale nozione tutti i possibili detriti orbitanti intorno alla Terra[49] e, dall'altro, per la difficoltà di individuare, in alcuni casi, il paese responsabile. Ad esempio, nell'ipotesi in cui uno Stato lanci un satellite in orbita, che ne distrugge un altro, producendo detriti spaziali che, a loro volta, impattano con un altro oggetto, provocando ulteriori danni, la prova si presenta di estrema difficoltà (*probatio* diabolica). In tal caso, chi è responsabile? Il Paese che, con il suo lancio, ha generato i detriti, oppure lo Stato nel quale è registrato il l'oggetto spaziale in orbita che – a seguito dell'impatto – ha prodotto detriti? Probabilmente la responsabilità dovrebbe essere comune a tutti i soggetti coinvolti nell'operazione.

Va, inoltre, sottolineato che la produzione di detriti spaziali non può essere considerata *in re ipsa* illegale, atteso che l'art. I del Trattato sullo spazio riconosce a tutti gli Stati il diritto di accedere pacificamente allo spazio extra-atmosferico, di esplorarlo e di utilizzarlo, con tutte le conseguenze che ne derivano. Pertanto, la produzione di *space debris* può essere considerata attività illecita solo quando interferisce con l'esplorazione, l'utilizzazione[50] e l'uso pacifico[51] dello spazio.

L'Assemblea Generale dell'ONU, nelle citate *Guidelines* del 2007, ha individuato talune misure di mitigazione del fenomeno, sia passive che attive. Le misure passive sono volte a evitare possibili collisioni con detriti mediante la rimozione dei satelliti inattivi, che rappresenta una delle maggiori fonti di produzione di *debris*. Le misure attive consistono in una

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stadi a combustibile solido con il nuovo motore P80, costruito da Fiat Avio, e la possibilità di avere un ulteriore stadio superiore a combustibile liquido. La sua altezza sarà di 27-30 metri, un peso di 128 tonnellate e la possibilità di inserire in orbita bassa carichi utili fino a 1500 chilogrammi. Questo nuovo vettore europeo nasce dall'esigenza che in futuro ci sarà una richiesta sempre maggiore di immettere in orbita satelliti più piccoli. Il primo lancio è avvenuto nel 2011 dalla base di lancio Kourou, in Guyana Francese. Nella missione *Apollo*, primo volo umano sulla Luna, del 20 luglio 1969, il «vettore» impiegato fu il *Saturno 5*, costituito da «tre stadi», propulsi il primo con ossigeno liquido e cherosene RP-1, gli altri due con ossigeno e idrogeno liquidi. Sulla missione v. B. FLOCA, *Moonshat. The Flight of Apollo 11,* New York, 2013; R. GOODWIN, *Apollo 11: the BASA mission reports*, Apogee Books, Burlington, 2002; C.R. GREEN, A. PINKERTON, *Apollo 11. Rockets to First Moon Landing*, 2004

[48] Questa lacuna è dipesa dalla mancanza di accordo tra Stati Uniti e Unione Sovietica sulla definizione.

[49] Ad es. v'è da chiedersi se i propulsori sia possano considerare parti del satellite.

[50] A. CANTÙ, *La responsabilità del produttore nel quadro dello sfruttamento commerciale dello spazio: la situazione statunitense*, in *Resp. civ. prev.,* 1994, p. 912 ss.

[51] Il Trattato del 1967 non proibisce espressamente la "weaponization" e le armi anti-satellite nello spazio: vieta le armi nucleari, chimiche e biologiche, ma non quelle convenzionali. Una lettura estensiva del concetto di «uso pacifico» consentirebbe di sostenere che è proibito nello spazio qualsiasi tipo di armamento. Ma non si tratta di un'interpretazione che raccoglie il consenso della comunità internazionale. Se entrassero in azione le armi antisatellite, i danni aumenterebbero in maniera esponenziale. Sul tema v. M. GESTRI, *Portata e limiti del principio dell'uso pacifico nel diritto dello spazio*, cit., p. 502 ss.

moderna progettazione dei veicoli, tale da ridurre la possibilità di esplosioni involontarie e il distacco di elementi, nonché nell'uso di vettori riutilizzabili.

Le misure di mitigazione dei detriti più voluminosi abbandonati nelle orbite più affollate, se correttamente attuate, possono ridurre in maniera considerevole il tasso detritico. La rimozione consiste nell'inviare piccoli satelliti «acchiappa-frammenti», che – per mezzo di cinghie – catturano e rimuovono frammenti di grosse dimensioni, che vengono poi trasportati nell'orbita di sicurezza detta «orbita cimitero» o bruciati nell'atmosfera.

A livello europeo, l'ESA prevede di portare in orbita la prima missione per la rimozione di detriti nel 2021.

L'Agenzia Spaziale Russa ha presentato un progetto di costruzione di un particolare apparato per la graduale rimozione – entro il 2025 – di una parte dei rifiuti spaziali, a partire dall'orbita geostazionaria, ma la comunità internazionale non sembra ancora disponibile a raggiungere un accordo su questo aspetto.

Per la rimozione dei detriti orbitali è, invece, necessario il raggiungimento del consenso sull'adozione di un piano strategico, basato sulla cooperazione[52] attiva e sulla condivisione delle spese.

Si tratta, tuttavia, di rimedi reattivi, che intervengono *ex post*, dopo che le collisioni si sono verificate, ma per invertire l'attuale trend, di continuo aumento dei detriti in orbita, le misure più efficaci dovrebbero essere quelle preventive, adottate *ex ante*, in fase di progettazione e costruzione dei satelliti, volte a ridurre la possibilità di eventuali incidenti.

Sebbene alcuni Stati *leader* (Francia Giappone, Russia, Stati Uniti) siano già intervenuti sul piano normativo, adottando leggi nazionali per contenere la produzione di detriti, sembra, tuttavia, improbabile che si possa pervenire, in tempi brevi, all'adozione di un trattato sullo *space debris*[53]. E anche qualora si dovesse giungere alla firma di una convenzione internazionale per regolamentare il fenomeno, il numero delle ratifiche rischierebbe di essere esiguo[54].

Dal momento che l'ambiente spaziale si sta modificando in modo tale da non essere più sfruttabile nel lungo termine appare quindi auspicabile una sempre maggiore sensibilità verso la tutela dell'ambiente extra-atmosferico da parte degli Stati[55] ed una maggiore disponibilità ad assumersi l'obbligo di adottare strumenti internazionali e misure efficaci, nell'ambito di una politica, certamente antieconomica nell'immediato, ma lungimirante e in grado di garantire maggiore sicurezza in un prossimo futuro.

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[52] Per un approfondimento v. per tutti C. ZANGHÌ, *Cooperazione spaziale europea e normativa comunitaria*, in *Riv. dir. eur.,* 1992, p. 527 ss.

[53] Cfr. S. HOBE, *'Project 2001' Plus – Global and European Challenges for Air and Space Law at the Edge of the 21st Century*, in *Institute Of Air And Space Law (Schriften zum Luft- und Weltraumrecht),* University of Cologne, Köln, 2006, p. 62 ss.; M. PEDRAZZI, *Il diritto internazionale dello spazio e le sue prospettive*, in *Quaderni Relazioni internazionali*, 2008, p. 46 ss.

[54] Sul tema v. D. ALWES, M. BENKÖ, K.U. SCHROGL, *Space Debris: An Item for the Future*, in M. Benkö, K.U. Schrogl (a cura di), *International space law in the making: Current issues in the UN Committee on the Peaceful Uses of Outer Space,* in *Forum for air and space law,* Editions Frontières, 1993, p. 233; M. BENKÖ, K.U. SCHROGL (a cura di), *Space Law: Current Problems and Perspectives for Future Regulation*, Utrecht, 2005.

[55] In particolare, ci si riferisce ai cinquanta paesi con capacità spaziali «space faring nations»: tra questi, oltre a Russia e Membri dell'UE, il Giappone, la Cina, l'India, Israele, l'Iran.

ABSTRACT: *Space Debris*

Space debris is man-made material that is orbiting Earth, but no longer functional. Some debris can be found in geostationary orbit, but much of it is in low Earth orbit, within 2,000 km of Earth's surface. A collision with even a small piece of space debris can damage both manned and unmanned spacecraft. Although an international level playing field is required, space debris has not yet arrived at the drafting of an adequate international framework to deal with the complex legal issues it raises. Despite great efforts over decades to define the concept of «space debris», no internationally agreed definition exists. The provisions *contained in the Outer Space Treaty* of 1967 are too generic to deal with the complex problems of space debris, posing major interpretation problems. This Treaty offers minimal guidance to oblige State Parties to avoid the creation of, reduce, and even remove, space debris and to allow all States to participate in the exploration and use of outer space with minimum risk from space junk.