

DEFSAT

Conference & Expo

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DEFSAT REPORT: 2024

The successful culmination of the DEFSAT Conference, organized by SIA-India, marks a significant milestone in the realms of defense and space. Scheduled from 7th to 9th February 2024 at the Manekshaw Centre in New Delhi, DefSAT 2024 brought together more than 500 visionaries, thought leaders, and stakeholders, facilitating an unprecedented convergence of expertise from government agencies, armed forces, policymakers, space industry leaders, technology innovators, and diplomats, this included a global audience representing Indian Embassies abroad who attended the live streaming of the conference proceedings. With participants from diverse expertise, the conference served as a nexus for sharing cutting-edge insights, fostering collaboration, and addressing key challenges facing the defense and space sector. The attendees explored innovative strategies and solutions to enhance India's space ecosystem that secures the civil & military necessities and fosters a self-sufficient Bharat.

The conference emphasized the integration of disruptive technologies to enhance India's defense space capabilities and address evolving security challenges. It served as a platform for dialogue, innovation, and collaboration among key industry leaders, government delegates, and stakeholders in the space and defense sectors. As delegates depart, they carry with them a wealth of knowledge, strengthened networks, and a renewed commitment to advancing defense technologies and capabilities. The success of the DEFSAT Conference underscores the power of collective effort in safeguarding our shared interests and shaping a more secure future.



The three days and 11 sessions, had the inaugural lineup of notable speakers and dignitaries adding to its prestige and depth include Gen Anil Chauhan, Chief of Defence Staff; Ministry of Defence, His Excellency, Mr. Philip Green, Australia's High Commissioner to India, Dr. Shailesh Nayak, Director NIAS, Former Secretary Ministry of Earth Sciences, AVM Sanjay B Bhatnagar, Director, CENJOWS; and Lt. Gen PJS Pannu, Chairman Space Committee on Defence, SIA-India.

SIA-India is proud to have the support from pivotal government entities and esteemed organizations such as Niti Aayog, ISRO, NSIL, IN-SPACE, DoT, DRDO, and Ministry of Defence for DefSat.

DEFSAT Conference & Expo

●●●●● HIGHLIGHTS ●●●●●



1. Two MoUs Signed

SIA-India signed a MoU with the Space Industry Association-Australia and another one with the Information Sharing and Analysis Centre.

2. India Space Congress Report

On the second day of the DEFSAT Conference, the Honorable Governor of Uttarakhand launched the India Space Congress Report 2023.



3. Remote participation of Indian Missions

More than 70 Indian Missions abroad participated in the conference.

Spotlight of the Conference

IndSpace Wargame Exercise 2024 – 2nd Edition



The DEFSAT 2024 conference featured the IndSpace Wargame Exercise, demonstrating India’s space industry readiness for defense applications. Through interactive tabletop exercises and simulated scenarios, participants from various sectors evaluated resources, logistics, and action sequences crucial for national security. The exercise included eight scenarios focusing on enhancing maritime awareness, ISR capabilities, communications resilience, hypersonic threat tracking, and AI integration. It highlighted the industry’s ability to develop microsatellite constellations, utilize global providers, and maintain trained personnel reserves. The exercise emphasized the need for clear operational requirements, collaboration between end users and providers, and exploring alternative launch capabilities. Overall, it showcased the industry’s innovation and adaptability in addressing defense challenges.

Release of India Space Congress Report: 2023



During the inaugural session on Day 2 of the conference, SIA-India released the India Space Congress 2023 report. The unveiling took place in the presence of distinguish dignitaries, Lt. Gen Gurmit Singh and Dr. Samir V Kamat, marking a significant moment in space exploration and technology. The report encapsulates the pivotal discussions and recommendations from the panel discussions of ISC- 2023, reflecting the depth of insights shared by speakers throughout the conference.

Memorandum of Understanding (MoUs)

During the DEFSAT 2024 conference, several Memorandums of Understanding (MoUs) were signed, highlighting the commitment of various organizations to enhance collaboration and cooperation in the defense and space sectors.

1. MoU between SIA-India and Space Industry Association-Australia

One significant MoU was announced between SIA-India and the Space Industry Association of Australia, emphasizing a significant step towards enhancing collaborations and fostering mutual growth within the space industry. This agreement aimed to facilitate greater information exchange and technology access between the two countries, promoting innovation and knowledge sharing in the space domain.

2. MoU between SIA India and Information Sharing and Analysis Centre (ISAC)

Another notable MoU was signed between SIA-India and ISAC, focusing on enabling greater information exchange and technology access between government and industry. This MoU aimed to enhance collaboration between academia, research institutions, and the industry, fostering innovation and driving advancements in defense space technologies, benefiting both B2B and B2C segments, as well as every stakeholder involved.



Exhibition

DEFSAT organized a three-day exhibition featuring 15+ exhibitors from leading space companies, startups, government bodies, and academic institutions, in conjunction with the conference. Inaugurated after the first day's inaugural session, the exhibition provided a platform for the industry to showcase their capabilities. It played a crucial role in the success of the conference by highlighting cutting-edge technologies, products, and services relevant to the defense and space industries. Attendees had the opportunity to explore innovative products and solutions aimed at enhancing India's defense space capabilities, including satellite systems, rocket systems, advanced communication networks, and surveillance technologies. The exhibition served as a networking and collaboration platform, allowing participants to engage with industry leaders, explore potential partnerships, and gain insights into emerging trends in the defense and space sectors.

List of exhibitors:

Ananth Technologies Pvt Ltd	Astrome	Ars4AI
Satsure & KaleidEO	Avantel	Anritsu
Galaxyeye Space	JV Micronics	AVCOM
Pixxel Space	Spantrik	Amity University
XDLinx Labs	Geospatial World	



Dignitaries Insights

The dignitaries at the DEFSAT conference offered invaluable insights, drawing from their extensive expertise and experience, which illuminated crucial strategies for navigating the complexities of modern defense and satellite technology integration. Some key highlights are:

His Excellency, Lt. Gen Gurmit Singh, PVSM, UYSM, AVSM, VSM (Retd), Honorable Governor of Uttarakhand

“We must leverage our technical credibility and excellence to propel our endeavors forward. Space Holds Tremendous Potential in Realizing Our Vision for 2047: Aiming to Attain the Status of ‘Vishwa Guru’. Harnessing the Power of Space Technology and Exploration is Crucial in Advancing Towards this Ambitious Goal.”



His Excellency, Australia’s High Commissioner to India, Mr. HE Philip Green, OAM

“The strategic partnership in space collaboration, marked by the signing of a MoU between SIA-India and SIAA, would foster growth in the global space sector through knowledge exchange and business collaboration.”



General Anil Chauhan, PVSM, UYSM, AVSM, SM, VSM, Chief of Defense Staff, Ministry of Defense, Government of India

“Indian armed forces have earmarked funds to the tune of Rs. 25,000 crore to meet its defence space requirements, highlighting the significant investment in this sector, and presenting a significant opportunity for the private sector to leverage.”



Dr. Samir V Kamat, Secretary DDR&D and Chairman DRDO

“The ‘New Space Policy’ was formulated in an era of boundless possibilities, with a myriad of startups pioneering breakthroughs in defense technology and space-based R&D. As the government sets forth 75 challenges, I as the chairman of DRDO am willing to provide comprehensive assistance, whether financial or otherwise, to the startups, underscoring our collective potential to ascend as leaders in the realm of space exploration.”



Dr. Shailesh Nayak, Director NIAS, Former Secretary Ministry of Earth Sciences

“By deploying a constellation of geosynchronous, high-resolution SAR small satellites, we are unlocking the potential of ISR within the LEO, while embracing innovation in civil-military integration to enhance global surveillance and security.”



Mr. Mahaveer Singhvi IFS, Joint Secretary, New Emerging and Strategic Technologies (NEST)

“As per IN-SPACe’s decadal vision and strategy for the Indian space economy, an investment of \$ 22 billion is envisioned in the next 10 years. With this investment, India’s space industry is projected to grow to a \$44 billion market, contributing 8-10% to the global space economy by 2033, alongside export sales reaching \$11 billion over the same period.”



Air Vice Marshal Pawan Kumar, VM, Director General, Defence Space Agency (DSA)

“I think it is important that space, being an expensive and data-intensive domain, requires synergy among civilian, commercial, and military entities to ensure the optimum utilization of space assets and the data they generate. Such synergy within the civil-military ecosystem would ensure the optimal use of high-value assets through the sharing of technologies and infrastructure, as well as accruing additional advantages.”



Dr. Ajay Kumar, Former Secretary, Ministry of Defence

“The Defense Acquisition Procedure has undergone several transformative changes over the last few years, which have enabled the overall private innovation ecosystem in the country, particularly in the domains of satellites and the space segment. I believe the DAP needs to proactively facilitate innovation on both the services and manufacturing fronts to streamline the procurement of innovative technologies.”



AVM Sanjay Bhatnagar, VM VSM (Retd), Officiating Director, CENJOWS

“Militarization of space is indicating that counter space operation capabilities are being developed with an explosive aim to enable own forces to exploit space capabilities to the best. While at the same time negating adversary’s ability to exploit the same in order to maintain the desired degree of of space control or security.”



Lt. Gen PJS Pannu, PVSM, AVSM, VSM (Retd), Chairman Space Committee on Defence, SIA-India

“There can be a space control within space. They can be space aggregation by satellites in space. They can be constellations which can actually shape the space for the battle on the ground.”



Day 1

Meshed Intelligence: Multi-sensor Payloads and Analytical Platforms

List of Moderators & Panelists:

- Dr Radhadevi, Director ADRIN-ISRO
- Mr Suyash Singh, Chief Executive Officer, Galaxeye Space
- Mr Akash Yalagach, CTO, KaleidEO
- Mr Kannan Kesavapillai, Co-Founder & Chief Executive Officer, Augsense Labs
- Mr Gurvinder Chohan, Chief Executive Officer, QSTC Inc
- Mr Damodaran Raman, Director, Deloitte Consulting

Summary of the panel discussion



The panel session delved into advanced integration of meshed intelligence systems, focusing on multi-sensor payloads and analytical platforms for military applications. Experts discussed the evolving landscape of military remote sensing, highlighting the significance of combining Synthetic Aperture Radar (SAR) and Electro-Optical (EO) sensors on single platforms. They emphasized the role of data fusion, AI integration, and edge computing in enhancing intelligence gathered from space assets. Collaborative efforts between the defense sector, academia, and the private sector were underscored to address complex military needs effectively.

Additionally, the discussion emphasized key technologies such as advanced spacecraft, data fusion, AI integration, quantum computing, satellite miniaturization, and IoT sensor networks. These technologies enable capabilities like communications, navigation, ISR, situation awareness, targeting, early warning, and search & rescue operations. They also discussed the need for a whole-of-nation approach in utilizing advanced technologies like AI and quantum

computing for military applications, emphasizing the importance of capacity building in the satellite data sector. The discussion concluded with a call for readiness to tackle the challenges of modern defense and intelligence, highlighting the dynamic nature of defense operations and the importance of cyber security and international cooperation.

“Informationized warfare harnesses the synergy of advanced spacecraft technologies, data fusion, AI integration, edge computing, and quantum computing, forming the bedrock of national security.”

Key Action points:

1. Develop Multi-sensor Payloads: Focus on creating satellites that can house multiple sensors to provide comprehensive data regardless of environmental conditions while having universal interfaces enabling modular plug-and-play integration across defense platforms and assets.

2. Enhance Data Fusion Techniques & Leverage AI: Invest in technologies that allow the integration of data from various sensors, improving the accuracy and utility of the information gathered. Utilize artificial intelligence to automate the analysis of vast amounts of satellite data, turning it into actionable intelligence more efficiently.

3. Implement Edge Computing: Adopt edge computing on satellites to process data on-board, significantly reducing the time taken to deliver critical information to decision-makers. Implement end-to-end encryption capabilities to harden satellites and communications against cyber threats.

4. Support Long-Term R&D: Allocate funding for research and development in emerging technologies like quantum computing, which can offer unprecedented capabilities in data security and processing.

5. Civilian Application and Strategic Implication: Civilian satellite operations have unintended strategic implications, and there’s potential for utilizing civilian data for strategic military purposes.

6. Adopt a Whole-of-Nation Approach: Recognize the necessity of integrating efforts across the nation and with international partners to enhance space diplomacy and cooperation.

7. Focus on User-Driven Solutions: Design and develop intelligence systems based on the operational requirements and feedback from end-users in the defense sector, ensuring that technological advancements align with practical military needs.

C5I2STAR2-Space enabled Precision and deep battles

List of Moderators & Panelists:

- Air Marshal Anil Chopra, PVSM, AVSM, VM, VSM (Retd), DG CAPS
- Air Cmde Abhijit Tokekar VM, Comdt. DIPAC, Head Quarters, IDS
- Dr Rituraj Kumar, Director CAIR, DRDO
- Prof Brejesh Lall, Indian Institute of Technology, Delhi
- Mr Anurag Garg, Head of Strategy – India, Thales
- Col Amandeep Singh, Specialist, Indian Army



Summary of the panel discussion

The panel delves into the critical role of space technologies in enhancing precision and depth in military operations, exploring the challenges and requirements for integrating space capabilities into defense strategies. The session highlighted the importance of integrating space technologies such as satellite reconnaissance, GPS-guided munitions, and satellite communications to revolutionize battlefield operations.

The vast expanse of areas like the Indian Ocean Region poses significant challenges for maritime surveillance, necessitating the deployment of advanced Earth observation satellites and ELINT (Electronic Intelligence) satellites for wide-area maritime surveillance. The need for prioritizing investments in space capabilities, including military Earth observation, MILSATCOM (Military Satellite Communications), and Space Situational Awareness (SSA), was emphasized to fill capability gaps compared to global standards.

The application of AI and advanced analytics in processing and analyzing satellite data for actionable intelligence was discussed. This includes automating data analysis for feature detection, change detection, and generating insights for military decision-makers. Concerns regarding data security in open-source models and the potential for tampering were addressed, underscoring the need for safeguarding critical data while promoting collaborative research and development.

“Space is considered the new frontier of warfare, with adversaries operating beyond conventional means.”

Key Action points:

- 1. Enhance Real-Time Surveillance:** Develop capabilities for near real-time, all-weather situational awareness through advanced Earth observation satellites.
- 2. Invest in MIL-SATCOM:** Prioritize investments in defence specific SATCOM for flexible, low-latency communications, incorporating software-defined elements for adaptability.
- 3. Advance Space Situational Awareness:** Build SSA capabilities to maintain an enriched, real-time catalog of space objects, ensuring space asset protection and offensive capabilities.
- 4. Leverage AI for Data Analysis:** Integrate AI and machine learning for automated analysis of satellite data, enabling proactive intelligence gathering and decision support.
- 5. Focus on Critical Data Sets:** Identify and prioritize critical data sets required for military operations, including high-resolution Earth observation and ELINT data, to guide investment and development efforts.
- 6. Develop Indigenous Capabilities:** Encourage the development of indigenous space technologies and capabilities to reduce dependency on foreign data sources and enhance national security.

Collaborative Frontiers: Synergising the Defence Innovation Ecosystem

List of Moderators & Panelists:

- Maj Gen C S Mann, VSM, Additional DG, Army Design Bureau
- Lt. Col Sanjay Mahala, Program Director, Defence Innovation Organisation
- Mr Anagh Singh, Assistant Vice President, Invest India O/o PSA to GOI
- Air Commodore Atul Anand, Directorate of Aerospace Design, IAF
- Cmde T Ajit, WESEE
- Cmde Arun P Golaya, OiC, Technology Development Acceleration Cell, NIIO
- Dr Roshan Srivastava, Director, Technology Innovation Hub, IIT Tirupati
- Prof Manan Suri, Indian Institute of Technology, Delhi

Summary of the panel discussion

The panel emphasized the need for collaboration between academia, industry, military services, and government to align research and development efforts with military requirements. The speakers highlighted the historical role of military needs in driving innovation and the current trend where academia leads in technological development, emphasizing the importance of dual-use technologies.

The dialogue underscored the need for clear communication and cooperation between the defense sector and industry partners, stressing the importance of government policies that facilitate innovation and collaboration. They outlined the components of the defense innovation ecosystem and the role of government in enabling its effective functioning.

The session identified various challenges, including the need for a common understanding of defense requirements, the importance of adjusting procurement processes to accommodate innovative solutions, and the potential of emerging technologies to transform defense capabilities. Successful initiatives such as the iDEX program and the Naval Innovation Office, which have bridged the gap between users and innovators, were shared, demonstrating the tangible benefits of collaborative innovation.

“Managing risk appetite and prioritizing timely functionalization of emerging technologies are critical in defense innovation.”

Key Action points:

1. Enhanced Communication Channels: Establish more effective communication mechanisms between the defense sector, academia, and industry to ensure alignment on requirements and capabilities.

2. Support for Academic Research & Talent Development: Increase support for defense-related research in academic institutions to translate innovative ideas into practical solutions. Invest in education and training programs to develop skilled professionals capable of contributing to defense technology innovation.

3. Investment in Emerging Technologies: Prioritize investments in areas such as AI, cyber defense, and unmanned systems to maintain technological superiority and Create incentives for industries to invest in defense technology R&D, including tax benefits, grants, and exclusive contracts.

4. Policy Frameworks: Develop policy frameworks that support innovation, protect intellectual property, and facilitate collaboration between the defense sector and civilian industries.

5. International collaboration: Explore opportunities for international collaboration to share best practices, resources, and technologies for mutual defense enhancement.

6. Regular Innovation Forums: Organize regular forums and workshops to discuss emerging technologies, challenges, and opportunities in defense innovation, fostering a culture of continuous learning and adaptation.

Redefining Aerospace – Near Space and Space Sovereignty

List of Moderators & Panelists:

- **Air Marshal GS Bedi, AVSM, VM, VSM (Retd) Former DG (FIS)**
- **Air Vice Marshal D V Khot (Retd), Former DSA and Fellow CAPS**
- **Mr Pawan Kakkar, Managing Director, Jugapro India Private Limited**
- **Gp Capt TH Anand Rao, Senior Fellow, CAPS**
- **Mr. Sameer Joshi, Chief Executive Officer, Newspace Research & Technologies**

Summary of the panel discussion

The panel session “Redefining Aerospace – Near Space and Space Sovereignty” explored the concept of near space, its challenges, and its potential applications. Near space, typically defined as altitudes between 20 and 100 kilometers, has been historically neglected due to technical and regulatory challenges. However, there is growing interest in leveraging this region for various military and civilian purposes.

The session discussed the limitations of traditional aircraft in near space and the advantages of using satellites, High Altitude Pseudo-Satellites (HAPS) and balloons for surveillance and intelligence gathering. Regulatory considerations, such as sovereignty and traffic management, were highlighted as key challenges for operating satellites in near space.

The panelists emphasized the need for a comprehensive approach to integrate capabilities in lower, near, and upper space to maximize effectiveness and efficiency. The session also touched upon the civil applications of near space operations and the importance of both military and civilian applications for technology to thrive. Key topics include defining near space zones and characteristics, potential military and civil applications like communications relays and earth observation, required technologies like HAPS, advanced balloons and solar-powered drones, and integration challenges across stakeholders and altitudes.

“Military ISR tasks find cost-effective solutions in near-space platforms, bridging gaps in data acquisition and delivery compared to traditional satellite-based systems.”



Key Action points:

1. Explore Near Space Applications: Investigate potential uses and capabilities of near space for military and civilian purposes and develop comprehensive capabilities for near space operations that integrate with existing space and ground capabilities.

2. Address Technical Challenges: Develop technologies and methods to overcome the technological challenges include designing lightweight structures resistant to environmental factors, managing helium for airships, and developing efficient propulsion systems and energy storage solutions suitable for harsh near-space environments.

3. Establish Regulatory Frameworks: Regulatory concerns arise due to the lack of internationally accepted terms for near space and ambiguity in defining airspace boundaries, necessitating the development of clear demarcation and traffic management mechanisms.

4. Invest in Anti-Drone Technology: Develop anti-drone technologies to mitigate risks associated with unauthorized drone activity in near space.

5. Improve Traffic Management: Develop systems for tracking and managing traffic in near space, especially for balloons and other lighter-than-air vehicles. Improve surveillance mechanisms to cover geographical gaps and enhance near space awareness for military and civilian purposes.

6. Develop Air-Launched Weapons: Develop air-launched weapons and procedures for engaging hostile platforms in near space to ensure security and sovereignty.



Day 2

Smart Satellites for Defence: Balancing Robustness, SWAP and Flexible Design & Manufacturing

List of Moderators & Panelists:

- Vice Admiral Pradeep Chauhan, AVSM**VSM (Retd), Director General NMF
- Mr Arpan Sahoo, COO, KaleidEO
- Mr. Radha Krishna, Principal Engineer, Dhruva Space
- Mr Rupesh G, Chief Executive Officer, XDLinx Labs
- Mr Gurvinder Chohan, Chief Executive Officer, QSTC Inc

Summary of the panel discussion



The panel delved into the evolving landscape of satellite technology, particularly the shift towards nanosatellites and their cost-effectiveness. The session highlighted the advantages of nanosatellites, such as lower costs, shorter development times, and the ability to launch them as part of constellations for risk distribution. The challenges of operating in low Earth orbit (LEO) were discussed, especially the impact of space radiation on satellite components. Panelists discuss approaches to mission requirements analysis, optimizing size, weight and power budgets, material and component selection, and manufacturing for nano and microsatellites.

This includes customization for payloads, redundancy, qualification testing and radiation shielding. The panelists emphasized the importance of balancing robustness and cost, especially in the context of using commercial off-the-shelf (COTS) technologies that may not meet military robustness requirements. In addition to satellites, the panel covers importance of ground stations and networks, new technologies like optical inter-satellite links and optical ground stations with fiber connection, use of mobile stations, AI-based onboard processing, Software Defined Radios (SDR) and satellite constellations for coverage and risk mitigation. The session concluded with a discussion on the future outlook for collaboration between civilian and defense space sectors and the potential for advancements in satellite technologies and applications for national interest.

“The ability to customize satellite buses according to payload requirements helps optimize costs and performance.”

Key Action points:

- 1. Promote Nanosatellite Development:** Encourage the use of nanosatellites for their cost-effectiveness and efficiency in satellite operations.
- 2. Address Space Radiation Challenges:** Develop mitigation strategies for the impact of space radiation on satellite components in LEO and apply hardening techniques to protect mission-critical devices from single-event effects caused by space radiation.
- 3. Balance Robustness and Cost:** Ensure a balance between robustness and cost, especially when using COTS technologies for military-grade satellites.
- 4. Optimize Investments:** Collaborate among stakeholders to optimize investments and reduce costs in satellite development and launching.
- 5. Maintain High-Quality Standards:** Ensure high-quality standards in satellite manufacturing to improve reliability and reduce production and launching costs.
- 6. Explore Advanced Frequency Bands:** Investigate the use of higher frequency bands like Q and V band for improved satellite communication and security.

Acquisition Process for Military-Grade Space Assets

List of Moderators & Panelists:

- Lt Gen (Dr) Subrata Saha, PVSM, UYSM, YSM, VSM** (Retd), Member NSAB
- AVM Rajiva Ranjan VM, ACAS OPS Space
- Col Manik Anand, Aerospace Sys Division, Dept of Defence Production, Ministry of Defence
- Col. Kuber Kandalai, E&Y
- Mr Arvind Khare, Senior Fellow, Manohar Parrikar Institute for Defence Studies and Analyses
- Mr Arpan Sahoo, COO, KaleidEO
- Mr Vinod Kaul, RVP South and South-East Asia, Gilat Satellite Networks
- Wg Cdr Satyam Kushwaha, Director, ISpA



Summary of the panel discussion

The panel explored the challenges and proposed reforms in India's procurement process for space assets. The discussion highlighted the gradual opening of India's defense and space sectors to private industry, emphasizing the need for a comprehensive review of procurement procedures to align with the rapid pace of technological advancements in the space sector. Panelists underscored the importance of aligning space requirements with armed forces' needs, involving industry more significantly, and ensuring that procurement processes are agile and adaptable.

The session also addressed the need to respect intellectual property rights, ensure timely payments to industries, and foster collaboration between the armed services and industry for innovation and efficiency. A call for a more liberal approach to information sharing with industry partners and the simplification of the procurement process to focus on technology and product value was also made. The session concluded with the consensus that the current defense acquisition procedures are not suitable for space acquisitions and that a fresh approach tailored for the space sector is essential for India's strategic and technological growth.

"Simplified procurement is imperative for fostering innovation, particularly for newer companies and technologies."

Key Action points:

1. Review, Simplify Procurement Procedures: Conduct a thorough review of processes and procurement procedures for defense space assets and advocate for a simplified procurement process that focuses on technology and product value rather than procedure-driven inefficiencies.

2. Align Defence Space Requirements: Ensure that space requirements are aligned with the armed forces' needs and involve industry in a significant way and encourage collaboration between the armed services and the industry for better understanding and innovation.

3. Adopt a Fresh Approach: Consider a new approach for space acquisitions that is not bound by legacy systems and is agile and aligned with technological advancements.

4. Respect Intellectual Property Rights: Emphasize the importance of respecting intellectual property rights of startups and industry players.

5. Streamline Quality Assurance Processes: Enhance Quality Assurance processes to ensure the effectiveness and efficiency of defense projects.

Day 3

Space warfare: Space Deterrence and Space Domination.

List of Moderators & Panelists:

- Air Vice Marshal Pawan Kumar, VM, Director General, Defence Space Agency (DSA)
- Dr Bulbul Mukherjee, General Manager (Data Synthesis and Modelling), SSOM, ISTRAC, ISRO
- Air Cmde Savinder P Singh, Sr Fellow, Centre for Air Power Studies (CAPS)
- Air Cmde Terry Van Haren DSM, Retd., Managing Director, LeoLabs Australia
- Mr Tushar Jadhav, Chief Executive Officer, Manastu Space
- Mr Sakthi Kumar R, Founder & Chief Executive Officer, OrbitAid Aerospace Pvt Ltd.
- Agnikul Aerospace
- Mr Tanveer Ahmed, Co-Founder, Digantara

Summary of the panel discussion

The panel discussed the critical aspects of space defense, space domination, and the implications of denying services like ISR, PNT, and communication in space warfare. The session emphasized the importance of coordinated efforts between industry, military, and academia to achieve space deterrence and dominance. The challenges of the congested and contested space environment were highlighted, along with the rapid increase in active satellites in Low Earth Orbit (LEO).

The panelists discussed the dynamic nature of space operations, the need for information superiority, and the role of observation and tracking in maintaining Space Situation Awareness (SSA). The concept of deterrence in space warfare was explored, differentiating it from nuclear deterrence and highlighting the unique threats and challenges faced by India in the space domain. The importance of developing rapid space launch capability, balancing offensive-defensive capabilities, and ensuring cyber resilience was underscored. The session also covered safe and sustainable operations management, conjunction assessment, collision avoidance, and the need for robust space situational awareness.

The role of satellites and launch vehicles in warfare, the significance of in-orbit servicing, and the exploration of cislunar and deep space were discussed as key elements in maintaining space dominance.

Key Action points:

1. Strengthen Space Deterrence: Develop strategies for deterrence by denial and deterrence by punishment to ensure space dominance and advocate for international regulations to control and manage space debris and mitigate the risks posed by adversarial use of debris in warfare.

2. Enhance Space Situational Awareness (SSA): Invest in a global network of radar systems and data analysis capabilities for tracking objects in LEO and collision avoidance. Foster collaboration among like-minded nations to overcome geographical limitations in SSA.

3. Develop Agile Space Launch Capability: Focus on agility in launch vehicles to enable quick deployment of satellites in response to threats. Design satellites with maneuverability and on-demand fuel availability to dodge threats and enhance operational flexibility.

4. Continuous Assessment and Safety Measures: Implement continuous assessment to estimate close approaches with operational satellites and utilize collision avoidance manuals and consider lift-off timing to avoid collisions. Further precision in reentry analysis is required to predict atmospheric reentry timing.

5. Implement In-Orbit Servicing: Explore in-orbit refueling and maintenance to extend satellite life and reduce costs.

6. Address Cyber Resilience: Ensure the security and resilience of space assets, including the NavIC system, against cyber threats.

7. Explore Cislunar and Deep Space: Consider the strategic implications of activities in Cislunar and Deep Space, which anticipate of contention over resource exploitation for future space dominance.



Communications Strategies for Modern Military Operations under contested and EW environment.

List of Moderators & Panelists:

- Maj Gen Manjeet Singh SM, Joint Secretary, National Security Council Secretariat
- Sri Y Purushotam, Scientist G, Defence Electronic Research Laboratory (DERL), DRDO
- Mr. Rajshekhar Pullabhatla, Director, Information Sharing and Analysis Center (ISAC)
- Mr Shivaji Chatterjee, President and Managing Director - Hughes Communications India Private Limited
- Dr V Seshagiri Rao, Advisor AVANTEL, Former Associate Director, ISRO
- Mr. Sai Krishna, CEO, Saptang Labs

Summary of the panel discussion

The panel session on “Communications Strategies for Modern Military Operations under contested and EW environment” discussed the challenges and imperatives of communication networks in modern warfare. The session highlighted the critical need for secure, resilient, and efficient communication systems to support net-centric operations and ensure operational superiority in contested environments. Panelists emphasized the integration of advanced technologies like Software Defined Radio, satellite communications, and artificial intelligence to bolster network flexibility, cyber-security, and real-time data exchange.

It emphasized the importance of exploiting niche and emerging technologies in ICT for communication at different levels. Key points included the complexity of modern warfare, the challenges posed by highly mobile entities, and the dependence on electronics and connectivity. The panelists emphasized the imperative for communication networks to be available, reliable, and survivable.

They stressed the importance of supporting operations through resilient, high-capacity backbone and satellite-based communications. Additionally, the panel discussed the need for information sharing, shared situational awareness, and speed of decision-making. The panel also emphasized the need for networks to be omnipresent, responsive, flexible, and ruggedized to withstand physical, cyber, and electromagnetic adversities.

Key Action points:

1. Invest in Secure Communication Networks: Develop and maintain secure communication networks that are available, reliable, and survivable, supporting operations through high-capacity backbone and satellite-based communications.

2. Information Sharing and Situational Awareness: In contested environment, real-time communication is crucial as information sharing and shared situational awareness enable speedier decision-making processes.

3. Omnipresent Networks: Develop networks that are omnipresent, responsive, flexible, and ruggedized to withstand physical, cyber, and electromagnetic adversities.

4. Adoption to Modern Warfare Scenarios: With the evolution of modern warfare scenarios, adoption of communication strategies to secure own communication, deny enemy access to their communication, and minimize human damage through the use of unmanned warfare technologies and cyber operations.

5. Capacity Building in Cybersecurity: Implementation of robust policies, access control measures, and proactive measures such as bug bounty programs to strengthen cybersecurity defenses. A proactive contribution from companies and startups in building cybersecurity capacity is required. Initiatives like cyber office simulations and collaborations between various agencies and sectors can help in identifying and addressing vulnerabilities in India's network infrastructure.

6. Integration of Satellite Communication: Integrate satellite communication with terrestrial networks for improved network resilience and coverage.

7. Collaboration and Information Sharing: Promote collaboration between companies and government sectors in researching and implementing SDR technology and encourage information sharing to build cybersecurity capacities.



Managing space control, information and Mosaic C2 enabled by effective ground' infrastructure

List of Moderators & Panelists:

- Lt Gen PJS Pannu, PVSM, AVSM, VSM (Retd), Chairman Space Committee on Defence, SIA-India
- Mr Pawan Kalra, General Manager, Business Development, Viking Optimum Solutions
- Lt Gen Karanbir Brar, General Officer Commanding (GOC), Dakshin Bharat Area
- Mr Gautam Sharma, Managing Director, Viasat India
- Mr Subhajit Chakraborty, Head of Business Development, Astrogate Labs
- Mr. Christopher McIntosh, CEO, Methera Global [Virtual]
- Mr. Akshay Singh, MD, EVIGWAY Technologies

Summary of the panel discussion

The panel discussion focused on the critical aspects of managing space control and information through the lens of Mosaic Command and Control (C2) systems, underpinned by robust ground infrastructure. It emphasized the transformative potential of Mosaic Warfare, which shifts from traditional linear kill chains to a dynamic and integrated “kill web” approach.

This strategy aims to aggregate diverse sensors, systems, and data sources to outmaneuver adversaries by leveraging the redundancy and resilience provided by space assets. Central to the discussion was the role of advanced technologies such as AI & ML in enhancing decision support systems, enabling real-time data analysis, predictive intelligence, and refined decision-making processes.

The panelists also highlighted the significance of secure and reliable communication through laser technology, offering high-speed data transfer capabilities critical for the seamless execution of Mosaic C2 operations.

The panel touched on industry challenges, particularly the need for regulatory exemptions for satellite equipment testing to foster innovation and growth within the sector. By integrating optical links, AI, ML, and efficient ground control systems, the panel underscored the collaborative effort required between ground and space infrastructure (deploy-on-demand satellites) to develop a comprehensive network-centric warfare capability.

Key Action points:

- 1. Adopt Mosaic Warfare Strategies:** Transition from traditional kill chains to a more resilient and adaptive kill web framework to enhance operational flexibility and effectiveness.
- 2. Enhance Laser Communication:** Invest in laser technology for secure, high-speed communication essential for network-centric operations, particularly for smaller satellites.
- 3. Leverage AI and ML:** Integrate artificial intelligence and machine learning for improved decision support, predictive analytics, and optimization of sensor and fighting system deployment.
- 4. Develop Resilient Space & Ground Infrastructure:** Build a robust constellation of satellites, including deploy-on-demand and software-defined satellites, for enhanced connectivity, data relay, and flexible space support while upgrading ground infrastructure.
- 5. Modern Warfare Concepts and techniques:** Explore the potential of both, infantry and signal bots, for strategic purposes, emphasizing the importance of modeling behaviors and utilizing specific knowledge domains. There is a need for careful design, control, and programming of war-fighting machines to ensure effective utilization.
- 6. Embrace Decentralized Decision-Making:** Empower tactical commanders with decentralized control for faster and more effective decision-making in dynamic operational contexts.
- 7. Integration:** Foster integration systems between ground and space infrastructure, incorporate advanced technologies like spatial multiplexing, transmit beam forming, etc. to develop an effective kill web and network-centric warfare capabilities.



Industry Roundtable: Catalysing National Industrial Capabilities for Space and Defence

List of Moderators & Panelists:

- Air Chief Marshal R K S Bhadauria PVSM AVSM VM ADC (Retd), Head, UP Defence Corridor
- Ms. Seema, Bharat Electronics Limited (BEL)
- Mr. Vedaprakash G, Head Business Development & Govt. Relations, TASL
- Mr Vikas Khitha, Vice President & Head, Corporate Office, Delhi, L&T Defence
- Mr Samit Ray, Dy. Vice President South Asia Government Affairs, Raytheon Technologies Corporation
- Col Rajneesh Singh (Retd), Research Fellow, Manohar Parrikar IDSA

Summary of the panel discussion

The panel discussion focused on catalyzing national industrial capabilities for space and defense, emphasizing technology development, indigenous manufacturing, infrastructure support, and collaborations between public-private sectors, startups, and academia.

The need for clear technology roadmaps, supportive policies, and investment in R&D to foster innovation and skilling was highlighted to overcome infrastructure and regulatory challenges. The panel underscored the importance of defense PSUs like BEL and large companies like L&T in driving technology transfer, indigenous manufacturing, and building a robust ecosystem through collaboration with research organizations and startups.




It also addressed the critical role of infrastructure development and regulatory support from the government to create a conducive environment for industry growth. The panelists expressed concerns about the challenges in meeting demands in the space and defense industries, including the lack of Indian space standards, limited access to test facilities, and the need for a clearer roadmap from ISRO.

Collaboration with international partners was seen as key to bringing investments, technology, and market access to enhance India's global standing in the space and defense sectors.

Key Action points:

- 1. Formulate Long-term Roadmaps:** Develop technology roadmaps for the next couple of decades to guide the space sector’s evolution.
- 2. Infrastructure Development:** Address critical infrastructure gaps by engaging with state governments and improving facilities in industrial parks and corridors.
- 3. Alignment of Industry capabilities with the user:** Continuously assess and adapt industry capabilities to address evolving needs, ensuring alignment with national requirements for defense and aerospace. Encourage collaboration between users and the industry to define existing use cases and future requirements, ensuring readiness to meet future demands through technology development and deployment.
- 4. Government Support & Regulatory Reforms:** Develop a regulatory roadmap to ease the business environment by addressing GST structures, implementation of space laws, etc.
- 5. Funding and Support Framework:** Provide R&D funding, guaranteed pilot order quotas, and incubation support to startups and MSMEs through tax benefits and funding allocations. Implement procurement norms that favor quality and innovation over just cost.
- 6. Skill Development and Workforce Training:** Create targeted programs to build a skilled workforce, addressing the current and future needs of the space and defense sectors.
- 7. Strategic Program Execution:** Leverage the capabilities of defense PSUs like BEL for strategic defense programs, ensuring alignment with national security objectives and industry growth.




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Policies, Doctrines, and Strategies for Securing India's Security Interests

List of Moderators & Panelists:

- Lt Gen Ajay K Chandele, PVSM, AVSM (Retd), Chairman, Geospatial World Chamber of Commerce
- Dr Ranjana Kaul, Partner, Dua Associates & Space Law Expert
- Air Vice Marshal D V Khot (Retd), Former DSA and Fellow CAPS
- Capt K. K. Agnihotri (Retd IN), Sr. Fellow, National Maritime Foundation

Summary of the panel discussion

The session on space policies, doctrines, and strategies for securing India's security interests underscored the critical role of space capabilities in defense and security. Panelists emphasized the importance of defining terms like "peaceful use" of outer space and the need for clarity in interpreting international space law.

They advocated for the development of a national space military doctrine to guide India's space activities and ensure alignment with national security objectives. The discussion also highlighted the significance of indigenization, capacity building, and collaboration between academia, industry, and government. Panelists stressed the need for a domestic space act and security guidelines to address the challenges posed by the evolving space environment.

Additionally, they called for a whole-of-nation approach to space policies, emphasizing the importance of training military personnel on space subjects and fostering innovation through funding startups. The session emphasized the complexity of space security issues and the importance of coherent policies and strategies to address them. It highlighted the need for a comprehensive understanding of space law and the organization of space forces to effectively safeguard India's security interests in the increasingly contested domain of outer space.

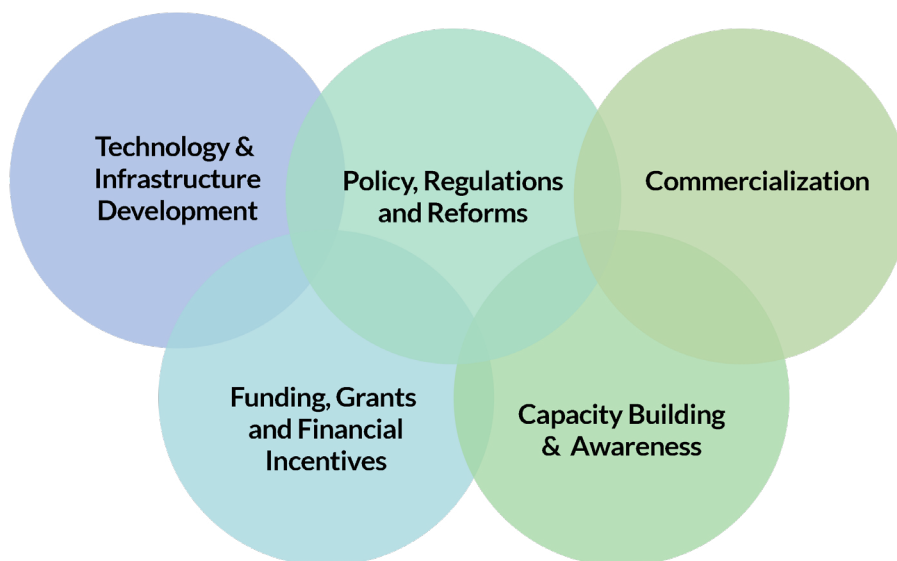


Key Action points:

- 1. Integration of Space Capabilities:** Focus on integrating space capabilities for maritime domain awareness and security, emphasizing the participation of the private sector in developing and utilizing space-based systems.
- 2. National Space Military Doctrine:** Promulgate a national space military doctrine to clarify terms such as “peaceful use” and “inner space”, signal intent, and share knowledge with stakeholders, ensuring a coherent approach to space security.
- 3. Education and Training:** Develop training programs and knowledge transfer mechanisms to enhance defense forces’ understanding of space subjects, enabling effective communication of requirements to industry and academia.
- 4. Standardization of Definitions:** Standardize definitions for terms like space situational awareness and space domain awareness across documents, ensuring clarity and consistency in communication and policy. Issuance of security guidelines by the government and adherence to the National Space Policy is mandatory.
- 5. Committee Formation:** Constitute a committee under the National Security Advisor (NSA) with representatives from all stakeholders to draft a coherent military space doctrine linking policy to operations.
- 6. Database of Experts:** Create a database of Indian academic experts and labs working on space-related R&D for consultations, facilitating collaboration and knowledge sharing in the space domain.
- 7. Government Reforms and Simplification of Policies:** Simplify policies, ensure stakeholder accountability, and implement data management policies essential for managing data proliferation and ensuring commercial success in space ventures.



KEY RECOMMENDATIONS



1. Focus Area: Technology & Infrastructure Development

Topic	Recommendation
<p>Advanced Satellite Technologies</p>	<ul style="list-style-type: none"> • Develop satellites with integrated SAR and EO sensors on the same platform to ensure comprehensive data collection across various environmental conditions. This integration allows for the capture of high-quality, actionable intelligence regardless of weather or lighting conditions. • Develop and deploy cutting-edge Earth observation satellites with advanced remote sensing capabilities for military applications, ensuring high-resolution, multispectral, and all-weather capabilities. • Emphasize the development and integration of disruptive technologies such as AI, cybersecurity, and space technologies into defense applications. This includes developing advanced Earth observation systems, enhancing communication systems, and building comprehensive Space Situational Awareness (SSA). • Prioritize the development of lightweight, high-capacity satellites with advanced functionalities for defense and commercial use.

	<ul style="list-style-type: none"> • Like developed nations, there is imminent need for developing capabilities for deterrence, both in the kinetic domain (direct ascent of co-orbital) and non-kinetic domain (electronic warfare, lasers, high-power microwave, EMP, etc.). • Need for sovereignty in the “Near Space” domain by building capabilities including HAPS (High Altitude Platform Systems), drones, swarms, and other countermeasures. • Develop and integrate cutting-edge payload technologies and sustainable propulsion systems to enhance ISR capabilities and ensure efficient maneuverability of satellites in strategic positions. • Increase the number of observational facilities, especially in the southern hemisphere, and augment tracking facilities with space-based observatories.
<p>Data Fusion and Integration Techniques</p>	<ul style="list-style-type: none"> • Civilian satellite operations have unintended strategic implications, and there is potential in utilizing civilian data for strategic military purposes. • Invest in technologies that enable the seamless fusion of data from diverse sensors and sources. This will improve the accuracy and comprehensiveness of intelligence gathered, making it more actionable for military applications. • Utilize artificial intelligence and machine learning to automate the analysis of vast amounts of data collected by satellites. This approach will significantly enhance the speed and efficiency of turning raw data into actionable insights through automated data analysis, feature detection, and generation of actionable insights. • Convergence of military intelligence and surveillance technologies with C5, I2, Star 2, to enhance space-enabled precision and deep batteries.
<p>Edge Computing on Satellites</p>	<ul style="list-style-type: none"> • Adopt edge computing technologies on satellites to allow for onboard data processing. This reduces the latency in delivering critical intelligence to decision-makers by processing data directly on the satellite before transmission to ground stations.
<p>Private sector Involvement</p>	<ul style="list-style-type: none"> • The need for greater involvement of the Indian private sector in filling capability gaps. This includes employing new high-end transformative technologies like edge computing, building resilience, redundancies, re-launchable vehicles, launch and demand, resilient

	<p>P&T (Positioning and Timing), and expanded NavIC coverage.</p> <ul style="list-style-type: none"> Continuously assess and adapt industry capabilities to address evolving needs, ensuring alignment with national requirements for defense and aerospace. Encourage collaboration between users and the industry to define existing use cases and future requirements, ensuring readiness to meet future demands through technology development and deployment.
<p>Infrastructure</p>	<ul style="list-style-type: none"> Establish dedicated infrastructure for rigorous testing and qualification of space technologies to meet military standards, ensuring reliability and effectiveness in operational scenarios. Develop technologies and methods to overcome the technological challenges include designing lightweight structures resistant to environmental factors, managing helium for airships, and developing efficient propulsion systems and energy storage solutions suitable for harsh near-space environments.
<p>Indigenization of Components</p>	<ul style="list-style-type: none"> Stress the importance of indigenizing critical components to reduce dependency on foreign suppliers and strengthen national security. Encourage and prioritize indigenization to reduce dependency on imports, especially in critical elements.
<p>Enhanced Communication Systems</p>	<ul style="list-style-type: none"> Prioritize the development of secure, flexible MILSATCOM (Military Satellite Communications) systems with software-defined elements to support low-latency, high-bandwidth communication across various theaters of operation. SatCom, especially low Earth orbit (LEO) constellations, should be considered as a primary communication method due to its resilience and lower latency. Invest in the development of resilient and adaptive communication systems that can withstand jamming and cyber-attacks, ensuring uninterrupted command and control capabilities.
<p>Space Debris Mitigation</p>	<ul style="list-style-type: none"> Implement and adhere to best practices and technologies for minimizing space debris and ensuring the sustainability of space activities.

<p>Space Situational Awareness (SSA)</p>	<ul style="list-style-type: none"> • Build comprehensive SSA capabilities to maintain an enriched, near-real-time catalog of space objects, incorporating optical and radar sensors for tracking both cooperative and non-cooperative space objects. • Build comprehensive SSA capabilities and space traffic management systems to monitor and manage the exponentially growing number of space objects and ensure the safety of space assets. • Foster collaboration among like-minded nations to overcome geographical limitations in SSA.
<p>Development of Sustainable Propulsion Systems</p>	<ul style="list-style-type: none"> • Focus on creating sustainable and efficient propulsion systems suitable for operations in near space. This includes electric propulsion systems for HAPS, balloons and UAVs that can operate at high altitudes.
<p>Adoption of Software-Defined Radio (SDR)</p>	<ul style="list-style-type: none"> • SDR technology offers increased spectral efficiency and adaptability for communication networks, making it essential for modern military operations.
<p>Advanced Manufacturing Techniques</p>	<ul style="list-style-type: none"> • Invest in material science to develop lightweight yet durable materials for high-altitude platforms, ensuring they can withstand the harsh conditions of near space. • Emphasize developing and incorporating advanced manufacturing techniques to enhance the quality and reliability of space and defense equipment. • Move beyond built-to-print models to enhance design capability in semiconductor manufacturing.
<p>Enhance Radiation Shielding Techniques</p>	<ul style="list-style-type: none"> • Develop and incorporate innovative radiation shielding methods to protect satellites in challenging space environments.
<p>Secure Communication Layers</p>	<ul style="list-style-type: none"> • Development of secure communication protocols, including encryption technologies like Quantum Key Distribution (QKD), to protect against cyber threats.
<p>Space-based Surveillance Technologies</p>	<ul style="list-style-type: none"> • Leverage space-based surveillance technologies for generating Maritime Domain Awareness. Implement strategies for accepting, avoiding, reducing, monitoring, and controlling maritime threats.
<p>New Areas of Space Exploration</p>	<ul style="list-style-type: none"> • Consider the strategic implications of activities in Cislunar and Deep Space, which anticipate contention over resource exploitation for future space dominance.

<p>Assessment and Safety Measures</p>	<ul style="list-style-type: none"> Implement continuous assessment to estimate close approaches with operational satellites utilize collision avoidance manuals and consider lift-off timing to avoid collisions. Further precision in reentry analysis is required to predict atmospheric reentry timing.
<p>DARPA's Model</p>	<ul style="list-style-type: none"> Learn from the Defense Advanced Research Projects Agency's (DARPA) model of agility and swiftness in developing critical technologies. Deliberate on replicating DARPA's model with an Indian touch for successful outcomes in the defense innovation ecosystem.

2. Focus Area: Funding, Grants and Financial Incentives

<p>Topic</p>	<p>Recommendation</p>
<p>R&D funding</p>	<ul style="list-style-type: none"> Allocate funding and financial incentives for research and development in emerging technologies like quantum computing and advanced AI models. <ul style="list-style-type: none"> This will ensure the development of cutting-edge space capabilities that can enhance national security and intelligence operations. This should include support for both academia and industry to engage in defense-oriented innovation. This support should extend to near-space technology development. Satellite development, SSA systems, and anti-debris measures to ensure technological superiority and sustainability in space operations.
<p>Investment in Space Capabilities</p>	<ul style="list-style-type: none"> Allocate substantial funding and financial incentives for the development of space capabilities, including Earth observation satellites, communication systems, and SSA infrastructure, to fill capability gaps and ensure technological superiority. Provide government funding to bridge the gap in the next five years until the industry can sustain itself. Simplify and stabilize policies to support innovation.

<p>Innovation Grants</p>	<ul style="list-style-type: none"> • Provide targeted grants and financial support for startups and SMEs engaging in the development of dual-use technologies and solutions that can be applied in defense as well as civilian sectors. • Encourage organizations to participate in bug bounty hunting programs and cyber-hackathons to address cybersecurity challenges.
<p>R&D in Near Space Technologies</p>	<ul style="list-style-type: none"> • Provide financial incentives for collaborations between the industry and academia to accelerate the development of innovative near-space technologies.
<p>Investment in Cybersecurity and EW Technologies</p>	<ul style="list-style-type: none"> • Allocate specific funds for the development and procurement of advanced cybersecurity solutions and electronic warfare technologies to ensure secure and resilient communications.
<p>iDEX Program</p>	<ul style="list-style-type: none"> • Continue funding the IDEX program for innovative solutions by startups, managed by DIO, to foster innovation and industry growth. • Provide funding and contracts for IDEX challenges and open challenges to drive innovation and product development.
<p>Support for Industrial Clusters</p>	<ul style="list-style-type: none"> • Ensure continued support from state governments for industrial clusters like space parks to support manufacturing and employment.
<p>Budget and Outlay</p>	<ul style="list-style-type: none"> • Advocate for increased budgetary allocation for space, particularly for defense, to accelerate India's space program. • Building defence space capabilities will require significant financial outlay, research and development, and sophisticated skills to close capability gaps. Public and private sectors need to invest in research, development, and innovation for this purpose.

3. Focus Area: Policy, Regulations and Reforms

Topic	Recommendation
Space Policy for International Cooperation	<ul style="list-style-type: none"> • Develop comprehensive space policies that encourage international cooperation and space diplomacy. Policies should also support the sharing of space-based intelligence and resources with friendly foreign countries to enhance global security.
Space Policy and Regulation	<ul style="list-style-type: none"> • Develop and implement comprehensive space policies and regulations to support the sustainable development and operation of space capabilities, emphasizing the importance of space security and international cooperation. • Develop robust space policies and legal frameworks to govern the use of space, including <ul style="list-style-type: none"> ◦ Regulations for the management of satellite constellations and frequency allocations. ◦ Regulations for debris mitigation, space traffic management, and the conduct of space operations in a contested environment. • Call for reforms in space laws to address the evolving challenges and opportunities in space operations, ensuring they promote sustainable and peaceful use of outer space. • Simplify policies, ensure stakeholder accountability, and implement data management policies essential for managing data proliferation and ensuring commercial success in space ventures.
Space Policy and Doctrine Development	<ul style="list-style-type: none"> • Promulgate a national space military doctrine to clarify terms such as “peaceful use” and “inner space”, signal intent, and share knowledge with stakeholders, ensuring a coherent approach to space security. • Advocate for the development of comprehensive space policies and doctrines that guide the operational, legal, and strategic framework for space activities. • Share the doctrine openly with various stakeholders including policymakers, industry, academia, intellectuals, the international community, uniform fraternity, lawyers, and taxpayers. • Collaborate with other nations for space catalog creation.

<p>Standardization of Definition</p>	<ul style="list-style-type: none"> • Standardize definitions for terms like space situational awareness and space domain awareness across documents, ensuring clarity and consistency in communication and policy. • Issuance of security guidelines by the government and adherence to the National Space Policy is mandatory.
<p>Streamline Regulatory Processes</p>	<ul style="list-style-type: none"> • Reform regulatory frameworks to facilitate the development, launch, and operation of satellites, ensuring timely and efficient deployment of space assets.
<p>Streamlining Acquisition Processes</p>	<ul style="list-style-type: none"> • Reform acquisition processes to be more adaptive to new technologies and innovations, reducing the time from development to deployment. • Advocate for significant reforms in the acquisition processes specifically tailored for space assets, ensuring agility, flexibility, and responsiveness to the fast-paced nature of space technology evolution. • Suggest amending the Defense Acquisition Procedure (DAP) to enable procurement of innovative solutions, even if there is just one provider, to support the private innovation ecosystem. • Reevaluate the relevance of current defense acquisition procedures for the space sector. Consider a new, tailored approach for space acquisitions that is not bound by legacy systems. Ensure that the acquisition process is agile and aligned with the rapid pace of technological advancements in the space sector. • A Special Space Empowered Committee must be formed to ensure speedy and smooth procurement. The empowered committee must have an overlap with the Defence Space Development Committee. This shall ensure that specialists are making decisions as no benchmarks would be available for procurement. • Defence Space Procurement must be delinked from DAP 2020 and new guidelines must be issued so that development and Procurement go hand in hand through an empowered committee of experts. • Implement a revised approach to defense procurement that focuses on quality and innovation, not just cost. Advocate for a value-based and milestone-based procurement approach, where the focus is on the desired outcomes rather than specific technologies or processes.

<p>Intellectual Property (IP) Protection</p>	<ul style="list-style-type: none"> • Develop robust policies for the protection of IP generated from defense R&D, encouraging innovation and participation from the private sector and academia. • Establish clear guidelines for Intellectual Property Rights and financial support to attract investors and support startups.
<p>Cybersecurity Measures</p>	<ul style="list-style-type: none"> • Implement stringent cybersecurity protocols for space assets to protect sensitive data from cyber threats. This includes the development of secure communication channels and encryption methods to safeguard intelligence data. • A proactive contribution from companies and startups in building cybersecurity capacity is required. Initiatives like cyber office simulations and collaborations between various agencies and sectors can help in identifying and addressing vulnerabilities in India's network infrastructure.
<p>Development of Near Space Regulations</p>	<ul style="list-style-type: none"> • Establish clear regulations and guidelines for operations in near space, ensuring safe and coordinated use of this domain for both civil and military purposes.
<p>Space Sovereignty and Security Policies</p>	<ul style="list-style-type: none"> • Formulate and implement policies addressing space sovereignty and security, particularly focusing on the strategic importance of near space in national defense and security.
<p>Knowledge Transfer and Security</p>	<ul style="list-style-type: none"> • Ensure responsible knowledge transfer practices to prevent the misuse of critical technologies.
<p>Addressing Inverted GST Structure</p>	<ul style="list-style-type: none"> • The inverted GST structure disproportionately affects certain areas of space sector where the input costs are higher relative to the output value, such as manufacturing sectors with significant import content or where raw materials are taxed at a higher rate than finished products. Need to address issues related to inverted GST structure to support sector growth and ensure fair taxation.

<p>Adoption of Modern Warfare Scenarios</p>	<ul style="list-style-type: none"> • With the evolution of modern warfare scenarios, adoption of communication strategies to secure own communication, deny enemy access to their communication, and minimize human damage through the use of unmanned warfare technologies and cyber operations. • Explore the potential of both, infantry and signal bots, for strategic purposes, emphasizing the importance of modeling behaviors and utilizing specific knowledge domains. There is a need for careful design, control, and programming of war-fighting machines to ensure effective utilization.
<p>Reforms in Off-Set Policy</p>	<ul style="list-style-type: none"> • The current Off-Set policy implementation is managed by Defence Offset Facilitation Agency (DOFA) under MOD, which is not efficient for the agency to take independent decisions. Relocating it to departments with expertise in international negotiations, such as Ministry of Economic Affairs, which has more expertise in conducting negotiations in the international economic arena for implementation of new offset avenues. • Draw international best practices to harness the benefits of the offset policy. Nations have achieved significant progress by prioritizing factors such as stringent criteria, technology transfer, investment in research and development, and fostering innovation. • India can refine its offset policy framework to promote technological self-sufficiency and industrial growth.
<p>Addressing Space Defence Trade Challenges</p>	<ul style="list-style-type: none"> • Need to provide solutions to challenges related to technology transfers, export control regulations, licensing, data localization policies, supply chain disruption, trade disputes, tariffs, etc.
<p>Production-Linked Incentive Scheme</p>	<ul style="list-style-type: none"> • Innovation in space technology can be harnessed by incentivizing diverse suppliers to engage in the development of varied components. Implementation of a Production-Linked Incentive (PLI) scheme can effectively accelerate this process, facilitating broader participation and advancement in the field of space technology.

4. Focus Area: Collaborations & Partnerships

Topic	Recommendation
Industry Academia Defense Sector Collaboration	<ul style="list-style-type: none"> • Foster strong partnerships between the defense sector, academia, government agencies, PSUs and the private industry to drive innovation in space-based intelligence solutions. Collaborative efforts should focus on developing tailored technologies that meet the specific needs of military operations. <ul style="list-style-type: none"> o Also applied for Near space exploration technologies • Create platforms for sharing requirements, capabilities, and facilitating joint development projects. • Encourage collaborative projects to accelerate technological advancements and applications in space.
International Collaborations	<ul style="list-style-type: none"> • Strengthen cooperation with international partners in emerging technologies through initiatives like Initiative on Critical and Emerging Technology (iCET). • Engage in international collaborations to share knowledge, best practices, technologies, and resources in space exploration and defense applications for mutual defense enhancement. • Engage in strategic partnerships with international allies to enhance space defense capabilities and ensure mutual security interests. • Foster international cooperation for the sharing of space-based assets and technologies to enhance global communication security.
Technology Transfer	<ul style="list-style-type: none"> • Create mechanisms for easy transfer of technology from research to development and then to production, ensuring that innovations can be effectively commercialized and brought into defense use. • Encourage collaborations for technology transfer from foreign companies and research organizations to bridge technological gaps and enhance domestic capabilities. • Encourage collaboration between the public and private sectors for indigenization and enhancement of space-based surveillance systems.

PPP

- Foster public-private partnerships to share knowledge, technologies, and resources for advanced space capabilities. Collaborate with commercial SSA providers to augment indigenous SSA efforts.
- Encourage PPPs to leverage the expertise and innovation of the private sector in developing advanced communication and cybersecurity technologies.

Information Sharing

- Enhance coordination and information sharing among maritime security agencies to enable quick response to emergencies.
- Urges companies to be proactive in sharing knowledge and participating in activities to build cybersecurity capacities.



5. Focus Area: Capacity Building & Awareness

Topic	Recommendation
<p>Awareness and Training Programs</p>	<ul style="list-style-type: none"> • Organize awareness and training programs for stakeholders in the defense and space sectors to familiarize them with the latest technologies and capabilities in space-based intelligence. This will help in the effective utilization of new technologies and foster a culture of innovation. • Conduct awareness campaigns to highlight the strategic importance of space technologies and the need for sustainable and responsible use of space. • Encourage the use of artificial intelligence (AI) and machine learning (ML) in cybersecurity to identify vulnerabilities and mitigate threats efficiently. • Develop a training program for active military users to understand space subjects, led by in-house academia under the supervision of space experts. • Encourage academia to take up the social responsibility of providing relevant knowledge to defense end-users, including space law and other related subjects. • Conduct cyber crisis simulation war games, especially tabletop exercises, and war games in the EW environment on a large scale in India.
<p>Investments in Training & Education</p>	<ul style="list-style-type: none"> • Invest in training and education programs for military personnel and other stakeholders in the space sector, enhancing understanding and operational proficiency with space-based capabilities. • Develop comprehensive educational programs to build expertise in satellite technology and space applications, targeting professionals and students alike. • Invest in cybersecurity training programs and simulation platforms to prepare military and civilian personnel for dealing with cyber threats effectively. • Facilitate access to frequencies and satellite transponders for private sector experimentation in space technology. • Implement skill development programs in collaboration with industries to create job-oriented certification programs.

	<ul style="list-style-type: none"> • Support startups by providing access to manpower and resources through the engagement of UG, PG, and PhD students.
<p>Public Awareness and Engagement</p>	<ul style="list-style-type: none"> • Promote public awareness and engagement in space activities, highlighting the importance of space for national security and encouraging support for space initiatives. • Conduct awareness campaigns to highlight the potential of near space for national security, economic development, and scientific research, encouraging public and private sector engagement. • Enhance awareness and information sharing about satellite capabilities and projects in the open domain.
<p>Government role</p>	<ul style="list-style-type: none"> • Emphasizes the role of the government in promoting the space industry, similar to how the US government supported its defense industry in the past. • Establish a support system for startups in the defense sector, including handholding and resources to navigate procurement processes.

6. Focus Area: Commercialization

Topic	Recommendation
<p>User-Driven Solutions Design</p>	<ul style="list-style-type: none"> • Focus on creating intelligence systems and technologies based on the operational requirements and feedback from end-users in the defense sector. Ensuring that technological advancements align with practical military needs will increase the effectiveness of space-based intelligence. • Focus on swath rather than resolution in satellite imagery for maritime applications to achieve broader coverage.
<p>Promote Commercialization</p>	<ul style="list-style-type: none"> • Encourage the commercialization of defense technologies in civilian markets where applicable, creating broader economic benefits and incentives for innovation. • Support the commercialization and the development of innovative solutions such as in-orbit servicing and refueling to enhance the sustainability and operational flexibility of space assets. • Support the commercialization of innovative communication technologies, including SDR and SATCOM solutions, to enhance their adoption in military operations. • Explore the potential of Direct-to-Mobile (D2M) satellite communications for providing uninterrupted, secure connectivity for military operations, especially in remote and contested environments. • Prioritize investment in future technologies where India can lead rather than constantly playing catch-up with existing technologies.

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Core Competencies



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Communication Systems



Network Management
& Software Development



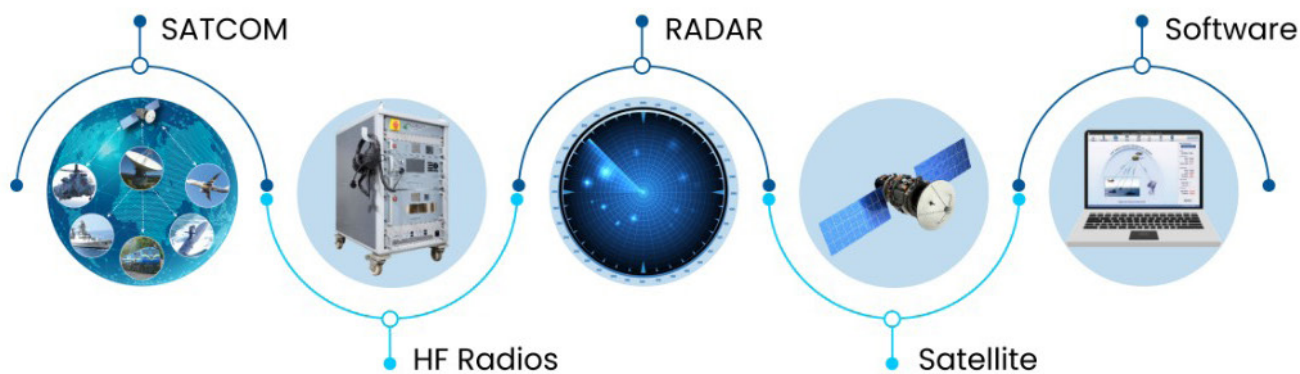
RF System
Design



Embedded Systems
& Digital Signal Processing



Engineering &
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Production Unit 2 & GSaaS Facility :

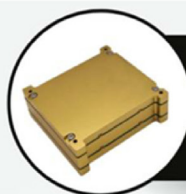
Plot No: S-119 (M), Sy. No: 49
Maheswaram Village
Rangareddy District
Telangana - 501359

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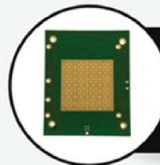




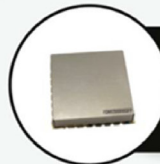
Services offered by us :



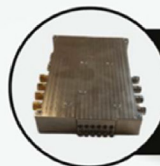
Satellite Transceiver Modules Ku/Ka and Q/V band



Ground to Space Beam Forming Networks



Surface mount mm Wave Synthesizers



Mono-Pulse Radar Module

- Provides on going support & maintenance
- Offers a single source of expertise & accountability across the enterprise



CONTACT: info@qstc.space

About DEFSAT Conference & Expo

DEFSAT 2024 by SIA-India aims to explore India's space ambitions with a focus on innovation, thought leadership, and disruptive technologies. It brings together diverse attendees, including government officials, military commanders, industry professionals, academics, scientists, and leaders in disruptive technologies from India and overseas.

The conference serves as a platform for organizations and countries interested in boosting India's defence space capabilities. It focuses on delivering space domain awareness and satellite communications to enhance military operations. Additionally, it addresses issues related to securing funding for new space capabilities, expanding international partnerships, and developing a defence space strategy aligned with national space strategy.

Message from Mr. Anil Prakash, Director General, SIA-India



Dear Esteemed Participants and Stakeholders,

I am honored to present the DefSAT 2024 Report, encapsulating the dynamic and visionary discussions that transpired during our recent conference held from 07th to 09th February 2024 at the Manekshaw Centre in New Delhi.

DefSAT 2024 embarked on a journey to propel India's defense sector into a modern, future-ready realm, safeguarding our nation's aspirations and interests. Over three enriching days, DefSAT 2024 served as a convergence point for over 500 visionaries, thought leaders, and stakeholders from diverse backgrounds, including government officials, military leaders, industry professionals, academics, and experts. The conference witnessed a remarkable synergy of expertise from government agencies, armed forces, policymakers, space industry leaders, technology innovators, and diplomats, both domestically and globally.

At this pivotal juncture, as India unveils its visionary Space Policy 2023 and Telecommunication Act 2024, DefSAT 2024 stands as a testament to our commitment to fostering robust space capabilities and a thriving commercial presence.

I acknowledge the unwavering support of pivotal government entities and esteemed organizations such as Niti Aayog, ISRO, NSIL, IN-SPACe, DoT, DRDO, and the Ministry of Defence, academia support from CENJOWS, NMF, CLAWS, and CAPS, and over 30 industry partners whose collaboration has been instrumental in shaping the success of DefSAT 2024. The agenda of DefSAT 2024 was meticulously crafted to offer insightful deliberations across a spectrum of defense space topics. From interactive exercises to industry roundtables and exposition, each session provided practical insights and fostered collaborative discussions aimed at shaping the future of our space and defence sector.

As we reflect on the achievements of DefSAT 2024, I extend my heartfelt gratitude to all participants, speakers, sponsors, and partners for their invaluable contributions. Together, let us continue to chart a course towards a stronger, more resilient defense sector that aligns with India's strategic vision and global aspirations.

Warm Regards
Anil Prakash, Director General
SIA-India

About SIA-India

SIA – India, a dynamic, not-for-profit space sector association, SIA-India is dedicated to advancing sectoral interests, accelerating industry growth, and catalyzing 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 Space Ecosystem in India.

Our Mission

Advocacy and representation to Government agencies and relevant stakeholders. 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.



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