IAC-11-7.-B3.8

POLICY AND LAW ASPECTS OF INTERNATIONAL COOPERATION IN SPACE

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Building mutually beneficial relationships of cooperation and coordination in space activities ties states together for the betterment and safety of all. Furthermore, international cooperation in space activities between states, and between national space agencies, non-governmental institutions, international organizations, and private enterprises has a long history of success. Today, amidst shifting geopolitical circumstances and a global economy in flux, both global spending on space and even the number of space-faring nations is increasing. Along with the commercialization of some sectors of the space industry, the ending of the United States space shuttle program, and the continuation of the International Space Station, international cooperation in space will face many new challenges. This cooperation must be shepherded by optimistic but pragmatic legal practitioners. Intergovernmental politics, military concerns, and popular perception all inform how international cooperation in space takes place. Many nations place restrictions on cooperation, including the requirement that the cooperation must conform to their national space policy and further the missions of their national space agencies. Additionally, the cooperation must not involve activities that counteract other national priorities like furthering domestic industrial or technological development. Export controls, choice of law, intellectual property, and reimbursement issues will also arise. Informed by international relations theory, but with an emphasis on international space law, national space legislation, and national space policy, this paper will discuss the likely policy and law aspects of large cooperative international space exploration activities in the years and decades to come.

I. INTRODUCTION

In today's fluid geopolitical and economic climate, international collaboration, coordination and cooperation in space activities will increase.[1] Most space agencies now realize that for any long-range, multi-year space exploration activity to remain feasible, international partnerships are indispensable. Cooperation in space increases the chance of mission success, and allows states to achieve together what they could not do alone[2]. This paper will look at some of the policy and law challenges which must be addressed by states and their national space agencies when planning their space activities, paying particular attention to the work and implications of the International Space Exploration Coordination Group (ISECG).

II. INTERNATIONAL COOPERATION

General examples of international cooperation in space exploration include "informal interactions among individual scientists, to formal government-to-government agreements to collaborate on one or a series of space missions, to permanent multinational organizations set up to facilitate particular areas of cooperation.[3]"

Cooperation can also be divided into either "programmatic enhancement" or "programmatic interdependence". Programmatic enhancement might be a space agency flying its hardware on a foreign space agency's craft (such as the European Space Agency's faint object camera housed on the US-led Hubble Space Telescope). In contrast, programmatic interdependency is when one agency is providing mission critical hardware to a project undertaken collaboratively[4] (*e.g.,* the International Space Station or the planned ExoMars rovers). The spectrum on international cooperation is very broad, and there are many reasons why a space agency or country might partner with another country or space agency.

Benefits of International Cooperation

The benefits in cooperation include an increase in the payoffs from the mission (*i.e.,* the ratio of capital and time invested compared to the science goals returned, or other mission objectives). It allows partners to accomplish what they could not otherwise accomplish. Cooperation also helps agencies share costs, and allows agencies to access the experience, technology and facilities of their partners[5].

As one of the basic rationales for governmental space activities is increasing a nation's prestige and displaying its capacity for international leadership, international cooperation can increase political support for a project. It might also create and strengthen good relations between countries, or it might even be an example of a country exercising influence over foreign partners[6]. In other words, besides the space agency's goals, international cooperative partnerships can align with a state's larger foreign policy aims.

Risks of International Cooperation

Despite the many benefits, there are implicit and explicit risks to international cooperation. These include

creating dependencies between the partners, which might include partners being responsible for different aspects of the mission where one partner's failure to meet objectives deleteriously affects the entire mission.

When planning missions, mission designers frequently chart the organizational and developmental steps towards accomplishing the mission's objectives. For project managers, this work breakdown structure shows the project's "critical path" towards completion of the goal. The longest time towards completion of the project is determined to be the "critical path". Where the project involves multiple partners, as would be the case in an international partnership, partners run the risk of crucial steps along the critical path falling to the mercy of foreign programmatic constraints, and thus outside of their control. Losing control of the critical path is another possible risk to international cooperation[7].

Complications also include an increase of overall costs, perhaps due to what economists would call the "transaction costs" of international cooperation – costs associated with the choice of doing a project with international partners rather than purely domestically. Examples of these transaction costs include flying parts and personnel abroad, scheduling delays from foreign holidays, time and money spend assuring that domestic procedures comply with foreign laws and requirements, and any other concerns which might not happen were the project done by a single agency or country, and perhaps even within the same field office or centre.

International cooperation also increases the managerial complexity of the overall project, as the mixing of resources engenderers many legal, technical and programmatic hurdles, to be discussed below. This complexity balloons the administrative hurdles, leading to duplication of efforts and personnel. Additionally, owing to the dual-use nature of space hardware and space-based assets, technology transfer and export control issues will likely arise. The sharing of resources and technology also creates the risk that a nation is fostering the growth of industrial competitors whom might damage the competitiveness of its own domestic industries. If all of the mission objectives are not all met, there is the risk that the cooperation would be seen as a failure by stakeholder (like the public, governments, industry, or other interested parties).

International cooperation is rarely an end in-and-of-itself. Nor is a universal panacea. A adherent to the international relations theory of "realism" would have no trouble agreeing with the statement that states participate in international cooperation only when it is in their own self-interest to participate in cooperation[8]. Lastly, Heads of Agencies are aware of the strengths and shortcomings of international cooperation, with ESA Director General Jean-Jacques Dordain remarking that "it's not easy to cooperate, but it's more difficult to succeed alone."[9]

III. INTERNATIONAL COOPERATION IN THE UNITED STATES

The United States of America conducts a large number of cooperative space activities. In fact, the impetus to engage in international cooperation is enshrined in the Federal Act creating the National Aeronautics and Space Administration (NASA)[10], and the early Mercy and Apollo missions were originally intended to engage other countries that President Kennedy thought susceptible to Soviet influences (owing to early Soviet successes in space)[11].

For over 50 years, NASA has engaged in well over 4,000 international agreements, and in 2011 had over 500 active international agreements[12]. Over half of these agreements, usually called Space Act Agreements (SAAs), are with its eight largest partners: France, Germany, the European Space Agency (ESA), Japan, the United Kingdom, Italy, Canada, and Russia. NASA's partnership with European partners accounts for over half of its total international agreements; though it has on average over 120 partners to active SAAs at any one time.

US National Space Policy

Indeed, the 2010 US National Space Policy makes international cooperation a stated objective and goal, with language so clear that it almost asks NASA to seek out opportunities for international cooperation and collaboration[13]. It states "the United States will pursue the following goals in its national space programs: Expand international cooperation on mutually beneficial space activities to: broaden and extend the benefits of space; further the peaceful use of space; and enhance collection and partnership in sharing of space-derived information."[14]

NASA Policy Directives

Further guidelines exist in NASA policy directives. NASA's stated policy on initiating and developing international cooperation requires that foreign participation in its programs bring or significantly enhances technical, scientific, economic, or foreign policy benefits[15]. Because scientific and exploratory projects have long lead times, are technically and scientifically challenging, and require large commitments of resources, NASA prefers governmental partners, rather than foreign universities and/or foreign private entities[16]. Additionally, internationally collaborative projects must support NASA's programmatic objectives, each partner must assume full responsibility for their financial contribution, and the division of responsibility must be clearly defined[17], which must be a formal agreement. Additionally, the activity must benefit NASA or the United States:

> *"Each cooperative activity must demonstrate a specific benefit to NASA or the United States. Such benefit may be in the form of data, services, or contribution to flight mission or operational infrastructure systems, or it may directly support broader U.S. policy or interests. Science projects must include a commitment to make any scientific results available to the international scientific community as soon as possible.[18]"*

This articulated policy also makes it clear that any possible partnerships or cooperative activity must take into account unwarranted technology transfer, and therefore comply with US export controls. Lastly, issues related to US industrial competitiveness must also be considered[19], which might require review by other agencies within the US government's executive branch, such as the US Department of State[20].

IV. INTERNATIONAL COOPERATION FOR SPACE EXPLORATION

In 2004, then US President George W. Bush announced the official US National Space Policy, containing a bold initiative for the US to return to the moon, develop new launch and crew vehicles, and send humans to Mars. While this program did not develop as planned (and was eventually cancelled in 2010), a sharper vision for international cooperation was created out of it.

When it became evident that the US could not pursue its ambitious space exploration plans unilaterally, NASA began a dialog with several space agencies to discuss and begin developing an organizing mechanism to guide their common exploration plans[21]. In May of 2007, fourteen space agencies were able to agree on a common framework for their future endeavours, called 'The Global Exploration Strategy – The Framework for Coordination'[22].

This group, the International Space Exploration Coordination Group (ISECG) meets periodically to articulate goals and coordinate actions. The members of the ISECG are (in alphabetical order): ASI (Italy), UKSA (UK), CNES (France), CNSA (China), CSA (Canada), CSIRO (Australia), DLR (Germany), ESA (European Space Agency), ISRO (India), JAXA (Japan), KARI (Republic of Korea), NASA (United States of America), NSAU (Ukraine), and Roscosmos (Russia).

The ISECG Global Exploration Strategy

The Global Exploration Strategy (GES) is a vision for human and robotic exploration of the solar system, and focuses on destinations where humans may one day live and work[23]. The GES incorporates specific themes or rationales to explore space: 1) to seek knowledge for the sake of knowledge itself, recognizing the difficultly and futility of predicting what one will discover; 2) to extend human presence to new frontiers; 3) to drive economic expansion on Earth through the development of new technologies required for space exploration; 4) to build global partnerships based on the spirit of friendship and cooperation, especially recognizing that "no nation has the resource to take on all of its challenges at once"; and 5) to inspire and educate the next generation of space professionals[24].

The GES is a voluntary, non-binding coordination framework for its partner agencies, and it lays our the goals and principles which the partners can use to guide their planning, in a concerted global space exploration effort. It states:

> *"[t]his Framework does not propose a single global programme. Rather, it recommends a voluntary, non-binding forum, the international Coordinating Mechanism, through which nations can collaborate to strengthen both individual projects and the collective effort."*[25]

The Coordinating Mechanism can be used to identify areas of potential cooperation (useful in reducing duplication of efforts across agencies) of key interest for space agencies worldwide. The Coordinating Mechanism will also serve to "enhance mutual understanding" and therefore should create a "common language" of exploration building blocks.[26] When mission designers, planners and engineers employ this common language, interoperability will allow for sharing of assets and resources. This reduces both risks and costs born by any one partner.

It is understandable that space agencies were hesitant to tie their future exploration programs to outside control, and thereby restrict their freedom of choice and leeway. Instead, the GES creates a voluntary, non-binding forum (the Coordinating Mechanism) which recognises that individual space agency activities "can achieve more through coordination and cooperation"[27].

Consequently, the GES is a policy statement[28]. While it is true that the GES is not legally binding and does not rise to the level of an international treaty, Memorandum of Understanding, Space Act Agreement, or anything of the sort, it is equally true that GES is a landmark statement of principals by the world's space agencies, laying out their mutual understanding for the exploration (both human and robotic) of the solar system.

The ISECG Terms of Reference

Subsequent to the GES, the participants were able to further articulate a Terms of Reference document, elaborating on the purpose and scope of the ISECG,

along with principles, membership and operating procedures.[29] They state that, in furtherance of the development and implementation of the GES, the ISECG provides a "forum for participants to discuss their interests, objectives and plans in space exploration."[30] Pursuant to this, an area of initial consideration include the "assessment of the requirement for any relevant international legal agreements.[31]"

The ISECG Global Exploration Roadmap

At the latest meeting of the ISECG, in Kyoto, Japan in the summer of 2011, the partners were able to finalize a further refinement of their vision, called the Global Exploration Roadmap[32]. This first iteration of the roadmap is meant to layout the actual steps for the exploration of the solar system, using both human and robotic elements[33]. It anticipates using the ISS as a platform for further exploration, and details both a "asteroid next" and a "moon next" plan.

The Roadmap will "inform and help focus the planning currently underway in each of the partner agencies in the areas of planetary robotic exploration, advanced technology development and use of the ISS in preparation for exploration."[34] The Roadmap acknowledges that considerable dialog between agencies will follow from the Roadmap, as agencies decide on how to align plans, policies and missions. National policy decisions and consultations will decide on actual destinations, but the coordinating mechanism will serve these developments[35].

V. INTERNATIONAL COOPERATION'S SPACE LAW IMPLICATIONS

With the understanding that the major international space law treaties were drafted with states as their principal concerns, and with the role of private commercial entities also being considered (if only tangentially, and falling under the aegis of states), it may be interesting to consider what implications the existing body of international space law might have on large cooperative space exploration efforts conducted by many nations and space agencies acting in partnership.

Positive Encouragement to Cooperate

States are positively encouraged to cooperate under the international treaties[36]. Outer Space Treaty Art. I says that states are obliged to "facilitate and encourage international cooperation in conducting scientific investigations"; Art. II holds that states should carry out space activities "in the interest of maintaining international peace and security and promoting international cooperation and understanding", along with afford "opportunities to observe the flight of space objects launched by them".

Additionally, Art. IX of the Treaty makes it clear that states shall be "guided by the principles of cooperation and mutual interest," and if states believe that their activities might cause harmful interference with the exploratory activities of other states, it should consult with them beforehand. It obliges states to "inform the Secretary-General of the United Nations as well as the public of the nature, conduct, locations, and results of their space activities."

Other sources of relevant public international law exist. A 1996 United Nations General Assembly resolution addresses international cooperation, stressing the interests of developing countries.[37] Concerning the 1996 resolution, while it is of a non-binding character[38], it can also be said that no state would object to action take by a state which is in conformity with it[39].

Prohibition on National Appropriation

One interesting effect of international cooperation for planetary space exploration is that it has the potential to solve, or at least obviate, the prohibition on appropriation of celestial resources which exists in the Outer Space Treaty.

The well-ratified 1967 Outer Space Treaty was drafted with the explicit undertaking that outer space, including the Earth's moon and other celestial bodies, is "not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means[40]." Celestial bodies are seen as *res communis* (rather than *res nullius*) and therefore cannot come under the jurisdiction of any states. States cannot assert property rights over the territory on celestial bodies. In this, the Outer Space Treaty is clear - even giving examples of activities (or "means") which will not give rise to property rights. These activities include use, occupation, claims of sovereignty, or, to be explicit, by "*any other means*."

States and other actors may take the view that this prohibition only affects national appropriation, and not the actions of non-governmental entities (as specifically mentioned in Outer Space Treaty. Art. VI in the context of space activities). This implies that this prohibition does not prohibit private ownership. However, this argument necessarily fails, as property rights are an extension of the sovereignty of the state[41]. Consequently, citizens, companies and other non-governmental entities cannot assert private property rights[42].

Contrary to this explicit prohibition are statements that states enjoy the freedom to explore outer space[43], and that the exploration of outer space is the province of all mankind[44]. It should be noted that this phrase, "province of all mankind", is distinct from the idea of the "common heritage of all mankind" as seen elsewhere in space law (*e.g.,* the Moon Agreement). The Outer Space Treaty, and the following space treaties,

mean to encourage and facilitate the exploration of outer space.

Economic Expansion

The GES discusses international cooperation as a means to enable economic expansion and new business opportunities.[45] After discussing examples such as mining moon rocks, space tourism, and virtual presences on the Moon and Mars, it states that businesses need the rule of law. "This means common understanding on such difficult issues as property rights and technology transfer. The Coordinating Mechanism foreseen as part of the [GES] will provide a forum to discuss these important issues."[46]

There is uncertainty and disagreement in the public and between nations as to the exact nature of the prohibition on appropriation of celestial resources, and amongst scholars, professionals and experts as to whether these prohibitions, as they now stand, completely bar the use of celestial resources. For example, it is unclear if the Outer Space Treaty truly prohibits the exclusive use of property, but allows for the use of minerals and other substances found on real property[47]. Consequently, the GES wisely does not lock partners into positions on this matter.[48] Rather, it leaves these issues open, perhaps to be discussed and agreed upon by the parties.

International Appropriation of Celestial Resources

In practice, it would be difficult to envision an international cooperative effort, by virtue of its international character, to violate the prohibition on *national* appropriation. Could two states, acting in concert, appropriate (or otherwise law claim to) celestial resources? It is arguable that they would not fall foul of the explicit prohibitions of Outer Space Treaty Art. II, so long as neither state asserts property rights to the exclusion of its partners, or towards any other states – regardless of whether they are partners in exploration or even parties to the Outer Space Treaty. In their use of mineral resources, they are exclusively using those resources, but perhaps not in a way which relies on having property rights to them. They may be using those resources in a manner more consistent with Outer Space Treaty Art. I, namely, scientific investigations encouraging and facilitating international cooperation. These cooperative missions might be furthering peace and security, by binding partners together.

Additionally, the ISECG Terms of Reference contain, in their Principles section, the statement that work done in furtherance of the GES shall be for mutual interest: contributing to "common peaceful goals and benefits to all participants" along with respecting the "national prerogatives of participating agencies"[49]. Importantly, the ISECG Roadmap details the major challenges of long-range human exploration of Mars, and includes the utilization of local resources, including oxygen, water and methane[50]. While the issue does not arise if these resources are in the very dissipated Martian atmosphere[51], resources extracted from the Mars regolith might be said to engender a legal issue under the Outer Space Treaty. Complications might arise if there were business interests reliant on the use of these resources, and non-stakeholder states might protest that the spirit, if not the letter, of the Outer Space Treaty is being violated.

However, it remains that an international cooperative mission to any celestial body which uses resources it finds there is a significantly less clear violation of the Outer Space Treaty than if that mission were done by a single state. There is also the possibility that the ISECG, or one of its working groups or bodies of experts, may recommend international legal agreements which enshrine the parties understanding of the legal consequences of their intended actions on celestial resources before such resources are actually used. Such practice by states might significantly develop our understanding of the exact limits and nature of the prohibition on national appropriation found in the Outer Space Treaty.

VI. FURTHER POLITICAL ISSUES IN INTERNATIONAL COOPERATION

Technology Transfer

In addition to the possible issues of resource utilization and its implications to the prohibition on national appropriation, another issue which will likely arise is technology transfer. While unwanted technology transfer from one state to another is a hazard, the ISECG need to make wanted the transfer of space-related technology easier. The GES and the roadmap acknowledge that a common understanding on this issue is essential, but also acknowledge that the ISECG does not create binding commitments of behalf of the parties.

While there has been much written about the need for reform of International Traffic in Arms (ITAR) and related export control regulations, this would be a clear case of where both the scientific and programmatic mission goals, space agency wide goals, and even the existing national and international legal framework is influenced by greater political concerns dealing with security and national influence.

Economic Complications

One current example of mission uncertainly due to its international nature is the planned NASA/ESA ExoMars missions, tentatively scheduled for 2016 and 2018. In 2016, an orbiter is to be sent to Mars, followed in 2018 by a rover. Due to orbital mechanics, the most logical times to launch towards Mars occur every 26 months, and due to the technical complexity of building spacecraft, long multi-year lead times are required for design and construction. Consequently, deadlines for the

2016 ExoMars orbiter are well in advance of 2016 and both ESA and NASA must assure each other of their commitments well before work begins. As each agency has industry contractors, there amount of schedule slippage is further reduced. When one agency cannot assure the other that it will have the funding commitment, this uncertainty places the entire project in jeopardy, or at least with a threatened schedule[52]. Options include de-scoping the project, finding other partners to fulfill tasks, and meeting milestones expect that the partner can eventually make good with their assurances.

The ExoMars project is an example of a project too large for either space agency to undertake alone, so the synergies of international cooperation are evident. However, it may also prove to be an example of a project where the transactions costs of international cooperation – relying on assurances from a foreign agency which that agency cannot necessarily guarantee – which might not have happened if the project were done internally, with a single space agency able to assure its private contractors that funding is assured and that construction can begin.

Political Pressures

One example of political pressures complicating space agency missions is found by looking at the long history of the International Space Station (ISS). Fortunately, it is also an example of deft handling by the space agencies and their personnel, who sought both institutional and legal solutions to successfully address political complications. The ISS is perhaps the best example of truly multilateral cooperation for space activities, and the legal framework underpinning this project is equally sophisticated, involving a "framework" or "Umbrella" agreement and several Memoranda of Understanding between the US and its partners[53].

However, when geopolitical circumstances changed for the US, unforeseen complications arose. The 2000 Iran Nonproliferation Act prevented the US (and its contractors) from making payments to Roscosmos and other Russian entities, except for previously agreed upon payments[54]. This act, which eventually grew to address both Syria and North Korea, prevented changes from going forward when payments to Russia were necessary for interim agreements on crew rotation and cargo schedules. Eventually, NASA lawyers were able to demonstrate to officials at the US State Department and other Executive branch offices that the payments to Russia would not end up in proscribed hands. Going forward, they had to craft an addendum to the Iran Nonproliferation Act. These events are examples of larger political pressures making pre-arranged international cooperative activities more complex. Creative and resourceful measures allowed changing political circumstances from creating programmatic complications, scheduling slip, or other deleterious effects.

VII. CONCLUSION

The above was a brief foray into some of the legal and political issues affecting international cooperation in space activities, which can and will be expanded on in further papers and addressed is additional forums. There is every reason to believe that space faring nations, and aspiring space fairing states, will continue to cooperate, and continue to accelerate and magnify the pace and extent to which they cooperate. Under the existing international space treaties, this presents no immediate problems. However, there is enough uncertainty in the existing body of public international space law to create issues, which space agencies and cooperative groups like the ISECG will have to discuss and resolve amongst themselves. They will likely promulgate agreements between the parties which demonstrate their mutual understandings of the existing space law, and they even may desire that the existing regulations and treaties be made more precise, through international bodies such as United Nations Committee on the Peaceful Uses of Outer Space (COPUOS).

As there is no regulatory body for activities in outer space, and no formal enforcement or regulatory mechanism[55]. Because of larger national concerns, this formal regulatory and enforcement vacuum serves states' interests. For now.

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