

The Case for Space

Opportunities in the Middle East Space sector



pwc



Overview of the space sector
in the Middle East

Space, the final frontier...



Space exploration epitomises the human race's continued pursuit to push all boundaries and to make the impossible possible. Since the first mission into space in 1957, to man stepping foot on the moon in 1969, this sector has witnessed incredible growth and innovation. Huge strides have been made in areas ranging from satellite launchers, space stations, material sciences, scientific experiments, exploration missions, and other advanced-technologies.

Recently, there has been a renewed emphasis in this field from the:

Public sector

The Public Sector is rethinking the model for mission delivery, customer centricity, mining and resources, and exploration.

Private sector

The Private Sector is exploring commercialisation and privatisation to capture the opportunity in alignment with Public Sector objectives.

From HRH Sultan bin Salman's journey into space with NASA's space shuttle Discovery in 1985, the Middle East has been making great strides. And we are seeing a significant rejuvenation of strategic ambitions in the space sector across the region, such as Saudi Arabia's evolving mandate and the UAE's historic Emirates Mars Mission in 2021 and deployment of the Hope probe.

The global space sector is predicted to exceed \$1 trillion USD by 2030¹, reflecting a growth of 186% from 2020's market size. The growth in the Middle East will be driven by concerted investment between the public sector, global original equipment manufacturers (OEMs) and local industry. Specifically, the areas of satellite launch, earth observations, space tourism, satellite communication, space mining, space research & development, space exploration, space debris, and manufacturing will be the key drivers of growth in terms of subsectors - with satellites alone projected to constitute 50% of the growth of the global space sector².

In the Middle East, there is ample opportunity to strengthen the foundations of the emerging space sector and build capabilities and infrastructure to thrive in the future. To do so, there is a need to bridge the gap between the ambitions of government and emerging private sector players on the one hand, and world class capabilities in manufacturing, science and aeronautics on the other - all while involving regional talent and supporting localization agendas.

In this paper we explore the key areas of opportunity to accelerate this transformation.



The journey so far

The Middle East has witnessed substantial developments in the space ecosystem over the last 30 years, and more recently has an increased focus on boosting major growth within the sector.

2000 - 2010



Qatar establishes satellite company Es'hailSat and international ExpoPlanet discovery program to identify exoplanets using the transit method - **2010**⁶

2016 - 2020



King Abdulaziz City for Science and Technology (KACST) establishes the Space and Aeronautics Research Institute - **2017**¹¹



Saudi Space Commission is established, and SaudiSat 5A and 5B (observation satellites) are launched into space - **2018**¹²



Jordan launches first-ever satellite JY1Sat - **2018**¹³



The Egyptian Space Agency is activated and the first Egyptian cube satellite is launched - **2019**¹⁴



The Arab Space Cooperation Group a regional space-focused entity was established - **2019**¹⁵



UAE Space Agency issues Space Strategy and launches the Hope Probe for Mars Exploration - **2020**¹⁶



The UAE Space Agency (UAESA) became amongst the first signatories of NASA's Artemis Accords - **2020**¹⁷

1950 - 1999



Egypt starts rocket manufacturing and launches its space programme - **1961**³



Kuwait built the first ground satellite station in the region - **1969**⁴



HRH Sultan bin Salman becomes the first Saudi, Arab and Muslim who traveled to space with NASA's space shuttle Discovery - **1985**⁵

2011 - 2015



The Regional Center for Space Science and Technology Education for Western Asia was established in Jordan - **2012**⁷



The Qatar Satellite Company successfully launches Es'hail -1, the country's first satellite - **2013**⁸



UAE established the UAE Space Agency and establishes the Mohammed Bin Rashid Space Centre for space exploration - **2014**⁹



Bahrain establishes the National Space Science Agency responsible for space science program - **2014**¹⁰

2021 - 2022



UAE Hope Probe enters orbit of Mars as it hosts the world's largest International Astronautical Congress in Dubai - **2021**¹⁸



Bahrain launches its first-ever satellite, Light-1 into orbit - **2021**¹⁹



Kuwait launched its first satellite, QMR-KWT, in partnership with SpaceX - **2021**²⁰



UAE Space Agency and MBRSC have signed an agreement to build the first Arab and Islamic unmanned probe to Mars - **2022**²¹



The Kingdom of Saudi Arabia is the 21st nation to sign the Artemis Accords - **2022**²²



Bahrain joins 16 other countries who have already signed the Artemis Accords - **2022**²³



Opportunities abound

Driving strategic national impact

The global space sector is expected to reach a \$1 trillion market size in the next decade. This growth offers a range of opportunities for Middle Eastern governments to advance across six strategic areas - all of which are key to the development and transformation of our region.

Economic Diversification



Oil dependent nations in the region such as KSA and the UAE have focused on diversifying their economies through national strategic goals such as Vision 2030. Opportunities in the space economy offer a new sector for regional economies to diversify into.

R&D Superiority



Companies innovate and adopt new ideas to reshape their visions in order to capture new opportunities of emerging sectors. Having a strong footprint in space through R&D will increase market participation and reduce future uncertainties.

Military Interoperability



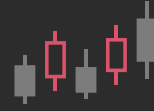
Interoperability within the military has become a necessary ability for armed forces globally. It allows the different branches to operate together and conduct joint operations. Continued development is critical for future military effectiveness, the use of satellites and space technology are key to achieving strategic and operational advantages.

Human Capital Development



Human capital development programs have been introduced into national strategies across the region. These programs aim to enhance the competitiveness of national human capabilities locally and globally to be ready for the current and future labor market.

Institutional Cooperation



Participation of nations in international programs and cooperations increases their diplomatic influence as well as the benefits derived from the cooperation. International cooperation at public and private sector level strengthens future planning that could extend beyond the space sector.

Geospatial Capabilities



Governments have a critical and foundational role in the development of geospatial capabilities. By providing the underlying infrastructure, they enable evidence-based solutions across social, economic, and environmental challenges reliant on earth observation, urban sensing, mobile contact-tracing, and more.

The key sub-sectors



With a projected growth rate of 186% by 2030, the thriving space sector can be broken down into nine main sub-sectors, each offering its own case for investment and development.



Satellite Launch

One of the largest sub-sectors, satellite launch focuses on technology and infrastructure to send satellites to near space and Low-Earth Orbit (LEO).



Earth Observation

This segment is rapidly growing in all aspects, focusing on developing imaging, tracking and analytics technology to monitor climate, weather, GPS and more.



Space Tourism

Efforts are moving towards developing access to space for space explorers, space adventure, space programs, private citizens and others.



Satellite Communication

Industry focus on improved connectivity through LEO satellites, wireless broadband, optical comms and other technologies.



Space Mining

Discovering the opportunity to extract rare minerals, metals and other raw materials from near-earth asteroids or minor planets in outer space.



Space R&D

Dedicated to research, exploration, science and education about space and its technology, that will enhance the capacities and expertise in this field.



Space Exploration

Develop high-level missions to explore outer space by manned - robotic spacecraft to reach beyond the earth's atmosphere.



Space Debris

This segment focuses on tracking and analysing man-made objects orbiting in the atmosphere, to prevent collisions with satellites and spacecrafts or falling to earth.



Manufacturing

A large sub-sector that focuses on designing and producing spacecraft, satellite, ground stations, hardware and other technologies and systems.



A giant leap
for mankind

Local examples of progress

The UAE, Saudi Arabia and Egypt in particular have made great strides in developing their foundation for space exploration, and driving strategic national impact. With an increased focus in this sector, they have built strategic ecosystems that enable the upskilling of their local capabilities in manufacturing and space missions, as well as creating international alliances to complement the region's efforts with best practice approaches.

UAE

Saudi Arabia

Egypt

Overview

The UAE has the largest space sector in the region in terms of both diversity and size of investments. The sector is driven by several leading space centers, institutions and companies. The UAE has more than six satellites for different uses, and boasts more than \$5 billion of national investments in space technologies²⁴. As the founding chair member of the Arab Space Cooperation Group, the UAE aims to be at the regional center of space developments in the Middle East.

Saudi Arabia has a long history of involvement in space sector and satellite technology. Recently, Saudi Arabia launched a space commission to accelerate economic diversification, enhance research and development²⁶, and raise private sector participation in the global space industry. Saudi Arabia is well placed to capitalise on the falling costs of launching rockets, advances in technology, and a growing public interest in space exploration.

In 1960, Egypt started its official space program with ambitious goals, and it was the first country to pioneer basic space sciences and remote sensing technologies in the MENA region. Nowadays, Egypt has a great infrastructure in the field of space and its applications, owning satellites and organising potential space activities for future young generations. It aims to be the regional leader of space exploration in the African continent.

International Network

Space collaboration groups:

- NASA²⁵
- Chair of Arab Space Cooperation Group
- Artemis Program

Top MoUs:

- China
- France
- Russia
- UK
- India
- Japan

Space collaboration groups:

- United Nations Office of Outer Space Affairs
- European Space Agency
- Member of Arab Space Cooperation Group
- Artemis Program

Top MoUs:

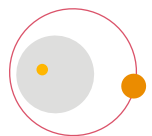
- EU Space Agency
- UK
- France
- Hungary

Space collaboration groups:

- Headquarters of Space in Africa
- Member of Arab Space Cooperation Group²⁷
- African Space Agency

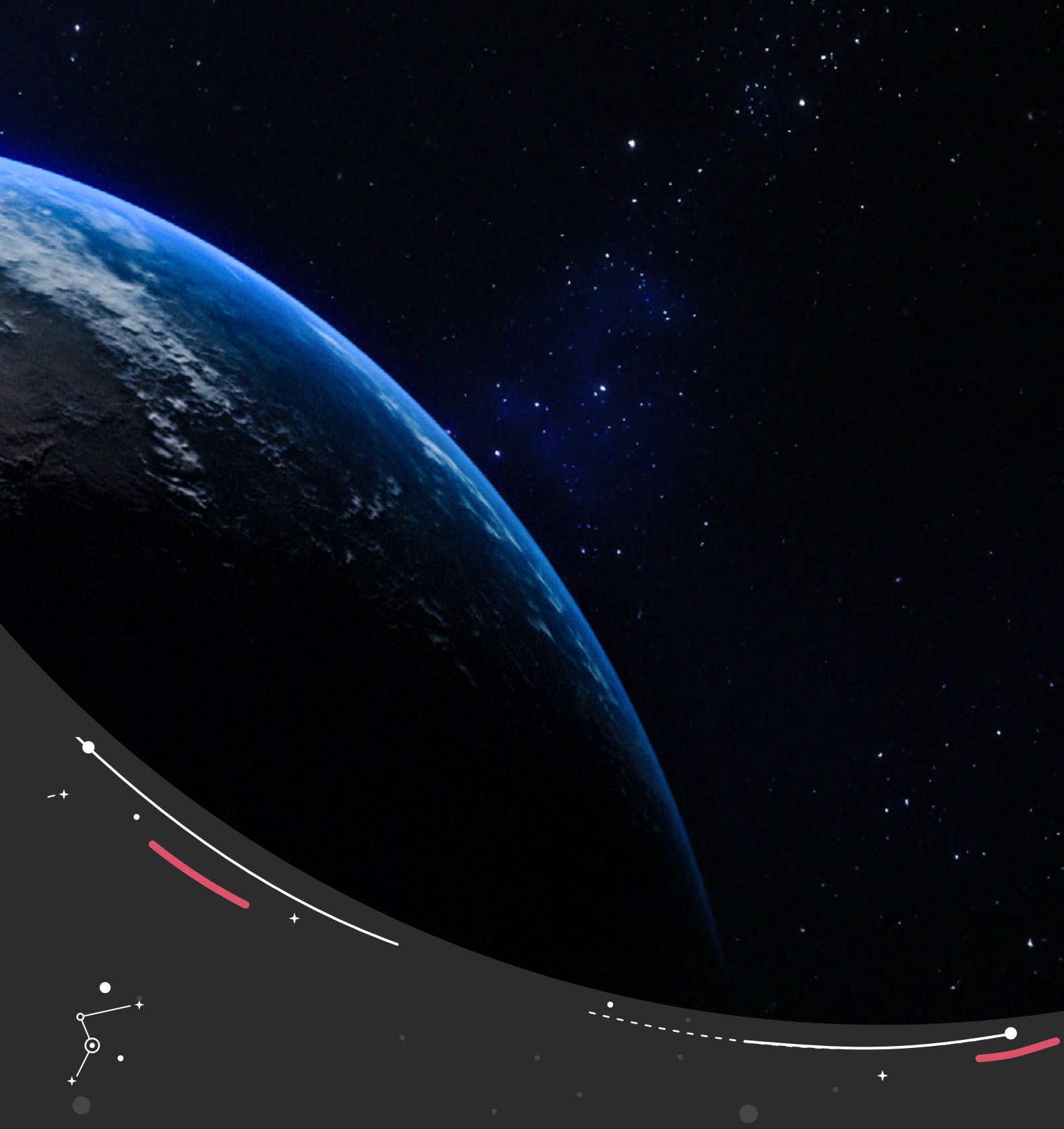
Top MoUs:

- China
- France
- Ukraine
- South Africa



Key Players

UAE Space Agency	Egyptian Space Agency	KACST	E-JUST	TAQNIA
MBRSC	THURAYA	Yahsat	Etisalat	NASA
Saudi Space Commission	International Astronomical Center	Arab Space Cooperation Group	KSA Ministry of Communications and Information Technology	Egypt Ministry of Higher Education and Scientific Research



On the horizon

A new space race led by the world's emerging economies and wealthiest individuals is now underway. Across our region, a number of countries are taking the lead in focusing on growing and enhancing their capabilities in space to capitalise on the opportunities that the sector offers, through leveraging the benefits of superior technologies, private sector finance, and a global profusion of scientific and engineering talent.

United Arab Emirates



Space Tourism

- The UAE National Space Strategy²⁸ highlights the importance of developing new activities in the space sector including space tourism. Since 2010 the UAE has invested in Virgin Galactic with hopes that the investment will support future space tourism infrastructure and activities.
- In 2021 the UAE entered into a space tourism partnership with Blue Origin. An outcome of the partnership is the potential construction of a spaceport in the UAE, where space tourism flights can be launched from in the near future.²⁹



Space Exploration

- A strategic objective in the National Space Strategy is to increase interest in space sciences and exploration.
- In 2024 the UAE is planning on sending a compact lunar rover to study the moon and in 2028 is planning on conducting an interplanetary mission which involves an expedition to the orbit of Venus, followed by an exploration of the asteroid belt beyond Mars³⁰. The UAE Space Agency signed the Artemis Accords in 2020, which align with the UAE's long-term programs to explore outer space and collaborate internationally on better understanding the solar system.³¹



Space Resources

- Launching inspiring space scientific and exploration missions is a key strategic goal of the UAE National Space Strategy³². To achieve this strategic goal, one of the initiatives set is to attract sector investment, in particular in the field of space resources utilisation. By achieving this initiative, the UAE will be better placed to discover, extract, and utilise resources from space.

Saudi Arabia



Space Strategy

- Saudi Arabia plans to finalise its Space Strategy by the end of 2022. As part of its Vision 2030 reform agenda, the Kingdom's long-term plan is to diversify its economy away from oil and embrace a wide array of next-generation industries. This strategy frames the Kingdom's initiatives and strategic direction and is the basis for evaluating opportunities in the sector.
- Saudi Arabia's national space strategy is envisaged to have more than 50 initiatives clustered around themes such as satellites, space science and emerging space.



Satellite Services

- King Abdulaziz City for Science and Technology (KACST), established a "Center of Excellence for Space and Earth" in cooperation with Stanford University, with aims to collaboratively provide global-impact research results and advanced technology developments.³³



Ground Equipment

- KSA is focusing on establishing a comprehensive and integrated space architecture, allowing the Kingdom's modern military systems and operations to be greatly strengthened across all domains.³⁴



Space Tourism

- Saudi Arabia's sovereign wealth fund, the Public Investment Fund, invested around \$1 bn in Virgin Galactic space travel ventures. This partnership with Virgin Group reflects the strides the Kingdom is making towards space tourism.³⁵

Egypt



Satellite Services

- The Egyptian Space Agency will be launching two Egyptian designed satellites, EgSAcube-3 satellite and EgSAcube-4 satellite by the end of 2022.³⁶



Satellite Hub

- Egypt started to build Space City that will consist of 23 buildings dedicated to promoting research, education, and development in the field of space, in addition to enhancing Egypt's satellite-manufacturing and designing capabilities. The plan is set to be complete in 2026.³⁷

Jordan



Space Strategy

• In 2020, Jordan developed a proposal to establish a Space Regulatory Commission to regulate all of its space and astronomy related activities.³⁸

Oman



Space Research & Development

• The Oman Ministry of Transport is currently developing a National Space Program for the country. The Program aims to support the development of Oman's capabilities and expertise in the space sector.



Launching Capabilities

• With Oman's location close to the equator, it offers a strategic location to launch satellites and rockets into space.³⁹



Satellite Services

• Oman is planning to launch its first satellite, Omani CubeSat, by the end of 2022. The Satellite will be launched in partnership with Virgin Orbit with plans to conduct scientific research and capture space imagery.⁴⁰
• The Oman Space Communications and Technology (SCT), is working on the future Omani satellite project, with aims to begin service in 2024. SCT is focused on utilising the latest technologies developed in building the satellites along with partnering with largest global satellite manufactures.

Kuwait



Rocket Design & Development

• Kuwait plans to launch the Kuwait Space Rocket (KSR), the first GCC suborbital liquid bipropellant rocket. Plans include the design and manufacture of the rocket in country by 2023.⁴¹



Space Exploration

• The 'Experiment on the Moon' project led by Orbital Space, the first private space enterprise in the Middle East, is set to launch in 2024. The project aims to be the first private Moon mission from the Arab region and the second lunar mission after the UAE.⁴²

Qatar



Satellite Services

• Having launched Es'hail-1 in 2013 and Es'hail-2 in 2018, Qatar aims to expand its satellite services and continue to develop and launch satellites over the coming years.⁴³



Space Research & Development

• The Qatar Aeronautical and Space Agency is aimed at strengthening and evolving four core competencies: Space science, Human-system collaboration, Computation, Space vehicle design.⁴⁴

Bahrain



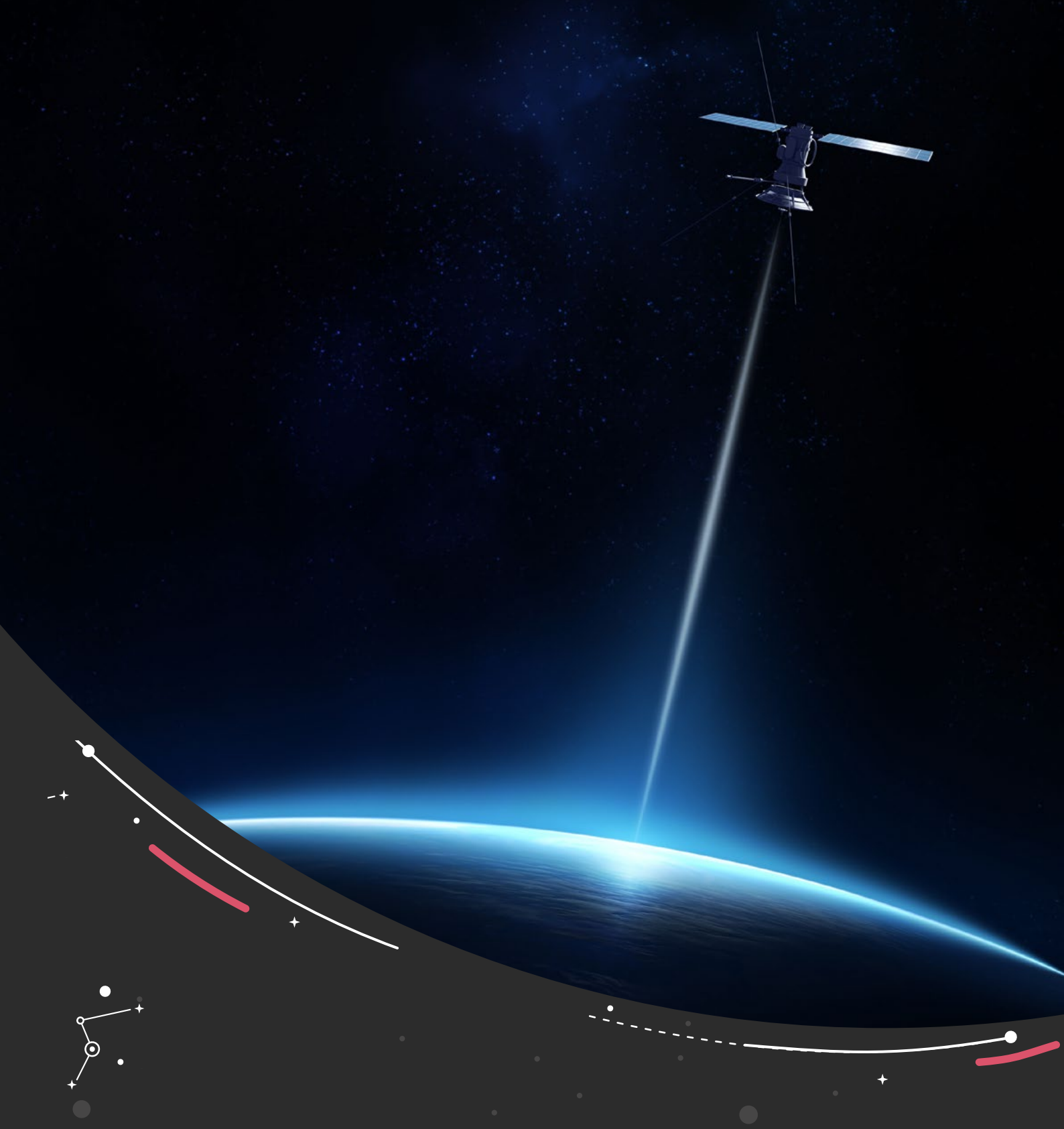
Satellite Services

• The National Space Science agency is planning to build and launch remote sensing satellites.⁴⁵



Ground Equipment

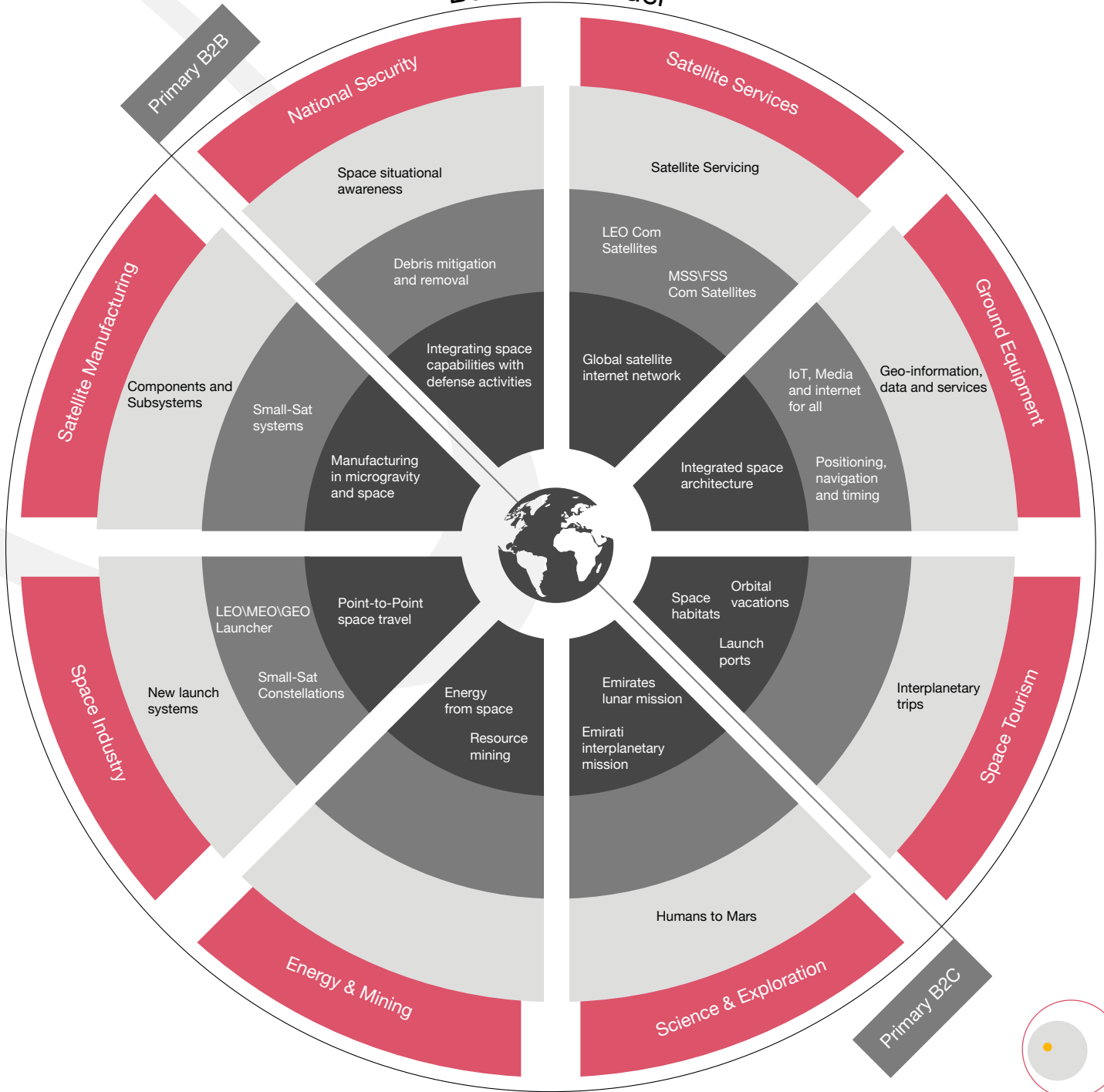
• The National Space Science Agency is set to begin the construction of a ground station for operating and tracking owned satellites.⁴⁶



The future may be closer than you think

The space sector presents an ever-evolving ecosystem where opportunity and ambition constantly push the boundaries of what is possible. Cross-industry and multinational collaboration is a must in a sector which expands beyond the traditional borders of engineering, technology and space.

Business Model



During the course of 60 years, the space sector has witnessed impactful achievements in science and technology; leading to exponential growth and modernisation of the world we live in today. Recently there has been a significant push by private sector players to enter the industry:

- **SpaceX** - An aerospace manufacturer and the first private company to send spacecraft to the international space station. SpaceX is also developing Starlink, a satellite internet system to provide commercial internet service around the globe.
- **Virgin Galactic** - The world's first commercial spaceline, focused on developing commercial space craft with aims to provide suborbital space flights to tourists.
- **Blue Origin** - A privately funded aerospace manufacturer and sub-orbital spaceflight services company. Blue Origin is committed to developing partially and fully reusable launch vehicles that serve the needs of all civil, commercial and defense customer
- **ArianeGroup** - A joint venture between Airbus and Safran consists of three core arms: aerospace, defence and security. ArianeGroup is currently developing its next-generation two-stage Ariane 6 launch vehicle on behalf of the European Space Agency.

Quick Wins

With many nations now establishing national space strategies and agencies, our region is on its way to becoming a significant player in the space sector. As the Middle East looks to the future of this industry and the promising economic opportunities it offers, the focus is shifting from feasibility studies to implementation and capability building to start benefiting as soon as possible. In the short term, opportunities in science and exploration, space resources, and space tourism present a lucrative economic entry point. Taking the lead, both Saudi Arabia and the UAE have launched national space strategies, with bold ambitions in the fields of space exploration, technology and application⁴⁷. Showcased in the visions are strategic goals and initiatives to achieve local sector growth. This includes capitalising on investments to develop space tourism infrastructure, and forging strategic partnerships with leaders in the private sector to become more competitive players in the field of space exploration and resource extraction.

Long-term opportunities

Activities in the space sector are expanding globally, with more countries and private firms investing than ever before⁴⁸. Poised with exponential growth, key factors to consider include rapid advances in technology, declining launch costs and the rising public sector interest in the field. By focusing on the long-term advantages that the sector promises, opportunities include satellite broadband and servicing, high speed product delivery through point-to-point space travel, active debris removal capabilities, to one day establishing a colony on Mars.

On the regional level, investment in the sector will lead to the localization of this industry, while building infrastructure will stimulate the local economies on a multi-sector basis and provide education, training, and future of work opportunities for citizens as we look ahead and into the space-age.

Future Considerations

While the decreasing costs of satellite development and space exploration increases the volume of regional players of all sizes, there are yet to be effective governance tools regulating the sector. There is a clear gap in policy development, with effective regulation missing in key areas such as satellite launches, space traffic control, and activation of enforcement principles. The absence of governing regulations that enable equal opportunities for growth leads to increasing inequality amongst regional and global participants, and will start to play an ever more critical role moving forwards. Given the rapid transformation happening across our region and especially in this sector, it is important for effective governance, trust and transparency to keep up as we pave the way into a more equitable, competitive and ambitious future.

Would you like to learn more?



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Sami has over a decade of experience in corporate and government strategy development, He has advised the region's most prominent entities in the aerospace & defence sector, having been at the heart of its transformation in the region. Most recently, he has been driving localization strategies for a number of industrial players to contribute in building strategic capability in the Kingdom of Saudi Arabia across the military and space industries.



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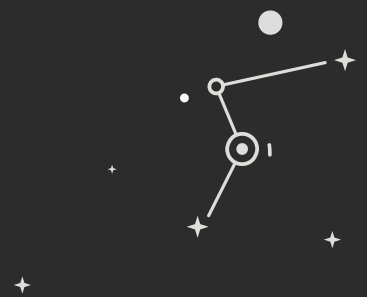
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