Creating Startups with NASA Technology

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ABSTRACT

In contrast to the “fail fast, fail often” Silicon Valley paradigm, “failure is not an option” is an adage often observed in traditional space activities. New Space aims to reconcile both perspectives. For that to happen, innovation and risk mitigation should take place in tandem; a role that public–private partnerships can play in establishing a successful entrepreneurial space ecosystem. This is the context for the program “Creating startup with NASA technology,” launched by the New York Space Alliance (NYSA), in collaboration with National Aeronautics and Space Administration (NASA) through a Space Act Agreement signed in October 2018. The initiative seeks to bridge the gap between NASA and startups. It also aims to lower risks for all stakeholders involved, including the public sector, investors, entrepreneurs, and customers while fostering connections between space and nonspace businesses. The first phase focuses on transferring NASA technology to participants in a pilot program in New York. Through a series of initiatives, NYSA has been assisting startups with licensing NASA technologies for both space and nonspace commercial applications. The second phase will tap on the New York startup and innovation ecosystem to support NASA's space missions. Benefits for stakeholders involved are multiple. Impact in the city and state of New York is expected by nurturing a nascent space-based startup ecosystem, contributing to a dynamic startup community, creating both high-quality and vocational jobs, attracting and retaining talent, and stimulating economic activity, among others. In parallel, NASA engages a new innovation ecosystem and shows concrete examples of economic benefits for its research activities. The agency is also reaching a new community of entrepreneurs that will support space exploration. Entrepreneurs have access to patent-protected technologies and algorithms vetted for technical and commercial viability, as well as NASA technical personnel and facilities for additional support.

Keywords: entrepreneurship, NASA, New Space, startups, technology transfer

INTRODUCTION

Humanity celebrated the 50th anniversary of the first manned moon landing in 2019. One of the most notable changes since the Apollo mission era has been the fast growth of New Space and participation of investors and entrepreneurs in a market-driven landscape. This article describes an innovative public–private partnership scheme that leverages National Aeronautics and Space Administration (NASA) technology to empower startups that will impact life in our own planet. The initiative also seeks to engage private ventures to support space exploration.

The brief history of human space exploration can be divided into 3 phases. In Space 1.0, there was a space race to go to the moon. It was a competition for political superiority demonstrated, in part, through the technical achievements and innovation necessary to reach the moon. During this first phase, NASA followed a more “traditional model.”1 It developed all of the technology it required in house or through procurements to the aerospace industry that supported government projects. The technology to accomplish such an incredible feat was not available elsewhere. By necessity, NASA grew the expertise and facilities inside of the agency.

During Space 2.0, human space exploration moved from competition to collaboration across numerous space agencies to create the International Space Station (ISS). Throughout that period, NASA was in a “transitional model.”1 It was moving toward a business model where not all of the capabilities required to accomplish the mission were found within the agency. In this transitional phase, NASA has looked to leverage the expertise and capabilities of the international space agencies to construct the largest orbiting laboratory for an international crew of astronauts. This vehicle has provided insights of the effects of the microgravity
environment on space explorers and translated to benefits for life on earth.

In the current phase, Space 3.0, human space exploration is able to leverage the increasing capabilities found in the growing commercial space industry. NASA is moving toward a “network model” where, in addition to the international community, it can leverage the capabilities of both industries that are unrelated to aerospace and the commercial space market. The start of this phase is best captured in the Commercial Orbital Transportation System program. During this program, NASA tested the market’s capability to provide commercial access to the ISS for cargo delivery and eventually for crew access to the vehicle. The success of this program enabled NASA to pursue the Commercial Cargo and Commercial Crew programs.

NASA is now looking to leverage the innovation community in preparation for the Artemis mission. The Next Space Technologies for Exploration Partnerships (NextSTEP) program is a public–private partnership model aimed at seeking commercial capabilities to support more extensive human spaceflight missions in and beyond cislunar space—the space near Earth that extends just beyond the Moon. In addition, the Commercial Lunar Payload Services program is looking for commercial capability to deliver payloads to the surface of the moon. In the recent award on May 31, 2019, 3 commercial service providers were selected that are less than a dozen years old and growing fast.

This is the context for the program “Creating startup with NASA technologies,” launched by the New York Space Alliance (NYSA), in collaboration with NASA through a Space Act Agreement signed in October 2018. The initiative bridges the gap between NASA and startups by lowering risks for all stakeholders involved. Next, we discuss how NASA has taken advantage of the fast-growing New Space scene. We proceed with a description of the program and draw preliminary insights from selected case studies. Brief conclusions follow.

**NASA AND NEW SPACE**

Seizing the momentum created by the New Space movement, NASA has looked for innovative concepts through various challenges and crowdsourcing campaigns. It has found innovation from engineers, scientists, inventors, and entrepreneurs who are not in the aerospace community but have provided solutions not previously considered by the agency. NASA has also seeded the startup community with NASA technologies, launched by the New York Space Alliance (NYSA), in collaboration with NASA through a Space Act Agreement signed in October 2018. The initiative bridges the gap between NASA and startups by lowering risks for all stakeholders involved. Next, we discuss how NASA has taken advantage of the fast-growing New Space scene. We proceed with a description of the program and draw preliminary insights from selected case studies. Brief conclusions follow.

After the project was completed, Bigelow Aerospace licensed the technology with the goal of creating the first space hotel. Upon launching a prototype vehicle to orbit the earth, Bigelow Aerospace looked for other applications until the capability was available to deliver its guests to the space hotel. They looked for applications on the ISS and on April 16, 2016 the Bigelow Expandable Activity Module was connected to the ISS.

There is a growing appetite by entrepreneurs and innovation ecosystems around the country to be a part of the trillion-dollar space economy. Brownsville, Texas, recently launched NewSpace Brownsville to grow the capability in their community to support their future spaceport and to create new startups that will impact the region. New Space New Mexico is looking to grow their commercial space capability across the state, beyond Spaceport America and to leverage the innovation from the national laboratories and NASA to seed companies that will impact the business community in their region. Even the Department of Commerce’s Minority Business Development Agency is hosting InVision tours that are looking to connect minority businesses with technologies at NASA to help accelerate their companies.

NASA has always had an economic impact with some reports crediting every $1 spent on NASA adding $10 to the economy. Yet, what we are seeing now is the proactive role innovation communities around the country are playing to grow the space economy. The NYSA is a leader in bringing together the innovation ecosystem in the tri-state region in New York to grow companies seeded by NASA technology and to find innovative startups and companies in the region to impact the human space exploration missions.

**Technology Transfer**

Technology transfer is one of the primary ways NASA engages the New Space ecosystem. The agency has been a major source of innovation since its founding in 1958. Besides supporting humanity’s dream of space exploration, NASA has created technologies that can be used for commercial applications.

To mainstream its inventions, NASA created a Tech Transfer program in 1962. Since then, it has granted 1,600 licenses. Currently there are about 450 active licenses for NASA-patented technologies, with 100 new licenses roughly being executed each year. In 2016, 2,600 software usage agreements were issued. NASA makes these technologies available to academia and industry, as well as state and local governments, through their patent licensing program.

Over the years, NASA technology has contributed to the creation of successful products that have impacted billions of
people through its inventions. Commercialized NASA technology—known as NASA spinoffs—can be found in cell phones, furniture, and cars. They have improved nearly every semitrailer truck on the road, airplane in the sky, and tractor working the fields. Following are some examples:

- Cell phone cameras. The technology for the cameras in cell phones is based upon the complementary metal oxide semiconductor (CMOS) image sensor from the NASA Jet Propulsion Laboratory. The inventor, Eric Fossum recalls, “People told me, ‘You’re an idiot to work on this.’” His persistence ended up disrupting the market. The prevailing technology at the time was the charge-coupled device, which required a lot of power and extremely high charge-transfer efficiency. The performance would be impacted as higher resolution was required. Initially the technology found its way into the GoPro cameras and as adoption of the CMOS technology grew, it is the standard used for cell phone cameras due to low power consumption and size of the sensor.

- Eyesight correction. Lasik eye surgery owes the precision that it requires for the procedure to a NASA technology that enabled the autonomous docking of 2 vehicles in space. In the 1980s, NASA’s Johnson Space Center awarded a Houston company, Autonomous Technologies Corporation Phase I and Phase II SBIR (Small Business Innovation Research) contracts to develop technology to enable autonomous rendezvous and docking of space vehicles to service satellites. The company developed a range and velocity imaging LADAR (laser radar) for this autonomous docking and rendezvous. Eventually the technology was acquired by Alcon who produced the LADARVision 4000. This capability combined the benefits of the LADAR tracking device from Autonomous Technologies with a flying small-spot laser beam. The resulting system became the first to gain Food and Drug Administration approval for wavefront-guided LASIK.

- Building stabilization. Tall structures in New York City would seem to have little in common with a NASA rocket, but the technology that prevented the Ares 1 launch vehicle from building up a dangerous vibration that could destroy the rocket was used in a building in Brooklyn. The engineering firm Thornton Tomasetti licensed the technology from NASA and first used it on the B2 BKLYN building. The structure is not very tall, but it is lightweight and, therefore, is susceptible to swaying when there is a lot of wind. Now with the dampening technology on the roof of the building it no longer sways.

Even though the annual Spinoff magazine captures the impact to numerous markets it is not as easy to quantify the impact from NASA’s technology transfer program. In 2010, an article presented at the 2010 International Astronautical Congress captured the various studies that have attempted to measure the benefits from NASA’s technology. They grouped the impacts in the following categories: jobs created (measured in number of jobs), revenue generated (measured in dollars), productivity and efficiency improvements (measured in dollars), lives saved/not lost (measured in number of individuals), and lives improved (measured in number of individuals). The authors concluded that there was “ample evidence from multiple studies and data collection efforts that NASA’s investments in space technology yield important benefits in terms of economic return, revenue generation, and creation of jobs. What is lacking is a consistent and sustainable method of regularly collecting data in consistent standardized categories that can be aggregated over time.” In 2013, the Tauri Group (currently Bryce Space and Technology) captured another survey conducted by NASA in 2011. In the survey NASA technology transfer office once again surveyed companies featured in Spinoff to determine the impacts generated by NASA spinoffs. The resulting data set was small, but the estimates of typical revenue ranged from $100 million to $1 billion annually.

Challenges and Opportunities

Access to NASA inventions has become more open recently. In 2014, the agency launched a central repository for software that contains NASA’s publicly released codes—all of which are available free of charge and can be downloaded from the site. A patent portfolio of NASA inventions, ranging from sensors and robotics to green energy innovations, is likewise managed through a single public-facing repository.

In 2015, “Startup NASA” was launched to support early stage companies. The program aims to address 2 of the biggest challenges the startups face, namely access to capital and securing intellectual property rights. It is open only to companies formed with the express intent of commercializing the licensed NASA technology. NASA waives the initial licensing fees, and there is a grace period for the first 3 years. NASA starts collecting royalties only after the company starts selling a product.

Since 2017, individuals and businesses interested in using NASA technologies can apply for a license through automated online application system. In addition, there are thousands of formerly patented technologies that NASA has gifted into the public domain and anyone can pursue product development
using these technologies for free, with no requirement to contact NASA.

It was anticipated that there would be an increase in startups licensing NASA technology once the barrier to entry was lowered by removing the fees for 3 years. The surprising low figures might be due to a number of factors:

1. Startups are not aware of the Startup NASA program and that they can have access to the NASA technology.
2. Many entrepreneurs consider the application of NASA technology for space applications only and do not realize the potential of the technologies to disrupt the markets that they are considering to enter.
3. Entrepreneurs view NASA as a large unapproachable agency and do not know how to connect with the agency.

The challenge is to increase the number of startups exposed to NASA technology and the Startup NASA program. It is expected that an increase in the number of startups connected to NASA will lead to an increase in startup licenses. Besides, the startup community needs an intermediary or connector that is embedded in the community to help them navigate the NASA processes to license the technology and to provide solutions to support the future space exploration missions.

At the same time, as part of the Space 3.0 context described earlier, a number of opportunities are being created for startups and established corporations that are looking to provide solutions to NASA. Such companies are expected to operate commercially and generate technology for the agency’s space missions.

“The Startup NASA initiative leverages the results of our cutting-edge research and development so entrepreneurs can take that research—and some risks—to create new products and new services”

David Miller
Former NASA chief technologist

PROGRAM OVERVIEW

“Creating Startups with NASA Technology” aims to tap the New York ecosystem to license NASA technologies for commercial purposes and enlist entrepreneur communities in solutions to address NASA technology challenges for space exploration. To engage the city and state of New York innovation communities, the program will (1) facilitate access to NASA technology by highly qualified entrepreneurs, (2) fast-track process in partnership with corporations, and (3) bridge the gap between tech developers and startups. Ultimately, the initiative will lead to creation of successful companies that will benefit both life on earth and shape the future of space economy and exploration.

The first phase focuses on transferring NASA technology to participants in a pilot program in New York. Through a series of initiatives, NYSA has been assisting startups with licensing NASA technologies for both space and non-space commercial applications. The second phase will tap on the New York startup and innovation ecosystem to support NASA’s space missions.

The scheme involves NASA, NYSA, the city and state of New York economic development community and corporations. Although NASA provides access to technology through licensing, NYSA identifies the most qualified entrepreneurs. Corporations participate by proposing challenges that will lead to the development of commercial applications.

Through its Tech Transfer Program, NASA provides access to patents, assists with licensing, and ensures continued technical support. NASA also introduces the technology challenges that need to be addressed to support its exploration missions. NYSA serves as the coordinating entity and identifies the most qualified entrepreneurs and corporations. Corporations work alongside entrepreneurs in the development of new commercial applications, eventually creating new products or helping spinoff solutions. Other partners include incubators and accelerators, as well as investors in different stages. The organizational framework of the initiative is presented in Figure 1. A list with all stakeholders and their respective responsibilities is presented in Appendix A1.

During the initial phase, startups are formed and play a central role in later stages. Close collaboration is established with economic development agencies to engage local corporations, as well as support the local entrepreneurial ecosystem. For instance, in New York City, NYSA has been collaborating with the New York City Economic Development Corporation (NYCEDC). An extended summary of the roles and responsibilities is provided in Figure 2.

The program is a win–win for all parts involved. NASA engages a new innovation community and introduces concrete examples of economic benefits for its research activities. In addition, it reaches a new community of entrepreneurs to create solutions to support space exploration. Entrepreneurs have access to patent–protected technologies and algorithms vetted for technical and commercial viability, as well as NASA technical personnel and facilities for additional support. They also connect with corporations that otherwise might not be within their reach.
Risk Mitigation

Risk mitigation is a primary driver of the activities. One of the most appealing aspects of the program is to reduce risks for everyone involved. Technology risks are addressed through NASA’s stringent standards. For both startups and corporations, the business risk is substantially lowered in different ways: early stage companies will benefit from access to funding, mentorship, and the disciplined imposition through contractual obligations, whereas large companies benefit from the resources they would not be able to access otherwise, giving them an edge against the competition. Finally, market risks are contemplated through the expertise of corporations.
Program Components

To support startups, NYSA created a roadmap to address the needs of space companies in different maturity stages. In parallel, it has tested some ideas to develop the space business ecosystem in New York in collaboration with key partners. Some of the main initiatives are as follows:

- Virtual Accelerator. Organized with participants from all over the world participating in a 3-day program before the signature of the Space Act Agreement. Some participants were selected from top candidates.
- Bootcamp. Partnership with the Founder Institute, the world’s premier idea-stage accelerator and startup launch program, for a 12-week bootcamp has been offered to selected participants free of charge.
- NYSA Startup Academy. Live webinar series with world-class experts was organized. The full speakers list can be found in Appendix A1.
- NYSA Global Innovation Exchange. Knowledge network created in collaboration with Swarm Intelligence to connect entrepreneurs, investors, and members of the space community.
- NYSA Space Business Roundtable. Forum that congregates the space finance and business communities of New York.

THE SPACE ACT AGREEMENT

NASA and NYSA signed an Umbrella Agreement in October 2018 for the purpose of tapping the New York ecosystem to license NASA technologies for commercial purposes and enlist entrepreneur communities in solutions to address NASA technology challenges. Through the program “Creating Startups with NASA Technology,” NYSA and its partners are pioneering a platform to accelerate the formation of space startups. Collaborating with NASA provides access to invaluable access to knowledge and resources to space entrepreneurs.

In parallel, NASA has engaged a new innovation ecosystem and show concrete examples of economic benefits for its research activities. The agency is also reaching a new community of entrepreneurs to create solutions to support space exploration. Entrepreneurs have access to patent-protected technologies and algorithms vetted for technical and commercial viability, as well as NASA technical personnel and facilities for additional support.

Phase 1—NASA Transfers Technology to Startups

This first phase focuses on transferring NASA technology to the New York startup ecosystem. It identifies NASA technologies that are a match for the innovation ecosystem in both the city and state of New York, as well as other parts of the world. The NYSA will work with an innovation ecosystem in the region to help grow these technology startups. Through a series of programs, NYSA ensures the startups are prepared to pitch their innovations to potential investors.

The agreement allows NASA to leverage the NYSA community in a manner that will effectively and efficiently determine viable transferees for NASA technology for commercial purposes. Once a startup is in a position to license the technology and the startup is deemed an acceptable candidate by NASA, NASA will enter into a licensing agreement with the startup. Each license will be separately negotiated between NASA and the startup company. Appendix A2 summarizes the expected responsibilities from NASA and NYSA in Phase 1.

Case Study: Startups

Table 1 shows 3 examples of the pilot program where NASA and NYSA have worked together to speed up technology transfer process. Preliminary results indicate that the program has the potential to accelerate the process, regardless of the stage. Besides, startups have seen positive externalities such as increased credibility due to the association with NASA.

In the case of CapCell, it is expected that it might take half of the time to complete the process. ClinicAI started working on the licensing before the company joined the program. The company has reported that communication with NASA has greatly improved afterward. Finally, the Storm Group had already developed its NeuroScan software before they were selected to the program. The benefit in their case has been on becoming aware about NASA source code and software

Fig. 3. Risk mitigation.
release possibility, as well as the improvement and validation that a NASA technology has brought about to their product.

**Phase 2—Startups and Commercial Entities Provide Solutions to NASA**

The program focuses on tapping the startup and innovation ecosystem in New York that align with current and future NASA space missions.\(^{15}\) It identifies technologies that are a match to NASA’s challenges and those ones created for commercial purposes for both space and nonspace applications. NYSA launched the initiative as part of the 50th anniversary of the lunar landing. Appendix A3 summarizes the expected responsibilities from NASA and NYSA in Phase 2.

**Case Study: Skidmore, Owings & Merrill LLP**

The agreement for phase 2 was signed in July 2019 and potential candidates are being selected as of the writing of the article.

For the past few months, NASA has been working with Skidmore, Owings & Merrill LLP (SOM), one of the leading architectural, interior design, engineering, and urban planning firms in the world, and suggested the project as a pilot in light of SOM’s recently released concept for the first permanent human settlement on the moon.

NYSA will work with selected organizations such as SOM to enable access by NASA Subject Matter Experts (SMEs) for review and technical guidance of the following technical insights related to extended lunar surface operations (*in situ* resource utilization [ISRU] structures).

**CONCLUSIONS**

The moon landing festivities in 2019 provided invaluable push for space activities. Besides celebrating past accomplishments, the occasion elicited discussions about space and the future of humanity. The current administration has highlighted commercial space and the return to the moon as key priorities, including bringing the first woman to Earth’s satellite. As part of the challenges to garner support, showing a direct correlation between public investment and social economic impact through technology transfer might reinforce NASA’s role in spurring innovation and promoting growth.

In contrast to the “fail fast, fail often” Silicon Valley paradigm, “failure is not an option” is an adage often observed in traditional space activities. New Space aims to reconcile both perspectives. For that to happen, innovation and risk mitigation should take place in tandem, a role that public–private partnerships can play in establishing a successful entrepreneurial space ecosystem.

“Creating Startups with NASA Technology” was conceived to reduce risks for entrepreneurs, NASA, investors, corporations, and all stakeholders involved. It also aims to bridge the gap between the space and nonspace sectors. Initial results have validated the approach, with startups being the primary beneficiaries.

Success will be assessed based on the launch of new startups, technologies licensed, and software release obtained from NASA, participation in incubators and accelerators, investment received, new products and solutions generated, and jobs created, among other outcomes, caused directly or

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**Table 1. Preliminary Findings of the Impact of the Program for Participating Startups**

<table>
<thead>
<tr>
<th>Startup</th>
<th>Product</th>
<th>Patent License or Software Release Status</th>
<th>Support Received Under Space Act Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>CapCell</td>
<td>Implants to treat rare disease</td>
<td>License expected by Fall 2019</td>
<td>NYSA guidance, connections, and mentorship; NASA fast-track process; NASA engagement before license</td>
</tr>
<tr>
<td>ClinicAI</td>
<td>First product is an at-home toilet monitor for detecting colorectal cancer, based on artificial intelligence and biotechnology for early detection of diseases</td>
<td>License expected by Spring 2020</td>
<td>NYSA guidance; NASA fast-track process; NASA engagement before license</td>
</tr>
<tr>
<td>Storm Group</td>
<td>The NeuroScan Software combines a series of deep artificial intelligence and computer vision solution with NASA technology. Also, it has embedded solution for media content markets to watermark and trace illegal content distribution.</td>
<td>Software release expected by Fall 2019</td>
<td>NYSA introduces opportunity; NYSA provided guidance in the software release process; NYSA and NASA are working to promote solution.</td>
</tr>
</tbody>
</table>

NASA, National Aeronautics and Space Administration; NYSA, New York Space Alliance.
indirectly by the program. Allowing participation of under-represented segments of the society is also a key metric.

Next steps include developing a framework for long-term financial sustainability of the program and creating new opportunities to support space entrepreneurship and commercial space.

Finally, we expect to expand the scale and scope of the space activities described in this article. The program was designed so that startups from New York and elsewhere could benefit from the opportunities created. Collaborating with other entities that help startups license NASA technology is a possible avenue. The use of the NYSA Global Innovation Exchange platform might help leverage support from the broader space community. Partnerships with organizations such as Space and Satellite Professionals International (SSPI) might engage its local chapters. Ultimately, we expect to harness the power of New York to support initiatives worldwide, eventually providing a boost to the global New Space economy.

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REFERENCES
15. Annex II between the National Aeronautics and Space Administration Lyndon B. Johnson Space Center and New York Space Alliance under Space Act Umbrella Agreement. NASA, 2019.

APPENDICES

APPENDIX A1: NYSA STARTUP ACADEMY
List of speakers by order of participation, topic, and organization: Joseph Fargnoli and Sidney Nakahodo | Introduction | NYSA: Mike Turillo and Stephen Lallo | NYSA Innovation Network | Swarm; Steve Wolfe | SpaceCom | SpaceCom; Kimberly Minafra | Software release license | NASA/ARC; Steven Gonzalez | Tech Transfer | NASA/JSC; Anna Bui Cordrey | SBIR | NASA/ARC; Kevin Siskar | Startup Bootcamp | Founder Institute; Heath Mills | Funding | Rho- dium Scientific; Hoyt Davidson | Investment | Near Earth LLC; Steven Kaufman | Legal | Hogan Lovells; Sean Casey | NewSpace | Silicon Valley Space Center; Scott Pollack | Business Development | Firneo; Kira Blackwell | NASA iTech | NASA/HQ; Carlos Westwelle | NASA Challenges + Commercial
Opportunities | NASA/JSC; Steve Rader | NASA CoECI + Solve | NASA/JSC.

APPENDIX A2: STAKEHOLDERS AND THEIR ROLE IN THE PROGRAM

The stakeholders, a description, and their respective roles are listed as follows (in alphabetical order): Corporations | Private organizations that partner with startup to test ideas and develop solutions for NASA | Business validation, mentorship, solution provider (SAA Phase 2); Founder Institute | World’s largest pre-seed accelerator | Star fellowship program for space startups, business plan, connection with investors; Hogan Lovells | Law firm | Legal assistance, regulatory expertise; Investors | Angel investors, VCs, Investment Banks, Family Offices etc. | Funding, feedback; NASA | Responsible for unique scientific and technological achievements in human spaceflight, aeronautics, space science, and space applications that have had widespread impacts on our nation and the world | Technology, New York City Economic Development Corporation (NYEDC) | NYC’s official economic development corporation whose mission is to promote economic growth in the city | Connector, outreach, funding; NYSA | A public benefit corporation that fosters space startups through mentorship, community building, advisory services, and investment | Coordination, execution, and industry connection; industry; Space and Satellite Professionals International (SSPI) | Professional organization that aims to promote space and satellite as the invisible but indispensable infrastructure of the modern world | Connector, industry, scaling; SpaceCom | Space commerce conference | Industry, visibility; Swarm Intelligence | SaaS provider | Technology; Startups | Early-stage venture that are using NASA technology or providing solutions to NASA | New businesses, peer learning.

APPENDIX A3: EXPECTED RESPONSIBILITIES UNDER THE SPACE ACT AGREEMENT

Under the signed Space Act Agreement, during Phase 1 NASA is expected to (1) select technologies in the NASA Intellectual Property portfolio that have potential commercial application; (2) evaluate any startup’s licensing request for NASA technology and enter into such agreements as necessary and appropriate—NASA will have the final determination on all technology transfer decisions; (3) provide SMEs to mentor startups on the application of selected technologies and to participate in a pitch event and showcase; and (4) as appropriate, support outreach initiatives aimed at promoting the commercialization of NASA technologies through startups. In parallel, NYSA will (1) provide input to NASA on the desired NASA technologies that have potential commercial application for prospective startups; (2) engage prospective startups among space organizations, as well as academic, nonprofit, public, and private institutions to participate in commercial application of selected NASA technologies; (3) connect appropriately qualified and competent startups within NYSA’s network of technology contacts for transfer of NASA technologies; (4) serve as lead for coordination, execution, and marketing of the program to include the pitch event and the showcase to coincide with the lunar landing 50th anniversary; and (5) notify NASA in the event of any new partners joining the NYSA alliance.

During Phase 2, NASA is expected to (1) select the challenges informed by the agency’s priorities. These challenges include the technology priorities identified by the Chief Technology Office and the technologies to support the Gateway and Lunar Surface Exploration missions; (2) provide access to SMEs, scientists, and engineers who will become mentors and advisors to entrepreneurs and startups joining the program; (3) provide access to NASA-developed software tools and programs as needed as outlined in software.nasa.gov or through other means; (4) support incubation of startups by coordinating or facilitating referral for access to facilities, resources, and facilitate connections with local partners; and (5) support outreach initiatives aimed at promoting space entrepreneurship with virtual support. NYSA will (1) in addition to the challenges identified by NASA in Article 2.1, be informed by the vision to return astronauts to the surface of the moon and identify potential solutions that could support extended surface operations. These potential solutions may include design solutions for integrated ISRU structures; (2) identify funding sources to ensure financial sustainability of the program; (3) select industry mentors and startups, as well selected organizations that may accelerate the technologies that could address the NASA priorities; (4) serve as coordination and executing entity for the program; (5) ensure companies deliver on technologies, capabilities, and reports to address the challenges identified by NASA and; (6) NYSA will work with selected organizations to enable access by NASA SME’s for review and technical guidance of the following technical insights related to extended lunar surface operations (ISRU structures).