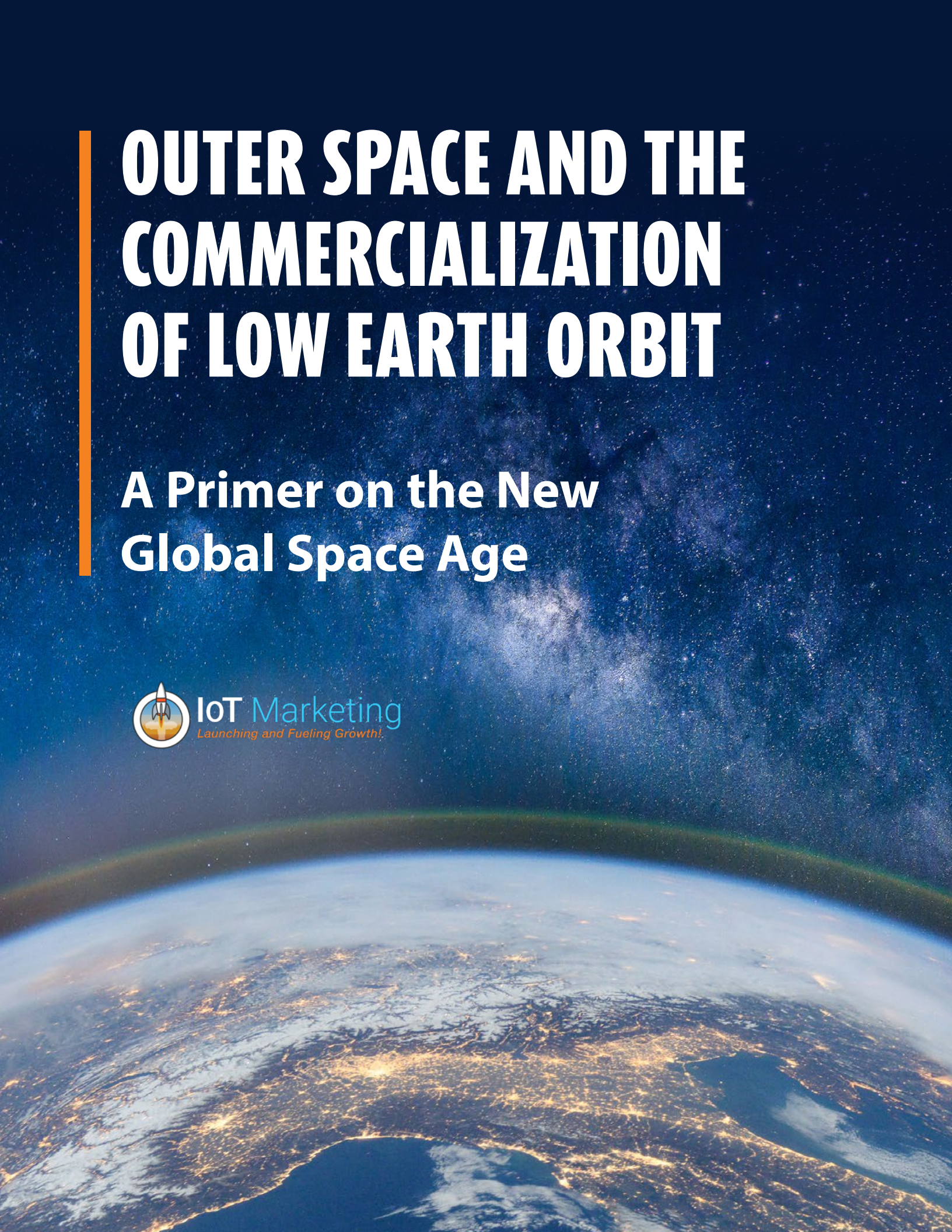
OUTER SPACE AND THE COMMERCIALIZATION OF LOW EARTH ORBIT

A Primer on the New Global Space Age



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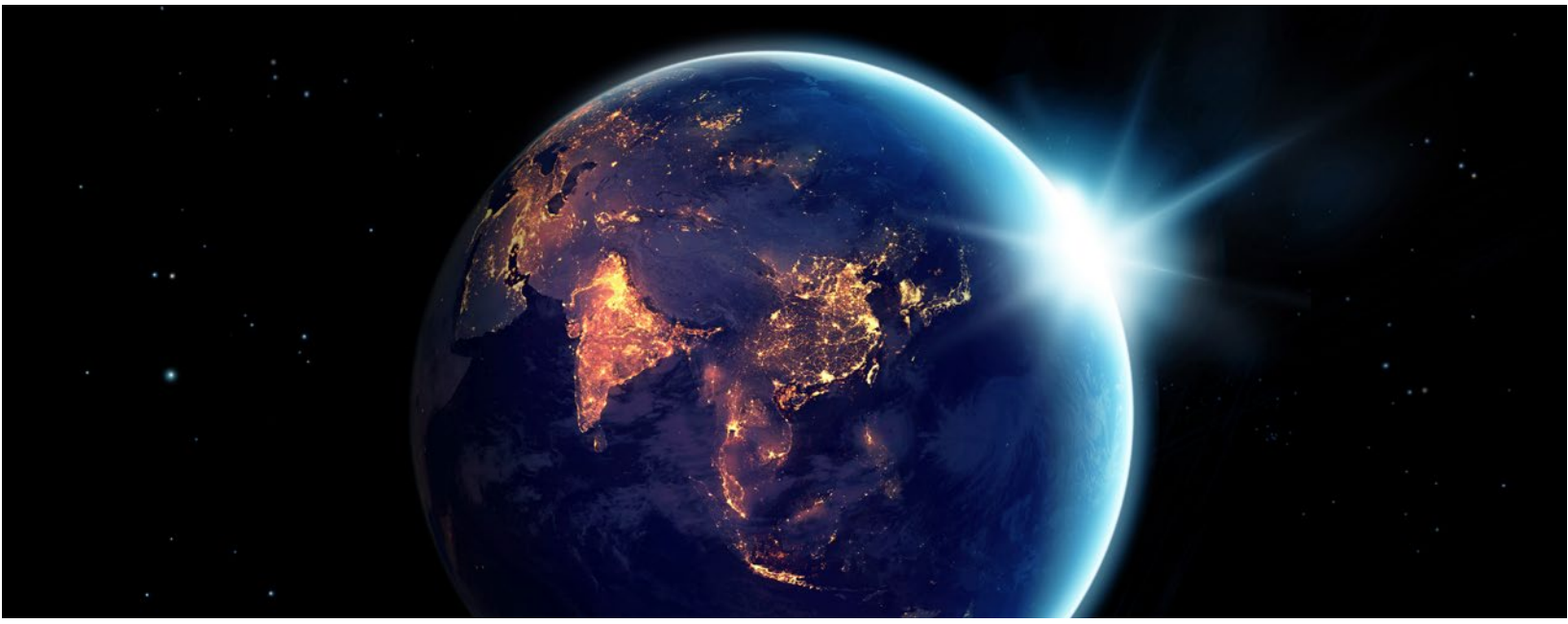

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Company Overview

About IoT Marketing

IoT Marketing is a full service marketing, PR, and production firm specializing in launching and fueling business growth for technology companies.

As an integrated marketing firm, IoT Marketing provides end-to-end services from planning and executing go-to-market strategies and product launches to delivering targeted lead generation. With deep industry knowledge in IoT and other advanced technologies, IoT Marketing provides the latest intelligence on emerging markets and their high-tech applications.

Based in Austin, Texas, IoT Marketing specializes in launching and fueling the growth of IoT and high-tech companies by planning and executing their go-to-market strategies and product launches. With decades of combined experience in IoT, high-tech, advertising, and public relations, IoT Marketing delivers vital insights into markets and technology applications as a foundation for positioning and branding a company's IoT initiatives. Clients benefit from working with one outsourced firm offering end-to-end marketing services, from websites to webinars. For more information, please visit IoTMktg.com.

About Industry Insights Webinars

IoT Marketing hosts a monthly series, Industry Insights Webinars, that draws in thousands of returning and new attendees for their monthly live event. The series provides value to the audience by simplifying complex topics, with a panel of experts, thought leaders and solution providers that share strategies for digital transformation across multiple industries.

Executive Summary

While it may seem new, the current acceleration of progress in the space industry is due to decades of work. Over the past 60 years, government space programs have led the way, quantifying the risks, identifying costs, and developing profitability structures for private industry to emulate.

Thanks to the latest advent of reusable rockets, the cost of launching material into space has decreased significantly. As a result, access to orbital space is now cost-efficient, which has reduced the barrier to entry for startups and entrepreneurs. Now, it is much easier for companies to join the business of providing satellite-based services.

The most lucrative opportunities currently revolve around providing satellite imagery for Earth observation. In a world where data is the new oil, consistent, actionable, real-time information is in high demand. For example, geosynchronous satellites that remain in one orbit provide daily images of the same area. When compounded over time, the analysis of these images allows companies to detect changes. This information is especially beneficial for monitoring the effects of climate change.

Previously, the Government was the single largest customer for satellite companies, as they needed information for defense intelligence. Now, business is spreading to companies providing services around communication, transportation, and online mapping for industry sectors such as energy, mining, and forestry.

Besides the prospect of asteroid mining, commercial interest in areas beyond the moon or deep space is relatively low. Explorative missions are not attractive to the average investor seeking gains within their current lifetime. Governments generally take the lead on long-term explorative missions because pushing the boundaries of space is expensive and risky. For this reason, it is easier to create a sustainable business case in areas where there is already significant progress. Long-term investments, such as endeavors to go to Mars, will remain the purview of NASA, the ESA, and of course, the occasional billionaire side project.

Beyond dreams of planetary exploration, there is still plenty of work to be done to foster the commercialization of near-earth orbit. The following paper provides a broad overview of the space economy's current direction. The aim is that engineers, entrepreneurs, and investors may begin to understand and find their place in what many analysts have predicted as the next trillion-dollar industry.

Democratizing Space for Commercial Use

Interest is quickly growing around the new space economy and its ability to support global pursuits towards sustainability. Based on the substantial private investment and growing curiosity about space exploration, space tourism may be a viable industry of the future. Previously, humans could only access space through government agencies, but now commercial entities are emerging to carve out their corner of the final frontier.

At first glance, it may not be obvious what kinds of businesses can thrive in space. One idea is a global cloud provider, which could appeal to industries considering the commercial possibilities of space. Additionally, new companies associated with the space industry can be funded as Special Purpose Acquisition Companies (SPACs).

Adam Jonas, who leads the Morgan Stanley Research Space Team has stated, **"space is existential, from the future of the planet to the future of commerce."**

Understanding the New Space Age

The space economy is on the media's radar while it's steadily gaining traction in the investment community. In the early days of the Space Age, the Organization for Economic Co-operation and Development (OECD), which began in 1961, was a network of nations working toward advancing economic progress and world trade. It helped establish international standards, including those for space. OECD defines the space economy as the spectrum of resources that create value and benefits for humans while exploring, researching, and utilizing space.

Following the Moon Landing of 1969, NASA has ventured into many space missions to collect data on planets, moons, asteroids, and other intergalactic bodies. In the early 2000s, the space industry began to deploy reusable launch vehicles as commercial ideas for space began to materialize. The new arena for entrepreneurs has been shaped the same way the commercial internet began, allowing for a low barrier to entry. New market entrants will need to learn as much as possible about new space technologies and trends to stay competitive.

Here are some key trends in the growing space economy:

- *Growing investment in space from all over the world*
- *New venture capital is moving into space investing*
- *Rising aerospace industry revenue*
- *Thousands of smartsats currently orbit Earth*
- *New space fields are emerging, such as micro-launchers*

Expanding Markets in the Global Space Industry

It wasn't long ago when most people thought of space travel as reserved for NASA astronauts or just a wild fantasy. Now investment firm Morgan Stanley has a Space Team that predicts the global space industry could triple in value to surpass $1 trillion by 2040. Governments continue to be the leading investors in space as opportunities open up to a broader base of private investors. The UK's Space Industry Act of 2018 reshaped its regulations to allow commercial space activities, particularly for small satellites.

According to an OECD report, after launching the first satellite in 1957, ten countries had visited space by 1970, and that number doubled by 1985. In 2000, forty nations had visited outer space, and that number has since increased to encompass well over 80 countries. ***Public investments in space reached $52 billion in 2008, then $75 billion by 2017. Currently, satellite broadband internet providers have the opportunity to dominate the space industry in its early evolution.***

Emerging Players in the Space Sector

Space for Sustainable Development - The international community is adopting Sustainability Development Goals (SDGs) for commercializing space.

Space Agtech - Australian National University (ANU) has found from a study that satellite internet could add $15.6 billion to the nation's gross production value.

Space Launch Services - In 2019, the market size for global space launch services reached $9.88 billion and is expected to hit $32.41 billion by 2027.

Smart Manufacturing - Technology will be manufactured in space on NASA missions as 3D printers figure to play a major role.

Satellite Manufacturing and Services - The market size for global satellite communications is expected to grow nearly 10 percent by 2028 from $66 billion in 2020.

Space Vehicle Manufacturing, Servicing, and Parts - There are currently 126 companies in the United States that manufacture space vehicles, employing over 73,000 individuals.

Space Debris Monitoring and Removal Technology - This industry driven by space tourism aims to use laser technology to remove space debris.

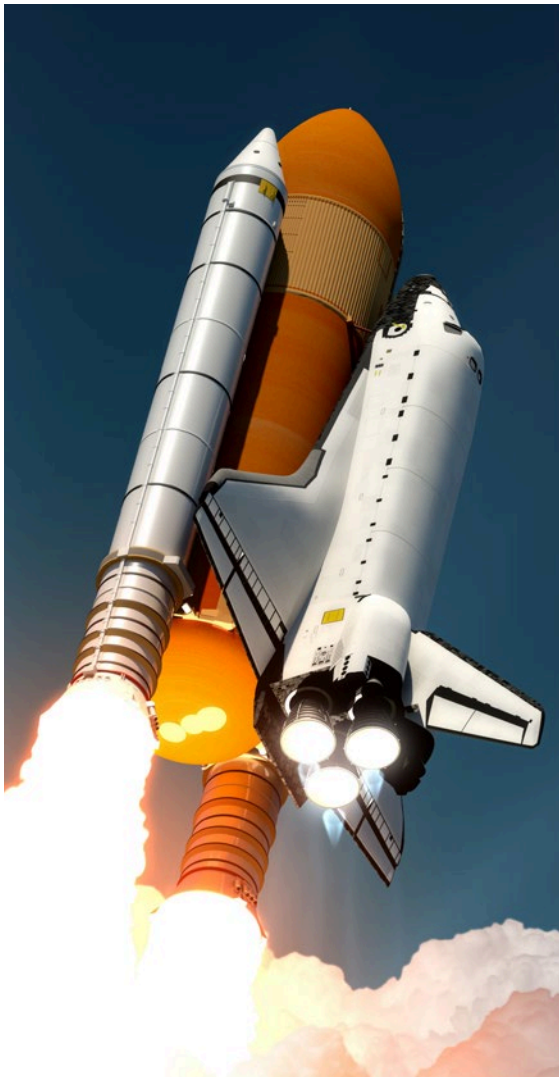
Flexible Payloads - The concepts of flexible power distribution and payloads are being pioneered by Airbus Defence and Space.

Information and Communications Technology/Satellite Internet - Three major components of the current space economy are ground equipment, consumer TV, and government spending.

Rendezvous & Proximity Operations and In-Orbit Servicing - To avoid interference issues, commercial space ventures are turning to alternatives such as Optical Satellite Communications (OSC).

Human Spaceflight and Space Tourism- Early pioneers for the space tourism industry are SpaceX, Virgin Galactic, and Blue Origin.

Deep Space Exploration - Following the Genesis I and II orbits, BEAM is set up to function as the first commercial space station.



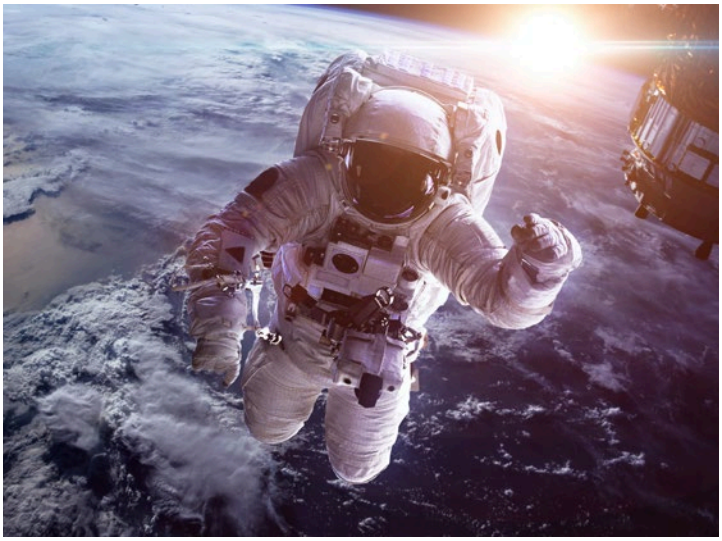
Challenges for Early Adopters and Stakeholders

New standards for space will be set in the coming years as its relationship with Earth becomes more diversified. Stakeholders in space exploration from various nations must come together to make international agreements. The Space Age of the last century was merely an introduction to this century's more comprehensive outlook for space exploration. The aerospace and computer tech industries have already worked closely together and must continue this collaboration for the space industry to thrive.

Here are some of the many issues that must be considered before nations begin to commercialize space:

Peaceful Uses of Space and Space Exploration

So far, space has been a peaceful place instead of a war zone, making it the perfect place to experiment with imagination and entrepreneurial technology without encroaching on another nation's domain.



Regulations Should Foster US Commercial Space as a National Asset

The expansion of commercial space entities will be driven by new opportunities in Low Earth Orbit (LEO).

Addressing COVID-19's Impact on US Commercial Space

In the past five years, $11 billion of private capital has been committed to the New Space industrial base.

Space as Existential Terrain for National Security

Competition has developed in space since the early 2010s for military and commercial organizations, as national security officials face challenges to keep space a peaceful place for business. That's why the U.S. Space Force was formed in 2019 under the direction of the Air Force.

Integrating Government Stakeholders, Policies, and Practices to Grow Space Capabilities

Establishing rational fiscal and acquisition policies will be key to expanding space-based businesses.

Cyber security

Outer space is like cyberspace in the sense that space technology can attract the same type of cybercriminals found on the internet. Omnipresent connectivity creates many new opportunities for hackers.

Space Economics of the Future

The future space economy will encompass sustainability as a central theme, as well as more efficient technology that cuts costs and improves communication from space to Earth. While there is a rush of private companies that want to be involved in the space industry, they must first transform their operations to have a greater focus on environmental, social, and governance (ESG) issues. Investors are starting to require a certain level of ESG ratings, which reflect a company's sustainability efforts.

Sustainability has become a core issue for a growing number of industries, particularly those that involve manufacturing. While today it's important for all companies to integrate sustainability awareness into their business models, future startups will be expected to use ESG as a business foundation. Increasingly, investors are concerned about addressing environmental issues, as well as social and governance issues. Ultimately, space investors will use ESG ratings to evaluate the sustainability of a space enterprise.

One of the new developments to watch for in the future will be launch systems that resemble conventional aircraft. Meanwhile, development companies are currently working on ideas to reduce the cost of access to space. The idea of reusable-friendly engines with lighter designs is already part of the next generation knowledge base.

The four main business environments suitable for the space economy ecosystem are:

1. ***Earth Observation***
   systems monitor and analyze Earth data from satellites.
2. ***Satellite Navigation***
   analysis of speed and time of data transmission through space.
3. ***Satellite Communication***
   transmission of radio signals through space.
4. ***Access to Space***
   requires control of all activities of space exploration.

The Bright Future of the New Global Space Age

New aerospace and telecommunications technology will define space opportunities in the future. Thanks to satellite broadband internet, it will be easier to track shipped packages and other assets all over the globe. Data processing firms are already poised to have a bright future, and space travel may become a regular part of delivery services. The ability to mine asteroids for earth-based and in-space resources will be a lucrative venture and a key development for long-term space habitation.

The global space economy is poised for unbounded growth and innovation over the next two decades. We are in the midst of a space renaissance, and the future of business in space is only just beginning.

Opportunities in the New Space Economy

The global space economy is poised for unbounded growth and innovation over the next two decades. We are in the midst of a space renaissance, and the future of business in space is only just beginning. If you are interested in joining the new space economy, now is the time to get involved. Do you have an existing product, idea, or concept for the space industry?
Contact us, we have the network and know-how to assist in creating your go-to-market strategy.
For more information contact info@iotmktg.com.