



INDIA SPACE CONGRESS [ISC]

REPORT: 2023

Organised by
SIA-India





INDIA SPACE CONGRESS 2023: A GLOBAL SUMMIT FOR SHAPING THE FUTURE THROUGH INNOVATION AND COOPERATION IN SPACE

The India Space Congress 2023 (ISC-23), held from July 10th to 12th, 2023, stands as India's global space summit, distinguished by its wide-ranging discussions and diverse participation from the global space community, including industry leaders, policymakers, scientists, and academics. Its alignment with India's G20 presidency and the concurrent Space Economy Leaders Meeting (SELM) underscores its strategic importance. ISC-23 covers critical topics like technological advancements, policy formulation, socio-economic applications, and international collaborations, highlighting its comprehensive approach to fostering innovation and growth within the space sector. The summit's emphasis on startup support and capacity building, along with its focus on global collaboration and space diplomacy, positions it as a key platform for shaping the future of global space activities, promoting sustainable development, and enhancing international cooperation in space exploration.

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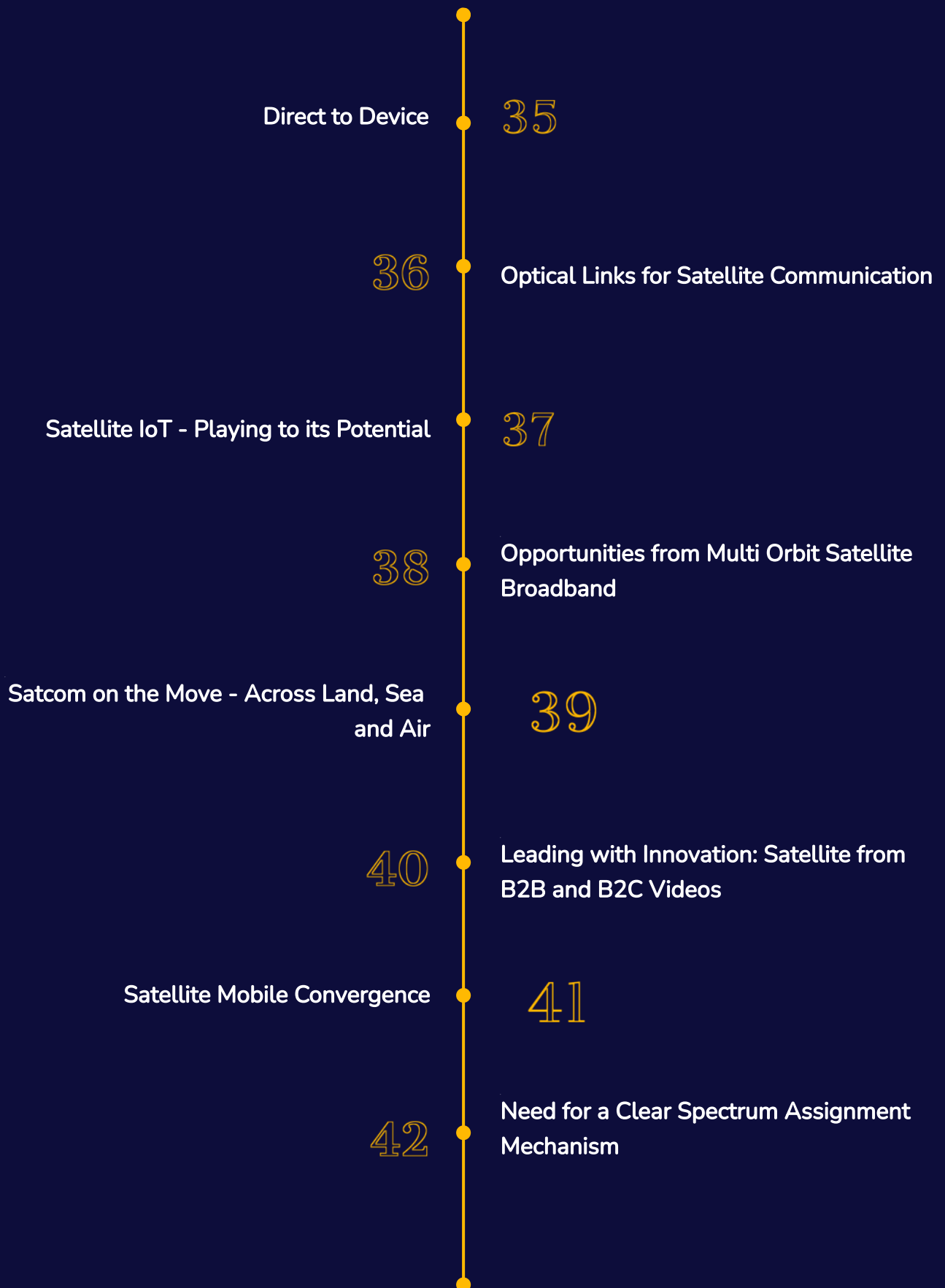
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KEY HIGHLIGHTS:

The India Space Congress 2023, hosted by SIA-INDIA, marked a significant milestone in fostering critical collaborations and advancements within the space sector, aimed at socio-economic empowerment. The conference attracted notable figures, including governors from Haryana, Uttarakhand, and Mizoram, ambassadors, secretaries, the head of the Netherlands Space Agency, the Chief Economist of NASA, and senior officers from ISRO and DOT. With speakers and delegates representing nearly 30 nationalities, the event facilitated a rich exchange of ideas under the theme 'Reimagining Space Sector for Empowering Socio-Economic Development.' ISC-2023 played a pivotal role in uniting key stakeholders to envision and drive transformative strategies for India's space endeavours. The focus was on leveraging space technology to catalyze growth and progress across key sectors, highlighting the congress's commitment to utilizing space advancements for comprehensive economic development and exploring new market potentials. Through these concerted efforts, SIA-India aimed to strengthen collaborations with state governments and harness space technology's potential to foster socio-economic development in the respective states.

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Dignitary Insights

The ISC-2023 was elevated by the esteemed presence of the Honorable Governors of three Indian states and other dignitaries, adding significant value and prestige to the event. Their participation underscored the importance of space technology in socio-economic development, highlighting the conference's impact and the commitment to leveraging space for national advancement.





Chief Guest: Shri Bandaru Dattatraya, His Excellency Governor of Haryana

"One of the most critical areas where satellite technology has made a significant impact is agriculture. As an agrarian state, Haryana faces the challenge of ensuring food security and optimizing agricultural practices. Thanks to satellite imagery and remote sensing data, we have achieved a comprehensive crop inventory, facilitating better planning and resource allocation. Additionally, disease detection and precision agriculture techniques have led to increased crop yield and enhanced productivity."



Shri S Somanath, Secretary DOS and Chairman, ISRO

"We proudly stand among the nations with immense potential for further expansion. Our relentless pursuit of growth, innovation, and collaboration positions us on the list of frontrunners, ready to embrace new horizons and shape a future filled with endless possibilities."



Chief Guest: Lt. Gen. Gurmit Singh, PVSM, UYSM, AVSM, VSM (Retd.), His Excellency the Governor of Uttarakhand

"In the innocent essence of Punjabi, 'Space' reveals the hidden potential of our entire humanity. All solutions can be nurtured from this sector, but India must now 'PACE' itself to fully exploit its possibilities. Dr. Sarabhai believed that space resources hold the key to solving mankind's challenges. The convergence of AI, space, and cyber will pave the way for sought-after solutions. India's growing strides in space science and technology are commendable, reflecting our dedication to excellence. As we undergo a paradigm change and technological transformation, the India Space Policy sets us on the long-awaited path we sought."



Chief Guest: Dr. Hari Babu Kambhampati, His Excellency Governor of Mizoram

"By harnessing the potential of space applications, Mizoram has made significant strides in comprehensive development. Space technology has played a pivotal role in various aspects, including informed land utilization decisions like creating the Land Resources Potential Atlas of Lunglei District, combating desertification, and preserving valuable ecosystems. Space tech has empowered local communities, boosted agricultural productivity, and has greatly enhanced our disaster preparedness. Space-based information has brought about a revolutionary change in our developmental approach. Mizoram stands as a shining example of how space technology can drive inclusive and sustainable growth, benefiting both our precious ecosystems and the livelihoods of our people."



Dr Subba Rao Pavuluri,
President, SIA-India & CMD
Ananth Technologies

“In the realm of disaster management, Uttarakhand faces the challenges of natural calamities such as landslides, floods, and earthquakes. However, through the utilization of satellite-based remote sensing and Geographic Information System (GIS) technologies, the state, with the help of advanced early warning systems (has been able) to predict and monitor these disasters. These systems have been instrumental in saving lives and minimizing the impact of such events.”



Air Marshal Surat Singh AVSM
VM VSM, Director General Air
(Operations)

“The Gulf War of 1991 illustrated the importance of space assets in wars on the ground. It involved only 100 hours of fighting on the ground, whereas, for 39 days, space assets were used to monitor, control and soften the battlefield. In recent times, Space and Cyber have become the newest domains in warfare. Space assets have to be hardened to protect them from cyber-attacks. Quantum technology can be used for the same. The Indian Air Force sees ‘Space’ as a continuum of the air domain from a doctrinal and conceptual perspective. From the perspective of the military, persistent ISR and high-precision PNT are of immense importance.”



Shri Prabhat Kumar, Special
Secretary, Economic Relations
and Development Partnership
Administration, Ministry of
External Affairs, Government of
India

“How can we enhance our presence in other countries? There are two aspects to consider: finance and trade arrangements. India already extends lines of credit (LOC) to 65 countries as government-to-government credit, which can also be utilized in the space sector. We must make other countries aware of our capabilities and willingness to collaborate, offering technology, experience, and assistance in areas where we excel.”



Ms Gunjan Dave, Member
(Technology) DCC, DOT

“The Government of India (GOI) is committed to its mission of “connectivity for all,” and the demand for satellite broadband is steadily increasing to fulfil consumer, enterprise, and last-mile connectivity needs. Encouraging greater participation from industry members will play a crucial role in paving the way forward towards achieving this mission.”



Lt. Gen. PJS Pannu PVSM, AVSM, VSM (Retd) Former. Deputy Chief, Integrated Defence Staff (Operations)

“India’s substantial investment in remote sensing empowers us with valuable insights into Earth’s resources and climate. However, as we forge ahead in our cosmic journey, we must remain conscious of our duty to preserve and protect our planet and its delicate balance with nature. By harmonizing our technological advancements with environmental stewardship, we can navigate the cosmos and safeguard our home for future generations.”



Mr Alex MacDonal, Chief Economist, NASA

“We stand on the brink of a remarkable era in space exploration. President Biden’s recent announcement of an Indian astronaut’s journey to the International Space Station in 2024 marks a momentous milestone for both nations. As the world sets its sights on returning to the moon with the determination to establish a lasting presence, it feels like one can embark on a celestial ‘Gagan Yatra’ without ever leaving the Earth in India. Let us join hands as we venture towards the stars, united in the pursuit of knowledge, inspiration, and a brighter future for all.”



Mr Nathan de Ruiter, Managing Director, Euroconsult

“In the vast expanse of space, we find a world of boundless possibilities. The Seven Space Opportunities, ranging from satellite broadband connectivity, Earth observation, and space exploration to defence and security offer a remarkable chance to reach new heights. With the United States leading the way through significant investments in space companies, and India emerging as a crucial market, we stand at the brink of an extraordinary journey. Let us come together to connect the unconnected, foster sustainability, and drive the space economy from 310 billion USD in 2017 to an astounding 740 billion USD by 2031. Together, we shall reach for the stars and forge a brighter future for all.”



Mr Shmuel Akler, Director, Communication Satellites, MBT Space Division, Israel Aerospace Industries, Ltd. (IAI)

“IAI’s flagship Mini Communication Satellites (MCS) outshines both HTS and Legacy Communication Satellites in terms of accessibility and cost-effectiveness. With a low barrier to entry and remarkably low cost per bit per year, MCS sets new standards in the satellite industry. Fully digital and all-electric, these state-of-the-art satellites boast flexible antenna configurations, enabling seamless multi-band operations. What sets MCS apart is its in-orbit flexible RF band capability, empowering users to adapt and modify its applications even after deployment in space. The possibilities are limitless with MCS, and we are thrilled to redefine the future of communication satellites, making space more accessible and communication more efficient for everyone.”



Mr. Thomas Bleeker, Head of International Relations, Netherland Space Office

“In the fast-paced world of space, we must prioritize sustainability. The Netherlands commits to a safe and secure outer space environment, but space debris remains a threat. Let’s adopt a global ‘leave no debris’ approach to protect our access to vital satellite data, ensuring a safer and more sustainable space for all.”



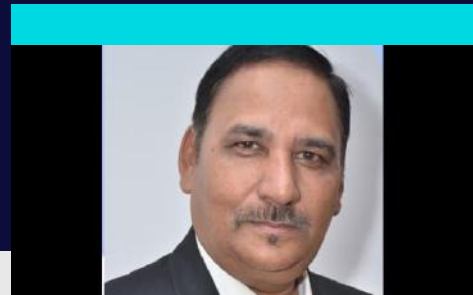
Mr Hazem Moakkit, VP-Spectrum Strategy, Intelsat

“The space industry is experiencing a revolution, witnessing the emergence of fresh satellite operators, launch providers, and in-orbit service pioneers. In this journey, India stands as a key player, holding a pivotal role in shaping the future of space exploration. The Indian government’s recognition of its significant role in the space domain is evident through the release of its forward-thinking space policy. A robust space policy not only guides our endeavours but also instils confidence in investors, fostering a thriving ecosystem of innovation and investment.”



Isabelle Mauro, Director General, GSOA

“The industry’s rapid evolution and the introduction of resilient and affordable connectivity solutions. Collaborations and satellite backhaul initiatives are playing a crucial role in bridging connectivity gaps, particularly in regions where traditional methods face challenges.”



Anil Prakash, Director General Satcom Industry Association

“Our pursuit of space is not merely a scientific endeavor but a testament to our collective ambition. As we navigate the cosmos, let this conference be a platform for exchange, sparking ideas that propel us further into the unknown. Together, let’s explore new frontiers, push boundaries, and elevate India’s presence in the global space community.”

Support from Esteemed Government Partners



We are immensely grateful for the support from a wide array of departments, ministries, institutions, and organizations. Their collective contributions and backing were crucial to the success of the India Space Congress 2023, demonstrating a remarkable commitment to fostering innovation and collaboration within the space sector.

1. Department of Telecommunications (DOT)
2. Indian Space Research Organisation (ISRO)
3. New Space India Ltd (NSIL)
4. Indian National Space Promotion and Authorization Center (IN-SPACE)
5. Department of Defence Production, Ministry of Defence
6. National Institution for Transforming India (NITI Aayog)
7. India Post
8. National Institute of Advanced Studies (NIAS)
9. Research and Information System for Developing Countries (RIS)

This diverse support underscores the event's significance and the shared vision for advancing space exploration and technology.



Spotlight on Key Reports

"Industrialisation of India's Space Capabilities" Symposium and Roundtable



The Industrialisation of India's Space Capabilities: Symposium and Roundtable was organised collaboratively by the National Institute of Advanced Studies (NIAS) and SIA-India on 10th March 2023, this report delves into the crucial aspects of industrializing India's space capabilities. It proposes actionable policy initiatives to position India as a major player in both national and global space endeavours.

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"DefSAT Conference 2023 Report - India's First International Defence & Space Conference & Expo"



Hosted by SIA-India from 27th to 29th April 2023, at the Manekshaw Centre in New Delhi, the DEFSAT Conference-2023 centred around the intersection of strategy and industrialization in the space sector for national security. The report captures the impactful outcomes of DefSAT 2023, steering concrete actions and policy changes to optimize national resources across civil, commercial, and defence space programs.

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Key Enablers: Law, Regulations, Policies, Space Diplomacy, and International Collaboration

India Space Policy – A watershed moment

KEY INSIGHTS

Align the Indian space policy vision with short, medium, and long-term goals

Establish Legal Directorate and Prioritize Data Security

Ensure high-resolution data accessibility for diverse stakeholders, especially in rural areas.

Establish Standard Operating Procedures for Verticals

Simplify the authorization process, enhance transparency, and provide clear guidelines.

Foster inter-ministerial cooperation and dialogue for holistic space sector progress.



- Mr Kaushik Moitra, Partner, Bharucha & Partners
- Ms. Seema Jhingan, Senior Partner & Co-founder, LexCounsel
- Mr Abhishek Malhotra, Managing Partner, TMT Law Practice
- Mr Shivaji Chatterjee, Executive Vice President, Hughes Communications India Pvt. Ltd
- Dr. P. K. Jain, Director PMAD, IN-SPACe
- Prof. Chaitanya Giri, Associate Professor, FLAME University, Editor, Interstellar_Go & Consultant RIS
- Capt. Vishal Kanwar, Executive Director, PwC India
- Mr Sherille Ismail, Associate General Counsel, Intelsat
- Mr Sreeram Ananthasayanam, Partner, Deloitte India

*Left to Right

“India is at a critical juncture, akin to past experiences of the U.S. and the European Union, where seamlessly integrating policy implementation into the policy’s core intent becomes our paramount challenge.”

India’s Space Policy 2023, approved in April, marks a pivotal moment in the nation’s space sector. Emphasising private sector participation and well-defined roles, the policy aims to foster collaboration and create a thriving space ecosystem. The challenges in the sector include ensuring robust competition, addressing legal directorate absences, and exploring the interplay between data security and national security. The policy allows non-governmental entities to engage in satellite manufacturing and Earth observation, benefiting sectors like agriculture and insurance. While the policy demonstrates a significant leap towards private sector involvement, challenges persist, requiring policy agility, data quality improvements, and spectrum allocation considerations. Collaboration among ministries, proactive implementation, and clear FDI policies are crucial for realising the space sector’s potential in India.

Start-up Journeys - from Ideas to Developing a Space Business

KEY INSIGHTS

Space startups should explore innovative funding approaches, leveraging accelerators, angel investors, and non-traditional credit models to overcome initial capital constraints.

Collaborative efforts with government bodies are essential to simplifying and reforming regulations, such as ITAR, streamlining operations, and fostering global competitiveness.

Streamlining pathways for startups to access testing facilities are crucial to reducing financial and time burdens and facilitating timely development initiatives.

Continued efforts to develop reusable launch vehicles contribute significantly to reducing the cost of access to space, making space endeavours more cost-effective.

Government departments should embrace satellite data analytics, encouraging private-sector participation and stimulating the growth of downstream analytics companies.



- Mr Sakthikumar R, Founder & CEO, OrbitAID Aerospace Pvt Ltd
- Mr Tushar Jadhav, Co-Founder, Manatsu Space
- Mr Raghav Handa, Director, Strategic Business Development, & Govt. Relations HSBC
- Mr DS Govindrajan, President, Aniar Communications & Executive Board Member, SIA-India
- Dr Susmita Mohanty, Director General, Spaceport SARABHAI
- Mr Awais Ahmad, Founder & CEO, Pixxel
- Mr Nitish K Singh, Co-founder & CEO, Astrogate Labs
- Mr Manu J Nair, Co-Founder & CEO, EtherealIX

*Left to Right

“Success lies in agility, openness to feedback, and adjusting strategies to fit market dynamics as this existing industry evolves.”

In the rapidly evolving landscape of space technology, startups are pivotal in transforming visionary concepts into tangible achievements. The session explores the journeys of pioneering space startups, including EtherealIX, Astrogate Labs, Pixel Space Technologies, OrbitAid Aerospace, and Manastu Space. Despite remarkable progress, these startups face funding challenges, including initial capital constraints and investor scepticism. The panel highlights the importance of global market entry, regulatory navigation, mentoring, and professional exposure. They emphasised the role of HSBC in empowering the space startup ecosystem. Challenges in infrastructure support, regulatory environments, and market entry are addressed, focusing on reducing barriers and fostering international collaborations. The evolving role of mentoring, ancillary industries, cost-effective access to space, and the growing demand for satellite data are key considerations. The conclusion underscores the pivotal role of Indian space startups in shaping the global future of space exploration.

Breaking Barriers, Inspiring Futures: Women in Space

The narrative of women in India's space industry is undergoing a transformative shift as they break barriers and leave an indelible mark on space exploration. In the session titled "Breaking Barriers, Inspiring Futures: Women in Space," diverse women from the space sector shared their experiences, challenges, and successes. Despite historical male dominance, women are pioneers in space science, entrepreneurship, and geospatial technology. Dr. Tessy Thomas, the "Missile Woman of India," and Dr. Argyha Banerjee are trailblazers in missile projects and geospatial science, respectively. Initiatives like YUVIKA promote STEM education and address gender gaps. Challenges persist, but the discussion advocates for policy changes, inclusivity, and dismantling gender bias. The conversation highlights the historical exclusion of women, urging a reevaluation of inclusivity in future space missions. While acknowledging progress, the panel emphasises the collective effort needed for gender equality in leadership and fostering a diverse workforce. The discussion concludes optimistically, recognising women as pivotal contributors to India's cosmic journey.

"The narrative of women in space is one marked by resilience, determination, and groundbreaking achievements".

KEY INSIGHTS

Advocate for policy changes promoting gender diversity in the space industry.

Implement diversity quotas, support mechanisms, and anti-discrimination measures.

Encourage STEM education for girls, addressing gender gaps in science and technology.

Foster mentorship and support networks for women in space and technology.

Recognise and nurture individual strengths to empower women in their careers.



- Ms Laura Roberti, Director of Licensing and Market Access, Telesat Canada
- Ms Nidhi Vasaiakar, APAC Regional Partnerships Manager, Space Generation Advisory Council (SGAC)
- Dr N. Ranjana, Director, Directorate of Systems and Technology Analysis (DSTA), DRDO
- Dr Susmita Mohanty, Director General, Spaceport SARABHAI
- Ms Isabelle Mauro Director General, GSOA
- Ms Devleena Bhattacharjee, Founder, Numer8 Analytics

*Left to Right

Government as a Bank, Customer, or a Partner? Finding the Right Balance

The discussion on the Indian government's role in the space industry highlighted its multifaceted contributions as a customer, partner, and financial supporter, particularly in the context of recent space policy developments. Emphasis was placed on the government's vision for private sector involvement, advocating for an export-oriented approach and financial incentives akin to the telecom industry's success. Challenges for startups were acknowledged, stressing the need for confidence-building beyond government investments. A comparative analysis with global counterparts, especially the U.S. model, showcased the significance of government support in fostering successful space ventures. The speakers urged for a comprehensive approach, inclusive strategies, and a transparent framework to bolster the private sector, aligning government transactions with startup agility.

"Aligning government transactions with the agile, short-term objectives typical of startups could be a potential game-changer"

KEY INSIGHTS

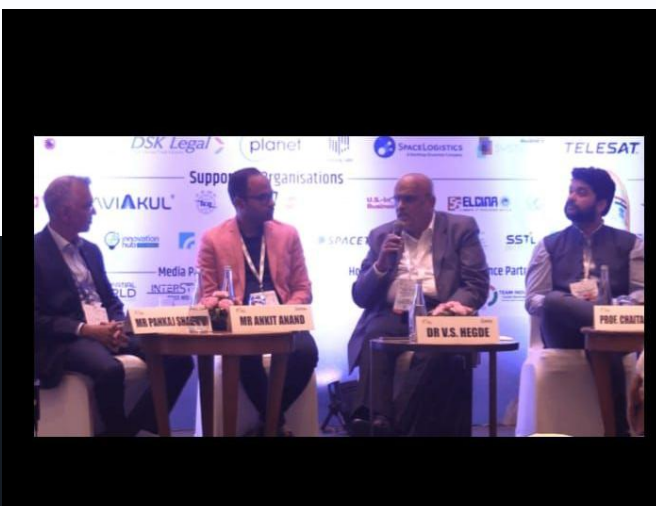
Revisit and reform the L1 approach ["lowest price technically acceptable"] approach in procurement and contracting, to foster innovation and hinder corruption.

Establish a clear national space vision and strategy for long-term goals.

Encourage an export-oriented approach and provide financial incentives for private sector involvement.

Facilitate technology transfer from ISRO to industry to enhance competitiveness

Develop measures to build investor confidence in addition to government support, as a sole dependence on government is not sustainable.



- Mr Pankaj Sharma, E&Y
- Mr Ankit Anand, Riceberg Ventures
- Dr V.S. Hegde, Fmr CMD, Antrix Corporation Ltd and Fmr Scientific Secretary, ISRO
- Prof. Chaitanya Giri, Associate Professor, FLAME University, Editor, Interstellar_Go & Consultant RIS

*Left to Right

Industrialisation of India's Space Capabilities

KEY INSIGHTS

Create incubation centres for space startups and maintain testing facilities to support innovation.

Streamline export promotion policies and simplify business procedures for industry engagement.

Increase the space budget to align with global competitors and stimulate industry growth.

Integrate space-related courses into educational curricula to enhance skill development.

Learn from successful global models, such as those in the U.S., to formulate a long-term roadmap for industry development.



- Mr Laxmesh BH, Vice President & Head - Missiles & Aerospace Business, L&T Defence
- Mr DS Govindrajan President, Anisara Communications
- Dr V.S. Hegde, Fmr CMD, Antrix Corporation Ltd and Fmr Scientific Secretary, ISRO
- Mr Krishna Reddy, Marketing Manager, SatSure
- Mr Samit Ray, Regional Director, Govt Affairs & Public Policy, South Asia

*Left to Right

“India has a significant opportunity to excel in the global space industry through collaboration with foreign OEMs, fostering startups, and leveraging its cost advantages, talent pool, and innovation capabilities.”

India's space sector has metamorphosed as it has opened avenues for increased industry participation to bolster its global standing. Focused on end-to-end manufacturing, the nation seeks to strengthen its space programme, foster innovation, and create jobs. While embracing a consortium model for its flagship launcher, PSLV, India prioritises indigenous manufacturing and technology development, aiming for a robust space ecosystem. However, unlike some nations, India lacks specific time-bound targets for its space industry growth. The global space economy's anticipated doubling by 2040 presents India with an opportunity. This necessitates increased budget allocation, policy clarity, skill development, and collaboration between the government and private sector to harness its potential.

Fundraising, SPACs and M&As - Scaling Space Business



- Mr Nakul Batra, Partner, DSK Legal
- Mr DS Govindrajan President, Aniara Communications
- Mr Ankit Anand, Founding Partner, Riceberg Ventures
- Mr Vishesh Rajaram, Managing Partner, Speciale Incept Advisors LLP

*Left to Right

“The trajectory to global prominence in space demands not just rockets but a robust ecosystem; India’s innovation capabilities chart the course.”

India stands at a crucial juncture to carve a prominent niche in the global space industry by strategically embracing collaboration with foreign Original Equipment Manufacturers (OEMs), nurturing indigenous startups, and harnessing its unique advantages. The nation's cost-effectiveness, vast talent pool, and innovative capabilities position it as a formidable contender in the international space arena. Through fostering partnerships with established foreign players, India can access advanced technologies and global market reach. Simultaneously, supporting homegrown startups enables the cultivation of cutting-edge solutions and fosters a robust space ecosystem. Leveraging cost advantages, a skilled workforce, and innovation, India can establish itself as a key player in the space sector, contributing to both economic growth and technological advancement on a global scale.

KEY INSIGHTS

Form strategic partnerships with global OEMs to access advanced technologies and enhance India's space capabilities.

Establish dedicated incubation programmes to support and fund space-related startups, fostering innovation and entrepreneurship.

Build state-of-the-art space infrastructure to support launches, research, and development, enhancing India's overall space capabilities.

Allocate substantial funds for research and development, encouraging the creation of innovative solutions and cutting-edge technologies.

Develop policies that encourage foreign investment, technological exchange, and a conducive environment for the growth of the space industry.

Enhancing India's Global Trade in Space Sector

"Proactive engagement and strategic approaches can elevate India's global standing in the space sector."

India's space sector stands as a source of national pride, with achievements sparking discussions on a strategic go-to-market approach. The Ministry of External Affairs emphasises the potential for international collaboration and trade opportunities. Government policies, financing mechanisms, and institutions like the Export-Import Bank are central to the dialogue. Dual-use technologies' trade challenges are addressed through participation in export control regimes. India's extensive space expertise, demonstrated by independent milestones and diverse applications, positions it as a global player. Collaborative models, akin to successful projects, offer a promising approach. Despite ambitious goals for space exports, challenges like R&D, skill development, and funding persist. India's geopolitical position, Artemis Accord commitment, and strategic partnerships enhance global influence. Leveraging strengths, addressing weaknesses, seizing opportunities, and mitigating threats are crucial for India's space exploration future.

KEY INSIGHTS

Explore and expand participation in export control regimes, like the MTCR, to facilitate trade in dual-use technologies.

Invest in R&D, skill development, and funding to achieve the ambitious goal of increasing space exports to \$10 billion by 2033-34.

Leverage India's strategic geographical position to enhance prospects in the Indo-Pacific region.

Identify and establish long-term partnerships with countries based on geopolitical interests in space exploration and technology.

Address weaknesses such as limited domestic investment, low R&D expenditure, and dependence on imports for specific commodities to ensure sustained growth.



- Anil Prakash, Director General, SIA-INDIA
- Prof. Chaitanya Giri, Associate Professor, FLAME University, Editor, Interstellar_Go & Consultant RIS
- Capt Vishal Kanwar, Executive Director, PwC India
- Mr Laxmesh BH, Vice President & Head - Missiles & Aerospace Business, L&T Defence
- Dr Subba Rao Pavuluri, CMD Ananth Technology
- Shri Prabhat Kumar, Special Secretary, Economic Relations and Development Partnership Administration, Ministry of External Affairs, Govt of India
- Mr Anagh Singh, Assistant Vice President, Invest India
- Mr Rohan Verma, CEO and ED, MapmyIndia
- Capt. Vinod Narasimhamurthy (Retd.), Associate Director, BCG

*Left to Right

Seizing Opportunities with the Indian Space Sector

The panel discussion on "Revisiting Space Laws for New Space" within a broader space industry event addressed India's evolving role in the global space economy. It highlighted challenges in the geopolitical scenario, particularly in the Indian Ocean, emphasising the need for robust policies. The panel stressed the vital role of India in the Indo-Pacific and the growing focus on defence aspects of space technology. Government support was acknowledged as pivotal for space sector growth, with optimism for enhanced India-U.S. collaboration. The International Financial Services Centre (IFSC) emerged as a key player, offering a foreign jurisdiction for space technology and financial innovation. The discussion underscored the convergence of space technology and financial services, emphasising the importance of collaboration and well-defined legal frameworks for India's space economy.

"The IFSC's unique foreign jurisdiction statute makes it an attractive destination for space tech and financial entities, fostering innovation and collaboration."

KEY INSIGHTS

Prioritise defence-related space capabilities to strengthen national security, emphasising the need for "eye in the air" and robust communication systems.

Encourage Indian companies to invest in strategic space goals beyond satellite services, and explore opportunities in resource exploration.

Leverage the IFSC as a landing and launch pad for foreign and Indian space tech companies, promoting innovation and collaboration.

Establish an incentive scheme within the IFSC to provide grants to space tech companies, encouraging further innovation.

Explore the potential of space technology in monitoring and tracking sustainable projects to combat issues related to "greenwashing"



- Mr Amitabh Ghosal, Vice President India Operations, L3Harris
- Air Cmde Savinder Pal Singh, VSM (Retd), CAPS
- Air Cmde Terry van Haren (Retd.), Managing Director, Leolabs
- Shri Mr Joseph Joshy, CTO, IFSCA
- Mr Kaushik Moitra, Partner, Bharucha & Partners
- Mr Vineet Khandare, Founder Myfundbazaar India and, Strategic Consultant

*Left to Right

Reevaluating Space Policies and Regulations



- Mr Anirudh Chaturvedi, Legal Operations Associate, Manastu Space Technologies
- Dr Ranjana Kaul, Partner at Dua Associates, Advocates & Solicitors
- Mr Ashok GV, Partner, Factum Law
- Ms Rimali Batra, Partner, DSK Legal

*Left to Right

“Effective implementation and alignment with overarching objectives are essential in space policy.”

The discussion on India's space policies and regulations emphasised the imperative need for a comprehensive reevaluation, aligning them with the dynamic space industry. The panel stressed effective implementation, focusing on bridging the gap between policy formulation and execution. In-SPACE's role in facilitating private sector involvement was acknowledged, but challenges in reversing the trend of new space companies opting for foreign jurisdictions were highlighted. The conversation expanded to India's vision for the commercial space sector, calling for a clear 30-year plan with divestment strategies and reduced reliance on foreign transponder capacity. Ownership, liability, and regulatory framework issues were explored, advocating for dedicated space legislation and a balanced government-private sector partnership. The necessity of synergy between the defence and civilian sectors was emphasised, addressing challenges in collaboration, intellectual property, and funding complexities.

KEY INSIGHTS

Develop a clear 30-year plan for the commercial space sector with divestment strategies and milestones.

Reduce reliance on foreign transponder capacity by supporting indigenous satellite projects like Tata Play.

Enact dedicated space legislation in India to provide a structured framework for private participation.

Clarify and prevent conflicts between different documents governing the same aspects to avoid supersession issues.

Reevaluate and align space policies with the evolving industry, emphasising effective implementation.

Enhancing International Cooperation in Space



- Mr Hirokazu Mori, CXO advisor at SPACETIDE Foundation
- Ms Caitlin Searle, Counsellor - Science & Technology, Australian High Commission
- Prof. Chaitanya Giri, Associate Professor, FLAME University, Editor, Interstellar_Go & Consultant RIS
- Mr Gurvinder Chohan CEO & Founder QSTC
- Mr Sameer Guduru, Director, Digital Economy & Aerospace & Defence at USIBC
- Mr Dhoya Snijders, Head of Innovation, Embassy of the Netherlands

*Left to Right

“Space technology is viewed as a key solution, contributing to monitoring climate change, managing water resources, and bridging the digital divide.”

The discussion on India's space endeavours showcased significant international collaboration, with contributions from nations like the Netherlands, Australia, Japan, the United Kingdom, the United States, and France. The signing of the Artemis Accords elevated enthusiasm, fostering opportunities in various sectors beyond space. Japan, Australia, and Canada highlighted their commitment to collaboration, emphasising potential in fintech, AI, big data, and more. Canada, a major aerospace player, emphasised regulatory ease and collaboration avenues. The U.S.-India collaboration, marked by the Space Policy 2023 and Artemis Accords, includes joint working groups and initiatives like INTERSECT. The Netherlands stressed collaboration on societal issues, while Australia emphasised bridging industry-academia gaps. Japan showcased partnerships in education and space projects, and the enduring India-Netherlands space partnership was lauded. The session concluded with a focus on planetary science opportunities, advocating for interdisciplinary education.

KEY INSIGHTS

Actively support initiatives like the Indian Space Investment Initiative (ISI).

Explore collaborative projects and partnerships with the global space agencies.

Bridge industry-academia gaps for comprehensive space industry development.

Encourage interdisciplinary education to diversity the space workforce.

Promote collaborative initiatives addressing societal issues.

Sustainable Space Operations - Tools and Business Models

The discussion on "Sustainable Space Operations" underscored the critical importance of Space Situational Awareness (SSA), Space Traffic Management (STM), and debris mitigation in ensuring spacecraft safety and minimising space debris. Moderated by Mr. Stephen Shannon, representatives from Astroscale and Leo Labs highlighted the surging number of operational satellites and the urgent need for scalable, reliable solutions. Astroscale focuses on removing defunct satellites and debris, while Leo Labs operates a global SSA network. The conversation delved into challenges such as close conjunctions, the risks of satellite manoeuvres, and the complexities of space traffic management. Astroscale outlined its mission lines for satellite deorbiting and capturing non-cooperative debris, emphasising sustainability. The discussion concluded with an emphasis on collaboration, government funding, and international initiatives to address the escalating challenge of space debris.

"The surging number of operational satellites necessitates scalable, reliable, and transparent solutions to manage space debris and bolster safety."

KEY INSIGHTS

Develop scalable, reliable, and transparent SSA solutions for managing the increasing number of operational satellites and space debris.

Establish collaboration between commercial SSA providers and national defence systems to build a robust SSA network.

Enhance cataloguing capabilities and data accuracy for effective SSA and collision avoidance.

Balance the utility of small satellites with the sustainability of space, particularly concerning CubeSats.

Focus on extending satellite lifespan through end-of-life preparation and third-party life extension refuelling capabilities.



- Mr Navin Gopal, Vice President of Strategy & Business Analysis, Astroscale
- Mr Stephane Chenard, Senior Consultant, Euroconsult
- Dr Rachit Bhatia, Space Safety Analytics & Research lead, LeoLABS

*Left to Right

Satellites for Effective Disaster Risk Reduction

The session on "Satellites for Effective Disaster Risk Reduction" delved into the critical role of satellites within the space industry in mitigating the escalating global trend of disasters. The discussions emphasised the impact of natural disasters on Earth's stability and their interplay with rapid urbanisation and industrialization. Satellites emerged as pivotal tools for early warning systems, real-time data collection, and supporting first responders during crises. Flood monitoring, landslide assessments, and the unique challenge of cloudbursts were scrutinised, showcasing the diverse applications of satellite technology. The session underscored international collaborations, the importance of space-based data, and the evolving dynamics of disaster management, concluding with a focus on communication bandwidth and the role of satellites in smart governance.

"Satellites and Earth observation technology's role in disaster response, including monitoring and prediction, ensures the safety and efficiency of first responders during a crisis."

KEY INSIGHTS

Develop comprehensive disaster risk reduction strategies, acknowledging the increasing frequency and severity of global disasters.

Strengthen international collaborations, like the International Charter, to enhance access to satellite data for effective disaster prediction and mitigation.

Enhance communication bandwidth and deploy small, rapidly deployable communication terminals like Man Portable Terminals (MPTs) for efficient disaster response.

Promote the use of satellite data in quantifying and assessing disaster damage, involving capital markets, insurance, and financial support for affected communities.

Facilitate collaboration between satellite and drone technologies in disaster management.



- Mr Stephane Chenard, Senior Consultant, Euroconsult
- Dr KHV Durga Rao, Group Director DMSG, NRSC, ISRO
- Lt. Gen. PJS Pannu PVSM, AVSM, VSM (Retd) Former. Deputy Chief, Integrated Defence Staff (Operations) Special
- Maj Gen Sudhir Bahl (Retd), Senior Consultant (ME & IRS), NDMA
- Suyash Singh, Co-founder & CEO, GalaxEye Space

*Left to Right

Improving Agriculture Yield and Farmer Income



- Mr. Jatin Singh, Founder & MD, Skymet Weather Services Pvt Ltd
- Ms Devleena Bhattacharjee, Founder & CEO, Numer8 Analytics Pvt. Ltd.
- Dr V M Chowdary, Group Director (Agricultural Sciences & Applications Group), NRSC, ISRO
- Mr Nipun Agarwal, Director, PwC India
- Mr. Gagan Agrawal, Founder and Investor, CI Metrics

*Left to Right

“ Space-based data can enable more efficient resource management, enhancing the sustainability of marine agriculture.”

The session on "Enhancing Agriculture Yield and Farmer Incomes" underscores the pivotal role of Earth observation technology in India's agriculture sector. Focused on addressing multifaceted challenges, the panel emphasised holistic solutions, including climate resilience for coastal economies and affordability issues in adopting agricultural products. The discussion introduced a new approach, emphasising R&D labs and tailored machine learning for unbiased data in crop measurement. Marine agriculture emerged as a focal point, leveraging space technology for sustainable practices. Challenges in agricultural sustainability were highlighted, urging traceability and improved insurance. Notable use cases of technology in agriculture were outlined, from hyper-local observations to blockchain for supply chain transparency. The forward-looking strategy advocated a sustainable business model via public-private partnerships, improved satellite data resolution, and stakeholder collaboration.

KEY INSIGHTS

Develop sustainable AgriTech solutions, considering network infrastructure and smartphone prevalence.

Foster digital market linkages for farmers to access real-time pricing information and expand their customer base.

Encourage precision agriculture using advanced technologies like GPS, drones, and sensors.

Implement sustainable crop insurance programmes to protect farmers and ensure financial security.

Promote AI applications for agriculture, including language-specific AI for better communication.

Encourage collaboration between satellite tech providers, credit rating organizations, and financial institutions

Satellite for Sustainable Development Goals (SDGs)



- Mr Abhishek Krishnan, Chief of Staff, Pixxel
- Ms Dechacca Ponappa, Business Development, Aerospace and Satellite Services, AWS
- Dr Sudheer Kumar, Director, CBPO, ISRO-HQ
- Mr Stephane Chenard, Senior Associate Consultant, Euroconsult
- Gp Capt Arvind Pandey (Retd), Senior Fellow, Geospatial Intelligence in Military Operations, Centre for Air Power Studies (CAPS)

*Left to Right

“The versatility of space technology demonstrates a range of applications, addressing climate change, carbon trading, and the need for sustainable agriculture.”

The session on "Satellites for Sustainable Development Goals (SDGs)" underscored the pivotal role of space technology, particularly satellites, in addressing global challenges. Key topics ranged from climate change monitoring to sustainable urban planning, biodiversity protection, and enhancing education access in underserved communities. Discussions revealed the intersection of financial interests and environmental concerns, emphasising the need for accessible satellite data and common platforms. Illicit fishing, methane detection, and versatile applications of space technology were explored, showcasing its potential in climate initiatives, agriculture, and infrastructure safety. The role of government entities, private participation, and innovative startups like Pixel were discussed, with a focus on geospatial data for SDGs. Challenges included centralising data, data fusion and commercialization in supporting sustainable missions and collaborations.

KEY INSIGHTS

Centralization of data collection and management to effectively track and measure progress towards Sustainable Development Goals (SDGs).

Explore the use of synthetic aperture radar (SAR) and microstructures in satellite technology to detect structural deformities in infrastructure, enhancing safety and resilience.

Develop economic models and procurement agreements to commercialize geospatial data, creating a beneficial ecosystem for both public and private stakeholders.

Create a consortium involving public-private partnerships and academia to develop specialized data fusion and analytics models for each SDG.

Form delicate balance between financial interests and environmental concerns, particularly in areas like climate change and carbon trading, emphasizing the need for sustainable practices.

Fintech, Insurance and Inclusion

The discussion on the intersection of agriculture, geospatial data, and financial inclusion explores the transformative potential and challenges in India's agricultural landscape. Emphasising the critical role of financial inclusion, particularly for small landholders in the agricultural sector, the conversation addresses the challenges of extending credit, the use of satellite imagery for risk assessment, and the importance of data-driven decision-making. The integration of alternative data sets, derived from geospatial information, aims to provide a comprehensive understanding of land capacity, crop performance, and associated risks. The discussion also delves into challenges in crop tracking, data quality, and the imperative of facilitating financial inclusion through macro-level information dissemination. Despite improvements in credit discipline, challenges persist in data granularity, debt restructuring, and reaching unbanked farmers. The collaborative efforts of technology, accurate data, and financial services emerge as key drivers for a transformative evolution in the agricultural sector.

“By harnessing technology, enhancing data quality, and ensuring equitable access to financial services, the agricultural landscape can undergo a transformative evolution, benefiting both farmers and the economy.”

KEY INSIGHTS

Invest in improving the resolution of satellite imagery for more granular data, addressing challenges in identifying and characterising mixed crops, especially in smaller land parcels.

Strengthen collaborations between geospatial data experts, agronomists, and field-level data sources to enhance the interpretation and analysis of data.

Encourage financial institutions to utilize high-resolution satellite data for accurate risk assessment, enabling targeted lending to specific villages and districts, particularly in the agricultural sector.

Incorporate alternative data sources into financial institutions' decision-making processes to broaden financial inclusion and reach unbanked farmers.

Collaborate with banks, insurance companies, and government agencies to disseminate macro-level information to farmers.



- Mr Stephane Chenard, Senior Associate Consultant, Euroconsult
- Mr Pushan Sharma, Director at CRISIL Limited
- Mr Amit Salunkhe, Head of Sales, SatSure Sage

*Left to Right

Demystifying Earth Observation: A Multi-Billion Dollar Market

The discussion on Earth observation (EO) centred on its commercial applications, excluding military uses, emphasising its role in driving socioeconomic development globally and particularly in India. Key points included the launch of Rukmini, the Indian Navy's communication satellite, revolutionising naval communication. The EO value chain and its impact on sectors like agriculture, manufacturing, and insurance were explored. The growth potential in India's private sector, driven by the new space policy, was highlighted. Global collaborations, sustainability considerations, and EO's vital role in achieving Sustainable Development Goals (SDGs) were emphasized. The transformative growth of EO, its economic significance, and the dynamic nature of space were discussed. The role of EO in national security, economic growth, and contributing to the SDGs showcased its multifaceted impact. The discussion concluded by emphasising the need for efficient data management, ground infrastructure, and private sector involvement for India's successful Earth observation endeavours.

"For every one dollar invested in space, the GDP impact ranges from 1.4 to 2.2 times, demonstrating the economic significance of the space sector."

KEY INSIGHTS

Leverage the new space policy to foster the growth of private entities in the Earth observation market.

Explore the introduction of launch-on-demand capabilities for satellites, addressing both defence needs and broader applications.

Advocate for a whole-of-nation approach to creating a national ground station infrastructure, involving private sector participation and advanced technologies.

Encourage investment and focus in the downstream sector to meet specific problem statements and make businesses more scalable.

Establish institutions offering courses in remote sensing and geospatial studies to bridge the skill gap in the EO industry.



- Capt Vishal Kanwar, Executive Director, PwC India
- Mr Arpan Sahoo, COO, KaleidEO,
- Lt. Gen (Dr) AKS Chandele, President-Defence, Internal Security & Public Safety, Geospatial World
- Gp Capt Arvind Pandey (Retd), Senior Fellow, Geospatial Intelligence in Military Operations, Centre for Air Power Studies (CAPS)
- Mr Gagan Agrawal, Founder and Investor, CI- Metrics
- Lt. Col Amandeep Singh, Spatial Domain Expert and Author

*Left to Right

Application enabled by Satellite PNT Capability

KEY INSIGHTS

Establish a competent national authority dedicated to overseeing PNT technology development.

Prioritise the development of indigenous navigation chipsets in India.

Promote standardisation in PNT technology for uniformity and compatibility.

Advance the development of high-precision and stable geodetic-grade antennas.

Accelerate efforts to reduce dependence on foreign entities for critical data access, particularly in defence.



- AVM Rajiva Ranjan, VM, ACAS OPS (Space)
- Mr Manish A Saxena, Director SATNAV-PO, ISRO Headquarters
- Dr Rachit Bhatia, Space Safety Analytics & Research lead, LeoLABS
- Prof Roshan Srivastava, IIT, Tirupati
- Mr Rohan Verma, CEO and ED, MapmyIndia

*Left to Right

“MapmyIndia’s journey to unicorn status exemplifies the vast market potential within the PNT and geospatial industry, surpassing global giants like Google.”

The discussion on Precision Navigation and Timing (PNT) systems underscores their transformative impact on industries, with a focus on the global PNT market’s projected growth to \$8.3 billion USD by 2031. The integration of Global Navigation Satellite Systems (GNSS), such as GPS and NavIC, has revolutionised diverse sectors, ranging from agriculture to 5G technology. Government support, private sector involvement, and emerging applications like Swamitra and 5G integration highlight the sector’s versatility. Challenges and opportunities, including indigenous solutions, signal redundancy, and stable antennas, are addressed. The case study of MapmyIndia exemplifies market potential, innovation, and the significance of indigenous EO satellites. The emerging areas of interest include commercial Low-Earth Orbit (LEO) PNT systems and self-reliance in navigation technology. The panel recommends a competent national authority, standardisation, R&D support, leveraging academia, and international engagement to propel PNT technology forward.



Satcom Use Cases: Leveraging Satellite Communication

Direct to Device

KEY INSIGHTS



- Mr H Rayappa, Director, Satcom PO, ISRO-HQ
- Mr Vivek Kimbahune, Executive Vice President, Saankhya Labs
- Mr Sathya Narayanaswamy, Vice President India, Viasat
- Mr Alexander Jeuck, ICT and SpaceTech Professional

*Left to Right

“ViaSat emphasises a collaborative ecosystem, not a competition between satellite and mobile operators.”

The session on "Direct to Device" explored advancements in handset satellite communication, aiming to enhance affordability and accessibility in challenging environments. Speakers discussed the potential of direct-to-device communication, covering satellite infrastructure's role in bridging digital divides. Key topics included technological challenges, economic projections, and industry leadership. AST SpaceMobile's groundbreaking testing and ViaSat's global impact were highlighted. Saankhya Labs showcased innovations in rural connectivity, and the discussion emphasised the transformative impact of D2D communication. Challenges such as end-user demand, scalability, rapid mobile refresh cycles, and regulatory hurdles were addressed. The evolving business models and the need for spectrum optimisation were explored, emphasising sustainable practices. The discourse unveiled the industry's promise, shaped by strategic choices, technology, and collaboration, showcasing influential figures like Jeff Bezos and Elon Musk driving innovation.

Manufacturers must strategically plan to address the absence of strong end-user demand for satellite connectivity on mobile devices, aligning pricing with perceived value.

Achieving widespread adoption of satellite-enabled devices requires scalability, standardisation, and navigating market dynamics, including competition in the B2B market.

Integrating D2D seamlessly into mobile phones amidst rapid refresh cycles demands adaptation to changing specifications and business models.

Overcoming licencing complexities for D2D services, especially in India, demands strategic solutions and proactive measures to navigate the authorization process effectively.

Startups, such as Numer8, should embrace global scalability ambitions, explore partnerships beyond ISRO, and strategically communicate technology to communities.

Optical Links for Satellite Communications

KEY INSIGHTS



- Mr Pranav Kumar Pandey, Head, Optical Communication System Division, SAC
- Mr Jeremy Rose, Partner, Comsys UK
- Mr Hirokazu MORI, CEO, WARPSPACE USA Inc.
- Mr Nitish Kumar Singh, Co-founder & CEO, Astrogate Labs

*Left to Right

“The key challenges in the proliferation of optical technologies have been described as a ‘double-edged sword’.”

The discussion on optical links for satellite communications emphasised their transformative potential in various applications, including space-based internet connectivity, Earth observation, and remote sensing. Astrogate Lab and WARPSPACE USA Inc. were highlighted for their focus on laser communication systems, catering to low-earth orbit links and Earth observation demands. Challenges, such as precision and reliability in pointing systems, scaling issues, atmospheric disturbances, and regulatory complexities, were explored. The need for synchronisation at higher data rates, data demand in Earth observation, and integration challenges with RF links were identified. The multifaceted nature of optical communication, standardisation efforts, funding concerns, and the importance of practical demonstrations were also discussed, underscoring the evolving landscape and opportunities in the optical communication industry.

Develop sophisticated tracking and control systems to address precision challenges in optical communication, especially in space-to-ground links with moving terminals.

Incorporate advanced pointing, acquisition, and tracking systems within satellite terminals to overcome limitations in maintaining the required pointing accuracy for space-to-ground optical links.

Focus on the development of space-qualified components to manage scaling challenges in optical communication, particularly concerning laser power and receiver sensitivity.

Mitigate vibrations impacting pointing accuracy by addressing challenges posed by moving parts within satellites, such as reaction wheels and thrusters.

Implement meticulous strategies for synchronisation at higher data rates, especially beyond the 1 Gbps threshold, to optimise communication between ground stations and satellite terminals.

Satellite IoT - Playing to its Potential

"Transforming into comprehensive solution providers is essential to increasing market share in the IoT space."

The session on "Satellite IoT - Playing to Its Potential" focused on evaluating the current state and future possibilities of satellite-based IoT and recognising its modest market share despite the vast IoT landscape. The discussion delved into challenges such as terminal costs, bandwidth availability, and regulatory support, emphasising the need for satellite companies to evolve into comprehensive solution providers. Panellists highlighted the importance of a hybrid approach, combining satellite and terrestrial networks, and explored diverse applications in transportation safety, energy efficiency, and healthcare. Key challenges included affordable economics, technical issues, and educating end-users. The conversation concluded with optimism about the evolving satellite communication landscape, emphasising collaboration, partnerships, and a customer-centric approach.

KEY INSIGHTS

Address bandwidth issues and develop weather-resistant IoT terminals for consistent connectivity in diverse environments.

Advance sensor technology and communication protocols to resolve device and connectivity challenges.

Transition from fragmented hardware costs to a system-as-a-service model, requiring adaptive pricing and seamless integration.

Advocate for a supportive and nuanced regulatory framework to facilitate the global growth of IoT services.

Overcome technical challenges within the IoT satellite market, including the Doppler effect, latency, and power consumption.



- Mr Nathan De Ruiter, Managing Director, Euroconsult
- Mr Alexander Jeuck, General Manager, ICT & SpaceTech International
- Mr Gaurav Kharod, Regional Vice President, Asia-Pacific, Intelsat
- Mr Jassem Nasser, Chief Business Development Officer, Thuraya
- Mr Punit Goel, Systems Design Engineer, Hughes Systique
- Mr. Ajay Jain, CEO, Lamhas Satellite Services Ltd

*Left to Right

Opportunities from Multi-Orbit Satellite Broadband

The discussion highlights the transformative impact of multi-orbit satellite broadband in satellite communication, offering a paradigm shift by leveraging constellations in Low-Earth Orbit (LEO), Medium-Earth Orbit (MEO), and Geostationary Orbit (GEO). This approach enhances global connectivity, resilience, and coverage, addressing the limitations of traditional systems. Key trends include software-defined satellites, multi-orbit exploration, inter-satellite links, and increased capacity. Advancements in collaborations, such as the one between Advantech and iDirect, showcase a hybrid constellation approach for unprecedented flexibility. The evolving satellite industry caters to diverse sectors, with a focus on maritime, aviation, rural connectivity, and government applications. Collaboration with OneWeb reflects Hughes Communication India's commitment to bridging the digital divide. The discussion concludes with a vision of diverse hybrid networks, offering flexible connectivity tailored to specific user needs.

"Leo constellations are creating a new market for satellite services that previously didn't exist."

KEY INSIGHTS

Invest in software-defined systems for flexible communication links.

Embrace multi-orbit strategies for improved network resilience and coverage.

Address regulatory challenges to ensure spectrum availability for multi-orbit constellations.

Focus on affordability and user-centric approaches for widespread adoption.

Leverage advancements in satellite technology for diverse applications, including emergency communication.



- Mr H Rayappa, Director, Satcom PO, ISRO-HQ
- Mr Nathan De Ruiter, Managing Director, Euroconsult
- Mr Dharmendra Singh (VP- New Business), Hughes Communications India
- Mr Harsh Verma, Vice President, Sales Asia, SES

*Left to Right

Satcom on the Move - Across Land, Sea and Air

KEY INSIGHTS



- Mr Gaurav Kharod, Regional Vice President, AsiaPacific, Intelsat
- Mr N Jairam, Sr Director Sales and Marketing, Hughes Communications India
- Alexander Jeuck, ICT and SpaceTech Professional
- Mr Kapil Kumar Sharma, Scientist Engineer SG, ISRO

*Left to Right

“The transformative impact of large Leo constellations, integration into 5G and future 6G networks, and rising demand for edge connectivity are collectively shaping the future of satellite systems.”

The session examines the pivotal role of satellite technology in bridging connectivity gaps, focusing on extreme edge cases like deep rural or oceanic locations. Titled "Satcom on the Move across Land, Sea, and Air," the discussion explores the evolution of satellite systems, emphasising the influence of Low Earth Orbit (LEO) constellations. Key drivers of demand in the maritime, aviation, and land domains are scrutinised, emphasising sustainability, operational efficiency, and safety. The panel anticipates a seamless integration of satellite services with terrestrial systems, necessitating automated satellite asset management. The challenges and opportunities in India's maritime and air connectivity domains are explored, shedding light on the industry's positive evolution. The discussion concludes by underscoring efforts in technological advancements, regulatory reforms, and industry collaboration aimed at optimising Satcom spectrum utilisation for efficiency and accessibility in satellite communication.

Innovate to create low-cost Satcom-on-the-Move (SOTM) terminals, enhancing market penetration and accessibility.

Facilitate a paradigm shift towards automated management of satellite assets to seamlessly integrate satellite services with terrestrial systems.

Address challenges in retrofitting existing aircraft for In-Flight Connectivity (IFC) by leveraging the cost reduction potential of Low Earth Orbit (LEO) satellite systems.

Capitalise on the transformative impact of large Leo constellations to meet the rising demand for edge connectivity and integrate with future 5G and 6G networks.

Create awareness about the value proposition of satellite communication in India, emphasising economic considerations, government support, and technological advancements.

Leading with Innovation: Satellites for B2B and B2C Video

KEY INSIGHTS

Embrace pay-as-you-use models and combine satellite technology with other delivery methods for comprehensive solutions.

Focus on adapting to changing consumer behaviours in the B2C space, exploring integrated approaches, and embracing innovations.

Address challenges such as shrinking satellite spectrum through initiatives like Sky CDN and efficient teleport operations.

Explore advanced modes of communication, like 6G satellites, to enhance quality and overcome interference challenges.

Invest in technological advancements like software-defined satellites and mobility solutions for future relevance.



- Mr Sanjay Duda, CEO, Planet Cast
- Mr Rajat Nigam, Group CTO at Network18 Media & Investments
- Shri Sunil, Additional Director General, Prasar Bharti
- Mr Raju Pulgurtha, Senior Sales Director, South Asia, SES
- Mr Rajdeepsinh Gohil, Sales Director, Asiasat
- Mr Thomas Antony, Director Sales, APSTAR

*Left to Right

“Consumers prioritise content accessibility over specific delivery methods, making satellite technology relevant in both B2B and B2C markets.”

The session on "Leading with Innovation: Satellites for B2B and B2C" brought together industry leaders, featuring SRI Sunil of Prasar Bharati as the moderator. Highlighting the transformative role of satellite technology, the discussion covered collaborative efforts driving the exponential growth of the Indian space economy. With the recent approval of Space Policy 2023, increased private-sector participation is emphasized. The session showcased satellite technology's significance in addressing broadband connectivity needs globally, especially in remote areas. Notable applications included the deployment of education channels and B2B collaborations enhancing media services. The evolving landscape was underscored by the impact on maritime operations and the adaptation to smaller, more powerful satellites. The narrative expanded to the media industry's shift from DTH broadcasting to the challenges and opportunities presented by OTT platforms. The dialogue concluded with a positive outlook, emphasising collaboration, innovation, and adaptation for the satellite industry's continued relevance in the dynamic B2B and B2C spaces.

Satellite Mobile Convergence

“The integration of satellite terminals, aligning their waveform and chipsets with 3GPP standards, plays a crucial role in optimising operational efficiency and connectivity.”

KEY INSIGHTS

The discourse on satellite-mobile convergence underscores the transformative phase in satellite technology, driven by rapid innovation and industry evolution. With a focus on providing affordable, resilient, and efficient connectivity, the integration of MEO, LEO, and GEO satellites addresses the demand for constant connectivity, particularly in underserved areas. The evolution of standardisation, notably through 3GPP Release 17, positions satellite technology as a fundamental component of 5G and lays the groundwork for 6G. Policy frameworks, spectrum allocation, and the convergence of non-terrestrial and terrestrial networks play pivotal roles in shaping the future. The discussion emphasises addressing infrastructure challenges, ensuring security and privacy, fostering education and awareness, strategic partnerships, market-specific approaches, adherence to standards and policy frameworks, and a collaborative global approach to spectrum management. Key takeaways include the significance of industry collaboration, policy interventions, and balancing technological advancements with economic feasibility.

Prioritise education and awareness for stakeholders to promote widespread adoption and success of satellite-mobile convergence.

Address security and privacy concerns in data transmission through integrated networks by safeguarding confidentiality and addressing cybersecurity challenges.

Prioritise standardisation and interoperability between satellite and mobile networks for successful convergence, enabling collaborative operation.

Develop a robust infrastructure backbone to ensure the resilience and strength of satellite networks and facilitate effective integration with their mobile counterparts.

Establish a balanced policy framework encompassing spectrum allocation, licencing, regulatory support, incentives for infrastructure investment, and data privacy standards.



- Ms Isabelle Mauro Director General, GSOA
- Mr Sagar Darbari, Partner, Deloitte India
- Mr Prabhat Kumar Sahoo, Centre Head, Hughes Systique Corporation
- Mr Bharat Bhatia, President, ITUAPT Foundation, Vice Chairman World Wireless Research Forum
- Mr Hazem Moakkit, VP-Spectrum Strategy, Intelsat

*Left to Right

Need for a Clear Spectrum Assignment Mechanism

The satellite communication landscape is undergoing transformative changes driven by trends like the rise of large Leo constellations, integration into 5G and future 6G networks, and increased demand for edge connectivity. This evolution spans land, sea, and air communication, impacting defence, surveillance, disaster response, and various industries. The session highlighted challenges and opportunities, emphasising the crucial role of satellite connectivity in emergency response, operational efficiency, and autonomy. Integration into 5G and 6G networks is a key driver, with regulatory considerations and technological advancements playing vital roles. The discussion also delved into spectrum management complexities, emphasising the delicate balance required to meet diverse stakeholder needs while preserving satellite spectrum potential. Concerns about spectrum auctions impacting satellite services were raised, stressing the need for a nuanced approach considering digital inclusion, affordability, and global competitiveness.

“Spectrum allocation should consider both national priorities and international collaboration, recognising the interconnected nature of satellite services that transcend geographical boundaries.”

KEY INSIGHTS

Investigate the potential of low Earth orbit (LEO) satellite systems to reduce costs and incentivize retrofitting of aircraft fleets for in-flight connectivity.

Prioritise efficient spectrum management, especially in higher frequency bands like KU and KA, to meet the growing demand for bandwidth.

Leverage satellite communication for broadband delivery in maritime, aeronautical, and land mobility sectors, emphasising autonomy, communication for the fishing industry, and extended sea connectivity.

Promote industry collaboration to address challenges and unlock satcom spectrum potential, focusing on advanced antenna tracking systems, motion emulator terminal development, and low-cost satcom-on-the-move terminals.

Encourage an integrated approach for network architecture efficiency, considering digital inclusion, affordability, and rural challenges, in the face of potential spectrum auctions.



- Gp Capt Arvind Pandey (Retd), Senior Fellow, Geospatial Intelligence in Military Operations, Centre for Air Power Studies (CAPS)
- Dr Mahesh Uppal, Policy Expert and Director Com First (India) Pvt Ltd
- Ms Laura Roberti, Director of Licensing and Market Access, Telesat Canada
- Mr Hazem Moakkit, VP-Spectrum Strategy, Intelsat

*Left to Right



Technological Advancement in Space Industry

Leveraging Civil-Military Fusion

KEY INSIGHTS

Strategically plan space capability deployment, resolving issues related to satellite launches and payload requirements through coordination between the military and civilian sectors.

Mobilise financial resources to support startups and innovation, following China's model of allocating substantial funds to the space sector.

Establish transparency in budget planning and technology adaptation to facilitate fruitful cooperation between the military and commercial sectors.

Designate points of contact or dedicated spaces for interaction between the military and commercial entities to facilitate smoother collaboration.

Foster an environment of controlled openness and collaboration to benefit both the military and commercial sectors.



- Mr Stephane Chenard, Senior Associate Consultant, Euroconsult
- Air Marshal GS Bedi AVSM, VM, VSM (Retd) former DGIS
- Dr Lt Gen. Vinod G Khandare, PVSM, AVSM, SM (Retd) Principal Advisor, Ministry of Defence
- Prof. Chaitanya Giri, Associate Professor, FLAME University, Editor, Interstellar_Go & Consultant RIS

*Left to Right

“In the rapidly changing geopolitical environment, safeguarding technological advancements is imperative.”

The discourse on civil-military fusion in India's space industry navigates the evolving landscape of space technologies, emphasising the integration of national military power and civilian capabilities. The burgeoning space sector, estimated to reach \$50 billion, underscores the pivotal role of the defence sector. Key focuses include practical applications like ISR and imaging technologies, necessitating educational initiatives for expertise development. Coordination between the military and civilian sectors is imperative, particularly in space situational awareness. The discussion explores the shift from secrecy to collaboration, with military involvement in civilian missions and a growing emphasis on cybersecurity. Space startups, which draw inspiration globally, face the challenge of aligning with international interests. The establishment of the Defence Space Agency (DSA) and the balance between military involvement and national security are critical, requiring efficiency, transparency, and collaboration for success.

Next-gen Innovation in the Ground Segment

KEY INSIGHTS



- Dr V K Anandan, Dy Director, ISTRAC, ISRO
- Mr John Saripally, Managing Director, ComSat System
- Mr Niket Bhatt, Co-founder & Executive Director, Digitron DefSpace Pvt. Ltd
- Mr Riaz Lamak, President, Mahdi Bagh Computers Private Limited
- Mr R K Singh, Managing Director, LeafSpace (US)

*Left to Right

"QuadSat is the world's first on-site antenna test and monitoring solution, backed by leading investors and trusted by major space organisations.

The evolution of the space industry, marked by the growth of private players and ambitious economic targets, has necessitated a paradigm shift in ground segment technology. Addressing challenges in antennas and infrastructure, the discussion highlighted the importance of a robust ground segment for satellite constellations and deep space exploration. Antenna innovation trends, such as higher frequency bands and phased-array monitoring, were explored. Notably, QuadSat's groundbreaking drone-based solution for antenna testing and validation was introduced, showcasing its impact on ensuring seamless access to the radio spectrum. The conversation emphasised collaboration, adaptability, and the transition to ground systems as a service. Overall, the dynamic landscape calls for resilient, interconnected systems to support the increasing number of satellites, underscoring the pivotal role of ground stations in the digitization of satellite movements.

Embrace higher frequency bands (Ku, Ka, Q, and V) to support growing Satcom demand and enable higher data rates.

Leverage Acer Technologies for flexible tracking of multiple satellites simultaneously and adaptive radiation patterns.

Adopt phase-ray radar antennas for agile beam steering, high-speed scanning, and advanced signal processing in satellite tracking.

Promote the use of wideband and multiband antennas to efficiently utilise the available spectrum amid the rising number of satellite constellations.

Implement advanced signal processing and beamforming techniques to mitigate interference and enhance satellite communication capacity.

Cyber-Security for Space Operations

This session delves into the critical role of robust cybersecurity in safeguarding space infrastructure and satellite systems. The discourse emphasises collaboration among space agencies, industry stakeholders, and cybersecurity experts to formulate effective strategies for space operations. Addressing the evolving challenges in the dynamic space environment, the discussion explores satellite vulnerabilities, the potential consequences of cyberattacks, and the impact of technologies like 5G and 6G. It underscores the need for rapid responses to space threats, the vulnerabilities stemming from the commercialization of low Earth orbit, and the interconnectedness of space and cyberspace. The session also highlights the unique challenges of space cybersecurity, ranging from legacy satellite systems to the increasing complexity of technology. The conversation stresses the indispensable role of cybersecurity in enhancing national security and economic interests and the imperative need to protect critical infrastructure networks.

"As space technology continues to advance and the world becomes increasingly reliant on satellite systems, it has become paramount to recognise space cyber threats as significant political risks and to invest in proactive measures to ensure the security, resilience, and sustainable growth of our ventures in the cosmos."

KEY INSIGHTS

Implement secure-by-design principles and certification processes for all organisations operating in the space sector to prioritise security over speed and profitability.

Establish auditors with domain knowledge in the space sector to conduct effective space cybersecurity audits, considering the unique protocols and knowledge required.

Foster the use of open-source technologies and encryption systems to fortify cybersecurity within the space sector.

Create cybersecurity standards and certification mechanisms for products used in space, emphasising the integrity and intent of organisations in the supply chain.

Establish dedicated Information Sharing and Analysis Centres (ISACs) specific to the space sector to promote the exchange of best practices and enhance information sharing.



- Lt. Col Amandeep Singh, Spatial Domain Expert and Author
- Mr Davesh Singh, PWC India
- Col KV Kuber, E&Y
- Mr Rajiv Chetwani, Chief Information Security Officer, DOS/ ISRO, Director, DISM, ISRO
- Mr Narendra Nath, Joint Secretary National Security Council Secretariat, GOI
- Mr Suhas Gopinath CEO, Globals Inc

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Above the Karman Line - Leveraging Microgravity

The session outlined satellite technology's transformative impact in both business-to-business (B2B) and business-to-consumer (B2C) domains. Focused on India's evolving space sector, key players discuss satellite contributions to the growing space economy, emphasising private sector involvement and government support per India's Space Policy 2023. The versatility of satellites in addressing connectivity needs in remote areas is highlighted, with applications ranging from education channels to maritime services. The text delves into the evolving landscape of content delivery, spanning from traditional broadcasting to emerging trends in consumer-centric content consumption. Innovation, collaboration, and adaptability emerge as key themes, shaping the satellite industry's future. The narrative extends beyond Earth, exploring space experiments, platforms like the Orbital Reef, and the progress of India's space missions, emphasising the industry's dynamic and resilient role in shaping global connectivity and exploration.

"With an eye towards the future, satellite technology remains not only relevant but also a driving force in shaping the trajectory of communication, exploration, and commercialization in space."

KEY INSIGHTS

Collaborate in both B2B and B2C sectors to drive efficiency and growth, as seen in partnerships like Network 18 Media and SES.

Explore High Throughput Satellites (HTS) for cost-effective broadband connectivity solutions in B2B.

Adapt to changing consumer behaviours and preferences, especially in the B2C space, by embracing satellite-based internet services and OTT platforms.

Innovate in content delivery for both B2B and B2C, addressing challenges like latency and evolving industry needs.

Explore collaborations and initiatives in the satellite industry, such as Sky CDN, to overcome challenges like spectrum constraints.



- Prof Sathyan S, IIT Madras
- Mr Xavier Raja, Deputy Director, ISRO
- Mr Kohei Yoshioka, Co-CEO & CFO, IDDK Co., Ltd
- Mr Ajay Kumar, Founder & CEO, Vellon Space
- Mr George Weinmann, Sr, Director, Blue Origin
- Mr Sebastian Klaus, CEO, Klaus Space Transportation GmbH

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Innovation in Spacecraft Design and Manufacturing

KEY INSIGHTS

Embrace lightweight materials and additive manufacturing for spacecraft construction.

Implement AI and computer-aided design for cost-effective and efficient satellite development.

Explore innovative satellite designs with specific functions and a focus on Leo orbit utilisation.

Transition from traditional machining to 3D printing for increased efficiency and reduced costs.

Investigate the economic viability of the Lego mode of vertical satellite building in space.



- Mr Rajiv Sinha, Group Director, TSTG, IISU, VSSC
- Mr Gurvinder Chohan CEO & Founder QSTC
- Mr Manu J Nair, Co-Founder & CEO, EtherealX

*Left to Right

“Innovation in spacecraft design involves addressing economic viability, satellite lifespans, and in-space manufacturing challenges.”

The session on spacecraft construction and satellite technology evolution presented a transformative journey in the space industry. Advancements in materials, manufacturing processes, and automation are reshaping satellite design, enabling cost-effective and efficient solutions. From a shift towards lightweight materials like composites and 3D printing to a remarkable reduction in satellite realisation time through automation, the landscape is evolving rapidly. The discussion delved into the economic viability of innovative approaches, such as the Lego mode of vertical satellite building, emphasising its advantages and challenges. Lifespan considerations, in-space manufacturing limitations, lunar resource utilisation, and the involvement of private players were crucial themes. The conversation concluded with insights into the economic challenges faced by Starlink and reflections on strategic approaches to intellectual property in the evolving space industry.

OSAM: Transforming Space Operation and Exploration



- Dr Joji Chaman, Deputy Director, Spacecraft Inertial Systems, IISU, VSSC
- Mr Thomas Carroll, Manager, Business Development Space Logistics LLC
- Mr Sakthikumar R, Founder & CEO, OrbitAID Aerospace Pvt Ltd
- Mr Navin Gopal, Vice President of Strategy & Business Analysis, Astroscale

*Left to Right

“OSAM strives to remain versatile and adaptable to different spacecraft configurations, maintaining the capability to service a diverse array of spacecraft.”

The discussion centres on OSAM's pioneering efforts in advancing space operations, with a focus on a revolutionary refilling and docking mechanism weighing under 350 grams. OSAM's commitment extends to payload applications, repeller innovations, and strategic collaborations with partners like Orbital Fab and DARPA. The organisation actively engages in space qualification tests and propellant transverter development and offers its robotic arm expertise to ISRO. Standardisation challenges in the global space market are addressed, emphasising adaptability. The conversation delves into upgrading components in space, assembling components, cooperative satellites, and the urgent need for space debris cleaning technology. The economic viability of extending satellite life and the market dynamics of debris removal in GEO and LEO orbits are explored, highlighting strategic considerations.

KEY INSIGHTS

Develop and deploy refuelling pods for last-mile fuel delivery to minimise spacecraft downtime.

Emphasise the role of autonomous robotic systems for various tasks, incorporating docking capabilities and AI for trajectory planning.

Address standardisation challenges in the space market, particularly concerning adapters and interfaces, with foresight and adaptability.

Research and standardise interfaces for Xenon electric propulsion, considering complexities and higher pressure requirements.

Investigate strategies for upgrading components in space, addressing challenges posed by radiation and thermal shielding.

The Quantum Leap

The session on "The Quantum Leap" delved into the transformative potential of quantum technologies in the satellite industry, focusing on quantum communications and spectrography. The panel explored the revolutionary capabilities, emphasising secure communication links and enhanced data protection. Satellite-based quantum communication was highlighted as a solution for overcoming Earth's curvature and signal attenuation, with potential applications in healthcare, banking, and defense. Ongoing projects, such as India's Quantum Experiments with Satellite Technology (Quest), were discussed, showcasing advancements in Quantum Key Distribution (QKD). The discussion also touched upon AI and machine learning applications in satellite data processing. The later part of the article shifted to OSAM's contributions to space operations and exploration, detailing their innovative refuelling mechanisms and collaborative efforts. The global nature of the space market, challenges in standardisation, and the importance of space debris mitigation were also explored.

"The potential market for debris removal in LEO is driven by the need for multiple missions requiring substantial fuel refuelling."

KEY INSIGHTS

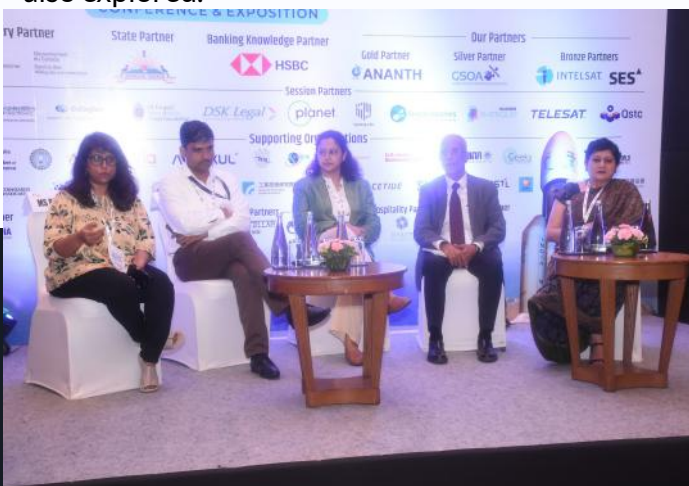
Explore satellite-based quantum communication solutions to address challenges posed by Earth's curvature and signal attenuation in traditional methods.

Collaborate on international projects for Quantum Key Distribution (QKD) to establish secure quantum communication links.

Actively engage in AI and machine learning applications for processing large volumes of satellite data in sectors like logistics, transportation, and disaster recovery.

Develop a hybrid High-Performance Computing (HPC) infrastructure integrating classical and quantum computing for efficient problem-solving.

Invest in the development of versatile and adaptable robotic systems for on-orbit servicing, including refuelling and payload upgrading.



- Ms Reena Dayal, CEO, Quantum Ecosystems and Technology Council of India
- Mr Pankaj Kumar Gupta, Head, QEPD, ISRO
- Dr Anindita Banerjee, Adjunct Scientist Corporate R&D, C-DAC
- Capt Sud, Qnu Labs
- Dr Rohini Srivathsa, National Technology Officer, Microsoft

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Innovative Approach to the Space Sector Insurance

The discussion on space insurance navigated the complexities of the industry, offering insights into key players, types of coverage, market dynamics, and strategic approaches. Gallagher, a global insurance broker, was highlighted for its pivotal role, employing a team of aviation specialists with extensive experience in space insurance. The discourse covered the roles of insurers, reinsurers, and brokers, emphasising that brokers like Gallagher facilitated negotiations and coverage without assuming risk. Insights into market performance, challenges, and the evolving landscape provided a comprehensive view. Startups' challenges, the importance of risk management, and the need for innovation in insurance methods were underscored. The evolving nature of space activities prompted a discussion on a portfolio approach and the role of insurers in supporting emerging ventures.

"The marketplace for space insurance encapsulates the cumulative capacity of all underwriters worldwide, offering coverage for various space risks."

KEY INSIGHTS

Prioritise Non-Disclosure Agreements (NDAs) and select a broker of record for efficient and competitive market engagement during insurance procurement.

Emphasise early sharing of technical details like programme overviews, payload information, and contract analyses to streamline the claims process.

Build relationships with insurers through tailored policies, generating competition, and negotiating premiums based on factors like launch vehicle heritage and experience.

Stress the importance of accurately determining the extent of damage for insurance claims, especially in scenarios like deployment failures or collisions, to ensure fair compensation.

Understand and adapt to market conditions, recognising the impact of commercial conditions, industry losses, and broker expertise on premium negotiations.



- Mr Nathan de Ruiter, Managing Director, Euroconsult
- Mr. Nikhil Kulabkar, Associate Director at Edelweiss Gallagher Insurance Brokers Ltd.
- Mr Darshan Parikh, Senior Vice President, Facultative Reinsurance & Marine Practice Leader, Marsh India
- Mr Keyur Gandhi, Regulatory and Legal affairs, Dhruva Space

*Left to Right

May the (F=mdv/dt) Be With You

KEY INSIGHTS

Invest in the development of efficient and reliable energy engines, thrusters, fuels, and propulsion systems to drive advancements in space exploration.

Explore diverse propulsion systems, including chemical, electric, and nuclear, considering their advantages and limitations for different space missions.

Focus on future technologies like composite tanks, additive manufacturing, and green propulsion to enhance spacecraft development and extend deep space exploration.

Emphasise reusability in space ventures as a game-changer for market dynamics, taking cues from successful models like SpaceX.

Explore the revolutionary potential of Starship and its impact on traditional satellite deployment timelines, emphasising the need for regulatory frameworks and logistical solutions.



- M Mr AP Baiju, (Group Head, HSWG-LP), ISRO
- Dr Arindrajit Chowdhury, CEO, Inspecity & Professor, Indian Institute of Technology, Bombay
- Mr Prashanth Sharma, Co-Founder, EtherealX
- Mr Tushar Jadhav, Co-founder, Manastu Space
- Mr Manu J Nair, Co-Founder & CEO, EtherealX
- Mr Thomas Carroll Manager, Business Development Space Logistics LLC

*Left to Right

"Collaboration, innovation, and risk mitigation underscore that the collective journey towards the future of space exploration is a collaborative and dynamic endeavour."

The session titled "May the Force Be with You" explored the dynamic landscape of space exploration, focusing on propulsion systems, future technologies, spacecraft development, and the role of private players. It emphasised the advancements in propulsion, including chemical, electric, and nuclear systems, foreseeing a shift towards green propulsion. The future outlook highlighted innovations in micro-electro-mechanical systems (MEMS) propulsion, high-thrust heavy-lift launch vehicles, and locksmithing engines. The integration of private players, such as EtherealX and Manastu Space, showcased their contributions to the evolving space industry. The session concluded with a commitment to advancing technology and nurturing high-end technical skills in India, while the subsequent discussions explored market dynamics, technological advancements, and the impact of new entrants like EtherealX. The final sessions unveiled the synergies between satellites and drones, their applications in various domains, and their collaborative potential for innovative solutions.

Satellites and Drones: Sparring Synergies & Synergistic Innovations

The session titled "Satellites and Drones: Sparring Synergies and Synergistic Innovations" explored the transformative integration of satellites and drones, revolutionising industries with enhanced capabilities in data collection, analysis, and decision-making. While satellites focused on diverse applications like agriculture and disaster monitoring, drones, categorised into various types, excelled at specific tasks based on their design. The Northeastern Space Application Centre showcased the successful utilisation of UAVs in diverse applications, from mapping to disaster relief. The integration of satellite and drone data emerged as a powerful approach, overcoming limitations and emphasising autonomy, accessibility, and cost-effectiveness. The discussion extended to collaborations between satellites and drones in various sectors, including agriculture and disaster management. The challenges of weather prediction and the importance of transitioning to autonomous machine operations were highlighted, stressing the need for collaboration and regulatory adaptation.



"Drones, especially combat unmanned aerial vehicles, play a crucial role in contemporary military operations, providing surveillance and filling gaps where satellites fall short."

KEY INSIGHTS

Promote the use of drones in agriculture sensing to complement traditional surveillance and satellite data, providing detailed insights for precise monitoring of crop health.

Invest in the development of hybrid UAVs to address challenges in challenging terrains, providing a versatile solution for different landscapes.

Investigate the feasibility of incorporating GPS technology in drone operations to explore valuable resources beneath the surface, such as gold deposits.

Foster collaboration between disaster management authorities and technology providers to enhance situational awareness through mock exercises and real-time response capabilities.

Advocate for a shift from human-dependent to autonomous machine operations to enable diverse applications and improve scalability, consistency, and cost-effectiveness.

- Mr. Riaz Lamak, President, Mahdi Bagh Computers Private Limited
- Dr SP Agarwal, Director NESAC
- Air Marshal GS Bedi, AVSM, VM, VSM(Retd), Former DGIS
- Grp Capt MJ Augustine, VSM (Retd)
- Mr Naveen Chittilapilly, CTO, Augsenselab Pvt Ltd

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Mankind to Moonkind- Humanity's Future in Space

The panel discussion, "From Mankind to Moonkind: Paving the Future in Space," showcased the diverse perspectives driving humanity's exploration of space. Representatives from ISRO, Blue Origin, and QSTC revealed insights into the Gaganyaan mission, lunar exploration plans, and lunar mining ambitions. ISRO emphasised meticulous planning for human space programmes, addressing life support and physiological challenges. Blue Origin outlined its role in the Artemis programme, unveiling a reusable lunar lander and stressing sustainability in lunar exploration. QSTC's vision focused on lunar mining, proposing a mining colony on the Moon by 2035. Collaboration emerged as a central theme, with the panellists highlighting international partnerships and the shared commitment to advancing humanity's presence beyond Earth. The discussion illuminated tangible goals of space habitats, lunar mining, and sustainable exploration, marking a transformative shift from Earth-centric to Moonkind and initiating an extraordinary odyssey into the cosmos.

"The dreams of space habitats, lunar mining, and sustainable exploration are no longer confined to science fiction but are becoming tangible goals within our reach."

KEY INSIGHTS

Foster international partnerships to share resources, knowledge, and technologies for more ambitious space missions.

Prioritise sustainability in lunar exploration, as demonstrated by Blue Origin's commitment to reusable lunar landers and innovative fuel use.

Explore intersections between terrestrial industry and lunar mining technologies for a comprehensive lunar ecosystem.

Establish open collaboration platforms to facilitate the global sharing of scientific data, research findings, and technological advancements.

Encourage partnerships between government space agencies and private companies to drive innovation and expand the scope of space exploration.



- Mr George Weinmann, Sr, Director, Blue Origin
- Shri Imtiaz Ali Kha, Director of Human Space Programme Directorate (DHSP), ISRO
- Mr Gurvinder Chohan CEO & Founder QSTC
- Mr Pallava Bagla, Science Journalist

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Key Recommendations

As we navigate the ever-evolving landscape of space exploration, ISC 2023 has yielded transformative insights across crucial domains that are set to shape the future of space endeavours. The recommendations deduced from the conference is listed below:

Issue	Recommendation
<h2>Policy and Regulation</h2>	
<p>Enhance India Space Policy Framework</p>	<ul style="list-style-type: none"> • Align Vision with Global Best Practices with short, medium, and long-term goals, drawing inspiration from successful approaches in space-faring nations, particularly the United States. • Establish a dedicated legal directorate with In-Space to oversee legal aspects of space activities and consult on robust data security measures. • Focus on maximising societal impact by ensuring inclusive data access, with a specific emphasis on sectors like agriculture, insurance, and banking. • Evolve the existing comprehensive space policy into sector-specific and detailed frameworks that cater to the unique needs of various industries. • Address the critical interplay between data security and national security, especially in the realms of satellite communication and remote sensing. • Simplify the authorisation process by providing clear guidelines, enhancing transparency, and establishing a fair appeals mechanism to promote efficiency. • Develop standard operating procedures for different verticals within the space ecosystem, including remote sensing, satellite communication, and human space flight. • Implement regulatory aggregation to consolidate guidelines and policies from multiple departments into a unified reference source, facilitating easier navigation for industry stakeholders. • Ensure the prompt implementation of Earth observation guidelines and technology transfer policies to harness the full potential of space-based technologies. • Set specific time-bound targets for India to capture a significant share of the global space economy, mirroring the approach of other leading nations. • Facilitate collaboration between the Department of Space, ISRO, In-Space, Meity, Ministry of Agriculture, and Ministry of Finance to create a unified and coherent space policy framework.
<p>Spectrum Assignment and Regulatory Framework</p>	<ul style="list-style-type: none"> • Ensure spectrum allocation decisions recognise the shared nature of the satellite spectrum, which is crucial for addressing connectivity gaps, especially in remote area. • Establish a transparent, tech-specific spectrum assignment mechanism, addressing the impact of large Leo constellations, integration into 5G/6G networks, and the rising demand for edge connectivity. • Emphasise efficient management in higher frequency bands (KU and KA) to meet bandwidth demands. Address global concerns about interference in satellite communication on the move through standardised procedures.

	<ul style="list-style-type: none"> • Exercise a balanced approach in spectrum assignment, considering digital inclusion, affordability, and rural challenges. Evaluate the potential impacts of auctioning the satellite spectrum. • It is imperative to assess the economic viability, technical feasibility, and regulatory impact of spectrum allocation decisions. This study, inclusive of stakeholder consultation and risk assessment ensures well-informed choices that align with industry needs and foster the sustainable growth of satellite communication services in India.
Space Bill	<ul style="list-style-type: none"> • A Comprehensive Space Act is essential to provide a clear legal framework for India's space activities and should cover diverse aspects, including international obligations, a level playing field for private entities, and balancing national aspirations with public interests. • This aspect will accelerate innovation and growth in satellite manufacturing, launches, and space-based services while safeguarding both public and commercial interests. • To provide a structured framework and accommodate the autonomous functioning of a regulator (similar to In-SPACe) to guide private participation. • Collaborate among ministries to draft the contours of the Space Activities Bill. Foster synergy between regulators, the private sector, and industry-wide collaboration. • Provide regulatory certainty for space insurance by establishing clear frameworks that address emerging challenges, such as damage disputes between space objects.
Third Party Liability Rules	<ul style="list-style-type: none"> • Collaborate with legal experts, insurers, and international organisations to establish clearer frameworks/rules for determining responsibility and resolving disputes. • Facilitate collaborative efforts between the government, private enterprises, and research institutions to develop and implement risk mitigation strategies. • Organise industry-wide learning initiatives, seminars, or conferences focusing on risk management in the space sector. Promote knowledge-sharing and best practices to enhance the overall risk management capabilities of stakeholders. • Consider the establishment of an advisory body or task force comprising experts from the legal, insurance, and space sectors. This body can provide ongoing recommendations, advice, and assessments related to third-party liability rules and risk management strategies, ensuring a dynamic response to evolving challenges.
Foreign Direct Investment	<ul style="list-style-type: none"> • Liberalise regulations to attract more funding from venture capitalists and simplify FDI processes. Liberalising domestic investment regulations is crucial for enhancing India's startup ecosystem and fostering international investor confidence. • Simplifying FDI processes and regulations attracts more funding, supporting the growth of the space industry.
Digital India and Broadband Policy	<ul style="list-style-type: none"> • India's Broadband Policy must focus on an optimal mix of technologies. • For many rural and remote communities in India satellites are the only connectivity option. • Under the BharatNet project, satellite-based digital/broadband connectivity has already been provided at about 4351 sites out of the planned 7000 sites. The remaining can be considered for satellite-based connectivity.

<p>IFMC Policy</p>	<ul style="list-style-type: none"> • Maritime, Aviation, and Land Connectivity: Address challenges and opportunities in providing connectivity to extreme edge cases. • Discuss the demand for satellite services in maritime, aviation, and land domains. • Explore sustainability, operational efficiency, and safety measures in maritime services. • Seamless integration of satellite services with terrestrial systems. • Address challenges and growth in Satcom on the Move (SOTM) applications, including disaster response and high-resolution surveillance.
<p>Civil-Military Fusion</p>	<ul style="list-style-type: none"> • Clearly define the strategic vision for India's military space program. Balance military involvement in the commercial space sector with transparent budget planning and alignment with broader defence objectives. • The dual-use nature of space technology, with applications in both the civilian and defence sectors, has historically complicated regulatory processes. The Government needs to foster a balanced approach to address security concerns while promoting industry growth.
<p>Demand Creation for Downstream Products and Services</p>	<ul style="list-style-type: none"> • Domestic demand for space-related products and services is crucial. Encourage government departments to embrace satellite data analytics and actively involve the private sector. • Policies should be designed to stimulate the growth of downstream analytics companies, fostering a robust domestic market. • Highlight existing government initiatives encouraging ministries and departments to leverage space technology for societal benefits. • Showcase Earth's observation potential in contributing to broader goals and serving the common good. • Advocate for policy measures to address satellite data costs and ensure that startups can access essential satellite data at competitive rates. • Encourage Midstream and Downstream entrepreneurs for holistic industry growth.
<p>Quantifying the Indian Space Economy</p>	<ul style="list-style-type: none"> • India lacks satellite accounts, hindering a connected framework with central accounts. Recommendations include conducting a detailed quantitative analysis, defining space economy sectors, adopting a satellite account aligned with the US BEA framework, boosting space sector funding, evaluating both direct and indirect impacts while determining the net value, and accounting for any negative consequences. • Highlight positive economic projections that attract investments in the space sector, emphasising the potential for economic growth and international collaboration. • Develop a comprehensive 30-year plan for the commercial space sector, subdivided into ten-year segments with clear objectives, potentially further divided into five-year milestones.
<p>ITAR Reform Advocacy</p>	<ul style="list-style-type: none"> • ITAR imposes stringent regulations on the export of defence-related articles and services, creating operational challenges for space startups, particularly hindering global operations. • Advocate for comprehensive reforms in ITAR to simplify regulations, alleviating the burden on space startups. The focus should be on making international operations more agile and less cumbersome.

<p>ITAR Reform Advocacy</p>	<ul style="list-style-type: none"> • Engage in diplomatic efforts to address international concerns related to ITAR. Foster collaborative discussions and negotiations to create a global environment that is more conducive to the needs of Indian space startups. • Outcome Goal: The objective is to facilitate smoother international operations for space startups by ensuring that ITAR regulations are streamlined and adapted to the evolving dynamics of the space industry.
<p>Regulatory Framework for Space Traffic Management</p>	<ul style="list-style-type: none"> • Establish a regulatory framework that addresses the challenges of space traffic management, including the proliferation of satellites and cubesats. • Enforce regulations that promote a cautious approach to the launch of educational and scientific cubesats, considering their potential impact on crowded orbits. • Develop a strategic vision for the country's space sector, emphasising sustainability, safety, and international cooperation.
<p>Policy Framework for Disaster-Resilient Development</p>	<ul style="list-style-type: none"> • Formulate and implement policies that integrate satellite-based early warning systems into disaster-resilient development planning. • Develop regulations that encourage the incorporation of satellite technology in infrastructure planning to mitigate the impact of disasters. • Facilitate collaboration between satellite and drone technologies in disaster management.
<p>Self-Reliance in Navigation and Timing Technology</p>	<ul style="list-style-type: none"> • Reinforce the importance of self-reliance in navigation and timing technology. Encourage the active role of defence forces in funding and driving the development of strategic and defence-oriented technologies. Support efforts to reduce dependence on foreign systems.
	<h1>Technology / Infrastructure</h1>
<p>Enhanced Access to Testing Facilities</p>	<ul style="list-style-type: none"> • Develop more accessible pathways for startups to utilise testing facilities, reducing delays and financial burdens associated with gaining permission and usage rights. • Implementing a robust scheme modelled after the successful Defence Testing Infrastructure Scheme (DTIS) for the space industry as the "Space Industry Testing Infrastructure Scheme (SITIS)" for Accelerated Growth. This initiative will not only expedite access to essential testing facilities but also catalyse critical investments necessary for the sector's growth in the coming decade. Similar to the DTIS, allocating an initial budget of Rs 400 crore over five years, with 75% government funding for the testing infrastructure, and the remaining 25% shared by implementation agencies, state governments, or private entities, will be pivotal in supporting the deep tech sector's expansion. • Provide transparency regarding government facilities accessible to startups, offering practical examples rather than cumbersome documentation.

<p>Satellites for Disaster Management</p>	<ul style="list-style-type: none"> • India, being highly disaster-prone, must integrate advanced satellite technologies for effective disaster management. Early warning systems, aided by decision-making analytics and space-based sensors, are critical for timely alerts and impact mapping. • Satellites are essential for assessing infrastructure and environmental damage, monitoring response effectiveness, and coordinating search and rescue operations. However, India faces challenges due to its vulnerability to various natural hazards and a lack of optimal utilisation of satellite technology. • To address this, adopting global best practices and leveraging satellite capabilities is imperative, aligning with the United Nations Office for Disaster Risk Reduction's emphasis on the pivotal role of early warning systems in reducing disaster impact. Early warnings issued 24 hours in advance can significantly reduce disaster-induced damage by 30%.
<p>Call for Advanced Satellite Technology Investment in Agriculture</p>	<ul style="list-style-type: none"> • Invest in higher satellite data resolution for accurate yield predictions, crucial for India's small land parcels. Boost digital infrastructure for improved data collection and accessibility for farmers. • Develop a holistic AgriTech ecosystem through public-private partnerships. Ensure farmer-centric, scalable solutions with training initiatives for diverse technological resources. Explore B2G2C models to maximise outreach through government channels, local bodies, and community groups. • Encourage collaboration between satellite tech providers, credit rating organisations, and financial institutions. Develop cutting-edge risk assessment models to facilitate credit access for small and marginal farmers
<p>Centralized Data Management for SDGs</p>	<ul style="list-style-type: none"> • Centralization of data collection and management to effectively track and measure progress towards Sustainable Development Goals (SDGs). • Foster collaboration between public and private entities for the development of specialised data sets for each SDG.
<p>Enhanced Access to Testing Facilities</p>	<ul style="list-style-type: none"> • Whole-of-nation approach for ground station infrastructure. • Address the need for ground station infrastructure and efficient data pre-processing. • Encourage private sector participation in setting up ground stations. • Explore advanced technologies like inter-satellite links and space-to-ground laser communication.
<p>Cyber Resilience</p>	<ul style="list-style-type: none"> • There is a need for enhanced cybersecurity measures to address potential cyber threats in both military and commercial satellite systems.
<p>Support for Navigation Technology Development</p>	<ul style="list-style-type: none"> • Encourage private sector involvement in navigation technology development through initiatives like gap funding. Acknowledge the role of non-governmental entities in driving innovation and expanding PNT applications. • Support continuous research in PNT technology to align with India's unique needs. Address identified gaps, including the development of RTK-enabled firmware, stable geodetic-grade antennas, open-source positioning software, and indigenous NavIC chips. • Enhancement of PNT signals, particularly those transmitted on the L5 and S bands of the NavIC system. Focus on strengthening signals through ground-based systems and multi-layer approaches to ensure reliability in various domains and applications.

	<ul style="list-style-type: none"> • Encourage open-source initiatives to provide free and accessible mapping data, contributing to the democratisation of geospatial information. • Emphasise the imperative need for indigenous solutions, including local manufacturing of navigation chipsets. Encourage self-reliance in navigation and timing technology, reducing dependence on foreign entities, especially during critical situations. • Support the development of high-precision and stable geodetic-grade antennas to advance the accuracy and dependability of PNT technologies.
Quantum Technologies	<ul style="list-style-type: none"> • Foster collaboration among government agencies, research institutions, and private enterprises to expedite quantum technology development in satellite communication. • Allocate specific resources and funding for quantum technology research, emphasising quantum communication and spectrography for satellites. • Back projects related to satellite-based Quantum Key Distribution (QKD) and quantum communication to ensure secure and efficient data transfer. • Provide financial and infrastructural support for initiatives like India's Quantum Experiments with Satellite Technology (Quest) to establish secure quantum communication. • Recognise and support organisations like the Quantum Ecosystem and Technology Council of India (QE TCI), which advocates for the quantum technology ecosystem.
Propulsion technology	<ul style="list-style-type: none"> • Support initiatives that focus on advancing propulsion technologies for both launch vehicles and satellites. • Allocate resources for research and development in efficient and reliable energy engines, thrusters, fuels, and propulsion systems. • Consider incentives or policies that encourage the adoption of eco-friendly practices in space exploration. • Develop regulatory frameworks for the integration of reusable technologies, considering their game-changing impact on market dynamics. • Address challenges related to rapid satellite deployment and associated regulatory and logistical complexities.
Drone Technology	<ul style="list-style-type: none"> • Invest in the development of drone-friendly infrastructure, including designated drone ports and airspace management systems. • Collaborate with technology providers to create testing environments for drones before widespread application.
	Finance / Funding
Funding Support for Startups	<ul style="list-style-type: none"> • Unlike some international counterparts, Indian startups have limited access to government grants and programmes that can provide substantial early-stage funding. While smaller grants ranging from five lakhs to ten lakhs are available, there is a notable absence of substantial grants required to prove the feasibility of space technologies and demonstrate their potential.

	<ul style="list-style-type: none"> • To address this gap, there is a growing need for more extensive government initiatives like iDEX to provide larger-scale funding opportunities. • Introduce specific financial instruments or funds that provide venture debt support to deep-tech startups. This can offer an alternative to traditional equity financing, supporting startups during their growth phases. • Establish an incentive scheme within the IFSC, providing grants to Space Tech companies setting up operations, fostering innovation, and collaboration between the space sector and the financial industry. • Explore the possibility of creating Alternate Investment Funds (AIFs) focused on space technology within the IFSC, offering favourable regulatory conditions to attract investors supporting long-term space projects. • Focus on the IFSC's role in supporting space technology and the financial sector, creating opportunities for domestic and international space technology companies to leverage the benefits of this innovative financial centre.
<p>Investment in Advanced Mapping Technologies</p>	<ul style="list-style-type: none"> • Encourage investment in advanced mapping technologies, such as high-definition, 4D digital maps. Recognise the potential applications of these technologies in diverse sectors, including ADAS, missile guidance, and drone technology. • Promote collaborations between companies like MapmyIndia and ISRO and meteorological agencies like IMD. Highlight the adaptability and potential of Navic technology, especially in areas with limited cellular connectivity.
	<h1>Taxation</h1>
<p>Tax Incentives to promote Deep Tech R&D</p>	<ul style="list-style-type: none"> • Recommend the creation of targeted tax incentives and investment-friendly policies to stimulate private sector participation in high-risk ventures related to deep tech R&D. • Suggest an extension of the tax vacation period for deep tech startups to at least seven years, accompanied by simplifying the process for startups seeking tax exemptions. • Recommend extending customs duty exemption to Tier-1 and Tier-2 contractors and sub-contractors involved in Department of Space projects. • Recommend allowing a refund of GST on capital goods for startups with limited revenues to optimise their financial flow during the research and development phase.
	<h1>International Collaboration</h1>
<p>Export Promotion</p>	<ul style="list-style-type: none"> • Aspire to increase India's space exports from \$400 million to \$10 billion by 2033-34. Focus on the downstream sector, particularly in Earth observation applications, big data analytics, and AI/ML, to unlock the full potential of space exploration. • Implement effective export promotion policies, streamline business procedures, and conduct extensive outreach programmes to encourage increased industry engagement.

<p>Export Promotion</p>	<ul style="list-style-type: none"> • Promote collaboration between startups, private industry, and the government, encouraging the government to act as an anchor customer. Leverage collaborations with foreign OEMs, startups, and India's unique advantages for global space industry success.
<p>Trade Promotion for Dual-Use Tech</p>	<ul style="list-style-type: none"> • Explore the potential for trade in dual-use technologies within the framework of export control regimes, such as the MTCR, to ensure compliance with international regulations. • Expand India's participation in the MTCR to cover certain space-related technologies, facilitating legitimate trade without compromising security. • Learn from successful international models, such as the consortium approach in Europe, and adapt strategies for collaborative development. • The consortium approach promotes a sense of interdependence among participating nations. Each country becomes a reliable partner, contributing a unique set of skills or technologies to the collaborative project. This shared responsibility fosters a spirit of cooperation, mutual support, and trust, which are crucial elements for the success of complex and ambitious space initiatives.
<p>Promotion of Lines of Credit</p>	<ul style="list-style-type: none"> • India should raise awareness in the target countries about its space capabilities and offerings, especially concerning lines of credit extended by the Export-Import Bank. • Facilitate effective interaction between Indian officials, diplomats, and representatives of host countries to promote these lines of credit. • Position the IFSC as a landing pad for foreign Space Tech firms entering the Indian market and a launch pad for Indian Space Tech companies looking to expand globally. • Utilize the international exchange in the IFSC as a platform for space-related companies to access international capital and engage in cross-border transactions. • Reduce reliance on renting transponder capacity from foreign providers, fostering the emergence of indigenous satellite projects to nurture a thriving and self-reliant space industry.
<h1>Capacity Building</h1>	
<p>Empowering Women in the Space Industry</p>	<ul style="list-style-type: none"> • Encourage diverse women's participation in all space industry disciplines, promoting inclusive roles in space missions. Address the lack of representation in astronaut selection for missions like India's Gaganyaan. • Support women's involvement at all levels in space exploration with mentorship, leadership training, and gender diversity policies. • Advocate for diversity quotas, robust work-life balance support, and anti-discrimination measures. • Challenge gender stereotypes in STEM education and promote girls' careers in science, technology, engineering, and mathematics. Collaborate with educational institutions and industry partners to create pathways for women in STEM fields, facilitating their entry into the space industry.

<p>Empowering Women in the Space Industry</p>	<ul style="list-style-type: none"> • Establish tailored mentorship programmes for women in the space industry, fostering self-confidence and assertiveness. • Emphasise the need for representation of women in leadership positions across various sectors, including the scientific community.
<p>Skill Development</p>	<ul style="list-style-type: none"> • Enhance space-related degree programmes, provide practical training, bridge courses, and implement initiatives similar to those in the IT sector for the better employability of engineering graduates in the space sector. • Integrate space-related courses into educational curricula at all levels to nurture a skilled workforce. Emphasise skill development and collaboration with educational institutions. • Establish institutions offering graduate courses in remote sensing and geospatial studies to address the skill gap.
<p>Promoting Industry-Academia Collaboration</p>	<ul style="list-style-type: none"> • Facilitate collaboration between Indian universities and international counterparts, particularly in space-related research and development. • Support joint research programmes and collaborative endeavours between academia and industry to bridge the industry-academia gap.

About SIA-INDIA

SIA-India, a dynamic, not-for-profit space sector association, is dedicated to advancing sectoral interests, accelerating industry growth, and catalysing innovation through strategic engagements with key governmental and global stakeholders, policymakers, regulatory bodies, and standardization entities, aiming to create a vibrant and innovative ecosystem within the space.

Our Vision

Thought Leaders for the Satellite Ecosystem in India.

Our Mission

Advocacy and representation to Government agencies and relevant stakeholders. A platform for exchanging ideas and networking across relevant industries, associations, and international communities via high-level committees to address issues and challenges faced by the industry.

Our interventions with state and central Governments and International Regulatory Bodies help create a conducive Business and Regulatory environment that maximizes the long-term benefit to the satellite industry at large and end-users in India.



EXCLUSIVE BENEFITS for SIA-India Members

- **Networking Opportunities:** Forge connections with a diverse network of space industry professionals, policymakers, peers, and experts during exclusive after-hours Networking Events for valuable connections available only to SIA-India Members.
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