

GLEX-2012.13.1.9x12666

EMERGING ISSUES, EXISTING LAW, AND PRAGMATIC SOLUTIONS

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The Outer Space Treaty of 1967 is widely ratified by major space powers and emerging space faring nations, and has helped with over forty years of the peaceful use and exploration of outer space. Fundamental portions of it have passed into the realm of customary international law, and it has largely hindered the militarization of outer space. This foundational treaty has also been supplemented by additional treaties on the rescue of astronauts, on international liability, and on the registration of space objects. The UN committee where the treaty originated has also promulgated various principles and declarations that further refine the legal framework for the use of space. However, aspects of the major space treaties may prove ill-suited for the next, more globalized and cooperative age of global space exploration. Vagaries over the extent and nature of the prohibition on appropriation and the treatment of celestial resources have engendered debate and confusion, and will continue to do so. The role of commercial providers – not just as contractors but as industrial partners to national space agencies was not foreseen during the early years of space treaty drafting. The concept of a launching state has also become problematic due to commercialization. And now, the characterization of astronauts aboard commercial launch providers has now stretched U.S. national law and will eventually become problematic under the applicable international law. This paper will investigate the short-term issue of the treatment of astronauts in domestic U.S. law, and the long-term issue of the treatment of astronauts under the public international law of outer space.

I. INTRODUCTION

A new and more globalized and cooperative age of space exploration is set to begin. Having realized that much more can be accomplished cooperatively than by working separately, the world's space agencies have begun to harmonize their national space plans and goals. They have come together under the auspices of the International Space Exploration Coordination Group to articulate a Global Exploration Strategy, and most recently, a Global Exploration Roadmap, which seeks to show the way that the world's space agencies can achieve synergies by transparently sharing their plans and even harmonizing their exploration objectives [1,2]. These foundational and aspirational documents illustrate the world's visions for the next few decades of humankind's exploration of space. It is from these plans and objectives that emerging issues in space law can be discerned.

The international and national legal framework for the use and exploration of outer space was created in the Cold War atmosphere of competition and distrust, and in an age of large space agencies and nationalized spending programs for space. The foundations, or hallmarks, of space law include principles of non-sovereignty, peaceful use of space, aid, assistance, and

return of astronauts as “envoys of mankind”, international responsibility and liability for national space activities, and the direct attribution of non-governmental organizations to their respective states.

The era of law-making in international space law is roughly demarcated from the 1963 United Nations Principles Declaration to either the 1975 Registration Convention or the 1979 Moon Agreement. Since then, the United Nations Committee on the Peaceful Uses of Outer Space has largely restricted itself to the articulation of non-binding Principles and Statements.

However, ingenious innovations and new approaches to outer space have stretched the coherence and applicability of international space law to the limits, while perhaps subverting the intentions of national space legislation.

The degree and extent of space commercialization was perhaps not envisioned when the 1968 Rescue Agreement regarded all personnel aboard a spacecraft as “envoys of mankind”, as commercial operators will soon begin serving national space agencies in new ways. In contemplation of the retirement of the U.S. Space Shuttle program and loss of domestic capacity to launch humans into Low Earth Orbit, NASA began the Commercial Crew Program, where commercial launch

providers bring cargo and U.S. astronauts (and its international partners) to the International Space Station. National legislation and international treaties need to be rationalized to reflect this emerging commercialization.

This paper first looks at a few problematic issues in the domestic space legislation of the United States engendered by the rise of commercial launch providers bring personnel to LEO. This short-term issue require the rationalization of Title 51 of the United States Code applicable to Commercial Crew. It will then turn to the international law framework within which astronauts are considered, and longer-term issues will be considered. The treatment and characterization of the human explorers in the next age of space exploration, on both a national and international level ought to reflect both changing realities and anticipate future developments.

II. SHORT-TERM ISSUE INADEQUACY OF U.S. LEGISLATION

Space activities in the US have traditionally been regulated along two lines: national activities carried out by the various governmental agencies with space activities, such as NASA and NOAA, and the governmental regulation of the civilian use of spaces [3]. This division has functioned smoothly but due to NASA's development of the Commercial Crew Program, the two sources of regulation must now synch with each other to an even greater degree.

In 2004, the Space Launch Amendments Act, an update to existing law regulating commercial launches, was made to regulate the then-expected soon arrival of commercial suborbital tourism, where private citizens would pay for a ride to the limit of national airspace to enjoy a few minutes of microgravity [4]. The (newly consolidated) Title 51 of the United States Code – Chapter 509 Commercial Space Launch Activities (CSLA) mandates that the Secretary of Transportation shall regulate Commercial Spaceflight [5]. The Department has delegated these duties to a sub-agency, the Federal Aviation Administration (FAA), which has further delegated oversight to its Office of Commercial Space Transportation (AST). The Agency is tasked with both “encouraging, facilitating, and promoting” private sector commercial space launches and re-entries and facilitating private sector involvement in

commercial space transportation activity, and also with encouraging, facilitating, and promoting the continuous improvement of safety (with the safety of the public first and foremost). These twin roles may be said to sit in an uneasy relationship to one another, as surely the best way to protect the public from the possibility of third-party damage from space activities (which the Chapter finds is “inherently risky”) is to proscribe them altogether. Nevertheless, the FAA's AST has been tasked with overseeing commercial launch and re-entries and launch and re-entry sites through its power to license and permit such activities.

II. I. Risk Allocation under the CSLA

As stated, the 2004 Amendments act was promulgated with the fledgling commercial suborbital spaceflight industry in mind. As such, it seeks to allocate risk to the most appropriate parties – usually those parties best suited to manage those risks. The Act's system of risk allocation is three-fold.

The first method (not otherwise detailed in this article) is through the requirement that spaceflight participants be informed, in writing, of the risks involved in their intended spaceflight. The licensee shall also warn the SFPs that the “U.S. Government has not certified the launch vehicle as safe” for carrying crew or SFPs. The nature and efficacy of this informed consent has been discussed elsewhere [6], but it is included as a risk-allocating measure by virtue of the insight that informing potential participants of the risk and possible repercussions of their intended spaceflight, they are the best suited party to determine what level of risk they wish to accept – by continuing or declining to proceed with the flight. By giving the SFP the information, they are then able to make an informed decision about their trip.

Secondly, licensees (the commercial companies) must acquire liability insurance – or demonstrate financial responsibility – sufficient to compensate for two avenues of claims: third-party claims for death, bodily injury, or property damage, and U.S. government claims for damage or loss of property. For third-party claims, the lesser of USD \$500 Million or the maximum “available on the world market at a reasonable cost”. For U.S. Government claims, the lesser of USD \$100 Million or the maximum available on the world market at a reasonable cost. Such

insurance protects the U.S. Government (and its agencies, personnel, contractors, and subcontractors) along with both the licensee and the customer's contractors and subcontractors. For third-party claims (except involving wilful misconduct, or claims against an SFP) beyond the required liability insurance, there is U.S. Governmental indemnification up to USD \$1.5 Billion (taking into account post-1988 inflation).

The third method of risk allocation is through two sets of reciprocal waivers of claims. The waivers make each party responsible for the loss it sustains, including losses from personal injury, death, and property damage. The first set of reciprocal waivers is between the industrial partners: between the licensee and each of their contractors, subcontractors, and customers (and each of their customers contractors and subcontractors). The SPF and crew on the vehicle are not a party of these federally-mandated waivers.

The second set of reciprocal waivers is broader. It is between the U.S. Government (and its executive agencies, contractors and subcontractors) and the licensees, contractors, subcontractors, and customers (along with their subcontractors and customers). Just like the first set of waivers, it covers the same types of loss. However, in distinction to the above waiver, it involves waivers between the U.S. Government and the SPFs and Crew. Additionally, it is only a waiver of claims for losses amounting to more than that which is covered by the licensee's insurance.

It is worth noting here that this regime of insurance, governmental indemnification, informed consent, and reciprocal waivers of claims by all parties (except as between the SFPs and Crew and the commercial provider) is seen as a regime well-suited to both foster the fledgling commercial suborbital spaceflight industry, and which properly incentivizes commercial companies to allocate resources on safety the safety of their craft, on the crew and SFPs aboard their craft, and on the uninvolved public.

II. II. CSLA Inadequacy

However, these regulations were drawn up in contemplation of a certain type of commercial activity, and are now set to apply to a different type of activity. They were drafted in contemplation of the FAA regulating commercial companies bringing private citizens for brief periods into suborbital microgravity,

which can be done within national airspace. With the advent of NASA's Commercial Crew Program, the FAA regulations are now the applicable regime of commercial companies bringing governmental personnel beyond national airspace and into an international arena, Low Earth Orbit. Consequently, both the AST's jurisdictional powers in orbit (or lack thereof), and its characterization and treatment of governmental personnel are problematic.

Jurisdictional Limitations

CSLA coverage begins at the vehicle's launch, stops with a successful separation of the upper stage from the launch vehicle, and resumes again at the initiation of deorbit burn. Consequently, there is no direct federal regulation of commercial space vehicles once they separate from the launch vehicle and head into orbit, and before they deorbit. Consequently, the abovementioned risk allocation measures (financial requirements, governmental indemnification, waivers of claims, perhaps even informed consent) are mute once the Commercial Crew vehicle separates from its launch vehicle and heads into orbit. In the case of damage to third parties (a commercial satellite in LEO, or space station, another space vehicle) it is unclear whether the indemnification for damages would extend to resulting claims. Do the waivers between the parties extend to claims which arise in orbit? Perhaps only a clear casual link between the activities in orbit and launch and re-entry would allow the insurance, indemnity, and waiver methods of risk allocation described above to have any impact [4].

NASA's Commercial Crew Program has recently taken some actions to addressing these concerns, and has published risk allocation provisions to be included in agreements with commercial crew partners. The provisions include supplemental waivers seemingly applicable beyond where the CSLA cannot regulate (see Figure-1 on following page), and include waivers between the partners, including waivers relevant to claims addressed in the 1972 Liability Convention.¹

¹ NASA Commercial Crew Program, *Risk Allocation Provisions* (March 16, 2012), available at: <http://commercialcrew.nasa.gov/page.cfm?ID=29>.

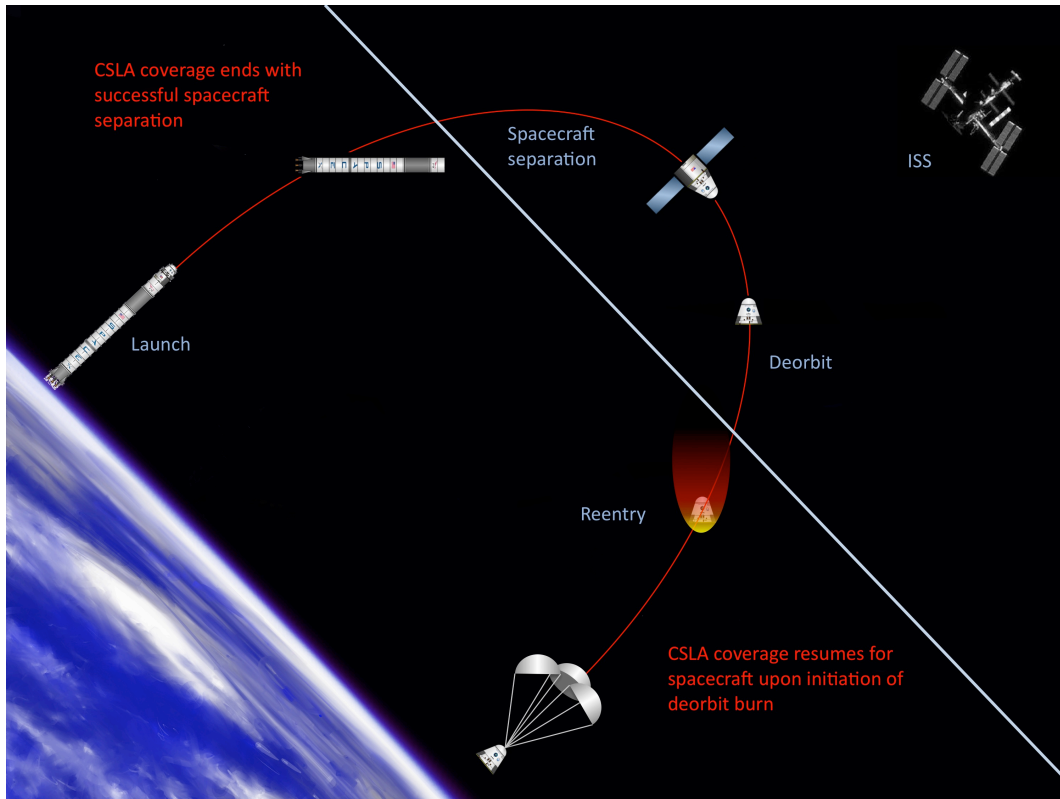


Figure 1 - CSLA Coverage

The FAA might have its regulatory powers extended by Congress to regulate on-orbit activities of commercial launch providers. Indeed, FAA oversight of orbital activities seems necessary in light of U.S. treaty obligations, as the national activities by non-governmental actors in space are directly attributable to those states. There have been no decisive actions in this direction, though the FAA regulatory powers have been extended in the space field in the past (the 2004 Act extended FAA oversight to human spaceflight).

Alternatively, some have suggested that NASA might be the competent agency to exercise oversight of commercial activities. A *prima facie* rejoinder to this proposal is that NASA would be both the customer of commercial launches and the regulatory body, a seemingly conflicted position. In fact, the approach so far has been the two agencies working together to bring Commercial Crew online and operational. NASA does not want to be a regulatory agency, and regulatory powers of the FAA will have to coincide with the procurement and contractual powers NASA has with its industrial partners taking part in Commercial Crew.

Starting with test flights, and progressing through berthing and docking at the International Space Station (ISS), commercial transportation of Astronauts is expected as early as 2017 [7]. However, there is ambiguity on how the two bodies will interact and oversee the same activities - especially given the FAA's "hands off" approach intended to foster innovation, and NASA's copious human spaceflight regulations [8].

Characterization of Personnel

Beyond the jurisdictional issues (which may be dealt with expeditiously by a proactive Congress), the CSLA and the regulations promulgated in its furtherance (*e.g.*, Title 14 Code of Federal Regulations part 401 *et seq.*) contain characterizations of astronauts which would defeat easy implementation for the Commercial Crew Program. Keeping in mind that the CSLA was drafted for suborbital spaceflight as a commercial venture by private firms, the definitions of crew, government personnel, third-party, and spaceflight participant would no be applicable to

Commercial Crew. At first, it is difficult to see what category they fall under, and this is crucial as it drives the waivers they are required to sign, the duties owed to them, and what insurance requirements apply to them. The CSLA contains definitions, which are further refined in the Code of Federal Regulations. For the purposes of the CSLA:

Crew means any employee or independent contractor of a licensee, transferee, or permittee, or of a contractor or subcontractor of a licensee, transferee, or permittee, who performs activities in the course of that employment or contract directly relating to the launch, reentry, or other operation of or in a launch vehicle or reentry vehicle that carries human beings. A crew consists of flight crew and any remote operator.²

Flight crew means crew that is on board a vehicle during a launch or reentry.³

Space flight participant means an individual, who is not crew, carried aboard a launch vehicle or reentry vehicle.⁴

Government personnel means employees of the United States, its agencies, and its contractors and subcontractors, involved in launch or reentry services for an activity authorized by an FAA license or permit. Employees of the United States include members of the Armed Forces of the United States.⁵

Third party means

- (1) Any person other than:
 - i. The United States, any of its agencies, and its contractors and subcontractors involved in launch or reentry services for a licensed or permitted activity;
 - ii. A licensee, permittee, and its contractors and subcontractors involved in launch or reentry services for a licensed or permitted activity;

- iii. A customer and its contractors and subcontractors involved in launch or reentry services for a licensed or permitted activity;
 - iv. A member of a crew; and
 - v. A space flight participant.
- (2) Government personnel, as defined in this section, are third parties.⁶

Looking at the plans of the Commercial Crew Program, a number of scenarios are possible, and approaches to commercial crew include the “taxi” and “rental car” approach, the former being astronauts ferried to LEO on commercial craft with commercial pilots at the helm, the latter being governmentally controlled launches to LEO using craft built and serviced by private industry. NASA’s approach to procuring launch services as though it were a traditional commercial customer therefore trigger the FAA licensing regime, beginning with cargo to the ISS and expected to expand to crew as early as 2017 [7].

Under the applicable definitions, NASA astronauts (and international partner astronauts) aboard commercial launch vehicles would fall into one of the above categories. Surprisingly, the definition of government personnel is not the appropriate category, as this category was envisioned to include FAA and other governmental personnel like range safety officers, inspectors of launch facilities, and other technicians to oversee private commercial launches. Meanwhile, crew are employees of the licensee (or transferee or permittee of a license), or their contractors or subcontractors. Accordingly, with NASA is customer, its personnel ferried to orbit would not be considered crew. Consequently, NASA astronauts are considered space flight participants according to the FAA scheme and this may lead to problems, especially considering the set of waivers between the SFP and the Department of Transportation included in Title 51 and discussed above. It seems problematic for U.S. government employees (NASA astronauts) waiving the right to bring claims against their employer, the U.S. Government.

² Code of Federal Regulations (CFR) 401.5.

³ CFR 401.5.

⁴ CFR 401.5.

⁵ CFR 440.3.

⁶ CFR 440.3.

III. LONG TERM ISSUE

INADEQUACY OF INTERNATIONAL LAW

Broadening this enquiry's scope – both internationally and into the future, the characterization and treatment of space personnel may prove to be again fraught with challenges.

Under the relevant public international law, the status and treatment of astronauts is addressed in both the 1967 outer space treaty and the subsequent *lex specialis* of the 1968 astronauts rescue agreement [7]. Under the article v of the Outer Space Treaty, astronauts are regarded as the “envoys of mankind”, and while this phrase is perhaps not legally operative language, as astronauts they are owed certain duties by state parties to the treaties in the event of accident, distress, or emergency. In such circumstances, astronauts are to be afforded quite a level of care – “all possible assistance” from other state parties (both in emergencies, and on the moon and other celestial bodies) and upon landing, shall be returned to the state of registry of their vehicle. It remains uncertain whether space adventurers on private suborbital craft are owed these duties, or whether these duties would be owed to personnel on commercial craft headed to orbital destinations, including both the ISS and privately owned space stations [9].

Astronauts of a national space agency quite logically fall into the definitions pertaining to them in international space law, as the representatives of their national space agencies, perhaps conducting activity pursuant to their national space policy, on governmentally procured launches, and aboard vehicles registered by their state and thus under their state's jurisdictional power, (and of course implicating that state's responsibility and liability under the relevant treaties). A private crew on a private craft ferrying non-governmental passengers to private orbital outposts would not be such a clear-cut situation. Article VIII of the Outer Space Treaty gives states jurisdiction over all personnel aboard space objects listed on their registry, again pointing to there being no distinction between astronauts and other possible personnel.

Looking again to the above definitions given by the FAA, which of the above is *not* an astronaut? Governmental personnel were not considered to be astronauts – and would not be aboard the craft, but the other characterizations might all be included. So long as “astronaut” is merely the term applicable to those passing a certain (as-yet-undetermined) altitude, it is

possible that all those who meet this criteria would be given the protections from the treaties.

To clarify the applicable regime, the possibility of private international law stepping in to regulate private activities might be envisioned. Though requiring domestic implementation of any internationally negotiated treaty obligations, such private law could substantially clarify the rights owed to the variety of possible commercial actors.

Looking further afield, there is also the possibility of astronauts on deep-space missions, or on celestial bodies for such long periods of time that the assistance and return provisions would either be unwanted or inappropriate to invoke [9]. These actors might be purely governmental, or some mix of private industry actors.

IV. CONCLUSION

PRAGMATIC SOLUTIONS

While some may consider these concerns premature, in light of the ISECG Global Exploration Strategy and the ISECG Roadmap, they may take on increasing importance. The ISECG Roadmap articulates common goals and objectives by fourteen national space agencies, which include extending human presence and performing science to support human expansion. Support the human presence objective includes exploring new destinations, increasing self-sufficiency of humans in space, and increasing opportunities for astronauts from all partner countries to engage in exploration. Additionally, a principle for guiding mission development is international partnerships [2]. Meanwhile, integrating commercial transportation, surface, and orbital elements into exploration hardware. Space exploration in the future will be both more international in nature – with more partners and personnel, and the role of private industries will be increased. The efficiencies and incentives of competition – on price, safety, and technology will make space exploration more affordable and innovation quicker, and the cooperation of interested states will make exploration broader in scope, with wider support. Regulations on a national level, and again on an international level, will have to be rationalized to reflect this new reality and foster its inception.

Having detailed the definitional and jurisdictional issues inherent in the existing U.S. federal legislation, it

is seen that Congressional rationalization of the confliction regimes is one pragmatic solution. Congress might extend the FAA's regulatory power into orbit, so as to rationalize their oversight of commercial launch providers. Alternatively, it might allow the FAA regulations to co-exist with NASA's Commercial Crew program and the NASA regime of Space Act Agreements, whereby the vagaries in treatment of liability, waivers of claims, and the treatment of governmental astronauts as either SFPs, crew, or Governmental Personnel is adequately dealt with in the Space Act Agreements between NASA and the Commercial provider.

Next, it was seen that international rights and obligations - though appropriate for the period in which they were drafted - need clarification due to new possibilities. First, the role of private commercial crews destined for either national laboratories or private space stations will have to be rationalized with the rights of assistance owed to national astronauts. Further afield, the status and rights owed to personnel on long-term deep space mission, or bound to celestial bodies for extended periods will have to be defined. These clarifications might first come about as contractual provisions as between the interested parties, and might evolve into international treaties. The axiom that law must precede man into space holds.

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