



Position Paper:

Outer Space Private Investment Corporation (OSPIC)

Executive Summary

Entrepreneurship and investment in space have never been more exciting and robust. As a result, hundreds of new space companies have been able to develop new technologies and systems, conduct technology demonstrations or even field initial capabilities. Many of these companies, however, are now at or will soon be approaching the point where their business plans require hundreds of millions or billions of dollars of capital to complete their space infrastructure. This space infrastructure is for both services and products and cuts across many industry segments, including but not limited to: transportation, communication, information, energy, research facilities, hospitality and tourism, manufacturing, advanced materials, pharmaceuticals, and even mining. The space infrastructure is also targeted at several diverse and developing space regions including low Earth orbit (LEO), geosynchronous Earth orbit (GEO), cis-lunar space (Earth orbit to lunar orbit), and the lunar surface. It will eventually also include Mars and the asteroids.

According to Morgan Stanley, space will be a \$1.1 trillion market by 2040.¹ Bank of America – Merrill Lynch believes space will be an even larger market of \$2.7 trillion by 2045.² However, given the immaturity of most space markets, in terms of predictable demand and heightened political/regulatory uncertainty, the private capital market sources representing the largest available pools of capital are mostly sitting on the sidelines. These sources include private equity funds, banks and the public capital markets. According to Bryce Space & Technology, in the period of 2012-2017 early stage commercial space companies received over \$5.64 billion of investment from early stage investors and venture capital firms. However, there was only \$631 million from debt financings, private equity firms and public offerings.³ If the breadth of space infrastructure envisioned by our entrepreneurs and world governments is to be realized, there appear to be only two choices: (1) a very significant and sustained increase in government funding, both direct and through public private partnerships (PPP); and/or (2) significant and sustained

government support of these later stage private capital markets. Ideally, and perhaps necessarily, both will be needed. For now, a mechanism is needed to grow the investments from these sources by an order of magnitude near term and perhaps another order of magnitude thereafter.

A similar problem existed decades ago involving the private capital market's inability to finance large and critical infrastructure projects in developing countries. As with space, these countries had uncertain markets and high political risks. They needed more affordable capital and capital with longer maturities and exit horizons to fit the slower development of their markets. To solve this problem, the U.S. created the Overseas Private Investment Corporation (OPIC), a federally-chartered agency backed by a government trust fund. OPIC supports industry growth and job creation in the U.S. while achieving significant foreign policy and national security goals in the developing world. OPIC achieved this through direct loans, loan guarantees, minority debt investments in private equity funds, and political risk insurance. This has been done in a manner to support versus compete with the private capital markets and has been extremely successful.

The National Space Society (NSS) recommends a very similar organization, the Outer Space Private Investment Corporation (OSPIC), be established by Congress with the same goals, but focused on supporting the development of commercial space infrastructure and associated businesses for the in-space production of products and provision of services for private and government applications. In an age where many nations are competing for preeminence in space, OSPIC would help the U.S. maintain its lead, enhance national security and spur economic growth.

Purpose

The objective for this paper is to inform key leaders in government, the space industry and the finance community as to the potential benefits of a new federally-chartered agency focused on supporting the financing of important new space infrastructure and related businesses. This would be an important new means of strengthening U.S. presence in space and commercial space enterprises and one focused largely on reducing financing risks on capital intensive initiatives. The U.S. has already put in place several mechanisms to support innovation and technology development, such as the Small Business Innovation Research (SBIR) grants and the Small Business Technology Transfer (STTR) program, as well as NASA Centennial Challenges. Other mechanisms have been utilized and are being explored to help build markets and demand for space infrastructure and services. These include: (i) purchase contracts such as was done on Commercial Resupply Services (CRS) as part of the Commercial Orbital Transportation Services (COTS) program; (ii) anchor tenancy possibilities as proposed for new commercial space stations; and (iii) indefinite delivery,

indefinite quantity (IDIQ) agreements such as proposed by United Launch Alliance (ULA) to purchase water on orbit at a set price for fuel depots.

As a starting point for discussion, it is proposed that the new agency, the Outer Space Private Investment Corporation (OSPIC), be closely modeled on the Overseas Private Investment Corporation, which has been an extremely successful economic and policy tool of our government for 47 years. The OSPIC idea has been around in various forms for many years and was first proposed by Near Earth LLC in a NASA funded study. The OSPIC idea (referred to as SPIC in the Near Earth LLC study) can be found in “Supporting Commercial Space Development, Part 1: Support Alternatives versus Investor Risk Perceptions & Tolerances,” November 2010.⁴ Another objective of this current paper is therefore to revive, enhance and further the discussion of this idea toward a detailed policy recommendation for implementation.

The Problem: Barriers to Intensive, Long-Term Capital Formation

Private financial institutional investors have fiduciary duties to their limited partners and strategic corporate investors have fiduciary duties to their shareholders. These duties include not taking undue investment risks, while seeking the best risk-adjusted return on the capital they have been entrusted to protect and grow. The U.S. government owes a similar duty to its taxpayers to make wise investments for the nation’s future. There are three major differences, however, underlying private versus public investment decisions.

1. Short Investment Horizons: Most private investing entities have a strictly limited timeframe within which to make and then exit their investments. For debt and equity funds, this tends to mean a range of three to seven years. For strategic corporate investors the time frames for expected investment results can be even shorter. Longer investment horizons do exist in certain rare cases where the end market is well-established and demand predictable (e.g. mining, oil exploration and development). In general, however, investments requiring 10 or 20 years to generate an acceptable return are significantly handicapped versus quicker returns on investment.

The creation of important space infrastructure often requires three to seven years just to design, manufacture and deploy. Furthermore, once operations have commenced it can be many more years before utilization increases to a point of profitability. The government, however, can and is even expected to take a longer view in its investments whether for future economic growth (e.g. basic scientific research) or the health of its citizens (e.g. cancer research). A 20-year investment would be well inside the Federal government’s mandate to invest for the future. A

private entity could never have done the Louisiana Purchase, acquired Alaska, funded Railroad Bonds or built the International Space Station.

2. Financial versus Public Gains: Private investors are expected to focus almost exclusively on financial returns. They are constrained by environmental and other regulations, but generally consider non-financial, societal benefits as “nice to haves” versus key investment criteria. Even where there are exceptions, like clean energy, the profit opportunity was created by a need to meet a societal imperative. A government can take into account a much wider variety of factors in making its investment decisions such as investments in fundamental scientific research and other long-term investments in the economy, job creation, national security enhancement, international diplomacy and cooperation, and the inspiration of its students and citizens. Much of our country’s investment in NASA can be attributed to the significant value to our nation of such non-financial and/or longer-term economic factors.
3. Risk-adjusted Capital Costs: A private investor is expected to search out, evaluate and compare a wide range of potential investments for its capital, selecting only those with the most return for the least amount of risk. Still, at times, a high degree of risk can be deemed acceptable, if the projected returns are commensurately large. One of the constraints of attracting investment capital to space endeavors is that they often include all of the normal business risks of other commercial and industrial activities, plus an additional set of material risks unique to operating in space (e.g. launch risk, harsh radiation environment, zero-gravity, difficult access, scientific knowledge gaps). Space development and commerce also comes with significant political risk both due to changing Administrative and Congressional priorities and the need for international coordination and regulatory compliance. These extra and unique risks can and have caused some past space investments to become worthless or significantly underperform investor return requirements.

These heightened risks can be acceptable to high net worth individual investors as they have no fiduciary duties to anyone but themselves and often have more than just financial gains in mind. The high risks can also be acceptable to angel and venture capital investors who are investing smaller amounts earlier in the hopes of large eventual returns on investment (ROI). The ROI targets for such early stage investors are frequently 20% to 50% per year. These early stage investors even expect that a high percentage of their investments will end up worthless. However, they are “betting” that one or a few will increase tremendously in value allowing them to achieve a good blended ROI over their whole investment portfolio.

A problem arises when the investment amounts become much larger, as when it is time to build space infrastructure. The remaining level of risk in the business plan is likely still quite high suggesting a need for high projected returns on investment. However, it is now extremely difficult for an investment case to close if it must generate, say 20%, returns on hundreds of millions or billions of dollars of new investment. On the other hand, a government can be satisfied with a more modest return on capital (e.g. 6%) as it is investing for more than purely financial reasons. A government also has the freedom to choose investments based on its total set of criteria and objectives versus being restricted to choosing only those investments with the best level of financial risk versus financial reward.

The combination of the challenges above will continue to make it difficult for many space infrastructure companies to attract adequate amounts of affordable and patient debt and equity capital. As a result, there is a significant risk that some well-financed and very promising space innovations and businesses will reach funding gaps that are impossible for the private markets to bridge on their own. There are many past and current examples of this phenomenon. For example, despite strong interest from the commercial satellite industry and even firm contracts from good credit quality customers, the in-orbit satellite servicing and logistics companies have not been able to attract sufficient amounts of private capital. The new spacecraft these companies have designed can extend the lives of existing satellites in orbit, relocate satellites from one location to another, rescue stranded satellites from bad launches, and in the future refuel empty satellites and perform repairs in-orbit. These are all important and highly desirable capabilities, but funding the first operational systems is a difficult ROI challenge for private investors versus other competing uses of their capital. Another example arising in the near future will be fuel depots. The economic gains and operational flexibility created by having fuel depots in space is significant and well understood, yet start-ups in this field are and will continue to face a similar “chicken and egg” problem of financing their first operational systems. The same can be said for those companies planning to build and operate commercial space stations to take over and extend the work of ISS once it is decommissioned. All of these applications and many more will need long term low cost capital to help close their business cases. An OSPIC facility could help solve these needs.

Part of the Solution: A Federally-Chartered Private Investment Corporation

Bridging this funding gap may require several strategies, but one of the most powerful possibilities is the creation of a non-profit government financing corporation to support large scale debt and equity investments and political risk insurance for space

infrastructure. A tentative name for such an entity is the Outer Space Private Investment Corporation (OSPIC) to mirror the existing Overseas Private Investment Corporation (OPIC). However, a different name and acronym may be preferred and adopted in the future and many alternatives come to mind.

A summary of OPIC is provided below as a point of reference. OSPIC would be subject to Congressional oversight, but otherwise be given operational flexibility to interface with private industry and the investment community. As such, OSPIC could enter into more standard commercial relationships than is generally possible under typical government-industry interactions.

The key advantages of this approach are the ability to:

- Provide significant debt capital through low cost, long duration loans (up to 20 year maturities) either directly or through loan guarantees;
- Support space infrastructure- and space services-focused equity investment funds through minority participations in those funds with qualified and experienced managers; and
- Reduce risk through low cost and available political risk insurance.

With OSPIC support, a company developing space infrastructure would have the opportunity, if its business plan and management team were sound, to raise large amounts of affordable and patient capital. The continuity and assurance of this capital would also be enhanced by OSPIC's participation. Another potential benefit is that unlike with some forms of government contracting, private ownership of any intellectual property developed could be maintained despite the government's funding and/or financing support. In return, the U.S. government receives certain assurances as to compliance with its space launch (FAA), space operations (DOC), telecommunications (FCC), environmental (EPA), labor and other regulations and enjoys the benefits of a stronger national space industry and enhanced employment. OSPIC's participation would also generally signal a strong desire to reap shared benefits from this space infrastructure for both commercial and government customers.

To create OSPIC, Congress (with Presidential approval) would charter the new agency and appropriate a trust fund to finance its administrative costs and its first years of financial support for selected space infrastructure projects and investment funds. This trust fund could be augmented in the future as desired and decided by Congress. The goal would be for OSPIC to charge reasonable and appropriate fees for its services, loans, investments and loan guarantees such that over time it would become a self-sustaining source of private funding. Ideally, it might even make money which would then be returned to the U.S. Treasury.

Overseas Private Investment Corporation (OPIC)

OPIC is a very good analogy for how OSPIC might be formed and operate. Below, is a side by side comparison of OPIC’s mission statement with a version replacing the overseas developing world concept with space infrastructure commercialization.

<p>OPIC is the U.S. government's overseas development finance institution. It mobilizes private capital to help solve critical development challenges and, in doing so, advances the foreign policy of the United States and national security objectives.</p> <p>Because OPIC works with the U.S. private sector, it helps U.S. businesses gain footholds in emerging markets, catalyzing revenues, jobs and growth opportunities both at home and abroad. OPIC achieves its mission by providing investors with financing, political risk insurance, and support for private equity investment funds, when commercial funding cannot be obtained elsewhere. Established as an agency of the U.S. government in 1971, OPIC operates on a self-sustaining basis at no net cost to American taxpayers</p>	<p>OSPIC is the U.S. government’s space development finance institution. It mobilizes private capital to help solve critical space infrastructure challenges and, in doing so, advances the space commercialization policy of the U.S. and national security objectives.</p> <p>Because OSPIC works with the U.S. private sector, it helps U.S. businesses gain footholds in new space markets, catalyzing revenues, jobs and growth opportunities both at home and in space. OSPIC achieves its mission by providing investors with financing, political risk insurance, and support for private equity investment funds, when commercial funding cannot be obtained elsewhere. Established as an agency of the U.S. government in [TBD], OSPIC’s objective is to operate on a self-sustaining basis at no net cost to American taxpayers.</p>
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OPIC History: The idea for OPIC originated in 1966 out of a desire of the U.S. government to foster growth and achieve economic benefits in developing and transitional geographic regions. Private investors found these regions too risky for many needed investments, particularly critical transportation, medical, energy, water, telecommunications and other infrastructure. It took five years before OPIC was established by Congress in 1971. Since its establishment, OPIC has supported more than \$200 billion of investments in over 4,000 projects in over 160 developing countries. It has been a leading contributor to world peace and prosperity. OPIC is also self-sustaining and since 1981, just ten years after its creation, has paid money back to the U.S. Treasury for 38 years in a row. In the last 10 years OPIC has contributed \$3.7 billion to the U.S. Treasury for deficit reduction. This was achieved with an initial portfolio of \$169 million in loan guarantees (\$1.1 billion in 2018 dollars) and \$8.4 billion of political risk insurance (\$53.2 billion in 2018 dollars).⁵

The beneficial impact of OPIC's credit support has been significantly greater than the amount of capital that OPIC contributes directly to projects and equity investment funds. There is a multiplier effect as the leverage OPIC's low cost loans provide makes private equity investor ROIs more achievable and thereby attracts more capital. For example, on the private equity fund support, according to OPIC's website, "*OPIC has committed \$4.1 billion to 62 private equity funds in emerging markets since 1987. These funds in turn have invested \$5.6 billion in more than 570 privately-owned and managed companies across 65 countries. Through our commitments, we catalyze U.S. foreign direct investment and accelerate the economic and social development within these markets.*"

OPIC Services: OPIC primarily sought to bridge this period of development and transition by engaging in three core activities to support U.S. companies working in the developing world and their private investors:

1. **Debt Financings and Guarantees:** OPIC provides medium and longer term financial support to qualifying projects/companies through direct loans and loan guarantees, subject to private equity investment representing 25% to 40% of total capital deployed. OPIC charges a fee for these financings and screens opportunities to back credible management teams with sound business plans.
2. **Private Equity Fund Support:** OPIC provides non-amortizing loans to private equity funds. The proceeds for these loans are generated by OPIC issuing certificates of participation (COPs) in the U.S. debt capital markets. Loans are typically 10-12 years in maturity and can be for amounts up to one third of the value of the total capital committed to the private equity fund. The private equity fund receiving the loan pays a fee to OPIC for providing the financing, and in addition to interest and principal payments on the loan, OPIC also receives a small profit participation in the fund.
3. **Political Risk Insurance:** OPIC provides international political risk insurance backed by U.S. government guarantees as well as engaging in co-insurance and re-insurance with private insurance carriers to increase coverage capacity for large projects. OPIC charges the project company or its investors, as the case may be, standard commercial fees for providing such political risk coverage.

Support Criteria: In addition to general business and financial due diligence, OPIC also bases its support on special criteria important to the U.S. These criteria include:

- U.S. control of supported entities;
- Private sector involvement in financing;
- The project not being in a prohibited category;

- Positive effect on U.S. jobs;
- No appreciable environmental impacts;
- Compliance with worker rights standards; and
- Positive impact on U.S. foreign policy goals.

Outer Space Private Investment Corporation (OSPIC)

The relevance of the OPIC model to space commercialization and infrastructure development is three-fold as it creates:

- (1) an independent entity to coordinate and manage larger scale financial support;
- (2) a more politically acceptable government funding mechanism that does not seek to pick winners and losers, compete with private capital, or engage in industrial policy benefitting a single industry (space is no longer about one industry but is becoming a new region of economic development for all industries); and
- (3) a more financially sustainable organization through financing fees and investment gains with the potential to pay back taxpayers over time.

Consider some of the potential applications that could be seeking funding support from OSPIC in these coming decades. They would include: spaceport operations, fully-reusable launch services, massive telecom and remote sensing applications, on-orbit fuel depot operations, on-orbit servicing and logistics, private space stations in low Earth orbit (ISS transition), orbital manufacturing, cis-lunar gateways, lunar landing services, lunar outposts, lunar mining and ISRU, lunar power and communications services, space position, navigation and timing networks, deep space communication networks, space solar power, and other critical space infrastructure as humanity reaches out to Mars and the asteroids. These may seem like audacious projects, but so were many of the billion dollar facilities OPIC funded in third world countries that now enjoy electricity, clean water, roads and hospitals where only jungles and poverty once reigned.

OSPIC Services: The success of the OPIC model also strongly suggests that OSPIC provide a similar set of services on a fee basis and include a similar set of support criteria. It is envisioned that a large majority of this support would be connected to senior secured debt financings and subject to maximum levels of loans to total capital (e.g. 60%-75% maximum debt levels). However, unlike similar aerospace industry support in the past from the Export-Import Bank of the U.S., these loans would not be tied to satellite manufacturing contracts or exports of any kind, and could be made either as direct loans from OSPIC or through full or partial loan guaranties to private lenders. In addition to providing greater flexibility in lending support to better fit each particular circumstance, the OSPIC model is not based solely or even primarily on an industrial policy designed to benefit one industry

or project over its competitors. The primary purpose is to leverage private capital to create commercial mixed use (i.e. private sector and government) space infrastructure and businesses across numerous industry sectors to benefit all aspects of our national space objectives and multiple sectors of our economy.

Equity financing support would be limited to minority participations in equity funds that have a strong focus on commercial space infrastructure and businesses. It is also likely that like OPIC, most of OSPIC's investments in equity funds would be in the form of 10-12 year non-amortizing loans limited to no more than one-third the value of the fund's contributed equity. Non-amortizing means that during the 10-12 year term of the loan, the fund manager only has to make interest payments on the loans. This allows for time for the investments to grow in value and profitability before the principal of the loans has to be repaid. By only investing in equity funds, and generally through loans, as opposed to direct equity investments into individual commercial space companies, OSPIC would avoid the role of picking winners and losers. As importantly, this form of financial support provides OSPIC the risk mitigation of professionally managed portfolios of investments, where the managers have the most "skin in the game," and also allows OSPIC to be the first party to get its money back from investment gains as its investments will be in the form of loans senior to other forms of indebtedness.

As a cautionary tale, something quite different was promoted in February 1979 in the 96th Congress (H.R. 2337) called the Space Industrialization Corporation (SIC), but was never enacted. SIC was designed to use congressionally appropriated funds to make direct equity investments in private space companies to "promote, encourage and assist in the development of new products, processes and industries using the properties of the space environment." The legislation was contemplated during the euphoria of the early Space Shuttle days and looking forward to the capabilities of ISS. However, large scale direct equity investments from a government trust fund are politically unlikely and would compete directly with private sources of capital. The OPIC model on the other hand reduces risk to encourage private capital investments and works with and supports sources of private capital. While OSPIC could face similar challenges getting Congressional approval, it would seem to be a far more appropriate role for government and more politically sustainable.

Support Criteria: OSPIC's support criteria would be similar to those of OPIC, but customized and expanded for the space marketplace. In addition to normal business and financial due diligence, the key criteria for support would include:

- U.S. control of supported entities;
- Private sector involvement in financing;

- The project not conflicting with any national security requirements;
- Commercial mixed use technology or infrastructure (commercial plus civil and/or national security);
- Strategic alignment with NASA and other U.S. civil space interests;
- Consistent with U.S. space commercialization priorities such as supporting a transition from the ISS to future commercial LEO space stations;
- Supportive of a long-term sustainable ecosystem in space;
- Positive effect on U.S. jobs;
- No appreciable environmental impacts;
- Compliance with worker rights standards;
- Compliance with national and international space regulations; and
- Potential for international cooperation, participation or utilization.

OSPIC Benefits: If OSPIC can be established and appropriately funded, the potential benefits are broad and numerous:

- Private Investors:
 - More transactions become financeable
 - Financial risk sharing
 - Availability of affordable political risk insurance
 - Increased probability of acceptable ROIs
- The U.S. Public and Taxpayers:
 - Maintain world leading position in critical aerospace industry
 - Increased economic growth
 - More high skilled, high paying jobs
 - Greater inspiration for STEM education
 - Eventual gains from OSPIC investments
- NASA:
 - More commercial mixed-use space infrastructure sooner
 - More capabilities to support more missions
 - Lower future mission costs
 - Technical and program risk spreading
 - Greater chance of sustained competition and innovation
- National Security:
 - Soft power projection
 - More commercial mixed use space infrastructure sooner
 - More capabilities to enhance national security
 - Reduced space logistics and space services costs
 - Maintain innovation and technical edge for national security

The purpose of OSPIC is to turn a developing region (initially cis-lunar space) into a broad-based, vibrant and sustainable ecosystem. However, to highlight just one key goal from above, job creation, the recent trend has not been encouraging. According to the Space Foundation,⁶ the total U.S. space workforce has declined for 8 years in a row to a level of approximately 173,000, which is 25.5% lower than 10 years ago. The availability of financial support from OSPIC could spur a significant increase in high paying space industry jobs, plus bridge the labor forces of the world's other industries into space.

Conclusion

The National Space Society strongly recommends that an Outer Space Private Investment Corporation modeled on OPIC could be the answer to closing the financing gap for capital intensive space infrastructure projects by providing low cost, long term debt capital and guarantees plus similar support for private equity investors risking capital in space. As with OPIC, the management of OSPIC would need to be good stewards of the public's capital and adhere to a strict set of support criteria, but there appears to be a great opportunity to unleash enormous financial and societal benefits for the U.S. and also the world.

Allowing OSPIC to charge fees and capture gains from successful commercialization support would help it cover the operating costs of the corporation and reduce and eventually eliminate the need for further Congressional appropriations. New funding requests could also be based upon demonstrated success and organizational prudence and diligence. An entity like OSPIC operating in the highly uncertain and emerging space market would, of course, experience occasional defaults on loans and equity investment losses. However, having an organization like OSPIC would provide the government the focused expertise needed to minimize such risks and losses and the ability to quickly change or modify practices and personnel as required.

Ultimately, the purpose of OSPIC is to serve as an interface between developers of significant space infrastructure and services, the private investment community and the U.S. government entities with space interests. The goal of OSPIC is to pro-actively support, and if prudent, accelerate the funding and deployment of commercial mixed-use space infrastructure and services to capture the many benefits listed above.

In conclusion, the example of OPIC provides a good roadmap for what the U.S. government can achieve in promoting large scale private investment in difficult, developing and transitional markets for long term economic and societal benefits. Space is just such a developing market and is likely to remain so for many decades. The new space

infrastructure and businesses created in part through OSPIC financial support could lead to enhanced U.S. leadership, greater global prosperity and the beginnings of an unbounded future for humanity.

¹ “Investment Implications of the Final Frontier,” Morgan Stanley, October 12, 2017

² “To Infinity and Beyond – Global Space Primer,” Bank of America – Merrill Lynch, October 30, 2017.

³ “Start-up Space – Update on Investments in commercial Space Ventures,” 2018, Bryce Space & Technology.

⁴ Located at Section 7.7 starting on page 207. The URL for the study report can be found at www.nasa.gov/sites/default/files/files/SupportingCommercialSpaceDevelopmentPart1.pdf

⁵ <https://www.opic.gov/who-we-are/opic-history>

⁶ “The Space Report,” 2018, The Space Foundation.

About the National Space Society (NSS): NSS is an independent non-profit educational membership organization dedicated to the creation of a spacefaring civilization. NSS is widely acknowledged as the preeminent citizen's voice on space, with over 50 chapters in the United States and around the world. The Society publishes *Ad Astra* magazine, an award-winning periodical chronicling the most important developments in space. To learn more, visit space.nss.org.