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Patch or Rebuild: A Comparative Analysis of Multi-Agency Regime vs. Single-Agency Regime within US Domestic Space Traffic Management Regulation

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Patch or Rebuild: A Comparative Analysis of Multi-Agency Regime vs. Single-Agency Regime within US Domestic Space Traffic Management Regulation

by

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SYNOPSIS:

ABSTRACT:

It has been suggested that expansion and modification of the current US regulatory regime is sufficient to regulate space traffic. It has also been suggested that a consolidation of the existing fragmented structure into a single agency would be superior. This article provides a detailed pro vs. con comparative analysis of the two approaches as they relate to civil space traffic and commerce. Expanding commercial needs place specific demands on the regulatory next steps and require thoughtful prioritization and coordination of efforts to ensure a successful future regulatory regime that addresses the competing needs of agencies and industry. The proper fit of domestic regulation within the international landscape, both presently and in the future, is another factor for ultimate success. This paper concludes with recommendations for near-term and longer-term next steps based upon the analytic outcome.

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I. CURRENT U.S. MULTI-AGENCY REGULATORY SCHEME FOR COMMERCIAL SPACE OPERATIONS: IT TAKES A VILLAGE TO RAISE A SPACECRAFT

It is well-established that space activity within the United States is currently regulated and managed by several primary, as well as some supporting, government institutions. Primary among these are the National Aeronautics and Space Administration (NASA), the Department of Transportation (DOT), the Department of Commerce (DOC), the Department of State (DOS) and Department of Defense (DOD).[1] Supporting these major players, space activity also may require involvement from the Environmental Protection Agency (EPA), the Federal Communication Commission (FCC), and private legal resources and organizations, and this is just domestically. To examine the potential future success of the current regulatory scheme, the functions must be examined as well as each agency's view of its' own role within the overall system and how the individual parts operate in concert to form a whole enterprise.

NASA is the "leading federal agency performing research, technology, and development of aeronautical and space science, exploration and application." [2] NASA's overall mission directives span the entire organization, but regulating the efforts in both a legal and practical way falls largely within the NASA Office of Inspector General (OIG). The NASA Office of Inspector General (OIG) is consists of four subsidiary offices (Audits, Investigations, Counsel, and Management and Planning), operating to achieve the respective functions as described below:

[1]Paul Stephen Dempsey , The Emergence of National Space Law, McGill University annals of Air and Space Law, Vol. XXXVIII(2013) at 317.
[2] Ibid.

"**The Office of Audits (OA)** conducts independent and objective audits, reviews, and other examinations to improve the economy, efficiency, and effectiveness and to identify waste and mismanagement in NASA programs, projects, operations, and contractor activities. In addition, OA oversees the work of the independent public accountant in its audit of NASA's financial statements.

The Office of Investigations (OI) investigates allegations of crime, cyber-crime, fraud, abuse or misconduct having an impact on NASA programs, personnel and resources. OI refers its findings to either the Department of Justice for prosecution or to NASA management for action. Through its investigations, OI identifies crime indicators and recommends effective measures for NASA management, designed to reduce NASA's vulnerability to criminal activity.

The Office of Counsel provides advice and assistance on a variety of legal issues relating to OIG review of NASA programs and operations. The legal staff reviews legislation, regulations, Freedom of Information Act requests, and other matters that require OIG attention. Additionally, the Office of Counsel provides legal advice to OIG senior management, auditors, and investigators, and serves as counsel in administrative litigation in which the OIG is a party.

The Office of Management and Planning (OMP) provides financial, procurement, human resources, administrative, and information technology (IT) services support to the OIG staff. OMP ensures state-of-the-art IT systems capabilities for the OIG, advises the Inspector General and OIG senior management on budget issues and human resources staffing matters, directs OIG internal management and support operations, and oversees development of and adherence to management policies and procedures."

The team members within the NASA OIG include auditors, analysts, specialists, investigators, attorneys and support staff, and they are located at NASA Headquarters in Washington, DC as well as other NASA centers located across the United States.[3]

Multiple other offices and advisory committees within NASA provide key aspects to law and regulation of space activities, but here three more shall be highlighted.[4] The NASA Office of Legislative and Intergovernmental Affairs provides executive leadership, coordination and direction of all communications and relationships, both legislative and otherwise, between

[3] Online:http://oig.nasa.gov/
[4] Online: http://www.nasa.gov/about/org_index.html

NASA, the United States Congress, and state and local governments.[5] "The Office of the General Counsel provides functional leadership regarding legal services and issues related to all aspects of NASA activities for Center Chief and Patent Counsel and, for Agency-wide issues, the Administrator. These services and issues include establishing and disseminating legal policy and interpreting new statutes and cases. The Office of the General Counsel is also responsible for developing the ethics and patent program requirements, establishing metrics, and developing quality standards." [6] The NASA Office of International and Interagency Relations (OIIR) provides executive leadership, coordination and direction for all NASA international partnerships and activities. "It also directs policy interactions between NASA and other U.S. Executive Branch offices and agencies. OIIR serves as the principal Agency liaison with the National Security Council, the Office of Science and Technology Policy, the Department of State, and the Department of Defense. OIIR also directs NASA's international relations; negotiates cooperative and reimbursable agreements with foreign space partners; provides management oversight and staff support of NASA's advisory committees, commissions and panels; and manages the NASA Export Control Program and foreign travel by NASA employees".[7] There exist six sub-divisions within the OIIR.[8]

The Department of Transportation (DOT) contains the Office of Commercial Space Transportation (AST) within the Federal Aviation Administration (FAA). The AST "licenses and promotes commercial launch operations, exercising launch and payload approval, in conjunction with other agencies, such as the Federal Communications Commission FCC (sic) (which

[5] Online:http://www.nasa.gov/offices/olia/home/index.html
[6] Supra note 4.
[7] Online:http://oiir.hq.nasa.gov/
[8] Ibid.

regulates broadcast frequencies)." [9] The FAA declares its' mission as "to provide the safest, most efficient aerospace system in the world."[10] To this end, the Federal Aviation Administration (FAA) Office of Commercial Space Transportation (AST) is "the U.S. government organization responsible for regulating the safe operations of the U.S. commercial space transportation industry and facilitating its international competitiveness. It accomplishes its task by licensing and permitting these activities, which include expendable and reusable orbital launch vehicles, and suborbital launch vehicles".[11] The AST notes that with the approach of private industry to testing vehicles capable of passenger suborbital flight/space tourism, companies and organizations are proposing to offer training in human spaceflight training and several organizations have already begun to provide this service [12] (which will increase their role). Recently, commercial launches account for approximately one-third of all worldwide launches.[13] Another growing part of the commercial space transportation industry in the United States impacting the AST is the development of "private or state-operated launch, re-entry, and processing sites known as commercial spaceports , which provide alternatives to government launch sites operated by the U.S. Air Force or NASA and are licensed by the AST." [14] Also within the DOT, the National Science Foundation is involved in aerospace development and research. [15]

[9] Supra note 1.
[10] Online: Faa.gov/about/
[11] Ibid at http://www.faa.gov/about/office_org/headquarters_offices/ast/industry/
[12] Ibid.
[13] Ibid.
[14] Ibid. By 2010, eight licenses in seven states had been issued by the AST.
[15] Online: http://www.nasa.gov/about/highlights/AN_Structure_OtherAgencies.html

The Department of Commerce (DOC) houses NOAA, the National Oceanic and Atmospheric Administration, which "engages in remote sensing, gathers data, conducts research, and (sic) makes environmental predictions regarding Earth."[16] Within NOAA, the Office of Space Commercialization coordinates space-related programs and issues within the DOC.[17] The Office of Space Commercialization describes itself thusly:

"The Office of Space Commercialization is the principal unit for space commerce policy activities within the Department of Commerce. Its mission is to foster the conditions for the economic growth and technological advancement of the U.S. commercial space industry. The Office focuses on several sectors of the space commerce industry, including satellite navigation, commercial remote sensing, space transportation, entrepreneurial "New Space" activities, and space-based solar power. The Office also participates in broad governmental discussions of national space policy and other space-related issues." [18]

With the establishment of the Space IPC (Space Interagency Policy Committee) by President Obama in 2010, the Department of Commerce renders support to the initiative through allocation of resources from the following organizations:

- Office of Apace Commercialization
- NOAA
- International Trade Administration
- National Telecommunications and Information Administration
- Bureau of Industry and Security [19]

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[16] Supra note 1.
[17] Ibid.
[18] Online: http://www.space.commerce.gov/about/
[19] Online: http://www.space.commerce.gov/general/nationalspacepolicy/. Note that this is separate and distinct from the Interagency Committee for Aviation Policy, which may also be relevant on suborbital flights, and has 18 member agencies, see also online: http://gsa.gov/portal/content/104529.

The Department of State (DOS) "has jurisdiction over export controls, and negotiates bilateral and multilateral treaties."[20] Within the Department of State, the Bureau of Political-Military Affairs is the principal link between the DOS and the Department of Defense (DOD)[21], who uses space for intelligence gathering, communications and defense.[22] There exist 44 other defense-related support units, commands, programs, etc., which are very material, but shall not be enumerated here.[23]

The interaction and interplay between these agencies, and others, comprises a complex web to be navigated only by an expert, or team of experts. Each agency has an important mission, laudable goals and faithful, diligently-executed input. The manner in which the overall scheme fits together, however, has been voiced by industry to be challenging and confusing at times.[24] What impacts result from the ease or complexity of the system?

[20] Supra note 1.
[21] Online: http://www.state.gov/t/pm/index.htm
[22] Supra note 1.
[23] Online: http://www.au.af.mil/au/awc/space/orgs.htm
[24] For example, as in Futron's *Feasibility Study for a Florida Commercial Spaceport for Florida Spaceport Authority* , Futron, (September, 2005) at 29, found online at http://www.futron.com/upload/wysiwyg/Resources/Reports/FSA_SpaceportFeasibility.pdf

II. DOMESTIC IMPACTS OF ANY SPACE REGULATORY SCHEME DESIGN

Impacts of the regulatory scheme for space traffic management and space commerce include economic, social, public safety, political, and scientific ones. To consider the proper system, considering its' impact in these areas is crucial.

Economic impacts may include increased revenue and jobs for American corporations who may venture into space tourism, launch facilities for communication purposes, launch support, and the design and manufacture of spacecraft. There are few industries potentially untouched by space activity. In addition to the expected aviation, aerospace, telecommunications, and defense industries, research opportunities in microgravity for pharmaceutical companies, biotech companies, and semiconductor manufacturers contain untapped economic power.[25] Energy developments in space-to-space solar power and the availability of higher frequencies for space-to-earth communication which it might afford may also result.[26] Other possible energy impacts would include nuclear energy or possible harnessing of other cosmic forces such as radiation.[27] Social and public safety impacts go hand-in-hand with economic ones, for it has been the vastness, beauty and remoteness of space that has inspired poets, artists, authors, screenwriters, scientists and engineers the world over. Three hallmark impacts in this arena have been the byproducts themselves (if sometimes inadvertent) of the endeavors, specific public focus on the mission and goals of space exploration, and environmental impacts. Some tangible existing improvements to life on Earth as a result of space exploration include GPS, satellite imagery, cell phones, water filters, cordless tools, long distance telecommunications, adjustable smoke

[25] US Department of Commerce, Office of Space Commercialization, Market Opportunities in Space: the Near-Term Roadmap, (December, 2002) at 31.
[26] Ibid at 34.
[27] Michio Kaku, *Physics of the Future: How Science Will Shape Human Destiny and Our Daily Lives by the Year 2100,* (Anchor Books, a division of Random House, 2011).

detector, ear thermometer, memory foam, scratch resistant lenses, improved air navigation services, and telescope range and clarity.[28] Medical advances such as the artificial heart pump and a lightweight firefighter breathing system also resulted. [29]

" Since the days of early man, humans looked into the sky and wondered what lay beyond the stars. Thus began a compelling dream to find out. The curiosity drove humans through the ages to explore the boundaries of earth and, eventually, to begin the age of space exploration with all the optimism, wonder and delight that might be expected from such a long-awaited achievement. Walking on the Moon was a milestone set by US President John F Kennedy in the early 1960's, wherein he set an arbitrary deadline of a decade to achieve it. There was no true basis at that moment to thoroughly believe it achievable, but the prevailing thought was if the right people, in the right concentrations, at the right time, focused on the problem with absolute clarity of the intended goal, it could become achievable. The key ingredient was setting the vision, then translation of vision into reality was able to follow.

To the surprise of all, this reality was realized in 1969, within the deadline set. The amazing vision had been realized! However, embedded in the space age from the outset were the subtle reminders that we are flawed humans. First, the primary original impetus for President Kennedy setting the goal was the cold war between the United States and Russia, at a period in time where peace set on a dangerous precipice as evidenced by the Cuban Missile Crisis. Second, the fact that President Kennedy himself was unable to see the realization of his vision for the tragedy of being assassinated. So, embedded in our very lofty visions of space from the outset were the reminders of the violence and political unrest that exist here on Earth. Therefore, the fate of the two are inextricably tied- what we enact here on Earth will forever affect space, and what we enact in space will forever impact life here on Earth. There is no imaginary dividing line as some have suggested, and to proceed with a notion in mind that we can have one set of values and rules for "out there" and one set of values and rules for "down here" is a false dichotomy.

Fast forward a few decades and the other problems of man too became entwined with our vision for space exploration. Climate change, overpopulation, disaster management, weather prediction, and militarization and weaponization all became embedded in different ways into the space industry. Like a permeable membrane, the problems "down here" began seeping into "out there", and our vision for "out there. The resultant concept has come to be known as the "sustainable development of space".[30]

The social impacts of space activity have been profound in forms of technology use, disaster avoidance and recovery, environmental focus and global communication ease, and every indication suggests they shall continue to be so.

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[28] Supra note 27 , throughout.

[29] Online: http://www.nasa.gov/50th/50th_magazine/benefits.html

[30] S.L.Willshire(the author), *Sustainable Development and Emerging Space Technologies*, (Fall 2013, excerpted, in partial fulfillment of Institute of Air and Space Law studies).

Political impacts include outright defense, power or perceived power, and the results of increased collaboration among spacefaring nations conducting joint missions or exercises. From a defense perspective, Robert Dudney cited in Air Force Magazine the five roads to space dominance (for the US) as (1) creating rules of the road, (2) strengthening US capabilities, (3) creating new partnerships, (4) bolstering deterrence, and (5) "prepare to win, period". [31] Coincidentally, one through three of these roads are also necessary for increased market share in the private sector as well. From a defense perspective, the relaxation of classified information standards is one of the largest challenges, but Secretary of Defense Gates took a critical first step in signing statements of principles to share situational awareness data with Australia, Canada and France.[32] Reaching similar steps with nations with whom the US has less conciliatory relations may be a tougher battle, and perhaps unwise. While 11 nations are spacefaring, only three are presently known publicly to have space weapons (US, China, and Russia).[33] In the private sector, focusing on creating new partnerships may be viewed as a further extension of prior collaboration with other spacefaring nations as global partners are found for joint commercial enterprise. Collaboration has increased with time, and while the international space station and human space flight remain the most prominent examples, a large number of scientific missions have been successful due to partnership from multiple nations.[34]

Scientific impacts of space exploration are most readily observed in the aforementioned list of technological improvements, but are arguably most profound in the arena of pure scientific

[31] Dudney, Robert. "Five Roads to Space Dominance." Air Force Magazine . July 2011 at 25-28.
[32] Ibid at 27.
[33] Ram Jakhu, *Spacefaring Nations*, lecture at McGill University (Fall, 2013).
[34] Online: http://www.space.com/15848-space-agencies-international-cooperation.html, going on to specifically reference the Aquarius/SAC-D satellite.

theory, origin of the cosmos, and the discovery of dark matter and other cosmic forces. The Physics of the Cosmos program at NASA summarizes itself thusly:

> "The Physics of the Cosmos (PCOS) program incorporates cosmology, high-energy astrophysics, and fundamental physics projects aimed at addressing directly central questions about the nature of complex astrophysical phenomena such as black holes, neutron stars, dark energy, and gravitational waves. By utilizing a fleet of space-based missions operating across the whole electromagnetic spectrum, PCOS ultimate, overarching goal is to learn about the origin and ultimate destiny of the cosmos." [35]

[35] Online: http://science.nasa.gov/about-us/smd-programs/physics-of-the-cosmos/

III. CHARACTERISTICS OF A PROPERLY DESIGNED REGULATORY SCHEME

To evaluate whether a regulatory scheme is successful, it must first be established what characteristics comprise the hallmarks of a good regulatory structure. To this end, examination across multiple industries provides the best approach to viewing the future of a nascent industry. According to the Office of Economic Cooperation and Development (of which the United States is a member state), some key indicators of regulatory systems include:

clarity and due process in decision-making

transparency

ease of access and understanding of regulations

consultation procedures

regulatory impact analysis

administrative simplification

"dynamic process" to evaluate and update regulations

Implementation and Compliance (ease and quality)

Assessment of performance [36]

[36] Jacobzone, Wong Choi and Miguet , OECD, Indicators of Regulatory Management Systems, Working Paper 4, Paris, France (2007), at 25-30, 35, 41, 45, 48, and 49, respectively.

Practical considerations such as the ability to effectively train and to effectively disseminate information also intervene.[37] In a position paper on characteristics of good regulators, a tech company cited accessibility, reliability, creativity, flexibility, and courage as required.[38]

The World Bank, in a likewise complex and heavily-regulated industry, establishes the ten principles for regulation as follows:

1. Independence. "... regulators should, by law, be free to make decisions within the scope of their authority without having to obtain prior approval from other officials or agencies of government. They need to be adequately insulated from short-term political pressure."

2. Accountability. "Regulators need to be held accountable for their actions."

3. Transparency and Public Participation. "The entire regulatory process must be fair and impartial and open to extensive and meaningful opportunity for public participation."

4. Predictability. "The regulatory system should provide reasonable … certainty as to the principles and rules that will be followed within the overall regulatory framework."

5. Clarity of Roles. "The role of the regulatory agency should be carefully defined in law."

6. Completeness and Clarity of Rules. "The regulatory system, through laws and agency rules, should provide all stakeholders with clear and complete timely advance notice of the principles, guidelines, expectations, and responsibilities, consequences of misbehavior, and objectives that will be pursued in carrying out regulatory activities."

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[37] Peter Ladegaard, OECD, Good *Governance and Regulatory Management-Seminar on Regulatory Management and Reform*, Moscow, Russia, (19-20 November 2001).

[38] Robert Eric Borgstrom , *Characteristics of Effective Regulators* , Online: http://www.ip3.org/ip3_site/characteristics-of-effective-regulators.html, undated- as viewed 2014.

7. Proportionality. “Regulatory intervention in the sector should be proportionate to the challenges the regulators are addressing.”

8. Requisite Powers. “Regulatory agencies should, under the law, possess all powers required to perform their mission.”

9. Appropriate Institutional Characteristics. “Regulatory agencies must be able to consistently perform professionally, competently and thoroughly…”

10. Integrity. “Strict rules covering the behavior of decision makers should be in place so as to preclude improprieties or any conduct appearing to be improper.”

The above represents a precisely quoted list. [39]

Lastly, the National Institute of Health- also complex, widespread, and critical to the health and safety of the public- declares the elements that are core to regulatory systems to include responsiveness, outcome orientation, predictability, proportionality (as to risk), and independence.[40] The primary duties of that regulatory system are registration, clear licensure requirements and publication thereof, unbiased information, notification of market entry, monitoring of safety and effectiveness, quality control testing, inspection of manufacturers, inspecting distribution process, and performance evaluation[41] (and reporting). These steps are similar enough, in subset and in principle, to space registration and manufacture to warrant a parallel consideration in the overarching goals and elements of a proper regulatory scheme.

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[39] Ashley C. Brown, Jon Stern and Bernard Tenenbaum, *Handbook for Evaluating Infrastructure Regulatory Systems*, The World Bank, (2006) at 59-63.

[40] Rivere, JE; Buckley, GJ , *Committee on Strengthening Core Elements of Regulatory Systems in Developing Countries, Board on Global Health*, Board on Health Sciences Policy, Institute of Medicine, (Washington DC, National Academies Press , 2012 April 4) at Chapter 2 (referring to FDA in biotech).

[41] Ibid.

IV. CONSIDERING THE INTERNATIONAL LANDSCAPE

To consider the international landscape, let us revisit some relevant mission statements of aforementioned agencies. NASA's vision is "to reach for new heights and reveal the unknown so that what we do and learn will benefit all humankind". [42] The Department of Commerce's mission is to "help make American businesses more innovative at home and more competitive abroad".[43] The Office of Space Commercialization (within NOAA) has a vision toward "a robust and responsive U.S. industry that is the world leader in space commerce." [44] Benefitting all of humanity has been a core tenet of space exploration from the beginning[45], but considerations of the international views in terms of space commerce and marketability has only more recently become a focus.

In addition to the national space agencies of multiple countries[46], various international organizations exist which must be considered in the regulatory and economic landscape of space development. To consider the proper regulatory framework for the United States, the ability to interact effectively with these organizations, as well as the partner nations and their space agencies themselves, is worthy of examination. Within the United Nations, both the Office of Outer Space Affairs (OOSA) and its' Committee on Peaceful Uses for Outer Space (COPUOUS) have longstanding involvement in space development: COPUOUS, established in 1959 and currently enjoying 76 member states, meets routinely to "review the scope of international cooperation in peaceful uses of outer space, to devise programs(sic) in this field to be undertaken

[42] Online: Nasa.gov
[43] Online: www.commerce.gov
[44] Supra note 18
[45] *The Outer Space Treaty*, Article I, "the province of all mankind".
[46] The Space Agencies Summit January 9,2014, at which 33 national space agencies were represented (Austria, Algeria, Brazil, Canada, Chile, China, Colombia, Czech republic, Denmark, Europe, France, Germany, India, Israel, Italy, Japan, Kazakhstan, Korea, Mexico, Netherlands, Nigeria, Norway, Romania, Russia, Saudi Arabia Kingdom, Spain, South Africa, Sweden, Switzerland, Ukraine, united Kingdom, United States of America, and Vietnam).

under United Nations auspices, to encourage continued research and the dissemination of information on outer space matters, and to study legal problems arising from the exploration of outer space." [47] It has both a scientific/technical subcommittee and a legal subcommittee. [48] The UN OOSA Program on Space Applications conducts various training, workshops, pilot programs in remote sensing, satellite and space sciences as well as mans a 24-hour disaster management hotline. [49]

Outside of the United Nations and space agencies, organizations cited by NASA as being relevant to the international space landscape include the International Telecommunications Satellite Organization (INTELSAT), International Maritime Satellite Organization (INMARSAT), European Telecommunications Satellite Organisation (EUTELSAT), North Atlantic Treaty Organization (NATO), NATO / Research and Technology Organization , International Standards Organization (ISO), Organization for Economic Cooperation and Development (OECD)[50] and the International Telecommunications Union (ITU), and these warrant interaction form a regulatory body or bodies. In addition, the International Academy of Astronautics (IAA), with members in 83 countries, fosters peaceful purpose, and provides programs for international contributions and advancements in aerospace science,[51]

Other civilian space and environmental organizations such as the Secure World Foundation, the Space Foundation, and their ilk also add to policy debate, research, and solutions.[52]

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[47] Online: http://unoosa.org/oosa/en/COPUOS/copuos.html
[48] Ibid. The legal subcommittee publishes positions on space law and policy whose review and interaction is will often be integrated into any regulatory scheme that is selected domestically.
[49] Online: http://unoosa.org/
[50] Online: http://oiir.hq.nasa.gov/f_orgs.html
[51] Supra note 46.
[52] Online:http://Swfound.org, and Online: http://spacefoundation.org

Clearly, the International Civil Air Organization (ICAO) plays one of the most primary roles in regulation of space traffic management, especially where sub-orbital flights occur.[53] ICAO's stated vision currently is "to achieve the sustainable growth of the civil aviation system." [54] While lengthy debates regarding the inclusion or exclusion of space within the civil aviation system are beyond the scope of this paper, it is noteworthy that by use of the airspace to reach space itself, ICAO must be involved. With 660 items on its' website relate to space (at least 35 of which pertain to sub-orbital journeys), many of which are position papers, recommendations, and procedures, it is clearly already very far down the space path. Whatever the future of space holds, it is sure ICAO will play a prominent role and is a prime candidate for a primary international source of space regulation, should it be so inclined to formally take up the challenge.

One other candidate as the industry grows to future robustness, if focus shifts to a more private commerce orientation than exists today, and perhaps less often considered, is the World Trade Organization (WTO). According to the WTO, it provides a forum for negotiating agreements aimed at reducing international trade obstacles, ensures a level playing field, provides a legal and institutional framework for the implementation and monitoring of the agreements, and settles disputes arising from their interpretation and application.[55] The WTO subject matter expertise in trade regulation and its' dispute resolution procedures add specific value. [56]

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[53] It remains to be seen whether ICAO will also play a role beyond the boundary of space, but it is clear that whether for sub-orbital flights only, or beyond, any U.S. regulatory scheme must continue to participate constructively with ICAO. See also, ICAO working paper C-WP 12436, Concept of Sub-Orbital Flights.
[54] Online: http://www.icao.int/about-icao/Pages/vision-and-mission.aspx
[55] Online: http://wto.org/english/thewto_e/whatis_e/wto_dg_stat_e.htm
[56] Ibid.

V. SUMMARY OF ANALYSIS [57]

Analyzing the elements within this paper against a single-agency regime vs. a multi-agency regime yields the following table, reflecting which position holds the advantage.

Characteristics of a Proper Regulatory Scheme	**Multi-Agency Scheme**	**Single-Agency-Scheme**	**Equivalent**
Clarity/Due Process in Decisions			X
Transparency		X	
Ease of Access and Understanding		X	
Consultation Process			X
Administrative Simplification		X	
"Dynamic Process" for updating			X
Implementation and compliance:			
Ease		X	
Quality	X		
Assessment of Performance	X		
Ability to Effectively Train	X		
Ability to Disseminate Information			X
Independence		X	
Accountability			X
Public Participation			X
Predictability		X	
Clarity of Roles		X	
Completeness of Rules	X		
Clarity of Rules		X	
Proportionality	X		
Requisite Powers			X
Integrity			X
Subject Matter Expertise	X		
Outcome Orientation (throughput)		X	
Impacts			
Scientific	X		
Economic		X	
Social			X
Public Safety	X		
Political (International Landscape)			X

[57] Decision rationale for each item is not included due to space constraints, but may be retrieved by contacting the author.

VI. CONCLUSION AND FINAL ROADMAP RECOMMENDATIONS

In conclusion, the importance of proper prioritization and coordination of activities is imperative to the future of commercial space development in the United States. Policy, regulations, licensing, launch permits, and other regulatory factors are of key importance within this field to economic growth, intellectual expansion, and public safety. A single-agency scheme would be superior for overall administrative simplification, predictability, clarity of roles, transparency, and ease of access and understanding. It is likely this model would drive more economic growth of the industry through consumer "ease of use" and overall efficiency for use by corporations and other parties by assuaging fears regarding complexity, lack of understanding, and extended time expenditures, which compete with market demands to hit launch schedules. On the other hand, the established subject matter expertise and already-built infrastructure within the multi-agency scheme favors quality, public safety, thoroughness, sufficient training, and scientific advancement. The technical expertise at each participating agency, built up over decades, is an irreplaceable asset that adds immeasurably to the success of the United States space position. However, as competing international markets develop improved subject matter expertise of their own, the United States may lose its' competitive edge if it does not solve the equation for administrative simplification. Therefore, it is recommended a short-term and long-term approach be adopted. In the short term, one of the existing agencies should be deemed as "primary" and serve as a central management point for an external user to the other agencies, not in content but in administration, as such acting as the quarterback for a multi-agency checklist and approval management system. The primary agency must be empowered to demand performance from partner agencies, and service level agreements with regard to

turnaround time and quality should be tracked and reviewed periodically for holistic system effectiveness. An end-to-end process map of the new system should be created, and individual criteria for success should also be viewed as a throughput metric. Longer-term, this should be reviewed annually for indicators in the international market and assessed against the agency best positioned to handle the emerging market needs, or with the closest relationships with the international organizations that may emerge as the global frontrunners. For example, if ICAO becomes a primary collection point internationally, it is more logical for the FAA AST to serve as the central management point. If, for instance, a coalition of space agencies emerges at the forefront, then it would be natural for NASA to serve as that primary manager.[58] Also, for long-term stability and to ensure current advancements are not outpaced internationally, a gap analysis should be conducted from the consumer perspective to see specifically where market needs will not be met under the current regime.[59]

In any outcome, the unique skills and attributes of the current agencies cannot be lost. Efficiency analyses to eliminate redundancies and promote efficiencies are recommended, but must be done methodically, with extreme care, and by team members senior enough to adequately assess the nuances and risk. Too often, such exercises are demanded quickly, and from junior staff, for which, in this arena, the results would be highly unfavorable. Prioritization rules should be established in advance to resolve competing interests, which will undoubtedly arise, through pre-determined criteria rather than sua sponte judgment.[60]

[58] Examples are merely demonstrative, not offered to be dispositive.
[59] This assumes gap analyses regarding soundness and safety have already been conducted in all agencies.
[60] Operational judgment, not legal judgment, in this case.

In summary, through

1) Primary central manager, streamlined checklist(s), and throughput metrics
2) Efficiency Analysis to eliminate redundancies
3) Gap Analysis to reveal areas requiring improvement, and
4) Prioritization rules

the current multi-agency scheme may be improved to ensure the future success and brilliance of the United States space activity.