# Commercial Space Industry

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Oregon Consulting Group

*Exceptional Value for Clients, Transformative Experiences for Students*

# Industry Overview

## What is Commercial Space?

Economic activities related to the manufacture and delivery of components that go into Earth's orbit, and delivery of services derived from those components

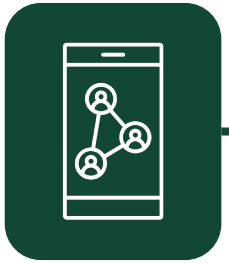
## Key Statistics

**Estimated Market Value**
$1-5 trillion+ (by 2040)

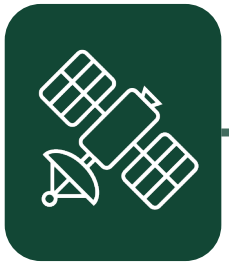
**2020 Estimated Market Value**
$423B

**VC Equity Investment since 2010**
$231.2B

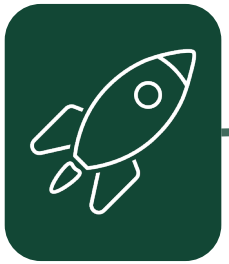
## Primary Segments



**Applications**
Uber, Lyft, Snapchat

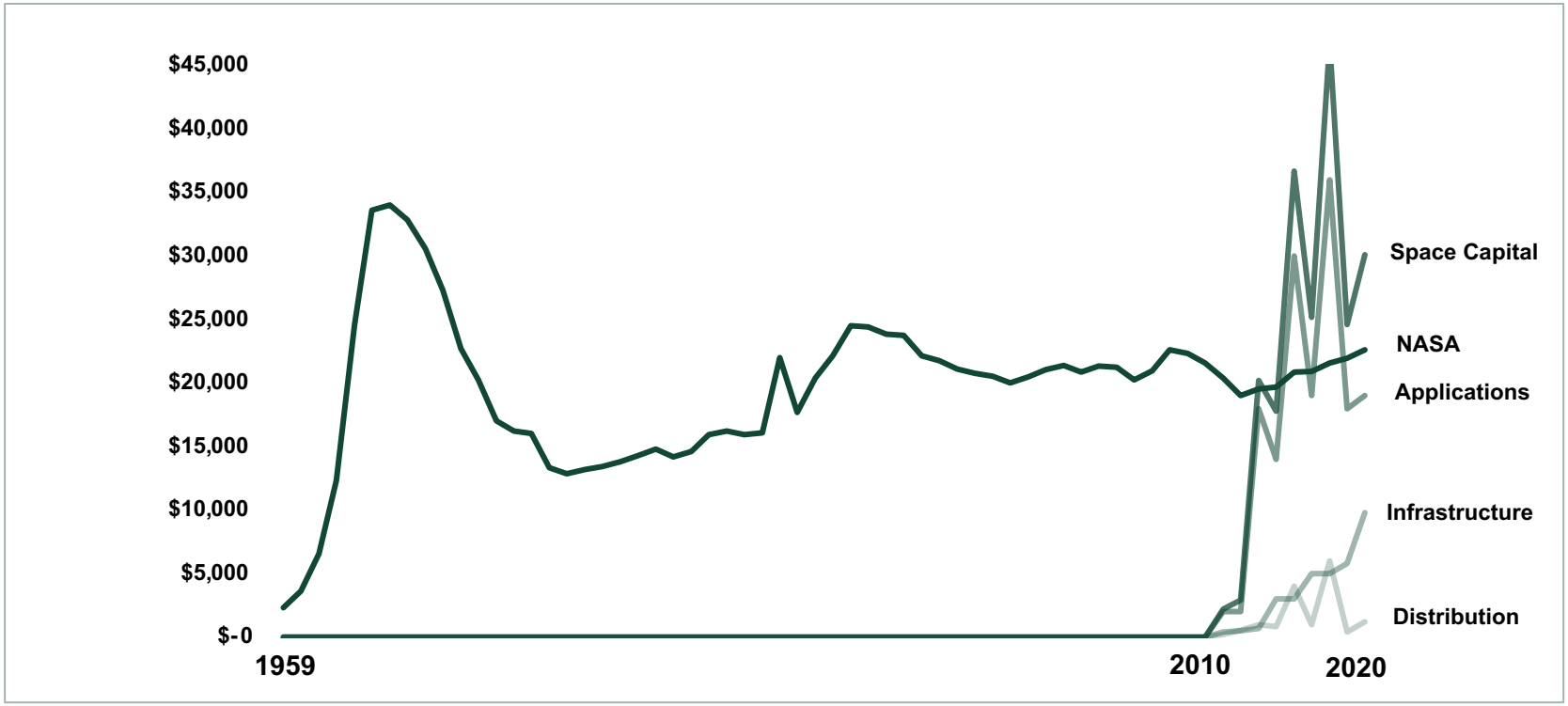


**Distribution**
Starlink, OneWeb, KORE Wireless



**Infrastructure**
SpaceX, Blue Origin, Virgin Galactic

# Commercial Space Industry Investment Growth (millions, USD)




## What drives market growth?

Pivoting research, innovation and commercialization from government to private enterprise

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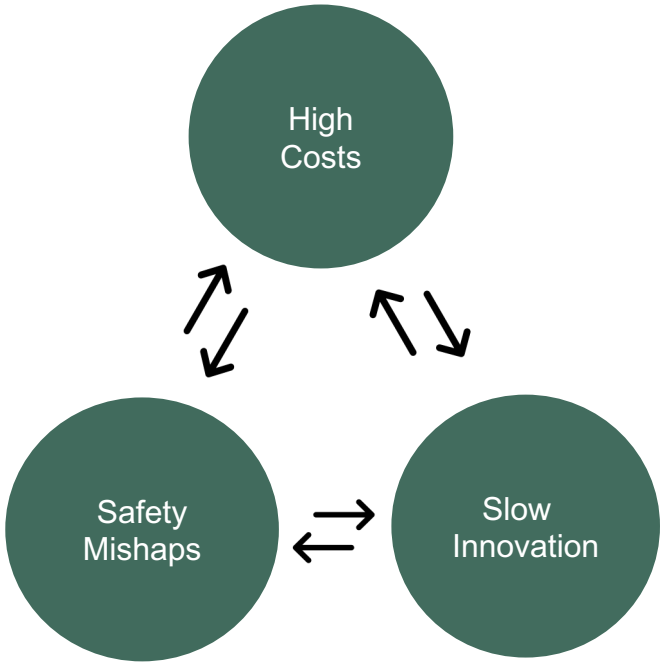
## Analysis Focus

Opportunities in Applications, Infrastructure & Distribution

# Commercial Space Industry Impediment Flow & Resolution

## Challenges



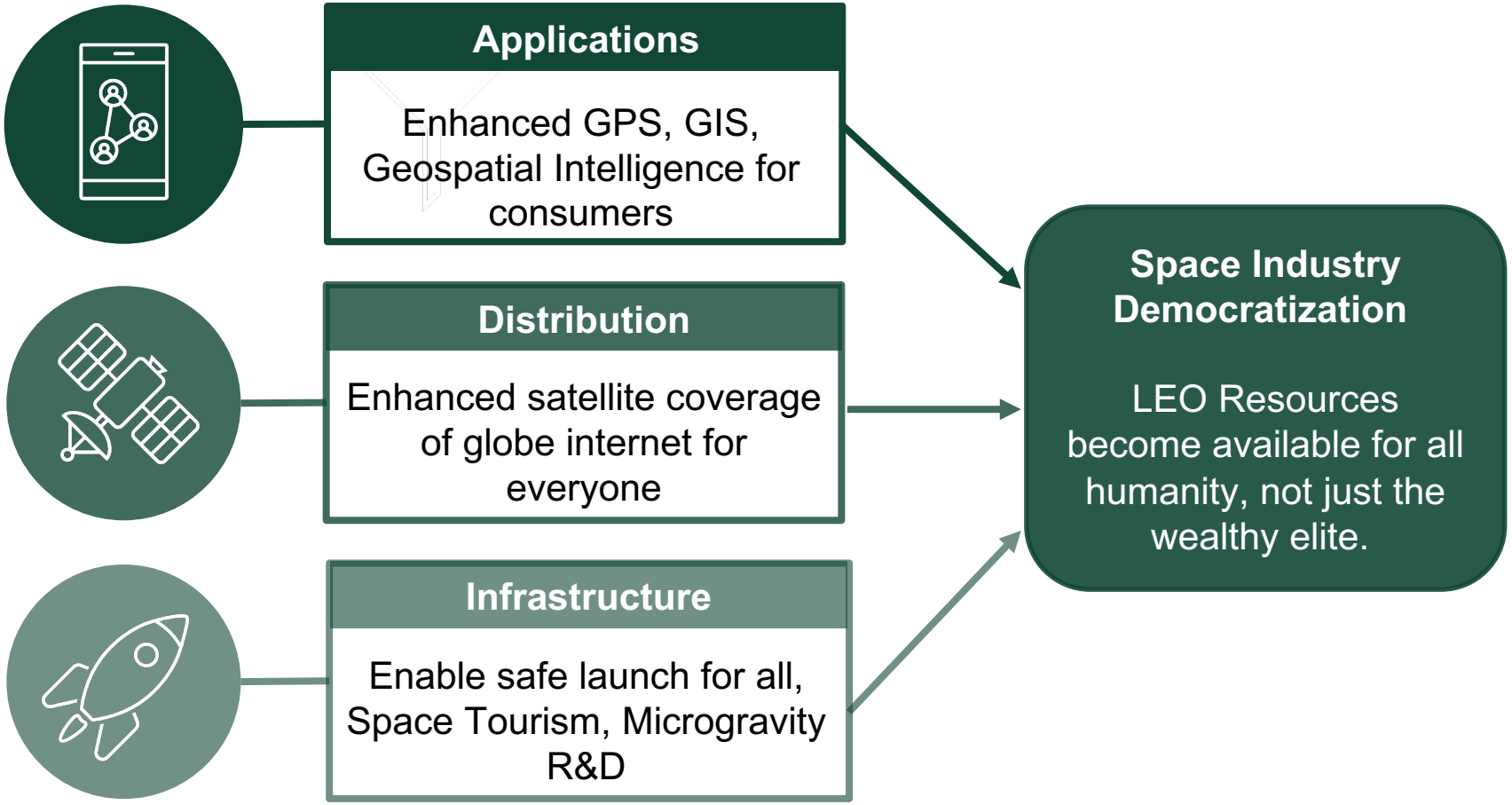

## Impediment

- Public Optics Sour
- Government Red Tape
- Finite Budgets & Small ROIs

## Resolution

- Private Innovation
- Rapid Technology Improvement
- Reduced costs, improved safety, better optics
- Circumvent red tape & create BIG exits & ROIs

# Future Benefits to the Public from Commercialized Space



## Understanding and Navigating the Emerging Commercial Space Industry

### Background

Expansion beyond the Earth's atmosphere has always captured the attention and imagination of humans. Since the late 1950's, the world economies recognized the immense potential of space as an economic resource. Recognition of the national security and economic importance of space resulted in the initial space race and culminated in the Apollo landings between 1969 and 1972 (Ross, Remarks, 2020). In modern times, many G20 countries have pivoted their attention to the economic potential of space. Recent successes of China's lunar landing and Japan's return of mineral samples from asteroid Ryugu point towards a new space race to leverage the economic assets of the solar system (Ross, Op-Ed, 2020).

Historically, the commercial space industry has been dominated by government funding (George, 2019). However, starting in the late 20$^{th}$ century, government policy changed, initiated by the Commercial Space Launch Act of 1984, which pivoted the industry towards commercialization in hopes of speeding up innovation and driving down cost. Private companies were invited into manufacturing and launching activities (George, 2019). This policy pivot caused commercial companies to enter the space industry and disrupt the market structure (George, 2019).

Current industry analysis indicates the market is worth approximately $423B globally, and projections suggest that the economy will be between $1 and $5 trillion by 2040 with the potential to reach over $1 trillion before 2030 (Ross, Remarks, 2020). The space economy is generally defined as "economic activities related to the manufacture

and delivery of components that go into Earth's orbit or beyond" (Tina Highfill, 2019). The industry is generally classified as: Infrastructure (hardware and software to build, launch, and operate space-based assets), Distribution (hardware and software to connect, process, and manage data), and Applications (specialized software applications that utilizes data), (Space Capital, 2021).

Private, venture-backed companies have steadily entered the market and delivered incredible industry milestones. In 2020, over 80% of the rapidly accelerating, $423B space economy was commercial, and the industry exceeded expectations by launching over 1,000 spacecraft into orbit (Ross, Op-Ed, 2020). The 2020 industry estimate is approximately 55% higher than a decade previous and represents a five-year trend of uninterrupted growth (Space Foundation, 2021).

As of 2021, applications of satellite technology have demonstrated to be the most lucrative sector of the economy. Successful company examples include Uber, Lyft, and Snap. All three companies built their applications based on global positioning/geographic information systems (GPS & GIS). Satellite applications have generated trillions of dollars in economic value and many of the largest venture exits in history (Space Capital & Silicon Valley Bank, 2020). According to 2020 Space Capital data, a cumulative total of 137 companies generated exits for investors resulting in a combined exit value of $170 billion with an average exit multiple of 690x. (Space Capital & Silicon Valley Bank, 2020). Exhibits A and B show the historical funding trends of NASA and Space Capital and point towards the accelerated investor interest in space companies. Where investor money flows, lucrative markets tend to emerge.

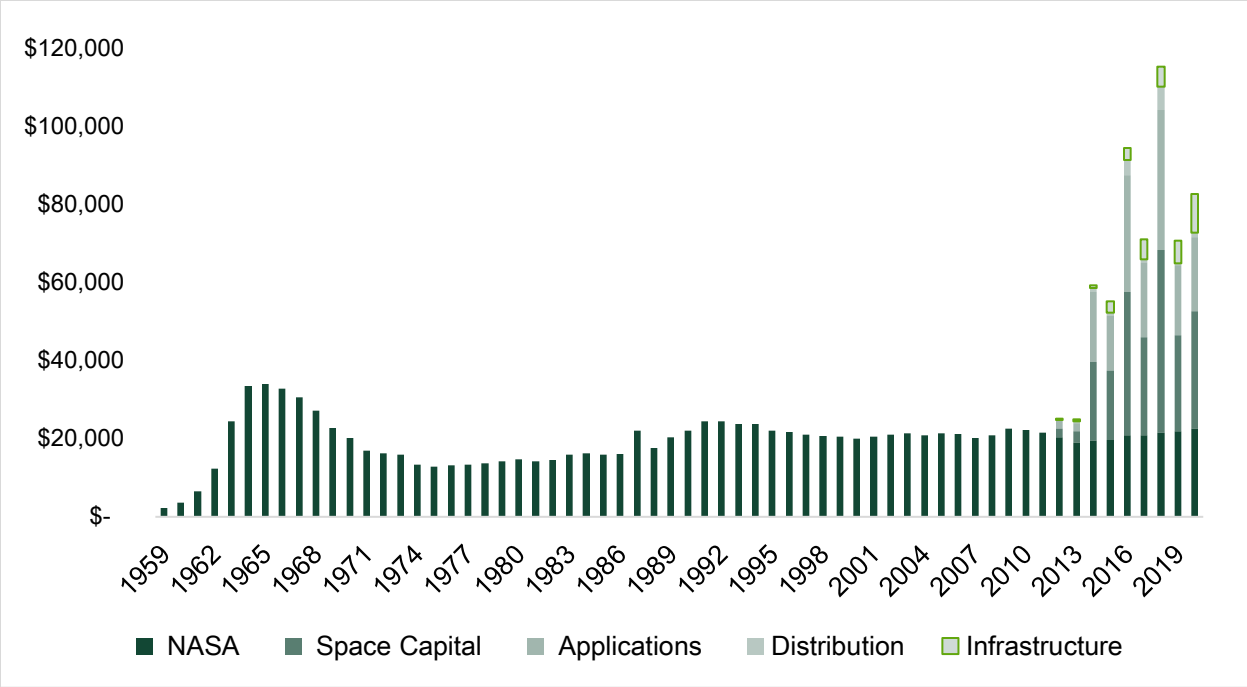



Exhibit A: Historical Spending between NASA & Space Capital Sectors (in millions, 2020 USD)

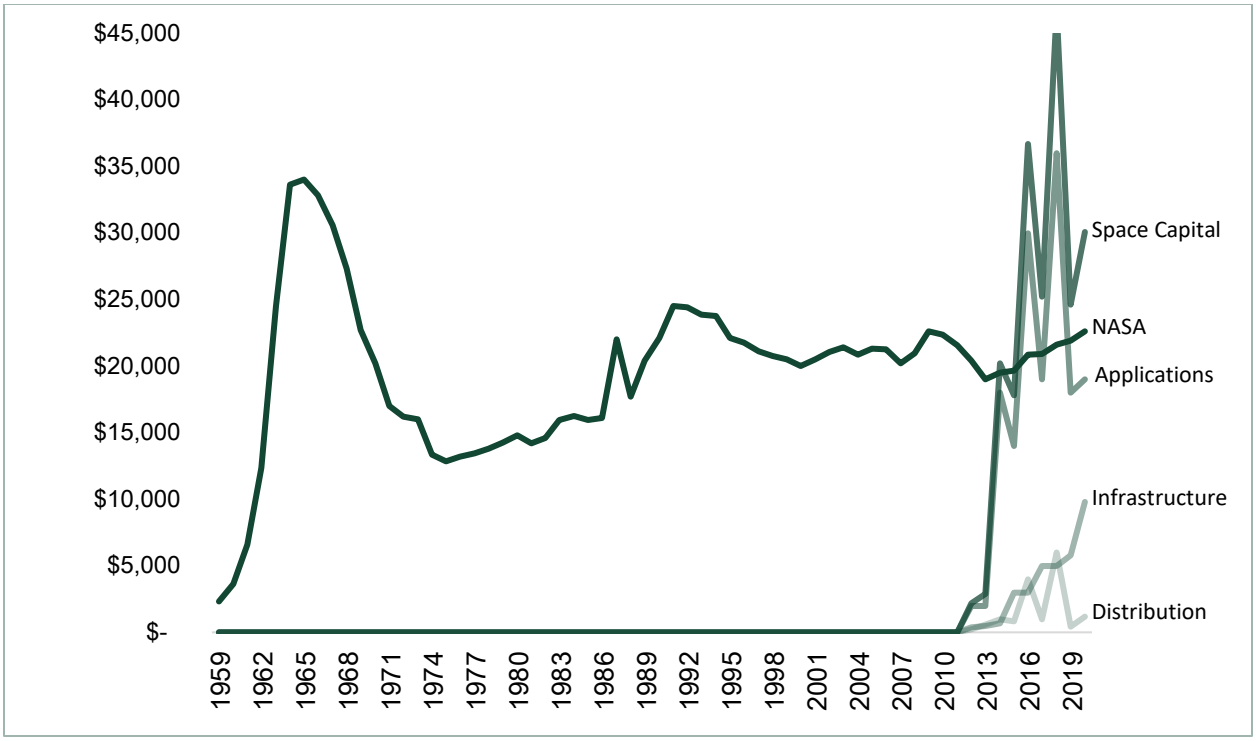



Exhibit B: Historical Spending between NASA & Space Capital Sectors (in millions, 2020 USD)

B

Starting in 2012, just after the end of the Space Shuttle Program, one can see a clear trend of investment capital into various space companies that deliver and manufacture infrastructure, distribution, and applications, with the bulk of investor excitement targeting satellite applications ventures. The Space Shuttle program ended due to three primary reasons: excessive costs per launch ($450M+ per shuttle), slow turnaround time between launches (approximately 54-88 days), and track record of safety fatalities (Challenger and Columbia crews) (Alder, 2020). From 2003 to 2012, the U.S. had been utilizing Russian spacecraft to take U.S. astronauts to space. On May 25, 2012, SpaceX's Dragon successfully connected with the International Space

Station, a hallmark moment removing the U.S. reliance on Russia, and hailed by NASA Administrator Charles Bolden as an important step towards a new future of private innovation in the space industry (CNN, 2012). It is likely that entrepreneurs, led by Musk, saw Dragon's success as an opportunity to break into a highly lucrative new space market. Exhibits A and B indicate the commercial market continues to be ripe for growth, and strongly suggest the trillion-dollar market valuation is attainable. U.S. private companies are poised to capitalize on the emerging space industry, but the U.S., as a society, needs to maintain its focus and resolve, to not miss the opportunity to lead the new space race.

**Current and Predicted Issues for the New Space Race**

The space economy faces three interlinked challenges: expensive technology constrained by finite budgets that are modulated by complex social-political support.

1. Expensive Technology: Presently, the largest challenges for the leading commercial space companies of SpaceX, Blue Origin, and Virgin Galactic revolve around how to manufacture spacecraft that are reusable, safe, and sustainable. (Blue Origin, 2021), (SpaceX, 2021), (Virgin Galactic, 2021). One of the primary reasons the U.S. government deliberately pivoted their federal space policy in 1984 was because government-funded R&D had become finically unsustainable due to high technology costs (George, 2019). Private industry took this challenge and continue to work towards cost-effective manufacturing. The recent technological advances in reusable rockets by

SpaceX, Blue Origin and Virgin Galactic suggest that constraints of expensive technology will diminish in the future due to economies of scale and accelerated advancement of technology.

2. Finite Budgets: NASA began in earnest in 1959 at $2.3B (2020 adjusted dollar value), peaked in 1965 at $34B, but steadily declined since 1965 to $22.6B in 2020 (Statista, 2021). The decline can partially be attributed to critics and policy makers questioned the return on investment of NASA's R&D efforts and wondering if public money could be better spent elsewhere (Wall, 2011). Current commercial space companies also suffer from similar investor resistance because the initial cash flow need for R&D is extremely high and short-term ROI is often non-existent. However, as technology progresses and as visionaries like Musk, Bezos and Branson continue to excite the public, one can expect investors to look beyond short-term ROI goals and focus their attention on the trillion-dollar market potential. The short-term benefit to the public lies in the application of space-based satellite technologies that utilize location-based services, on-demand deliver, and ride-hailing integration. Additionally, the rapid advancement of GIS-based augmented reality technology (i.e. Meta's Metaverse) will further enhance consumer products and experience. From a long-term perspective, commercial space tourism, low-earth orbit and microgravity research and manufacturing will render exciting new opportunity for the industry and consumer products and experiences. The rapid increase in venture capital since 2012 suggests that entrepreneurs are excited to capitalize on these opportunities.

3. Social-Political Support: Financial support to develop space technology has always been interconnected with political buy-in both in public and private ventures. As indicated by NASA's oscillating budget history, the American public became weary of spending billions of dollars on a space program that seemed out-of-touch with the social needs of many citizens (The New Republic, 1968). Many critics today still echo the same sentiment, and some thought leaders feel the commercial space companies are being driven by "wealthy, mostly white men" that seem to "play by their own rules while much of society gets left behind" (Felsenthal, 2021). However, because of the shift towards predominately private ventures, over 80% of the space economy was commercial in 2020 (Ross, Op-Ed, 2020), the importance on managing public concerns about spending has become less of an issue to maintain investor cash flow. If entrepreneurs are not sensitive to trending social-political sentiment, public support will diminish, and private-public ventures will ultimately not thrive, and the U.S. space economy will be limited. Private-public ventures are well suited to addressing the public concerns because the government does not need to continuously justify public-money spending: money spent is from private firms and accountable to private investors, a task that entrepreneurs are wells suited to handle; government can focus on the general benefits of space research and exploration without getting caught in the financial thickets of public debate. This combination appears to be a win-win for the space industry.

**How to Address Current Issues and Lead the New Space Race**

The United States is already strongly positioned to lead the new space race in the technology, budgetary, and socio-economic realms. Entrepreneurs and public program managers should continue to reduce the cost of expensive technology by focusing on sustainability and attending to political sentiments that influence public-private ventures. Additionally, individual states must provide meaningful space policy leadership, supportive business eco-systems, and world class infrastructure that will attract next-generation talent (Space Florida, 2021).

The interconnected issues of expensive technology, finite budgets and social-political will specifically revolve around the problems of space safety and cost sustainability, and they should be the primary area of focus for the next decade. The high cost of non-reusable rockets and launch components should be addressed by continuing to invite innovation from private companies and supporting them with public-private venture funding as demonstrated by the NASA-SpaceX launches, and NASA-Blue Origin Orbital Reef project. By demonstrating safe launches with budget-friendly reusable rocket technology, the public and investors will likely continue to support the space economy.

Additionally, states should expand their space economic visions to build facilities that encourage and support economic development, STEM education opportunities for under-represented populations, and provide exceptional program transparency to the public. Successful examples where states are leading with the aforementioned focus areas include Florida's space coast, guided by the federal-private collaboration of Space Florida (Space Florida, 2021), and New Mexico with the construction of

Spaceport America, a $220 million publicly-funded project (Bieri, 2021). These two model states provide the blueprint for other curious states to invest in their own space economies.

NASA, Florida, and New Mexico clearly lead the U.S. space economy from a facility and finance perspective, and they also lead the way in addressing the socio-political support issue. Critics of the space economy say that space is currently the domain of wealthy, white men who often leave society behind (Carlisle, 2021). From a certain perspective, this is a fair critique of Musk and Bezos. They are often not focused on expressing why their visions are beneficial to humanity at large. On the other hand, Branson has made clear his mission with Virgin Galactic is to launch OneWeb, a 2000 satellite array with the goal of providing internet connection to the entire globe (Virgin Galactic, 2021). To solve this perception problem with Musk and Bezos, the public arms of the venture (NASA, Space Florida, and Spaceport America) take on the public relations roll and provide regular media updates on various projects. In these updates, program managers share the ‘what’, ‘how’ and—most importantly—the ‘why’ of their projects, which helps to maintain public support. This media focus on transparency and excitement helps to keep the public engaged and reduces the feeling that part of humanity is being left behind.

The commercial space industry ultimately promises to be a multi-trillion-dollar economy that will be realized in the next 10-20 years. Private investor excitement coupled with public support offers an opportunity to unlock this highly lucrative market. Currently, the most lucrative aspect of the space industry for private companies lies in the application of satellite technology. For example, from 1978 to 1999, companies

focused on the development and distribution of GPS-related consumer products and services. During that time, due to the ubiquitous distribution of GPS and exponential growth in applications, 764 companies raised $77B in equity financing and created a combined value of $405B (Space Capital & Silicon Valley Bank, 2020). GPS-based signal applications such as Uber, Yelp, Google Maps, and Niantic have created many of the largest venture outcomes in history. Among the top 25 exits generated, the average exit multiple for early investors was 690x, and three signal companies were in the top 10 venture exits (Uber, Lyft, and Snap) (Space Capital & Silicon Valley Bank, 2020). Using GPS as an analogy, VC firms estimate that over $1T of equity value could emerge from space-based communications and geospatial intelligence segments in the next decade (Space Capital & Silicon Valley Bank, 2020). By focusing on sustainability to reduce expensive technology costs, improve safety of launch and space-debris waste management, carefully manage budgets, and attend to socio-political sentiments via transparency and public-relations tools, the U.S. public and private ventures can lead the world in the emerging commercial space industry.

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