Between traditional procurement and venture capital: An update on public-private interaction in the space sector

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INTRODUCTION: THEN TO NOW

A decade ago I wrote about public-private partnerships ("P3s"), in the context of the space sector.[2] My interest was the effect of sovereign immunity on equitable allocation of cost and risk between partners. At the time, the industry had not yet seen its first hosted defense-related payload. The military was starting to look to the private sector to manage its capacity shortfalls for communications and was partnering with industry to facilitate Internet access to mobile units.[3] MacDonald Dettwiler and Associates, Ltd. was still a Canadian-owned company in partnership with the Canadian Space Agency with respect to RADARSAT-2.[4] Neighborhood Watch was bringing the term "space situational awareness" into the lexicon.[5] Significantly, NASA had just recently introduced its Commercial Orbital Transportation Services program to spur private

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[2] Diane Howard, "Achieving a level playing field in space-related public-private partnerships: Can sovereign immunity upset the balance?" 73 J. Air L. & Com. 723 (Fall 2008).
[3] Mark A. Kellner, Satellite Firms Could Sell Directly to DoD, Def. News, Jan. 15, 2007, at 6; See SatNews Daily, Final Day of ISCe Stress Importance of Commercial Satellite Industry and Government Partnership (June 8, 2007), http://www.satnews. com/stories2007/4573/.
[4] RADARSAT-2, Mission, *http://www.radarsat2.info/about/mission.asp* (last visited Sept. 7, 2008).
[5] See Joseph Rouge, Nat'l Sec. Space Office, The State of Space Security: Space Situational Awareness 3 (2008), available at http://www.dtic.mil/dtic/tr/fulltext/u2/a484496.pdf (date accessed: 29 October 2018).

development.[6] This program was the precursor to what became the Cargo Resupply and Commercial Crew programs which successfully kick-started a host of new technologies like SpaceX's Falcon series and, ultimately, the return and reuse of stages. NASA planned to give away half of its rack space on Station; [45] this ultimately became the CASIS program. Clearly, these P3s not only came to fruition but also were successful by any metric applied and, in most instances, represent epic and constructive change for the space sector and the world community at large.

P3s continue to facilitate a host of applications, from public utilities to infrastructure projects. Following this Introduction, Section II of the paper will discuss P3s in the context of other cost and risk allocation models such as traditional procurement and venture capital investment. Section III will contrast space P3s with those utilized in other sectors. Section IV will explore how being deemed a public good can impact risk allocation between public and private partners. Section V will conclude the paper with agreed upon principles for successful P3s and some recommendations for the next phase of space development.

[6] Frank Morring, Jr., Tourist Destination, Aviation Wk. & Space Tech., Apr. 16, 2007, at 22, available at 2007 WLNR 8624601.

[45] David Bond, Seeding the Station, Aviation Wk. & Space Tech., Oct. 22, 2007, at 25, available at 2007 WLNR 22357663.

BOUNDING THE CONTINUUM:
TRADITIONAL PROCUREMENT ← → ANGEL INVESTORS
and everything in between

Multiple funding and risk models exist to execute projects, regardless of whether the stakeholders involved include government entities or whether the mission is purely private. Traditional procurement mechanisms typically involve fixed-price and cost-reimbursement contracts.

With fixed-price, the contractor agrees to deliver a product or service within mutually agreed upon limits. These are most effective when the costs and risks are known and can be clearly defined.

Cost-reimbursement contracts can be riskier for the government purchaser since the contractor is guaranteed reimbursement for all allowed costs incurred in fulfillment of the contract. Despite this increase in government risk, these can be more appropriate when costs are difficult to accurately estimate in advance, but, as will be addressed in the third section of this paper, are not always a good fit for space ventures.

The US government procurement process is currently under examination, particularly in the Department of Defense.[7] Efforts are underway to streamline the process to make it more responsive to the needs of all parties, both public and private.

Private parties include both legacy manufacturers and start up companies. Often times, a start up will depend upon venture capital to fund its initial research and development phases, with later reliance upon a government contract to meet business plan projections.

Brief discussion of angel investing and venture capital is warranted here. Archetypally, venture capital usually refers to completely private funding of a project. Funds from an individual or an investment entity flow to the start up in exchange for a healthy percentage of preferred stock or debt service or both with

[7] Jared Serbu, "To streamline acquisitions, 809 Panel presses Do/d to adopt portfolio management", Federal News Network 29 June 2018; available at: https://federalnewsnetwork.com/defense-main/2018/06/to-streamline-acquisitions-809-panel-presses-dod-to-adopt-porfolio-management/ (last accessed: 20 Oct 2018)

a pre-agreed exit strategy to allowing the initial investor to sell to a bank or corporation once certain benchmarks are met.[8]

A universe of other mechanisms to fund or facilitate a project exists between the poles of procurement and venture capital. This is the world that includes partnerships between the public and private sectors, those between public and public,[9] and sometimes involving academia.[10] The balance of this section will provide a brief history of public-private partnerships, hereinafter P3s, and some general principles that apply, no matter the context where they are found.

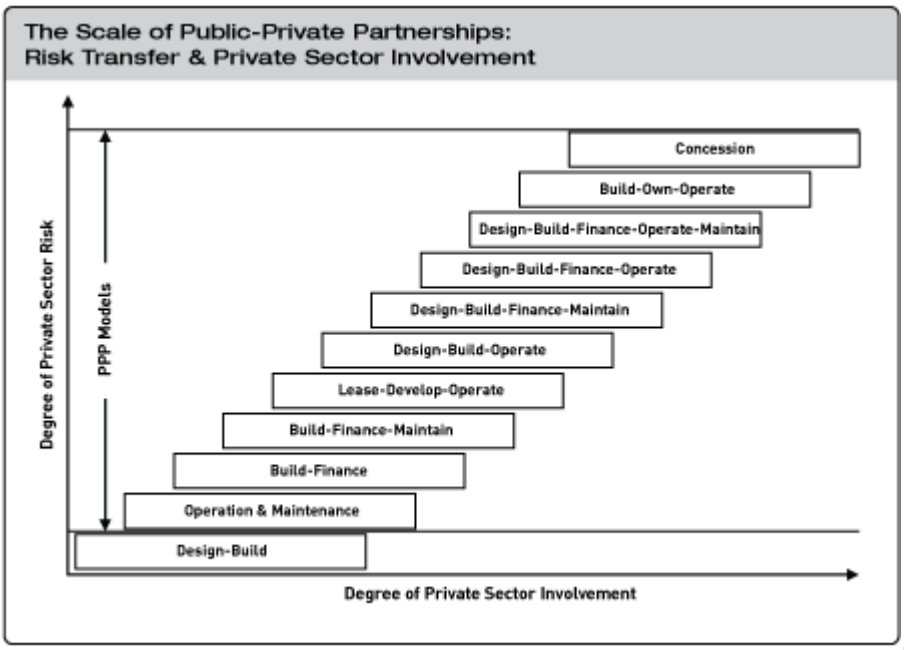
P3s enjoy a long and successful history in developing infrastructure such as highways or port authorities or providing services such as water and energy. They have been traced back to Benjamin Franklin and the standing of both the first volunteer fire department and the first lending library in the United States.[11] Infrastructure development in the19th century utilized P3s to build railroads, canals, and turnpikes; in fact, many partnership successes are found in the transportation sector.[12]

The military has a history of benefit from P3s as well. Skunk Works, Lockheed Martin's Advanced Development Program, remains in existence today. It was conceived as a government owned/company operated partnership to develop weapons for World War II and its name has become the vernacular when describing a small autonomous unit unencumbered by bureaucracy.[13] Notably, P3s are not interchangeable with traditional procurement contracts; they

[8] Bob Zeder, "How Venture Capital Works" Harvard Business Review, November-December 1998, available at: https://hbr.org/1998/11/how-venture-capital-works (date accessed: 21 October 2018).
[9] Janet K. Tinoco, "Public-private partnerships in transportation: lessons learned for the new space era" World Rev. of Intermodal Transportation Research, Vol. 7, No. 1, pp. 1-22 at 6.
[10] Fact Sheet: Launching New Public-Private Partnership and Announcing Joint Declaration on Leveraging Open Data for Climate Resistance (22 September 2016) available at: https://obamawhitehouse.archives.gov/the-press-office/2016/09/22/fact-sheet-launching-new-public-private-partnership-and-announcing-joint (accessed: 20 October 2018)
[11] Tony Kinn, et. al.; "Public-Private Partnerships: Five Principles for Success" Booz Allen Hamilton (2014) at 2.
[12] Ibid.
[13] Skunkworks Project, Wikipedia available at: https://en.wikipedia.org/wiki/Skunkworks_project (date accessed 22 October 2018).

"are a financing tool, not a source of funding."[14] In some respects, NASA use of P3s in the form of Space Act Agreements has been likened to venture capital investment, an idea to be explored more fully in the next section.

Viewing these partnerships in relation to the bounds we have set as our poles for this discussion, the following table helps to illustrate the concept that P3s exist along a continuum.



[15]

The Canadian Council for Public-Private Partnerships describes each step in the preceding table, as below. However, note that it is the concepts and the continuum that matter more than the words used to describe these programmatic steps.

> **Design-Build (DB):** The private sector designs and builds infrastructure to meet public sector performance specifications, often for a fixed price, so the risk of cost overruns is transferred to the private sector. (Many do not consider DB's to be within the spectrum of PPP's).

[14] Emilia Istrate and Robert Puentes, "Moving orward on Public Private Partnerships: U.S. and International Experience with PPP Units" December 2011, Brookings-/Rockefeller: Project on State and Metropolitan Innovation

[15] Online: The Canadian Council for Public-Private Partnerships <http://www.pppcouncil.ca/aboutPPP_definition.asp> (date accessed on 20 April 2008).

Operation & Maintenance Contract (O & M): A private operator, under contract, operates a publicly-owned asset for a specified term. Ownership of the asset remains with the public entity.

Design-Build-Finance-Operate (DBFO): The private sector designs, finances and constructs a new facility under a long-term lease, and operates the facility during the term of the lease. The private partner transfers the new facility to the public sector at the end of the lease term.

Build-Own-Operate (BOO): The private sector finances, builds, owns and operates a facility or service in perpetuity. The public constraints are stated in the original agreement and through on-going regulatory authority.

Build-Own-Operate-Transfer (BOOT): A private entity receives a franchise to finance, design, build and operate a facility (and to charge user fees) for a specified period, after which ownership is transferred back to the public sector.

Buy-Build-Operate (BBO): Transfer of a public asset to a private or quasi-public entity usually under contract that the assets are to be upgraded and operated for a specified period of time. Public control is exercised through the contract at the time of transfer.

Operation License: A private operator receives a license or rights to operate a public service, usually for a specified term. This is often used in IT projects.

Finance Only: A private entity, usually a financial services company, funds a project directly or uses various mechanisms such as a long-term lease or bond issue. [16]

[16] *Ibid.*

In 2014, the World Bank included a definition of P3s in its Public-Private Partnerships Reference Guide 2.0: "A long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance."[17] Key elements include a long-term contractual agreement that addresses both risk and cost.[18] Other P3 elements incorporate the source of a project's funds and the use of performance benchmarks (as opposed to design requirements).[19]

P3s are creative. A governmental entity enters into contract with a private consortium, which sets up a single purpose entity known as a special purpose vehicle (SPV). Most often and optimally, enabling legislation forms the special purpose vehicle.[20] The private consortium is typically formed by a joint venture (JV) between a range of contractors, banks, investors, and suppliers willing to commit equity and/or resources to the project and contracts are in the form of joint venture agreements.[21] The best of these contracts reflect care in drafting or utilize standardized contracts. The most successful arrangements are transparent and survive long enough to realize the returns.

Six guiding principles have been identified for the sustainability of P3s in infrastructure contexts and they can easily be applied when creating space-related ventures.[22] They remain virtually unchanged from those identified a decade ago:

1. Design the project to deliver a balanced risk profile between the public and private partners

[17] Public-Private Partnerships Reference Guide 2.0 at 14, The World Bank available at: https://ppp.worldbank.org/public-private-partnership/library/public-private-partnerships-reference-guide-version-20 (date accessed: 22 October 2018)
[18] Ibid.
[19] Karen L. Jones, "Public-Private Partnerships: Stimulating Innovation in the Space Sector" Center for Space Policy and Strategy, The Aerospace Corporation April 2018 at 7.
[20] Booz Hamilton at 3
[21] A. Ng, Martin Loosemore, "Risk Allocation in the private provision of public infrastructure" (2007) 25 Int'l J of Project Management 66, 67.
[22] Cledan Mandri-Perrott, "Six Guiding Principles to Achieve Sustainable PPP Arrangements", online: www.ip3.org <http://www.ip3,org/pub/2005_publication_002.htm> (date accessed: 18 April 2008); contrast these with the 5 principles identified by Booz Allen Hamilton in 2014: 1) authority in the form of enabling legislation; 2) consistency understood by all stakeholders; 3) transparency; 4) communications plan; and 5) focused project management organization, supra note 7 at 3.

2. Win the commitment of critical stakeholders and operators
3. Develop a strong contract setting forth the rules of the game and clearly defining roles and responsibilities
4. Drive the bidding program allowing buy-in at all levels and stages of the process
5. Demonstrate improved service delivery
6. Sustain change.

Value for money (VFM) is also a crucial underlying principle. It refers "to the best possible outcome after taking account of all benefits, costs and risks over the whole life of the [project]."[23] Risk is perceived from the public sector's perspective as "any event which jeopardizes the quality or quantity of service that they have contracted for" and from the private sector's perspective as any event which "causes the cash flow profile of the project to depart from the base case and jeopardize the debt servicing ability of the project or its ability to generate a dividend stream for shareholders."[24]

P3 scholarship describes benefits in terms of need drivers. These include *inter alia* budgetary challenges, infrastructure needs, mission changes (and provide a considered approach to cost and schedule uncertainty), and economic development (including facilitation of innovative technologies).[25]

Potential risks to be allocated between partners can be divided into "general risks" and "project risks."[26] "Project risks" flow from management and events in the project's immediate environment, i.e. natural risks like weather, technical problems, plant and equipment, materials and supply problems, organizational problems with contractors, union difficulties, disputes with the JV agreements, and environmental problems. "General risks" are not directly associated with the project itself, but have an effect on its outcome. They tend

[23] Xiao-Hua Jin and Hemanta Loloi, "Risk Allocation in Public-Private Partnership Projects – An Innovative Model with an Intelligent Approach", presented at The Construction and Building Research Conference of the Royal Institution of Chartered Surveyors, Georgia Tech, Atlanta USA, 6-7 September 2007, at 3.
[24] *Ibid.* at 3 – 4.
[25] Booz Allen at 3; "Public-Private Partnerships: Benefits and Opportunities for Improvement Within the United States" Syracuse University 2017 at 7.
[26] Loosemore, *supra* note 16 at 69.

to occur in the macro-environment and are arise from natural, political, regulatory, legal, and economic events.[27]

The costs associated with payment of claims against a project are a contemplated risk more likely falling into the project risk category, although there is the possibility this could occur outside the immediate project environment. Note the difference between a standard contractual claim and one flowing from a 9/11-type catastrophe.

The most effective agreements allocate risks to the party in the best position to control them. Rules have developed regarding how best to distribute risk between partners. The party to whom the risk is allocated should:

- Be made fully aware of the risks they are taking.
- Have the greatest capacity [expertise and authority] to manage the risk effectively and efficiently (and thus charge the lowest risk premium).
- Have the capability and resources to cope with the risk eventuating.
- Have the necessary risk appetite to want to take the risk.
- Have been given the chance to charge an appropriate premium for taking it.[28]

[27] *Ibid.*
[28] Loosemore, *supra* note 16 at 70.

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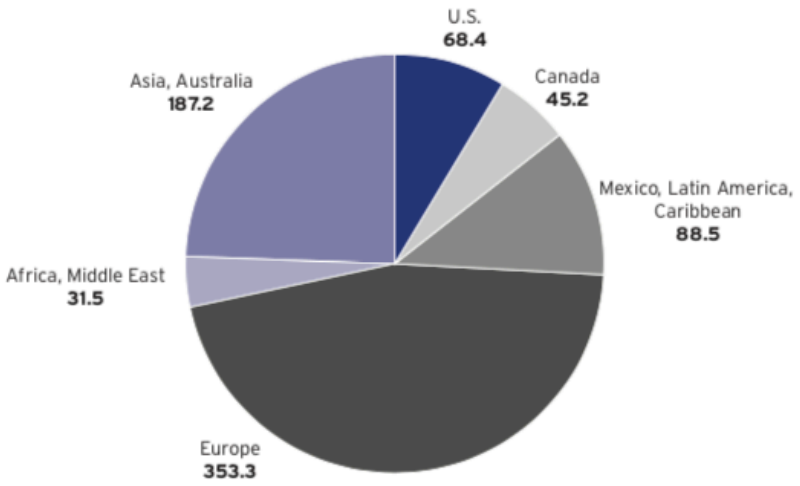
Table 1: Effective Risk Transfer of P3 Delivery Method

	Type of Project			
	Traditional		P3	
Risk	Public	Private	Public	Private
Design Risks	✔			✔
Construction Risks		✔		✔
Entitlements and Utilities	✔			✔
Completion Risk	✔			✔
Disputes between Designer and Builder	✔		✔	✔
Landlord Risk and Shortfalls	✔			✔
Operation and Maintenance	✔			✔
Regulatory Compliance	✔			✔
Capital Maintenance	✔			✔
Technological Obsolescence	✔			✔
Excess Energy Consumption	✔			✔
Environmental Regulations	✔		✔	✔
Changes in Law	✔		✔	
Force Majeure Events	✔		✔	
Pre-existing conditions	✔		✔	✔
Commissioning Delays	✔		✔	✔
Inflation	✔		✔	

(Syracuse University 2014 at 9.)

Europe, Asia, and Central/South America (with the Caribbean) are light years ahead of the United States with regard to utilization of P3s to accomplish infrastructure goals, as reflected in the graphic below.

Figure 1. Public/Private Partnerships (PPPs) Worldwide, Nominal Total Costs (in billions $USD), 1985-2011



Note: Includes funded road, rail, buildings, and water projects through October 2011 in nominal dollars converted into U.S. dollars at the time of financial close. Excludes U.S. design-build projects.

Source: PWF, 2011

Independent advisors have been recognized as useful in structuring P3 transactions to ensure the proper balance between public and private interests.[29] Further, some countries have formed institutionalized PPP Units or P3 Units to aid in the formation of effective P3s.[30] The units are formalized structures that reflect as much variance between them as P3s themselves and are formed to serve the interests and needs of the country where created. Brookings-

[29] Jagun, supra note 9.

[30] Emilia Istrate and Robert Puentes, "Moving orward on Public Private Partnerships: U.S. and International Experience with PPP Units" December 2011, Brookings-/Rockefeller: Project on State and Metropolitan Innovation.

Rockefeller surfaced commonly held characteristics of these units in a 2011 study, to include the following.

PPP Units are public entities (either governmental, P3, or non-profit) created in support of other governmental agencies to facilitate projects via the P3 process. They are not procurement agencies. They manage or work with multiple projects at any given moment and assist with policy formulation and coordination on a macro level in a country. PPP Units can facilitate quality control by assessing a project's accomplishment of pre-determined criteria and by providing technical assistance. They can standardize procedures and requirements and perform outreach and promotion. PPP Units have great utility in serving a diverse community of stakeholders in need of nimble mechanisms to accomplish complex objectives.[31]

[31] Brookings-Rockefeller at 6-7

DIFFERENT MODELS: TRAD P3s vs. SPACE P3s

The preceding section described characteristics of P3s across the board. Spaceports probably lend themselves most easily to use of a P3 structure because of their similarities to airports and port authorities. Spaceport America in New Mexico was first funded by a county Spaceport Tax, and is a good example of a P3. The facility houses aircraft and spacecraft, as well as Virgin Galactic's operations facilities, including pre-flight and post-flight facilities, administrative offices, and lounges.[32] While those similarities to the mature airport markets exist, spaceport development remains unpredictable, notably because of timeline challenges and market volatility.[33] Clearly, Spaceport America reveals pitfalls in trying to predict return on spaceport investment. Virgin Galactic, while closer to its goals, has yet to perform its first commercial spaceflight from the facility eight years after it performed its mid-construction fly-by in 2010.

Likewise, NASA, a public entity, has been partnering with the private sector for years as it transitions legacy infrastructure and its launch-friendly location from a traditional federal launch site to its Kennedy Space Center multi-user/multi-use plan.[34] Space Florida, the P3 legislatively created to promote the development of Florida's aerospace industry, has been instrumental in brokering some of the resulting arrangements including SpaceX's lease of Launch Complex 39-A, the use of Launch Complex 39-B proposed by Orbital ATK (now Northrop Grumman's Innovation Systems), and Blue Origin's possible use of Launch Complex 40. The cooperative venture uses and re-purposes already-existing infrastructure, and envisions multiple spaceports throughout the state,

[32] Spaceport America, News Release/Communique, " UP Aerospace, Inc. Successfully Flies Multi-faceted Mission "(28 April 2007) online : <http://www.spaceportamerica.com/news.html> (date accessed : 13 March 2008); Leonard David, " Spaceport America : First Looks at a New Space Terminal "(4 September 2007) online : SPACE.com <http://www.space.com/businesstechnology/070904_virgingalactic_spaceport.html> (date accessed : 13 March 2008).

[33] Tinoco at 2.

[34] Anthony Young, "The growth of public-private partnerships in commercial space ventures" The Space Review, 21 April 2014, available at: http://www.thespacereview.com/article/2495/1 (date accessed: 22 October 2018).

supporting commercial space and personal spaceflight, as well as military and civil applications.[35]

P3s are not only driven by funding/financing concerns. These represent aspects of only one of a number of needs/benefits driving the use of a P3. Complex projects utilizing one-of-a-kind or first-of-a-kind technology/expertise defy scheduling attempts and cost projections. Certainly, one of the first space P3s, Intelsat, was formed in 1964 to address these some of these uncertainties.[36] In situations such as these, source of funds is not the key driver to how best to structure a deal.[37] This point is made eloquently by Peter Martins, NASA's Inspector General, in his testimony to the US House Science, Space, and Technology Subcommittee on Space: "The technical complexity inherent in NASA projects remains a major challenge to achieving cost and schedule goals."[38]

NASA successful use of its Other Transaction Authority (OTA), granted to it by enabling legislation in the Space Act of 1958 which formed the agency, is best seen in its use of Space Act Agreements (SAAs) via the Commercial Orbital Services (COTS) program which ultimately let to commercial cargo resupply of the International Space Station (hereinafter "ISS" or "Station") and will someday result in commercial crews flown to Station on private space vehicles.

This OTA allows NASA to partner with industry to achieve mission goals that cannot be supported by traditional procurement models. The SAAs rely upon performance-based benchmarks for funding. NASA provides insight via access to lessons learned and personnel, rather than micro-managing with oversight of the many nuances involved in the development of the new technologies made a reality by SpaceX, Orbital ATK, Boeing, Sierra Nevada, and others in furtherance of the partnerships.[39] Because NASA basically leveraged seed money for the new technologies by requiring its commercial partners to fund at least 50%, with

[35] Strategic Business Plan: Space Florida online:
<http://www.spaceflorida.gov/docs/Strategic_Business_Plan-2007-2.pdf> at 13.
[36] Intelsat, available at: https://www.britannica.com/topic/Intelsat (date accessed: 22 October 2018).
[37] Syracuse at 18-19.
[38] Testimony by Paul Martin at 2. 14 June 2018.
[39] CSSS/ Aerospace at 10.

an exit strategy that awarded first generation resupply contracts, this arrangement has characterized NASA's role as that of a venture capitalist.[40]

NASA now utilizes the partnership model for other missions, relying "on the private sector to leverage its capacity, innovation, and competitiveness."[41] These include development of the next generation of space communications to replace its current Tracking and Data Relay Satellite (TDRS) spacecraft now in orbit,[42] and Bigelow's BEAM module attached to the ISS.[43] Space P3s are not limited to NASA. ESA and Airbus signed a Partnership Agreement for a new ISS commercial payload platform named Bartolomeo to be attached mid-2019.[44]

Lunar missions will likely utilize P3s to accomplish their objectives. SpaceX's Falcon Heavy has been discussed in terms of a public-private return to the Moon program.[45] Bob Richards of Moon Express testified that traditional procurement would not have the same potential to foster and develop lunar technologies that translate to a customer base that goes beyond the government, citing this as rationale for a policy environment that continues to maximize public-private interaction.[46]

Space Situational Awareness/Space Traffic Management (SSA/STM) initiatives are imminent and very complex. Recent studies to address the challenges inherent to this public good for the space sector have examined P3s as a potential mechanism. The next section will delve into this particular set of capabilities and how status as a public good can impact risk for partners in such a venture.

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[40] CSSS/Aerospace at 11.
[41] Martin testimony at 5.
[42] Jeff Foust, "NASA to study use of commercial partnerships for space communication services" Space News 22 August 2018.
[43] Bigelow Expanded Activity Module, NASA site, available at: https://www.nasa.gov/content/bigelow-expandable-activity-module (date accessed: 22 October 2018).
[44] Airbus site, available at: https://www.airbus.com/newsroom/press-releases/en/2018/02/bartolomeo.html (date accessed: 22 October 2018).
[45] Doug Plata, "Why the Falcon Heavey should be America's next Moon rocket" The Space Review (22 January 2018) available at: http://www.thespacereview.com/article/3414/1 (date accessed: 22 October 2018).
[46] Robert Richards Testimony to the Senate Committee for Commerce, Science, and Transportation: Space, Science, and Competitiveness Subcommittee; Outer Space Treaty/American Space Commerce and Settlement (23 May 2017).

WHERE FROM HERE? THE IMPACT OF BEING A PUBLIC GOOD

Clearly P3s have been successful for space ventures. Not so clear is how to handle the effect upon risk allocation posed by status as a public purpose/public good. Disputes arise in all contexts and are an enormous part of the risks allocated in a P3 agreement. Contract breach and third party liability claims often occur in P3s; jurisprudence regarding these claims can be found with the most rudimentary of legal searches. The issues surrounding international and domestic sovereign immunity in space-related P3s are well developed in the paper the immediate paper references and updates. The tests and the law remain on point and relevant.

However, we are now looking at a public purpose mission/scenario. Reasonableness and public purpose tests are available to determine whether an activity is truly for the public good and, as such, eligible for or exempted from benefits that accrue. It is not on these tests that this section will focus. Instead, the focus here will be on risk allocation in the public good provision context. It would be a disincentive and inequitable to allow either party to bear all, or dodge all, responsibility for damage from the cessation or malfunction of a signal of a global emergency response system or navigation system.

Provision of SSA data to the private sector has been likened to a public good.[47] What impacts does this have on cost structure and how could it affect risk allocation? When avoiding or granting immunity internationally, the commerciality of an endeavor has profound impact. In domestic P3s, immunity does not always attach to a public partner and can sometimes be avoided by a private partner depending upon the role each plays and whether decisions and actions were taken on behalf of the state in question. To fully exercise transparency and remain aligned with the principles and elements identified as fundamental to successful P3s, these issues must be addressed at inception and with full disclosure to all parties and stakeholders, including end-users.

[47] B. Lal, et. al., "Evaluating Options for Civil Space Situational Awareness (SSA)" August 2016 at xiii.

Why is the SSA community considering a P3 model? For one, collection and provision of SSA data is complex. Data is sourced in multiple formats from diverse providers. Orbits are international. Expertise is distributed across stakeholders horizontally. National security is implicated for every spacefaring sovereign and by every space activity. This list is not exhaustive. Rendezvous and proximity operations hold great potential for utility and as much downside in the form of unintended or even intended consequences. Even the most benign spacecraft can be utilized in nefarious ways.

It is necessary to distinguish SSA services from STM. SSA is data or information pertaining to the location of space objects and debris. SSA services refer to maintenance of a catalog of objects and debris, provision of conjunction assessments and includes and some national security impacts due to object characterization. STM refers to oversight, coordination, regulation and promotion of space activities…normative constructs and governance.

The 2015 US legislation titled the Commercial Space Launch Competitiveness Act (CSLCA) noted the imminent necessity for a space traffic management framework and asked for several related reports to address the issues and whether and who an appropriate extant agency might be to create an implement such a framework.

One of these reports was the US Department of Transportation's SSA Feasibility Study, which noted the need for both statutory authority for any US Executive Branch entity to go forward, and governmental immunity similar to that in place to protect the US Department of Defense, currently providing SSA data through ComSpOC.[48] Another of these reports was that by IDA Science &

[48] "Report on Processing and Releasing Safety-Related Space Situational Awareness Data" at 11, lead agency: US Dept. of Transportation (September 2016), available at: https://spacepolicyonline.com/pages/images/stories/CSLCA%20report%20on%20SSA%20%20Sept%202016.pdf (date accessed: 22 October 2018).

Technology Policy (STPI), which evaluated multiple options to address how civil agency provision of SSA services might look.[49]

STPI's study iterated four options, ranging from civil capability embedded within the already existing DoD to civil agency certification of a purely private SSA service provider (and allowing for multiple providers).[50] Option 3 represented civil agency capabilities derived from partnering with or buying commercial software and analytics. This option describes a P3. Academia and industry have come forward with proposals to fill the need. One of these is UT Austin's ASTRIA initiative, currently maintaining an online catalog sourcing data from multiple providers.[51]

The original studies made a baseline assumption that the civil agency to perform SSA and ultimately STM functions would be the FAA AST, housed in the US Department of Transportation. However, in Space Policy Directive 3, the US National Space Council announced the Executive Branch policy that the Department of Commerce should actually take the lead for the interagency activities to come.[52] Nine days later, the House Committee on Science, Space and Technology introduced its American SAFE Space Act, which repeatedly includes the private sector's capabilities as necessary for SSA and STM development and gave the Department of Commerce the authority to stand a center for research at an academic institution and a pilot program involving all stakeholders.[53] Soon after, the Senate rebounded with its bill containing far less detail and far less clear authority, but giving on-orbit jurisdiction (implicitly including SSA and STM) to the Department of Transportation.[54]

Regardless of to which civil agency these responsibilities ultimately fall, the basics of allocating the risk between private and public partners will remain.

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[49] Ibid. 43.
[50] Ibid. at viii. Note that the STPI study assumed the civil agency to be FAA's Office of Commercial Space Transportation (AST). This is no longer an absolute outcome but might be again in the future.
[51] Moriba Jah, "A Public-Private Partnership for Space Traffic Management:" University of Texas at Austin Aerospace Engineering and Engineering Mechanics, on file with author.
[52] US National Space Policy Directive, Space Traffic Management Policy (18 June 2018) available at: https://www.whitehouse.gov/presidential-actions/space-policy-directive-3-national-space-traffic-management-policy/ (date accessed: 22 October 2018).
[53] H.R. 2226.
[54] S. 3227

In this scenario, it is necessary to address the risks that flow from public provision of or endorsement of data that will inform private decisions, potentially with dire consequence.

Legal risk within the US is one aspect; international liability is another. First, Congress can provide statutory immunity for a civil agency just as it does for DoD now.[55] This immunity extends to "agencies and instrumentalities thereof, and any individuals, firms, corporations, and other persons acting for the United States" for "any suit in any court for any cause of action arising fro the provision or receipt of space situational awareness services or information, whether or not provide in accordance with this section, or any related action or omission." Both sides are protected.

While my 2008 paper focused upon fairness to the partners in the context of a commercial P3, this paper focuses upon fairness to partners in the face of a public good P3. A grant of immunity for the public and private partners to a public good provision must be clear and unambiguous. *Parkridge 6 LLC v. United States DOT,* 2010 U.S. Dist. LEXIS 34182 (Eastern District of VA 2010).

[55] 10 USC 2274 § 2274 (g)

PRINCIPLES AND RECOMMENDATIONS

It is far easier for a P3 formed to provide a public good to protect all partners from suit with a clear ambiguous grant of immunity. And, with such a grant, it becomes well nigh impossible for an injured third party to bring a claim. In the early stages of this technology, this is likely appropriate. As it matures, Congress could deem such broad immunity no longer necessary. GPS users can bring product liability claims against manufacturers of that equipment. The answer to the conference's thematic inquiry, whether the space economy is in urgent need of regulation, is yes…specifically, enabling legislation giving authority to public participation in P3s as needed, and clear and unambiguous legislation granting immunity to all partners (and their agents) when in the early stages (at the very least) of providing a public good.

Some things remain constant with regard to P3s in space. The most effective P3s are fair for all partners. They are governed by transparency and clear delineation of roles and responsibilities. And, they provide the means to achieve complex missions that require technologies still nascent. Standing PPP Units can provide necessary utility in structuring successful partnerships.

I ended my 2008 paper with discussion of Article I of the Outer Space Treaty and the space freedoms it promised and Article VI and its tacit acknowledgement that space actors were both private as well as public. I will end this one with recognition of those and also Article IX which imposes an obligation for State parties to the Treaty to perform their space activities with due regard for the corresponding interests of all other State parties. Certainly, safe operations in space fall within due regard. As such, we all need to support use of space as a public good and acknowledgment of the need to provide immunity for private and public partners in the provision of public good services.