# INDO PACIFIC GEOINTELLIGENCE FORUM

4-5 MARCH 2025 | VIVANTA-DWARKA, NEW DELHI

**NextGen Sovereign GeoIntelligence Assets for Regional Security**

# CONFERENCE REPORT 2025

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# A Visionary Convergence!

The 2025 conference brought together a diverse global audience, reaffirming its position as a premier platform for innovation, collaboration, and strategic discussions. Leaders from defence, government, industry, and academia convened to explore the evolving landscape of space and geospatial technologies and their role in ensuring regional stability and security. The event featured thought-provoking plenary sessions, expert panel discussions, and interactive tracks, addressing critical challenges and opportunities in the industry. Cutting-edge technology showcases highlighted the latest advancements, offering attendees a glimpse into the future of defence, intelligence, and geospatial solutions. With 500+ exclusive business user engagements and 31 foreign participants from 14 countries, the conference facilitated meaningful connections, international cooperation, and new partnerships—driving forward innovation and resilience in an increasingly complex global security environment.

## Key Figures

**500+**
Participants

**14+**
Countries

**80+**
Speakers

**240+**
Organizations

**40+**
Foreign Participants


# IPGF 2025 at a Glance


# Key Takeaways from the Address


## Lt Gen AKS Chandele, PVSM, AVSM, PhD

President - Defence, Internal Security & Public Safety, Geospatial World

Lt Gen AKS Chandele welcomed the distinguished guests and attendees. He introduced the dignitaries on the dais, starting with the Chief Guest, Honorable Governor of Mizoram, General VK Singh PVSM, AVSM, YSM, PhD and other high-ranking military officials and industry members, Lt Gen V.G. Khandare, PVSM, AVSM, SM, Principal Advisor Ministry of Defence, Government of India; Vice Admiral Tarun Sobti AVSM, VSM, Deputy Chief of Naval Staff, Indian Navy and Adam Reedy, International Government Sales Manager for Esri. He briefly introduced Geospatial World, a knowledge company advocating the use of space and geospatial technologies across various sectors, including agriculture, energy, transportation, infrastructure, and largely defence. He further highlighted the company's three verticals'- communications, consultancy, and events, which includes global conferences and exhibitions in over 37 countries over the past 28 years. Gen Chandele acknowledged the presence of Armed Forces officers from friendly countries attending the conference. These included senior officers from Malaysian Army, Sri Lanka Navy, Royal Thai Armed Forces, and from Vietnam. He was happy that defence Attaches from a number of friendly countries were also present.  He expressed gratitude for their participation and noted that they would be contributing to the conference over the next two days, helping make it a truly Indo-Pacific event.

> "Geospatial World is a knowledge company, which advocates the adoption of space and geospatial technologies in every sector of human endeavour, including agriculture, energy, transportation, infrastructure, and, of course, largely in defence. We achieve this through our three divisions: communications, consultancy, and events—events like this conference and exhibition. Over the past 28 years, we have organized events on every continent, across 37 different countries."


## Lt Gen V G Khandare, PVSM, AVSM, SM

Principal Advisor, Ministry of Defence, Government of India

Lt Gen V G Khandare addressed global and regional security challenges, focusing on the changing world order after World War II and the Cold War. He highlighted the impact of "Trumpism" and the realignment of international powers, particularly between the U.S., Europe, Russia, and China. Gen Khandare highlighted NATO's challenges, including Europe's distancing from the U.S., the rise of right-wing politics, and internal issues like demographic crises and refugee influx, which may pose greater threats than Russia or China. He also acknowledged the impact of the "America First" policy on global affairs. In South Asia, he emphasized India's vulnerability amidst political instability, China's economic assertiveness, and issues in neighbouring countries like Nepal, Pakistan, Sri Lanka, and Myanmar. He stressed the growing maritime security concerns, particularly in the Bay of Bengal. He also discussed the narcotics threats from Myanmar and Afghanistan, the importance of advancing in cyber and geospatial intelligence, and the need for technological progress to ensure national security. Finally, Gen Khandare touched upon various security domains, including cyber threats, space, air, surface intelligence, maritime issues, and the emerging challenges in the biological and chemical domains, particularly in light of the COVID-19 pandemic. He stressed the need to monitor the nuclear threshold and highlighted the importance of remaining vigilant about unconventional threats in a rapidly evolving security environment.

> "If we do not advance technologically, we face a major problem, as cyber dominance in the information space will have significant implications on cyberspace and outer space. When discussing geointelligence, we must focus on enablers like cyber and cognitive domain dominance. In this domain, we need to consider all aspects, from outer space to inner space, airspace, surface intelligence, maritime issues, and underwater domain awareness. There are many challenges, including monitoring the nuclear threshold. The emergence of biological threats due to COVID-19 and chemical issues, are also critical."


## Adam Reedy

International Government Sales Manager, Esri

Adam Reedy International Government Sales Manager, Esri Adam Reedy stressed on the importance of integrated decision support for national and regional security through the use of geospatial technologies. He discussed how Geographic Information Systems are essential in managing information, integrating diverse data types, and supporting decision-making processes. He outlined the key components of GIS, including systems of record (data storage), systems of engagement (collaboration tools), and analytics (data analysis). he also highlighted the role of geospatial infrastructure in enabling a common understanding of the operational environment and enhancing situational awareness. He further stressed on the importance of integrating advanced technologies such as artificial intelligence (AI), machine learning (ML), and computer vision (CV) to process and analyse data more efficiently. He shared examples of how these technologies are applied in defence and intelligence to improve decision-making, boost productivity, and solve complex problems. In conclusion, Reedy underscored the need for an integrated, scalable, and secure geospatial enterprise system that enhances collaboration, speeds up decision-making, and supports better outcomes in national and regional security

> “AI is helping us work with more and different types of data to solve complex problems faster and more automatically. We’re designing models and algorithms for object detection, feature extraction, and spatial analysis, which allows us to focus more on critical thinking. The real shift is integrating AI and automation into enterprise-ready systems to boost productivity, enhance workflows, and make GIS easier for everyone.”


## V Adm Tarun Sobti, AVSM, VSM

Deputy Chief of Naval Staff, Indian Navy

Vice Admiral Tarun Sobti highlighted the strategic importance of geospatial intelligence for maritime security in the Indian Ocean Region (IOR), a critical hub for global trade. With increasing geopolitical competition and naval presence, he stressed the need for advanced space-based surveillance to enhance real-time threat detection and situational awareness. He underscored the importance of self-reliance in space assets, calling for expansion of programs like Cartosat, RISAT, and NavIC to strengthen surveillance, navigation, and secure communication. AI and machine learning were emphasized as key enablers for faster intelligence processing. Recognizing the slow pace of government initiatives, he welcomed private sector participation in satellite development and data analysis. He concluded that next-generation sovereign space assets are essential for India's maritime security, strategic autonomy, and role as a regional power.

> "The growing importance of space-based capabilities cannot be overstated, and India has made significant strides in this direction. However, there is a need to expand and enhance these capabilities in the maritime context. The creation of next-generation sovereign space and geospatial assets with a maritime focus is not a luxury but a necessity for India's national security and strategic autonomy."

# Inaugural Address


## General VK Singh PVSM, AVSM, YSM, PhD

Hon'ble Governor of Mizoram

Hon'ble Governor laid emphasise on the critical role of geospatial technologies and GEOINT in security, strategic decision-making, and regional cooperation. He began by stressing the importance of "sense-making" in intelligence, cautioning that vast data and advanced technology are ineffective without proper analysis. Highlighting the Indo-Pacific's strategic importance, he noted that 60% of global maritime trade passes through the region, making it a centre of economic growth, geopolitical competition, and security challenges. He underscored that GEOINT is now essential for situational awareness, threat anticipation, and decision-making, particularly in tracking maritime activity, assessing resources, and responding to crises.

Hon'ble Governor highlighted the importance of emerging technologies such as artificial intelligence, machine learning, 3D modelling, and digital twins, which shift intelligence from reactive to predictive analysis. He stressed on the need for self-reliance in geospatial capabilities, warning against over-dependence on foreign entities. Investing in sovereign technologies, including satellite navigation systems and AI-driven analytics, would enhance security and strategic autonomy. Cybersecurity, he warned, is a key challenge, as GEOINT systems rely on cloud computing and interconnected networks, making them vulnerable to cyber threats. Strengthening cybersecurity is critical to maintaining the integrity of intelligence systems. He also advocated for regional collaboration, as many Indo-Pacific nations lack independent GEOINT capabilities. By pooling resources and expertise, nations of the region can enhance security, improve disaster response, and strengthen maritime governance.

Concluding, he warned against "information obesity," where excessive data without clear analysis can hinder decision-making. He called for a lean, efficient intelligence system that provides actionable insights to those on the frontline. He urged continued innovation, cooperation, and investment in cutting-edge geospatial technologies to ensure a secure and stable Indo-Pacific region.

> "Data, as they say, is the new oil, and data insight is today the driving wheel of the knowledge economy, penetrating and integrating across workflows and processes of every industry."

**Sanjay Kumar**
Founder & Chief Executive Officer
Geospatial World

Sanjay Kumar noted the increasing prominence of the space and geospatial industry—a trend underscored by the robust half-day space track at the recent Assam Advantage Summit and discussions on the "Look East" policy. He reflected on how COVID-19 fundamentally reshaped global priorities by exposing supply chain vulnerabilities and fostering an inward focus on self-reliance, factors that have contributed to what he described as an "elastic" world order. He emphasized that space technology is the foundation of the digital age—enabling positioning, observation, and communication through satellite systems such as GNSS and Starlink. Highlighting the urgency of building indigenous capabilities, he advocated for a "buy and build" approach to quickly secure national assets. Sanjay also celebrated India's significant demographic and economic contributions, noting that the country's educated workforce is central to its global influence. He concluded by expressing gratitude to Hon'ble Governor for his unwavering support and underscored the need for timely innovation and strategic partnerships in driving the nation's geospatial future. He thanked all are sponsors, strategic partners & supporting organizations

> "I would like to also put a caution that we don't have 20 years to build everything—now, we need it now. So, we have to go for an approach which is 'buy and build.' By adopting this strategy, we can secure our nation and our resources by leveraging the best available technologies while rapidly developing our indigenous capabilities."

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# Special Address

**Lt Gen RS Raman, PVSM, AVSM, YSM**
Director General Military Intelligence

Lt Gen RS Raman's address at the Geospatial World event centred on four key issues critical to the future of geospatial technology and intelligence. He began by emphasizing that while there is a plethora of available technology, the immediate challenge is to harmonize existing sensor inputs, platforms, and analytics. Integrating these disparate systems—using bridging technologies to connect different ecosystems—can enable a collaborative and trustworthy platform for data sharing without overhauling established processes. He then addressed the apparent contradiction between maintaining sovereign geospatial assets and promoting collaboration. Lt Gen Raman argued that while nations must secure their sensitive data through indigenous data centres, sensors, and encrypted channels, there is potential for a middle path where critical information is curated within a secure, controlled ecosystem that allows for controlled sharing of insights. The third issue he raised was the risk of the geospatial domain itself becoming a contested battleground. As these platforms emerge as authoritative sources of truth, they could be subject to manipulation, spoofing, and biases—whether state, commercial, or otherwise—thereby necessitating strict ethical oversight and continuous technological updates.

> "Sovereign geospatial assets and collaboration may seem contradictory, but our critical, sensitive data must be preserved through our own sensors, encrypted channels and secure data centres, The key is a curated ecosystem that balances collaboration with robust security, ensuring no sensitive information leaks out."

# Plenary Session 1

## Global Geopolitical Scenario & Regional Security Environment

### CHAIR

**Lt Gen Syed Ata Hasnain PVSM, UYSM, AVSM, VSM, SM**
Member, National Disaster Management Authority

### SPEAKERS

**Amb. Gurjit Singh**
Developmental Diplomat, Author, Commentator

**Lt Gen Dato' Seri Haji Muhammad Huzaimi bin Sabri**
Chief Executive, Malaysian Institute of Defence & Security

**R Adm Indika De Silva**
Flag Officer Commanding Naval Fleet, Sri Lankan Navy

## KEY TAKEAWAYS

→ **Global Shifts and the Indo-Pacific Power Framework**: The world is undergoing significant shifts in its global order, marked by turbulence from historical transitions, COVID-19, and recent conflicts. The Indo-Pacific region has emerged as a critical strategic arena—not merely a geographic or economic zone, but a power framework shaped by varied national interests, especially as a bulwark to counter Chinese influence.

→ **Strategic Importance of the Indian Ocean:** The Indian Ocean is a vital global trade artery, handling a significant portion of seaborne commerce and oil shipments. Its security is crucial for global markets, energy security, and economic stability, underscoring the need for comprehensive, collaborative, and technologically advanced maritime strategies.

→ **Geospatial Intelligence as a Strategic Asset:** Geospatial intelligence provides vital insights into territories, borders, natural resources, and infrastructure. Modern space and geospatial technologies—such as satellite imaging, predictive analytics, and AI—are essential for effective disaster management and resolving boundary disputes.

→ **Indigenous Capability and Modernization:** There is an urgent need for a "buy and build" approach that combines the acquisition of proven technologies with the rapid development of indigenous capabilities. Traditional methods relying on human intelligence are insufficient, making modernization critical for addressing immediate national and regional security needs.

→ **Impact of Major Power Rivalries and Territorial Disputes:** The region is experiencing intense competition between major powers, particularly between the West (including the United States) and China. An increasingly belligerent China fuels ongoing territorial disputes (notably in the South China Sea) and affects freedom of navigation. Countries like Malaysia have adopted pragmatic strategies to defend their sovereignty in line with international law.

→ **Regional Collaboration and Collective Action:** Tackling the complex security challenges of the Indian Ocean and surrounding regions requires cohesive regional cooperation. Establishing intelligence-sharing platforms and unified task forces—as encapsulated in the adage, "if you want to go fast, go alone; if you want to go far, go together"—is essential for ensuring lasting security and stability.

"The world is in disarray at the moment—a turbulent time witnessing the emergence of a new world order. From the aftermath of 1945, through the Cold War, and now in the post-COVID era with conflicts in Ukraine and Gaza, global dynamics are constantly shifting. Yet, amidst this flux, the strategically critical Indo-Pacific region—with its vast trade routes, resources, and geopolitical significance—remains under-examined and demands our focused attention."

**Lt Gen Syed Ata Hasnain, PVSM, UYSM, AVSM, VSM, SM**
Member, National Disaster Management Authority

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"The Indo-Pacific is not just a geographic or economic region but a power concept that challenges the old Asia Pacific model. It's about ensuring that this vast region—with its immense trade routes, seas, and resources—does not become the playground of any single power. India and Japan must lead in crafting a balanced, multipolar strategy."

**Amb. Gurjit Singh**
Developmental Diplomat, Author, Commentator

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"Malaysia will continue to defend its sovereignty, sovereign rights, and interests in its maritime area in alignment with universally recognized principles of international law, including UNCLOS 1982. Our pragmatic strategy combines robust defence capabilities with balanced diplomacy—establishing strong ties with global and regional partners—to ensure long-term security, stability, and prosperity in the region."

**Lt Gen Dato' Seri Haji Muhammad Huzaimi bin Sabri**
Chief Executive, Malaysian Institute of Defence & Security

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"In our collective security efforts, fostering trust and reducing dependency on extra-regional powers is key. Maritime security is a shared responsibility, and the challenges in the Indian Ocean region are complex. However, through regional cooperation, technological innovation, and trust-building measures, we can create a safer and more secure maritime environment."

**R Adm Indika De Silva**
Flag Officer Commanding Naval Fleet, Sri Lanka Navy

# Plenary Session 2

## Defence Geospatial Platform and Knowledge Infrastructure for Enabling Digital Twins and Actionable Intelligence

### CHAIR

**Lt Gen Rajiv Sahni, AVSM, VSM**
Director General Information Systems

### SPEAKERS

**Dr P.V. Radhadevi**
Outstanding Scientist & Director, Advanced Data Processing Research Institute

**Bruno Versini**
Chief Operating Officer, e-GEOS

**Dr V S Subrahmanian**
Professor
Northwestern University


## KEY TAKEAWAYS

→ **Dual-Use Integration:** The convergence of military and civilian technologies is crucial. By fusing geospatial data with digital innovations (such as AI/ML, digital twins, and quantum computing), raw data is transformed into actionable intelligence.

→ **Real-Time Decision Making:** Rapid data processing—from high-resolution satellite imagery to edge computing on satellites and UAVs—is revolutionizing defence decision-making, enabling near real-time intelligence generation and deployment.

→ **Technological Evolution:** Advancements in digital technologies (big data, mobile applications, immersive tech) are enhancing traditional geospatial tools like GIS, remote sensing, and photogrammetry, paving the way for advanced 3D mapping and multi-criteria decision support.

→ **National Defence Geospatial Strategy:** A comprehensive strategy is needed that covers data collection, spatial analysis, visualization, integration, and governance. This is essential for building a resilient, self-reliant defence ecosystem that leverages cutting-edge geospatial capabilities.

→ **Infrastructure and Platform Requirements:** Rapid deployment of military satellites, high-altitude pseudo-satellites, and robust communication links is vital for proactive (predictive) rather than reactive defence measures, ensuring continuous, near real-time intelligence.

→ **Overcoming Adoption Challenges:** Addressing issues such as siloed organizations, unclear data-sharing guidelines, and outdated approval processes is key to fully harnessing geospatial intelligence in defence.

→ **Proactive and Predictive Defence:** Utilizing an adversarial perspective—anticipating threats by "putting ourselves in the shoes of the bad guys"—and integrating diverse data sources can optimize predictive accuracy and minimize potential damage.

→ **Integrated Command & Control:** Consolidating tri-service data into a unified GIS platform creates a robust operational environment, enabling rapid decision-making and resource deployment even in degraded or contested networks.

→ **Continuous Innovation and Collaboration:** Ongoing refinement of geospatial platforms through collaboration between the military, academia, and industry is essential. As echoed in Steve Jobs' sentiment, innovation often reveals unrecognized needs, prompting continuous improvement in defence capabilities.

"What is required is to have a GIS engine that is absolutely robust, adaptive, and responsive—because while the backend processing can be handled by experts, the image in the front must be perfect, integrating real-time temporal changes, advanced photogrammetry, 3D modelling, and immersive capabilities to support mission planning and rapid decision-making."

**Lt Gen Rajiv Sahni, AVSM, VSM**
Director General Information Systems

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"The fusion of advanced geospatial and digital technologies is revolutionizing defence decision-making. By integrating the physical, biological, and digital worlds, we are transforming raw data into an actionable intelligence cycle that empowers real-time responses."

**Dr P.V. Radhadevi**
Outstanding Scientist & Director, Advanced Data Processing Research Institute

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"We are transforming the traditional pixel-to-report cycle by integrating advanced geospatial data with digital technologies such as AI, digital twins, and edge computing. This fusion enables us to generate actionable intelligence in near real-time—providing early warnings and rapid decision-making that ultimately saves lives."

**Bruno Versini**
Chief Operating Officer, e-GEOS

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"We have to look not just at different data types and integrate them, but also integrate different forms of reasoning—combining geospatial data, sensor inputs, and predictive analytics—so that we can maximize the accuracy of our predictions and minimize the damage if an attacker is not mitigated."

**Dr V S Subrahmanian**
Professor, Northwestern University

# Plenary Session 3

## Space & Computing Infrastructure Enabling Sovereign Capabilities

### CHAIR

**Lt Gen Anil Bhatt PVSM, UYSM, AVSM, SM, VSM**
Director General, ISpA

### SPEAKERS

**AVM Pawan Kumar VM**
Director General, Defence Space Agency

**Vincent Kessler**
General Manager - Head of Asia, Synspective

**Abhineet Jain**
Director - Sales & Business Development, Asia Pacific, BlackSky

**Amit Kumar**
COO & Co-Founder, Suhora

**Lt Col Gil Elmalem**
Embassy of Israel



"Sovereignty in space is not achieved in isolation. With our limited space sensors and ground-based radars, no single nation can cover the entire globe or develop a complete picture of space situational awareness on its own. We must collaborate with like-minded nations and allies to share capabilities and data."

**Lt Gen Anil Bhatt PVSM, UYSM, AVSM, SM, VSM**
Director General, Indian Space Association

"Technology is not going to fight the war; the war is going to be fought by the operational capability we present. That's why we need an apex structure—a collaboration of military, academia, think tanks, and industry—to ensure our innovative ideas translate into effective, real-world solutions."

**AVM Pawan Kumar VM**
Director General, Defence Space Agency

"Our mission is to create a better world by providing critical information in infrastructure, security, and sustainability. We develop our own satellites and innovative solutions—such as our direct-to-user intelligence tool—that enable rapid disaster response and deliver actionable insights in just a few hours."

**Vincent Kessler**
General Manager - Head of Asia, Synspective

"Imagine a concept of operation where the entire workflow—from satellite tasking to data delivery—is completed within 10 minutes. With our mid-inclined orbit strategy and inter-satellite data links, we can adjust plans as late as 5 minutes before overpass, enabling sub-hourly revisit and redefining real-time geospatial intelligence."

**Abhineet Jain**
Director - Sales & Business Development, Asia Pacific, BlackSky

## KEY TAKEAWAYS

→ **Space Segment Focus**: Satellite-based technologies are key for terrain mapping, real-time surveillance, precision navigation, and are affected by space weather, highlighting the importance of maintaining resilient sensor systems.

→ **Technological Advancements and Cybersecurity**: Emphasis on integrating advanced technologies such as neuromorphic sensors, edge computing, quantum computing with AI, and ensuring robust cybersecurity through strong encryption and cyber-hardening measures to enable rapid predictive intelligence.

→ **Sovereign Infrastructure Development**: There is a strong call for developing independent space and ground infrastructures—characterized by rapid satellite deployment and low-latency communications (under 100 milliseconds)—to handle vast data and maintain national security.

→ **Collaboration and Space Diplomacy**: While sovereign capabilities are crucial, collaborating with major space-faring nations and engaging in space diplomacy (e.g., through regional satellite navigation systems) can enhance collective security and share advanced capabilities.

→ **Strategic and Operational Frameworks**: Recommendations include establishing dedicated think tanks and apex structures that integrate military, academic, industry, and policy experts to accelerate strategy development and operational readiness.

→ **Future-Backward Planning and Adaptive GIS Engines**: The approach involves envisioning an ideal future state for defence operations and planning backward to set milestones, while employing robust GIS platforms that support real-time updates, advanced photogrammetry, and 3D modeling.

"Sovereignty is the freedom to govern oneself with complete control over critical infrastructure—ensuring full security and self-dependence. In today's globalized world, while collaboration is essential, it's equally vital to have an independent backup plan, especially when supply chains are disrupted by sanctions or policy shifts."

**Amit Kumar**
COO & Co-Founder,
Suhora

"Self-reliance and sovereignty are achieved not solely through internal strength, but by leveraging our foundation in science, technology, and manpower alongside collaboration. You cannot be completely self-reliant if you do not collaborate—map your advantages, identify your weaknesses, and compensate for them through partnership. That is the pathway to reaching our full potential."

**Lt Col Gil Elmalem**
Embassy of Israel
India

## INDUSTRY EXAMPLES AND INNOVATIONS

→ **Synspective (Japan):** Developed from a national R&D initiative, Synspective has launched radar satellites for high-resolution imaging (25 cm) and provides innovative data solutions, including super-resolution algorithms and direct-to-user intelligence tools. Their capabilities have proven crucial in disaster scenarios, such as effective flood mapping in Nepal.

→ **Black Sky (US):** Black Sky is advancing towards a next-generation constellation with improved resolution (35 cm) and reduced data latency (targeting as low as 10 minutes), complemented by a self-service platform (Spectra) that streamlines satellite data acquisition and analysis. Their model emphasizes a balance between sovereign access and collaborative innovation.

→ **Balancing Collaboration with Self-Reliance:** While international partnerships are valuable, true sovereign capability requires independent infrastructure and a backup strategy to mitigate risks from supply chain disruptions and policy shifts, ensuring national autonomy in defence and security operations.

# TRACK 1: Technology

## Session 1: Reality Capture & Geointelligence

### CHAIR

**Lt Gen Anil Kapoor, AVSM, VSM**
Former DG EME

### SPEAKERS

**Brig B Sareen Chander, Comdt**
Centre for Automated Military Survey, Indian Army

**Royston Ong**
Business Development Manager (National Security), Asia Pacific, Esri Global

**Brahmam GVS**
Director, NeoGeoinfo Technologies

### KEY TAKEAWAYS

→ **Fluid Reality and Data Validation**: Reality is constantly evolving and must be continually validated, especially given the presence of misinformation and disinformation.

→ **Foundational Tech Pillars**: Modern strategies are built on four pillars—Data, Digitization, Digitalization, and Disruption—augmented by quantum technologies that handle vast data and enable real-time awareness.

→ **Data as the New Oil**: Data is highly valuable and comparable to oil, with technology acting as the refinery that transforms raw data into actionable intelligence.

→ **Central Role of Geospatial Intelligence**: Geospatial data is crucial for capturing reality, integrating diverse sources (GIS, LiDAR, multispectral imagery, SAR, digital twins) to create a comprehensive, multi-domain operational picture.

→ **Expanded Battlefield Domains**: Modern conflicts and operations now extend into space, cyberspace, electromagnetic spectra, and information operations, making geospatial intelligence essential for strategic planning.

→ **Enhanced Reality Capture**: The integration of AI, machine learning, and digital twin technologies automates data fusion and analysis, enabling rapid, real-time situational awareness and more effective operational planning.

→ **Need for Robust Infrastructure and Cybersecurity**: High-precision geospatial data depends on a robust national geodetic reference frame, dedicated IT infrastructure, and strong cybersecurity measures to protect critical data.

→ **Collaborative Innovation**: Advancing geospatial capabilities requires close collaboration among defence agencies, industries, startups, and academia, alongside targeted research and education.

→ **Evolution of Mapping Technology**: Advances in sensor technology have transformed static maps into dynamic, mission-critical tools that provide real-time, actionable intelligence.

→ **Essential Domain Expertise**: Expert knowledge is key to ensuring that the right data is captured, accurately modelled, and effectively interpreted to support decision-making in an ever-changing landscape.

"When we look at the new tech World Order, there are four D's and one Q – data, digitization, digitalization, disruption, and quantum – because today the human-machine interface is actually being augmented, if not replaced by machine-to-machine communication, which is hugely fast, and therefore quantum computing and quantum communication are no longer a choice; they're a compulsion when you look at petabytes of data that have to be transferred in a very short time to create real-time situational awareness."

**Lt Gen Anil Kapoor, AVSM, VSM**
Former DG EME

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"If you see the modern character of warfare, the dominance and deterrence is coming up which seems costly, but then if you see the war, it's more expensive, so we have to ensure that we have a good amount of dominance and deterrence in the region. Reality capture can be an essential tool to achieve this dominance and deterrence because of its essentials such as reference reliability, precision, accuracy, and accessibility."

**Brig B Sareen Chander**
Comdt, Centre for Automated Military Survey, Indian Army

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"Reality mapping is the foundation for our warfighters' digital twin. By leveraging advanced AI, we gain a decisive advantage—empowering analysts to focus on high-level operations, such as analysing routes and discerning enemy intent, rather than spending time manually cataloguing every building or asset."

**Royston Ong**
Business Development Manager (National Security), Asia Pacific, Esri Global

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"I consider a map a passive tool until it's enhanced with a sensor—even something as simple as a GPS sensor. That enhancement transforms it into a mission-critical asset, much like Google Maps."

**Brahmam GVS**
Director, NeoGeoinfo Technologies

# Session 2: Cloud Computing & Data Integration

## CHAIR

**Col Deepak Sisodia, VSM***
DGIS, Indian Army

## SPEAKERS

**Col Dr Mahendra K Sekaran Nair**
Director, Contemporary Security
Malaysian Institute of Defence & Security

**Col Vineet Tripathi**
Indian Army

**Balpreet Singh**
Manager- Aerospace & Defence, EY India

**Lt Col Shrutika Dutta**
DGIS, Indian Army


## KEY TAKEAWAYS

→ **Cloud Fundamentals**: Cloud computing integrates infrastructure, platform, and software layers to allow remote access to applications and services via the Internet.

→ **Deployment Types**: Organizations can choose between private, public, and hybrid cloud deployments to balance control, security, and scalability.

→ **Service Models**: Modern cloud services are delivered through models like IaaS, PaaS, and SaaS, ensuring continuous accessibility and operation.

→ **Case Study Insights**: The Malaysian Army's evolution from isolated, legacy systems to an integrated, secure private cloud highlights the challenges and benefits of strategic IT integration.

→ **Governance and Operations**: Effective cloud governance and operations are critical for maintaining system security, performance, and data quality.

→ **Data Management**: Various data storage options—including relational databases, NoSQL databases, and data warehousing—are essential for business intelligence and advanced forecasting techniques.

→ **Data Ubiquity and Governance**: Continuous data generation requires robust governance, clear stewardship, and accountable management to ensure data reliability.

→ **Emerging Technologies**: Edge computing and edge AI can reduce latency and improve local data processing, which is especially important for remote or critical operations.

→ **National Security and Data Sovereignty**: Protecting sensitive military information necessitates reducing reliance on foreign cloud providers and developing indigenous, bespoke solutions.

→ **Defence Cloud Architecture**: A secure defence cloud system may involve a private cloud for classified data, a hybrid model for inter-agency communication, and a public cloud for research and partnerships.

→ **Strategic Integration**: Emphasizing a unified, scalable data ecosystem—potentially enhanced by digital twin technology—is key to maintaining strategic advantage in modern warfare.

"Even if I'm developing a Python script for advanced AI models, I can't simply store an API key in an environment file and connect over the internet. Instead, I must bring the entire infrastructure on-premises, sandbox it, test it, and then deploy it. Although this process poses challenges, it ensures that our data remains secure and never leaves our premises—an absolute must when handling sensitive Indian Army data."

**Col Deepak Sisodia VSM***
DGIS, Indian Army

"Cloud computing leverages external resources, enabling users on tablets and PCs to access applications via a web browser over the Internet. Essentially, the cloud consists of underlying wired infrastructure that remains unseen, yet provides the necessary connectivity and feedback. There are three main deployment options: a private cloud, where the infrastructure is under your control; a public cloud offered by external providers; and a hybrid cloud that combines both approaches. In essence, cloud computing is about seamless access to applications through the Internet."

**Col Dr Mahendra K Sekaran Nair**
Director, Contemporary Security, Malaysian Institute of Defence & Security

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"Reality mapping is the foundation for our warfighters' digital twin. By leveraging advanced AI, we gain a decisive advantage—empowering analysts to focus on high-level operations, such as analysing routes and discerning enemy intent, rather than spending time manually cataloguing every building or asset."

**Col Vineet Tripathi**
Indian Army

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"In the digital age of warfare, data is our most powerful weapon. Without sovereign control over our defence cloud and mastery of AI-driven intelligence, we risk strategic blindness in an era defined by precision warfare."

**Balpreet Singh**
Manager- Aerospace & Defence, EY India

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"Cloud computing is revolutionizing defence operations by enhancing data accessibility, security, and interoperability. A strategic shift toward secure, scalable cloud architectures will be key to maintaining operational superiority and safeguarding national security."

**Lt Col Shrutika Dutta**
DGIS, Indian Army

# Session 3: NextGen Tech, AI, ML, IoT & IoMT

## CHAIR

**Maj Gen Shivendra Kumar**
Additional Director General EME, Indian Army

## SPEAKERS

**Lt Col Anupam Tiwari**
Advisor (Cyber) to Principal Advisor
Ministry of Defence

**Lt Col Amandeep Singh**
Spatial Domain Expert

**Saranya M, Manager**
Pre-Sales (Data Science), Esri India

**Dheeraj Mehra**
Chief Executive Officer, Micronet

**Atul P Agarwal**
Founder and Managing Director, Apt Software


## KEY TAKEAWAYS

→ **Emerging AI Terminology & Influence**: Concepts like alignment, persuasive AI, and differential privacy are shaping AI discourse. AI can subtly influence user opinions over time.

→ **Privacy & Data Protection**: Differential privacy introduces noise to protect sensitive data. Privacy budget balances data utility and privacy exposure.

→ **Advanced AI Learning Methods**: Bayesian programming, transfer learning, and knowledge distillation allow AI to learn efficiently from small datasets.

→ **Multimodal AI & Hardware Considerations**: AI models are evolving to integrate text, voice, and video. AI behavior varies based on hardware (e.g., Nvidia vs. TPUs), raising concerns about security vulnerabilities.

→ **Ethical and Security Concerns**: Machine unlearning helps remove banned data. AI evolution, including AI-generated languages, poses unforeseen risks.

→ **AI in Military & IoT Integration**: IoT, AI, and ML are revolutionizing military operations. Internet of Military Things (IoMT) & Internet of Battlefield Things (IOBT) improve situational awareness and decision-making. Challenges include communication stability, security, and large-scale deployment.

→ **AI in GIS (GeoAI) & Satellite Intelligence**: AI enhances GIS for image interpretation, object detection, and spatial analysis. Pre-trained AI models in ArcGIS streamline workflows. AI-driven aircraft detection, defence monitoring, and maritime security improve intelligence gathering.

→ **AI in Military Intelligence & Decision-Making**: Graph-based AI models and ontology enhance intelligence analysis. Natural Language Processing (NLP) extracts insights from large text datasets.

"The integration of AI in military intelligence and decision-making is not just about technology—it's about enhancing operational efficiency, situational awareness, and strategic advantage. As AI evolves, so must our approach to security, ethics, and adaptability in the defence landscape."

**Maj Gen Shivendra Kumar**
Additional Director General EME, Indian Army

"When discussing next-generation technology, we focus on AI, machine learning, IoT, and similar innovations. We celebrate the promises of large language models like GPT—imagining breakthroughs, powerful analytics, and more informed decision-making. Yet, we rarely acknowledge the intricate, behind-the-scenes processes that make all of this possible."

**Lt Col Anupam Tiwari**
Advisor (Cyber) to Principal Advisor, Ministry of Defence

"AI is only a tool—we use it to classify, identify, and analyze, but the real impact comes from how we apply it to solve real-world challenges. Whether its detecting dark vessels engaged in illegal activities, monitoring strategic defence sites with high-resolution satellite imagery, or automating 3D modeling for digital twin cities, AI enables us to transform traditionally manual and time-consuming processes into efficient, data-driven solutions."

**Dheeraj Mehra**
Chief Executive Officer, Micronet

"GeoAI sits at the intersection of artificial intelligence and geospatial workflows, allowing users to leverage AI-powered algorithms to fast-track GIS and imagery analysis. By integrating machine learning and deep learning techniques, GeoAI enables automated object detection, change detection, and predictive analytics, making spatial data processing more efficient and insightful."

**Saranya M**
Manager, Pre-Sales (Data Science), Esri India


"After having AIML IOT and IOMT this brings us to a military man with the technology but what a military man is trained for battles so AI ML IOT and IOMT will remain incomplete if it doesn't reach IOBT—that is, Internet of Battlefield Things. IOBT is already becoming a reality but with the p of particate it is expected to develop and perform with dominant and leading existence in the Warfare military operations which largely be based on interconnected technology leveraging advances in embedded systems and machine intelligence in order to achieve Superior defence capabilities."

**Lt Col Amandeep Singh**
Spatial Domain Expert

"An ontology in a domain is representation of the knowledge in that domain in a formal manner and why do you want to do that? You want to do that because if you represent knowledge in a formal manner rather than in somebody's brain or in paper, the computer can reason about it and you can do inferencing."

**Atul P Agarwal**
Founder and Managing Director, Apt Software

# Session 4: Understanding the Realms of Digital Twins

## CHAIR

**Maj Gen Dilawar Singh**
Senior Advisor, Indian Centre for Interdisciplinary Studies in Science and Technologies

## SPEAKERS

**Dr Anirudha Roy**
Chief Technology Officer, Genesys International

**Col Satish Kumar Tyagi**
Col MI-16, Directorate General of Military Intelligence

**Dr Kinjal Dave**
PhD, Principal Researcher-Geoinformatics, Rashtriya Raksha University

**Brig Sunil Mishra**
Chief Executive Officer, Hawk Eye Aerial Imaging & Mapping Solutions Pvt Ltd


## KEY TAKEAWAYS

→ **Digital Twins Overview**: Advanced 3D GIS models integrating real-time data for accurate simulations and decision-making. The company has been a leader in mapping for 25+ years, actively developing Digital Twins for Indian cities like Varanasi, Kanpur, and Mumbai.

→ **Technology & Data Collection**: Uses aerial platforms (aircraft, drones), mobile mapping (LiDAR-equipped vans), and ground surveying. Owns and licenses geospatial data to companies like Google.

→ **Digital Twin Maturity Model**: Involves data acquisition, 3D model generation, platform-agnostic integration, real-time environmental simulations, IoT automation, and predictive analytics.

→ **Applications**: City planning, urban development, disaster management, infrastructure monitoring, and environmental tracking. Future plans include real-time satellite data (ISRO's NISAR) and IoT-based monitoring.

→ **Validation & Verification**: Digital Twins require continuous validation to ensure accuracy. Verification ensures correct model building, while validation confirms real-world representation.

→ **Military Applications**: Enhances battlefield situational awareness with high-resolution 3D models, aiding tactical planning and decision-making. Used for mapping entry routes, structures, and escape points.

→ **Drone & 3D Mapping**: Drones with 1 cm ground sampling provide superior reconnaissance. Factors like platform type, sensor placement, and lighting conditions affect data accuracy.

→ **Challenges in Military Use**: Real-time data processing delays, lack of a centralized Spatial Data Infrastructure (SDI), GNSS limitations, and reliance on foreign tech for semiconductors and defence-grade cameras.

→ **Intelligence & Surveillance**: Digital Twins support intelligence analysis, infrastructure assessment, and rapid decision-making through real-time simulations, reducing the OODA (Observe, Orient, Decide, Act) loop.

→ **Global Use Cases**: U.S. Air Force uses Digital Twins for F-35 maintenance (25% cost reduction), China for naval ships, and Australia for naval vessel maintenance (30% cost savings).

→ **Future Innovations**: AI-driven automation, quantum computing for predictive analytics, enhanced cybersecurity, and industry-academia collaborations to bridge technology gaps.

"Digital Twin has a solution for every sector, every stage of the lifecycle of any equipment, system, or process. Whether you are a strategic commander, operational commander, tactical commander, or staff officer, DT holds immense value. From predictive maintenance to operational planning, real-time data integration to strategic decision-making, DT is transforming military operations and optimizing resources. It is not just a technology—it is the future of efficiency, readiness, and cost-saving in defence and beyond."

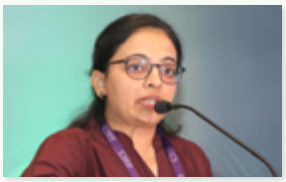
**Maj Gen Dilawar Singh**
Senior Advisor, Indian Centre for Interdisciplinary Studies in Science and Technologies

"The way the real world is behaving, the digital environment—each and every feature—should behave in the similar manner, both in the look and feel and in terms of behaviour and attributes. That is where the role of communication protocols, IoT, and automation comes into play. If there is wind moving in the real world, it should be exactly replicated in the digital environment, with the same speed and direction. This is what we call a 'living digital twin'—a model that not only represents geometry but also responds dynamically to real-world changes."

**Dr Anirudha Roy**
Chief Technology Officer, Genesys International

"If Digital Twins is helping me in shortening my OODA loop or preparing an intelligence report and disseminating it to my ground forces as early as possible, then it is of use to me. This technology must seamlessly integrate with our existing systems, ensure data accuracy, and be adaptable to different terrains and infrastructures. While AI and Digital Twin technologies have the potential to revolutionize intelligence analysis, their true value lies in their ability to enhance efficiency, provide reliable insights, and support critical decision-making in real-time."

**Col Satish Kumar Tyagi**
Col MI-16, Directorate General of Military Intelligence



"Digital twin is a replica of the real world. The only difference between simulation and digital twin is that digital twins require continuous updating and modification, while in a simulation model, it's just a model which is static, where we can't expect continuous updating and integration. In the case of digital twins, the first figure on the left shows us the main components, which start with the actual real world and the virtual world. There is one very important link between them, which is communication, where we are concerned about our cybersecurity part, and the third component is the user."

**Dr Kinjal Dave, PhD**
Principal Researcher-Geoinformatics, Rashtriya Raksha University

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"Digital Twins are transforming the way we visualize, analyze, and predict real-world scenarios. From urban planning to battlefield intelligence, these high-fidelity models empower decision-makers with real-time insights, enhancing both efficiency and security in an increasingly data-driven world."

**Brig Sunil Mishra**
Chief Executive Officer, Hawk Eye Aerial Imaging & Mapping Solutions Pvt Ltd

# TRACK 2: Defence Geospatial Knowledge Platform

## Session 1: Defence Geospatial Enterprise Platform

### CHAIR

**Brig Arun Kumar**
Additional Director General, Military Survey, Indian Army

### SPEAKERS

**Lt Col Dr. Warakan Supinajaroen**
Member, GEOINT Working Group, Royal Thai Armed Forces

**Capt (IN) Amol Merwade**
Vice President, SPRY Technocon

**Lt Col AR Packianathan**
Directorate General of Information Systems, Indian Army

**Harsha Vardhan Madiraju**
Associate Director, Open Geospatial Consortium

**Dr Monika Tanwar**
Assistant Professor, School of Management and Entrepreneurship, IIT Jodhpur

### KEY TAKEAWAYS

→ **Integrated GEOINT Evolution**: The Royal Thai Armed Forces' creation of a unified GEOINT Operation Command (GOC), merging traditional survey and mapping with intelligence functions, exemplifies the shift toward a consolidated, agile defence geospatial enterprise. Collaboration with specialized agencies like GISTA enhances capabilities through satellite measurements and photogrammetric surveys.

→ **Crisis Response and Operational Limitations**: GEOINT systems have proven essential in disaster scenarios (e.g., the massive flood in Messi, 2024) for identifying affected areas and coordinating relief. However, limitations in precise predictive modelling and effective communication (e.g., translating scientific warnings) underline the need for enhanced operational tools.

→ **Advanced Technology Integration**: Utilization of AI/ML for predictive modeling, anomaly detection, and prescriptive decision support is crucial for real-time tactical and strategic decisions. Incorporating distributed cloud and edge computing, alongside emerging quantum computing technologies, is key to achieving ultra-low latency and processing vast datasets in real time. Blockchain is proposed to secure data integrity, prevent tampering, and ensure immutable, trustworthy records across the entire data lifecycle.

→ **Autonomous and Real-Time Data Collection**: Autonomous systems such as drones, satellites, IoT devices, and unmanned vehicles are central to continuous, real-time data collection, enabling rapid situational awareness and mission responsiveness.

→ **Holistic, Adaptable Enterprise Architecture**: The envisioned defence platform requires a robust data injection-processing-delivery loop that is agile and adaptable to rapid environmental changes. Integration of digital twins for visualization and predictive insights, supported by blockchain for secure data sharing, will be critical for mission planning and autonomous operations.

→ **Interoperability, Cybersecurity, and Data Sovereignty**: Addressing interoperability issues—due to multiple proprietary data formats—through cross-platform APIs and AI-driven data fusion is essential. Strengthened cybersecurity measures, including AI-driven intrusion detection and zero-trust frameworks, are necessary to protect against evolving threats such as hacking and GPS spoofing. Clear governance and secure data sharing protocols are needed to resolve

"The future of defence geospatial intelligence lies in integration, adaptability, and innovation. By leveraging AI, autonomous systems, and secure data-sharing frameworks, we can enhance operational agility, crisis response, and strategic decision-making, ensuring a superior edge in both military and humanitarian missions."

**Brig Arun Kumar**
Additional Director General, Military Survey, Indian Army

"Without applying trust and provenance to AI training data, the best algorithm is useless—or even dangerous—if it is trained on fraudulent data. There is a concept called Integrity—ensuring that the data is accurate, complete, and consistent throughout its lifecycle—and Provenance, which is the chain that tracks how the data arrived at its current state. Only by embedding both Integrity and Provenance can we truly trust the data within our secured ecosystems."

**Harsha Vardhan Madiraju**
Associate Director
Open Geospatial Consortium

"Today, when I'm talking about enterprise-based geospatial platforms, what my future requires is the autonomous systems, the AI-driven analytics, the quantum computing, the edge computing, and the networks—this is the entire process in which I can get unmatched speed, accuracy, and reliability in my application. The platform we're looking forward to will be totally data-driven and decision-making centric, adaptable to rapid environmental changes, and will integrate everything from autonomous data collection to blockchain security and real-time analytics for mission success."

**Lt Col AR Packianathan**
Directorate General of Information Systems, Indian Army


"The Defence Geospatial Platform challenges require a strategic, multifaceted approach combining technology, policy, and human expertise. I believe it's time we embrace continuous innovation, global collaboration, and maintain geospatial superiority in an ever-evolving operational landscape."

**Capt (IN) Amol Merwade**
Vice President, SPRY Technocon

"From our experience applying GEOINT super intelligence technology in crisis prevention, we've learned that even though our advanced space technology can predict the possible volume of rain, we still cannot precisely know how much water will come to Thailand—especially when the river is fed from our neighbour country. Moreover, our warnings, often delivered in scientific language, don't effectively communicate to the public what actions to take."

**Lt Col Dr. Warakan Supinajaroen**
Member, GEOINT Working Group, Royal Thai Armed Forces

"We should not just look around the world blindly and follow the stuff with the technologies—that's the biggest challenge. Once you adopt it, you will be highly dependent on those technologies, and you might destroy your existing system completely. So, you should be very well aware of your existing system and your customization requirements."

**Dr Monika Tanwar**
Assistant Professor, School of Management and Entrepreneurship, IIT Jodhpur

# Session 2: Navigation Satellite System for Regional Security

## CHAIR

**Lt Gen Girish Kumar**
VSM, Advisor Govt. of Haryana

## SPEAKERS

**Brig Samresh Malhotra**
Brig MI (Tech), Directorate General of Military Intelligence

**Dr (Col) Kailash Chandra Tiwari**
Professor Civil Engineering, Delhi Technological University

**Akhileshwar Reddy**
Scientist SE, Satellite Navigation Program Office, Indian Space Research Organisation


## KEY TAKEAWAYS

→ **Essential Role of PNT**: PNT (Positioning, Navigation, and Timing) is crucial for military platforms, weapons systems, command and control, and critical infrastructure. Precise timing is vital for effective operations and communications.

→ **Vulnerabilities and Threats**: PNT systems face risks such as jamming, spoofing, and various forms of interference, which can disrupt aviation, maritime navigation, and guided weapon systems. For instance, jamming can cause critical systems (e.g., NATO Link 16) to fail within an hour.

→ **Proliferation of Jamming Devices**: The availability of low-cost consumer jammers alongside sophisticated military-grade equipment underscores the increasing threat landscape to PNT reliability.

→ **Multi-Level Resilience Strategies**: Resilience can be achieved through a range of strategies, from basic systems using a single PNT source to advanced architectures that leverage multiple sources, automatic recovery, and robust backup solutions. Techniques such as obfuscation, signal verification (e.g., beamforming and three-way handshakes), and diversification of sources enhance overall system resilience.

→ **Sovereign and Indigenous Technologies**: Developing indigenous PNT technologies, such as India's NavIC, is crucial for ensuring strategic autonomy and reducing reliance on foreign GNSS systems. This helps protect national interests and maintain control over navigational data.

→ **Data Sovereignty and Security**: With the ease of data acquisition by multiple nations, strong policies and dedicated geospatial authorities are needed to manage and secure navigation data, safeguarding against misuse.

→ **NavIC System Architecture and Benefits**: NavIC, a regional navigation satellite system, comprises a constellation of seven satellites (three in geostationary orbit and four in geosynchronous orbit), providing consistent coverage within a 1500 km range beyond Indian boundaries. It underpins several critical infrastructures, including power grid synchronization and financial sector timekeeping, enhancing national security.

→ **Resilience Against Environmental and Electronic Threats**: Specialized grid models for ionospheric corrections improve signal performance amid solar activity. Features like controlled transmit power allocation, advanced antenna gain control, encrypted restricted service signals, and developing authentication services make NavIC resilient against jamming and spoofing, thereby enhancing overall system integrity.

"Ensuring resilient and secure PNT capabilities is paramount for national security and strategic autonomy. By advancing indigenous systems like NavIC and strengthening multi-layered defense mechanisms, we can safeguard critical infrastructure, enhance operational effectiveness, and maintain a tactical edge in an evolving threat landscape."

**Lt Gen Girish Kumar**
VSM, Advisor, Govt. of Haryana

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"If we talk about resilient PNT, it is the ability to prepare, adapt, withstand, and recover rapidly in case of disruptions—whether from deliberate attacks or accidents. Any designer must take this point home: attacks will happen. You must apply defence in depth with a layered architecture, minimize the attack surface, and protect your inertial PNT sources by diversifying them. That is the conceptual framework for assured and resilient PNT."

**Brig Samresh Malhotra**
Brig MI (Tech), Directorate General of Military Intelligence

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"Data acquiring can be done by anyone, anywhere. However, with the advancement of technology, a country other than ours can capture our geodata and use it for its own purposes. That's why data sovereignty is a challenge every nation faces—we must ensure that the data we create is not misused and that we have strong geospatial authorities to address this issue."

**Dr (Col) Kailash Chandra Tiwari**
Professor Civil Engineering, Delhi Technological University

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"Coming to spoofing, because we have our own system, we have our own encrypted signals that are being designed—and that is the RS service of NavIC—and since we have access to it, it becomes very difficult to spoof RS signals for the civilian case; we are in the process of developing an authentication service wherein the civilian applications can also use this service to detect spoofing."

**Akhileshwar Reddy**
Scientist SE, Satellite Navigation Program Office, Indian Space Research Organisation

# Session 3: Integrated EO platform for Geointelligence

## CHAIR

**Col S K Sarkar, Commander**
Faculty of Geospatial Sciences, College of Military Engineering, Pune

## SPEAKERS

**Brig Anshuman Narang**
Defence Advisor, Suhora

**Lt Col Ramanathan V**
Vice President, Strategic Liason KaleidEO Satsure

**Yetender Singh**
Assistant Manager Business Development, Satpalda

**Satish Raju Gottumukkala**
Senior Manager Industry Accounts, APJ, Planet

## KEY TAKEAWAYS

→ **Enhanced Military Decision-Making**: The integrated platform significantly shortens the OODA loop (Observation, Orientation, Decision, Action) and enables an efficient kill chain cycle—from detection and acquisition to tracking and engagement—thereby supporting rapid, precise military operations.

→ **Real-Time, On-Demand Data Acquisition**: The system guarantees multiple daily image acquisitions (10–20 images under optimal conditions) and supports on-demand retrieval, ensuring timely situational awareness and responsiveness for both tactical and strategic decision-making.

→ **Cross-Domain Operations & Multi-Sensor Fusion**: By integrating data from diverse sensor domains (electro-optical, SAR, thermal, IR, RF, hyperspectral), the platform facilitates seamless cross-domain operations such as border and maritime security, enhancing target identification and tracking even when individual sensors may have limitations.

→ **Advanced AI and Data Processing**: Leveraging AI and machine learning allows for intelligent aggregation and fusion of multi-sensor data, transforming vast raw data into actionable intelligence and supporting complex analyses across various time scales.

→ **Simplified Data Access and Procurement**: The "one-window solution" approach streamlines data procurement by eliminating the need for multiple tenders, ensuring that diverse sensor data—from historical archives to real-time tasking—is easily accessible for integrated decision support.

→ **Strategic Edge and Operational Efficiency**: By integrating capabilities similar to those developed by adversaries, the platform provides a strategic advantage through timely, precise, and reliable geospatial intelligence. Enhanced communication (e.g., RF enhancements) further reduces data latency and improves operational efficiency.

→ **Multi-Level Integration Approach**:

**The strategy includes:**

- Multi-Payload Integration: Combining different sensor payloads on a single satellite.
- Multi-Orbit Constellation Integration: Utilizing satellites in various orbits (LEO, MEO) for comprehensive insights.
- Unified Data Integration: Consolidating sensor outputs into a single, analytics-ready platform for holistic intelligence.

→ **Bridging Technology with Human Intelligence**: Beyond technical integration, the ultimate goal is to convert massive data streams into actionable insights that enhance human decision-making, supported by edge computing and advanced AI analytics.

→ **Full-Stack Earth Observation Value Chain**: The platform aims to be sensor-agnostic—integrating data from satellites, aerial drones, and commercial sources—spanning the entire value chain from payload development and scheduling to downstream data processing and visualization.

"The integrated Earth observation platform isn't just a technical necessity, it's a strategic imperative—as our economic stability, security, and technological future depend upon it."

**Col S K Sarkar**
Commander, Faculty of Geospatial Sciences, College of Military Engineering, Pune

"When you detect a ship using SAR or EO and then move on to the next stage of acquisition and identification—potentially targeting it with a UAV or aircraft—you are engaging in a cross-domain movement. This integration of diverse electro-optical platforms is essential to shorten the kill chain cycle and enable rapid military decision-making."

**Brig Anshuman Narang**
Defence Advisor, Suhora

"The biggest challenge isn't just integrating all these sensors—SAR, EO, hyperspectral, RF, thermal—but in transforming that massive influx of data into actionable human intelligence. It's about converting raw sensor outputs into insights that enhance our battlefield clarity and drive effective decision-making."

**Lt Col Ramanathan V**
Vice President, Strategic Liason, KaleidEO Satsure

"When you integrate all these different electro-optical platforms together, you're not just getting a high-resolution image; you're getting a fused, multi-sensor product that can automatically identify changes, track convoys, and even detect black ships at the border—all in one cohesive package."

**Satish Raju Gottumukkala**
Senior Manager Industry Accounts, APJ, Planet

"We are now moving from static mapping to dynamic mapping, which means that users are more concerned with getting imagery without any human interaction or third-party involvement."

**Yetender Singh**
Assistant Manager Business Development, Satpalda

# Session 4: Drone Platform for Modern Warfare

## CHAIR

**Lt Gen Vivek Kashyap PVSM, AVSM, VSM**
Director General, Armoured Corp
Indian Army

## SPEAKERS

**Maj Gen Roopesh Mehta, SM, VSM**
Additional Director General Capability Development (B), Integrated Headquarters
Indian Army

**Lt Gen IJ Singh, AVSM, VSM**
Former DG, EME & Strategic Advisor
IdeaForge

**Maj Gen Mandip Singh, SM, VSM**
President, Droneacharya


## KEY TAKEAWAYS

→ **Evolutionary Development**: Drones are not a sudden revolutionary invention but rather an evolutionary extension of longstanding practices—from early reconnaissance balloons and artillery support to modern combat and surveillance roles.

→ **Incremental Innovation**: Each wave of drone operations demonstrates continuous tweaking of tactics and technology. This iterative process is essential for countering evolving enemy defences and maintaining operational effectiveness.

→ **Integration of Offensive and Counter Measures**: Effective deployment of drones requires the integration of both offensive systems and counter-drone capabilities. Manufacturers should design drones with built-in counter-drone features to stay ahead of adversary measures.

→ **Indigenization and Technological Independence**: True indigenous development is critical. Building core technologies like sensors and control chips in-house is key to reducing dependency on foreign components and ensuring strategic autonomy.

→ **Future of Swarm Warfare**: The future of warfare is likely to be defined by coordinated drone swarms, where multiple specialized drones operate together to overwhelm enemy defences. This distributed approach offers resilience and operational flexibility.

→ **Multifaceted Applications**: Beyond combat, drones will play crucial roles in logistics, such as delivering supplies, ammunition, and medical aid, as well as in maritime and aerial operations. Their diverse applications demand a balanced and integrated development strategy.

→ **Emphasis on Continuous R&D and AI**: Robust research and development—especially the integration of AI and automation—is essential to continuously refine drone capabilities, adapt tactics based on battlefield data, and improve successive drone systems.

→ **Future Operational Framework (2030–2035)**: Integrated drone systems are expected to be a staple at all levels of military organization. This includes potential autonomous combat teams and agile procurement models that allow for real-time technological upgrades.

→ **Organizational and Training Reforms**: The military needs dedicated drone units, standardized systems, and specialized training programs to ensure seamless integration of drones into operations, from combat roles to support functions.

→ **Policy and Doctrinal Implications**: A comprehensive national-level drone strategy is required, incorporating joint doctrinal changes, clear inter-services collaboration, and defined command structures.

→ **Support for Indigenous Startups**: Addressing challenges such as rigid procurement systems and lack of orders is essential. Flexible operational requirements, financial support, and access to infrastructure (like cantonment facilities) are needed to foster indigenous innovation.

→ **Unmanned Traffic Management (UTM)**: With increasing drone numbers, managing airspace through UTM systems is crucial to prevent congestion, accidents, and misuse, particularly in the low-altitude environment.

"The future of war is swarming in drones. While single drones or FPVs will persist, it's the distributed, collaborative drone swarm that will ultimately evade countermeasures and decisively disrupt enemy defences."

**Lt Gen Vivek Kashyap, PVSM, AVSM, VSM**
Director General, Armoured Corp, Indian Army

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"Drone employment options depend on size, endurance, payload, autonomy, cost, and survivability. The combinations are too numerous to fall into the formats that we, as Defence Forces, are used to—I'm used to a tank or a gun, maybe two or three types, but with drones, there are so many varieties."

**Maj Gen Roopesh Mehta, SM, VSM**
Additional Director General Capability Development (B), Integrated Headquarters Indian Army

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"For India, the development of indigenous drone technology, which is exemplified by various companies including my company IdeaForge, is very crucial for national security. By investing in homegrown solutions, India can enhance its defence capabilities, reduce reliance on foreign technology, and assert its position as a leader in the global market."

**Lt Gen IJ Singh, AVSM, VSM**
Former DG, EME & Strategic Advisor, IdeaForge

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"An FPV is a low-tech, very high-skill weapon. What you're looking for is something that, in 2 km at 150 km an hour from any direction, can put the scare of the Lord into the opposing forces. It is cheap, it's scalable, and we are still behind. FPV 1.0 is what you all are reading now, but we're already into FPV 2.0—wire-guided FPVs. And FPV 3.0? People are talking about the mothership concept—motherships taking FPVs and releasing them."

**Maj Gen Mandip Singh, SM, VSM**
President, Droneacharya

# TRACK 3: User and Applications

## Session 1: Sensor to Shooter Application

### CHAIR

**Lt Gen K.S Brar, PVSM, AVSM, GOC**
Dakshin Bharat Area, Indian Army

### SPEAKERS

**Gp Capt Arvind Pandey,**
Centre for Airpower Studies

**Col Anurag Mathur**
Col Industry, Army Design Bureau, Indian Army

**Col Somen Parida**
Director General of Information Systems, Indian Army

### KEY TAKEAWAYS

→ **Integrated Warfare Concept**: Sensor-to-shooter is not a standalone technology—it's a comprehensive warfighting methodology that combines sensors, data processing, and weapon systems to rapidly detect and engage targets, thereby shortening the decision-action cycle.

→ **Transformation of Traditional Systems**: Modern integrated systems (akin to an "Uber" model) replace traditional hierarchical methods (like a taxi operator managing 100 taxis), emphasizing efficiency and direct data flow over sheer asset numbers.

→ **Technological Components and Data Fusion**: A broad range of technologies is integrated, including diverse sensors (radar, space-based ISR, acoustic), AI/ML, C4, edge computing, and secure communication systems. Data fusion and processing play a critical role in producing a unified surveillance picture for effective target identification.

→ **Mosaic Warfare and Domain-Specific Adaptation**: The concept evolves from net-centric warfare to "mosaic warfare," where agile, interconnected nodes work collaboratively. Systems must be tailored to specific operational needs (e.g., maritime, high-altitude, land-based) for maximum effectiveness.

→ **Strategic and Tactical Advantages**: Superior integration enables even fewer assets to outperform larger forces through faster response times, enhanced situational awareness, and optimized resource utilization, all while reducing collateral damage.

→ **Incremental and Scalable Implementation**: Instead of deploying one massive system, starting with smaller, functional sensor-to-shooter applications allows for quicker implementation and iterative improvements based on real-world feedback.

→ **Battlefield Surveillance System (BSS)**: BSS aims to automate and integrate various surveillance sensors—from ground-based and commercial drones to existing military sensors—to provide a unified, real-time battlefield picture.

→ **Real-Time Engagement and Post-Strike Assessment**: Integration ensures that target acquisition, shooter selection (artillery, air support, etc.), and engagement occur in near real time, with automated post-strike assessments to guide follow-up actions.

→ **Key Integration Requirements**: Effective integration demands persistent all-weather ISR, advanced AI-driven data processing, secure high-speed data transfer, and a joint or civil-military synergy to overcome indigenous capability gaps.

→ **Importance of Emerging Technologies**: The evolution includes incorporating satellite constellations (e.g., electro-optical, SAR), drones, swarm systems, and miniaturized sensors, alongside robust cybersecurity measures, to achieve near-real-time operations.

→ **Challenges and Considerations**: Critical challenges include data transmission delays, interoperability across diverse sensor formats, computational demands for 2D/3D rendering, and maintaining scalability while ensuring low latency in fast-changing battlefield scenarios.

## CASE STUDIES AND APPLICATIONS:

→ **Israel/Hamas**: Automation tools (like the "Lavender" system) enable rapid target identification and engagement, even mapping thousands of potential targets.

→ **Joint and Civil-Military Collaboration**: A fully integrated GIS platform will likely require public-private partnerships and joint collaboration to ensure a common, secure, high-level architecture that meets the rapid data transfer and processing needs of modern warfare.

→ **Russia/Ukraine**: Applications like "GIS art" (an "Uber for artillery") dynamically allocate fire units based on real-time target profiles, showcasing how integrated systems can optimize limited resources.


"If I have to give you a definition of sensors to Shooter, firstly it is a concept of warfare which has got enabled due to technology and in short, it integrates the sensors, does data processing and also integrates the weapon system to detect targets and engage them as quickly as possible simultaneously and continuously, thus shortening your OODA Loop."

**Lt Gen K.S Brar, PVSM, AVSM**
GOC Dakshin Bharat Area, Indian Army

"The most challenge comes when this sensor transmits this data to the Ground Control, this Ground Control assesses this data and transforms this data to the shooter and then shooter carries on with their mission so there is a lot of time gap which is happening between sensor to Shooter and my aim today is to tell you as to how to reduce this time Gap or to shorten the kill chain."

**Gp Capt Arvind Pandey**
Centre for Airpower Studies

"The speed of response is basically integrating the sensors to the shooter — enabling the commander to get a common battlefield picture in real time so that he has enhanced situational awareness and can take decisions in real time. ."

**Col Somen Parida**
Director General of Information Systems, Indian Army

"Geospatial intelligence as we understand it—it's the collection, analysis, and application of all geographic information. When you integrate this data and align it with your operations, that's where contextual geointelligence comes in, providing actionable intelligence to commanders and staff alike at all levels."

**Col Anurag Mathur**
Col Industry, Army Design Bureau, Indian Army

# Session 2: Harnessing GeoIntelligence for Maritime Security

## CHAIR

**R Adm Sachin Sequeira, SC**
Assistant Chief of Naval Staff
Indian Navy

## SPEAKERS

**Cmde Atul Deswal**
Deputy Director General, Navy Cyber Group & Chief Information Security Officer, Indian Navy

**Cmde Sujeet Samaddar**
Founder and Secretary, SAMDeS

**Kapil Kumar Malik**
Regional Sales Manager, Synspective

**Sarunisha R**
Product Lead, Suhora


## KEY TAKEAWAYS

→ **Focus on Geointelligence for Maritime Security**: The session centres on how geo-intelligence can be leveraged to bolster maritime security, reflecting a strategic shift toward using advanced technology and data analytics in this domain.

→ **Historical and Strategic Context**: Maritime security has long influenced national stability and global trade. The speaker highlights that while maritime control once underpinned imperial expansions, it now remains critical to economic growth and the security of nations.

→ **Evolving Threat Landscape**: Modern challenges include piracy, terrorism, drug trafficking, smuggling, and illegal fishing. The transcript notes that threats have expanded geographically and in complexity, often involving non-state actors and even state linkages.

→ **India's Maritime Significance**: India's extensive coastline, numerous ports, and its vast exclusive economic zone underscore its reliance on maritime trade. The Indian Ocean is particularly strategic, as it handles a major portion of the country's energy imports and trade.

→ **Technological Investments**: The government is investing in advanced technologies such as Earth observation satellites, space-based AIS, all-weather monitoring systems, and secure communication networks. Additionally, artificial intelligence and machine learning are being harnessed for predictive analysis in the maritime domain.

→ **Enhanced Domain Awareness and Integration**: Efforts are underway to integrate data from multiple sources and engage stakeholders across central and state levels to develop comprehensive maritime domain awareness.

→ **International Cooperation**: Recognizing the transnational nature of maritime threats, India is actively engaging in international collaborations. Initiatives like the International Fusion Center in the Indian Ocean Region facilitate information sharing and joint responses with partner nations and organizations.

→ **Emerging Threats and Challenges**: Modern challenges include the rise of dark fleets, illegal trafficking, the proliferation of inexpensive maritime weapons, and attacks on critical infrastructures like data cables and offshore installations. Additional issues such as oil spills, pollution, open registry ships, and environmental impacts (rising sea levels, climate change) further complicate maritime security.

→ **Role of Geointelligence (GEOINT)**: GEOINT is a cornerstone of modern Maritime Domain Awareness, enabling vessel tracking, illegal activity detection, and environmental monitoring.It integrates data from various sources, such as Earth observation satellites, remote sensing, and digital nautical charts, to provide a comprehensive maritime picture.

## TECHNOLOGICAL ENABLERS

→ **Automated Identification System (AIS)**: Fundamental for tracking maritime traffic, though it has limitations (e.g., can be switched off).

→ **Remote Sensing Technologies**: Including electro-optics, infrared sensors, synthetic aperture radar, and hyperspectral imagery provide both day and night observations.

→ **RF Fingerprinting**: Allows for unique identification of vessels, integrating with other data sources to track and monitor maritime activity.

→ **Advanced Data Modeling**: Utilizes AI, machine learning, neural networks, and other computational tools for pattern recognition, change detection, and anomaly interpretation.

→ **Collaborative and Regional Approaches**: Given the vastness of the maritime domain, no single nation or technology can cover all aspects alone. Programs like the Indo-Pacific Maritime Domain Awareness initiative emphasize the importance of international collaboration to balance sovereignty with shared security interests.

→ **Opportunities for Innovation**: There's a significant opportunity for businesses, academia, and defence sectors to develop new sensor technologies and innovative modelling tools. Environmental monitoring is emerging as a key area, potentially leading to better regulatory compliance and port security.

→ **Real and Evolving Cyber Threats**: Cyber-attacks are no longer hypothetical—incidents such as those affecting DP World Australia, US Navy operations, and ports in Lisbon, the Netherlands, and Taiwan demonstrate the vulnerability of maritime systems. Examples include ransomware attacks, GPS and AIS manipulation, and exploitation of known vulnerabilities that lead to significant operational disruptions and financial losses.

→ **Critical Vulnerabilities in Digital Infrastructure**: Digital and operational technologies in ports (e.g., automated port cranes) and ships (e.g., integrated management systems) are susceptible to cyber exploitation. Reliance on foreign suppliers for critical equipment, such as Chinese-manufactured port machinery, raises national security concerns due to potential unauthorized remote access and shadow connectivity.

→ **Need for Robust Cybersecurity Measures**: There is an urgent requirement for systematic and evolving cybersecurity frameworks, including automated audit techniques, AI-based threat monitoring, and dedicated Security Operation Centers (SOCs) in ports. International cooperation and the sharing of best practices are crucial, as cyber threats do not respect national borders.

→ **Human Factor and Cyber Awareness**: While technology provides significant advantages, human vulnerabilities remain the biggest challenge. Fostering a culture of cyber awareness where every individual act as a vigilant cyber sentinel is essential to strengthen overall defences.

→ **Strategic Imperative**: Embedding cybersecurity by design is critical—not only for safeguarding maritime operations and ensuring uninterrupted trade but also for preserving national security and maintaining a country's global maritime leadership.

"We have also been investing in the latest geo-intelligence capabilities subject of this discussion to address these threats; we've included Earth observation satellites, space-based AIS, all-weather day and night monitoring satellites, and communication satellites for fast and secure data relay with minimum latency in order to enhance our ability to process and analyze the vast amounts of data from the maritime domain."

**R Adm Sachin Sequeira, SC**
Assistant Chief of Naval Staff, Indian Navy

"The ultimate cost of a lack of Maritime domain awareness not only impinges on the National Security and stability and the sovereignty of the country but it also impinges on trade it also impinges on cost it also impinges on human life and the resources that are required for its subsidence."

**Cmde Sujeet Samaddar**
Founder and Secretary, SAMDeS

"We do have automatic Target monitoring solution which not only does the detection but also do the classification of the different target or object of our interest so this is again through the platform we have a very easy to use easy to access platform which can ingest the data we collect and run certain operations or certain processing in the background can produce these things."

**Kapil Kumar Malik**
Regional Sales Manager, Synspective

"We must acknowledge the fact that the maritime industry is evolving rapidly; however, this technological progress comes with a set of threats. Cyber security is now a strategic imperative—protecting port infrastructure and shipping is not only critical for sustaining economic growth but also crucial for safeguarding national security and preserving India's position as a global maritime leader. As Indian ports continue to evolve in a digital age, cyber security must be embedded by design."

**Cmde Atul Deswal**
Deputy Director General, Navy Cyber Group & Chief Information Security Officer, Indian Navy

# Session 3: Resilient PNT

## CHAIR

**Maj Gen Gaurav Kaushal, SM, VSM**
Dy Comdt, College of Military Engineering, Pune

## MODERATOR

**Lt Col Vivek Gopal**
National Security Coordination Secretariat

## SPEAKERS

**Col Pawan Pandey**
Director Technical, Military Survey

**Cdr Mukesh Saini**
Former National Information Security Coordinator (GOI)


## KEY TAKEAWAYS

→ **Critical Importance**: PNT is essential for modern military operations and critical infrastructure, affecting systems from missile defence to fighter jet navigation.

→ **Limitations of Traditional GNSS**: Systems like GPS have inherent vulnerabilities (e.g., interference, spoofing, and atmospheric errors) that necessitate the development of resilient alternatives.

→ **Resilient PNT Concept**: Resilient PNT is achieved by combining multiple technologies (including radar, LIDAR, cameras, and inertial systems) to ensure reliability, even in contested or degraded environments.

→ **Deployment Environment**: Solutions must be tailored to static or mobile, and different domains (air, land, sea).

→ **Output Requirements**: Depending on the mission, systems may need simple timing or comprehensive data including velocity and orientation.

→ **Accuracy and Duration**: Requirements can range from sub-tactical (short duration) to high-accuracy, long-term tactical systems.

→ **Interference Detection**: Systems should automatically detect disruptions and switch to alternative data sources.

→ **Assured vs. Resilient PNT**: There is debate whether a stable, assured base layer of PNT is necessary for building resilience, or if resilience itself is what guarantees reliable PNT in hostile environments.

→ **Real-World Examples**:

- India's NAVIC: Offers dual-frequency signals that enhance resilience against interference and jamming.
- GAGAN: Improves navigation accuracy for civil aviation but is currently dependent on GPS.

→ **Operational and Security Implications**: Resilient PNT is critical not only in peacetime but especially during conflicts where GNSS denial, spoofing, and jamming are significant risks. This is underscored by incidents involving drone hijacking and interference near national borders.

→ **Recommendations for Improvement**:

- Adopt a multi-GNSS approach with NAVIC as the primary system.
- Develop real-time detection systems for GNSS spoofing and jamming.
- Transition to backup solutions such as terrestrial and inertial navigation systems.
- Expand indigenous satellite systems (more NAVIC satellites and independent GAGAN).
- Encourage widespread adoption and governmental support for Indian-made navigation technologies.

→ **Collaborative and Strategic Approach:** Enhancing PNT resilience requires coordinated efforts across multiple agencies, industries, and academic institutions, as well as international cooperation and adherence to robust auditing practices.

"Going further, warfare in the future will be multi-domain. We often refer to the concept of unrestricted warfare—a notion discussed decades ago. While we may not be officially at war, in reality, we are in constant conflict. To deter aggression, we must make conflict cost-prohibitive by denying adversaries the services, accuracy, lethality, and precision they rely on in their daily operations. This approach is our strongest defence."

**Chair: Maj Gen Gaurav Kaushal, SM, VSM**
Dy Comdt, College of Military Engineering, Pune

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"The ability to leverage multi-dimensional sources of reliable PNT data including out of domain resources is essential to ensure resilient PNT which help to ensure the continuous operations of PN dependent systems and Safeguard our national critical infrastructure during war."

**Col Pawan Pandey**
Director Technical, Military Survey

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"Assured PNT provides the stability needed in times of peace, but only a truly resilient PNT system can withstand the disruptions and threats that come with conflict and uncertainty."

**Lt Col Vivek Gopal**
National Security Coordination Secretariat

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"We must have multiple GNSS approach with NAVIC as primary, designing a system which will immediately know if it is Jam or spoofed and then react accordingly then may take over and move out from the satellite based situation to either terrestrial or inertial navigation system to provide you the reasonable assurance"

**Cdr Mukesh Saini**
Former National Information Security Coordinator (GOI)

# Session 4: Climate Resilience & Disaster Management

## CHAIR

**Col Nadeem Arshad**
Senior Consultant Ops
National Disaster Management Authority

## SPEAKERS

**Anil Prakash**
Director General
SatCom Industry Association

**Dr Balakrishnan Nair T. M**
Scientist-G & Group Director, OMARS, ESSO - Indian National Centre for Ocean Information Services

**Dr Shiv Prasad Aggarwal**
Director, North Eastern Space Applications Centre

**Raghavendra Ashrit**
Scientist - G, National Centre for Medium Range Weather Forecasting, Ministry of Earth Sciences, Government of India

## KEY TAKEAWAYS

→ **Role of Geospatial Data**: Essential for early warning systems, real-time decision-making, and risk assessments. Helps minimize threats to infrastructure, population, and livelihoods.

→ **Integration with Sustainable Development**: Disaster management aligns with sustainable development goals. Focus on disaster risk governance and leveraging technology in national and international agendas.

→ **Climate Change & Agriculture**: Shift from water-intensive crops like rice in Punjab due to changing climate. Rising temperatures in hill stations indicate climate change effects. Potential sea level rise threatens small island nations.

→ **Emerging Technologies in Disaster Management**

- Satellite Constellations – Real-time disaster monitoring.
- Miniaturization of Sensors – Affordable satellites improve data collection.
- Geospatial AI – Enhances weather models & forecasting.
- Drones – Provide real-time, high-resolution disaster response data.
- Virtual Reality – Simulates disaster scenarios for preparedness.
- Cloud & Crowdsourcing – Public participation enhances real-time data analysis.
- Sensor Web Technology – Integrates satellite, UAV, IoT, and ground sensor data.

→ **Practical Applications**

**Examples**:

- Crowdsourced disaster mapping (2013 Kedarnath floods)
- Drone-based flood assessments (2022)

→ **Role of Government, Private Sector & R&D**: Government alone cannot handle disaster management; private sector participation is critical. Investment incentives needed to boost private industry involvement. Research and collaboration among government, industry, and academia are essential.

"No early warning can ever work without geospatial. The geospatial data is a mandatory requirement to provide lifetime Realtime information, which is essential for our decision-making tools and support systems. There's a close link between climate assessment and risk management to ensure our decisions are climate resilient. We have to minimize exposure to our infrastructure, our population, and the livelihoods of those in village areas. Our critical infrastructure must be managed so that, as we expose it in a resilient manner, it brings about the societal improvements we are striving for."

**Col Nadeem Arshad**
Senior Consultant Ops, National Disaster Management Authority

"The Indian Ocean is no longer a data-sparse region; with real-time geospatial data integrated from satellites and in-situ observations, we provide critical early warnings, disaster management solutions, and climate resilience services to safeguard coastal and maritime communities."

**Dr Balakrishnan Nair T. M**
Scientist-G & Group Director, OMARS, ESSO - Indian National Centre for Ocean Information Services

"Geospatial intelligence, combined with emerging technologies like AI, drones, satellite constellations, and crowdsourcing, has the potential to revolutionize disaster management—enabling faster decision-making, real-time monitoring, early warnings, and more effective response strategies to build a resilient future."

**Dr Shiv Prasad Aggarwal**
Director, North Eastern Space Applications Centre

"For tropical cyclones, we generate forecasts using multiple models, including track predictions, intensity estimates, and animations. But when a cyclone is about to cross the coast, the critical question is: Where exactly will it make landfall? How far east or west of the predicted track should evacuations take place? We have developed products to address this. Instead of relying on a single-track prediction, we produce an uncertainty cone. The uncertainty cone is a globally recommended tool by the World Meteorological Organization and is widely used by the India Meteorological Department. It provides crucial guidance for precautionary evacuations and risk mitigation, ultimately saving lives."

**Raghavendra Ashrit**
Scientist - G, National Centre for Medium Range Weather Forecasting
Ministry of Earth Sciences, Government of India

"Geospatial intelligence and emerging technologies are revolutionizing disaster management, enabling real-time monitoring, predictive analytics, and effective response strategies. A collaborative approach between government, industry, and academia is essential to building resilient communities and safeguarding lives."

**Anil Prakash**
Director General, SatCom Industry Association

# Valedictory Session

A Call to Action for the Future of Defence and Geospatial Intelligence As the Indo-Pacific GeoIntelligence Forum 2025 concluded, the valedictory session delivered a powerful message on the urgent need for strategic advancements in defence technology and geospatial intelligence.

The session also addressed the critical role of AI, cloud computing, and data accessibility. Without structured, secure, and shareable data, AI-driven decision-making remains ineffective. A culture of excessive classification can hinder progress, limiting the development of predictive analytics and battlefield automation. Decentralization is the future of warfare, demanding integrated, adaptive systems capable of real-time response.
Cybersecurity remains a growing concern. Geospatial intelligence and AI-driven warfare cannot advance without robust, sovereign digital infrastructure. Protecting sensitive software and intellectual property is not just a technological necessity—it is a matter of national security.

Discussions alone are not enough. The insights shared must now translate into decisive action. The future of intelligence-driven defence depends on the ability to execute, innovate, and adapt at speed.


**“Lt. Gen. AKS Chandele, PVSM, AVSM, PhD**
Reinforced the importance of leveraging advanced technologies to make sense of vast datasets. Intelligence without interpretation is meaningless. The future of defence will be defined by how effectively we transform data into actionable insights. Conferences like this play a vital role in driving awareness and fostering collaboration between defence, industry, and government leaders.”

**“Lt Gen KS Brar, PVSM, AVSM**
GOC Dakshin Bharat Area, Indian Army emphasized that modern warfare demands a shift in approach. Space-based intelligence is no longer optional—it is essential. Restricted airspace in conflict zones limits conventional intelligence-gathering methods, making satellite-driven insights crucial. However, the lack of readily available, high-resolution data presents a challenge. The defence ecosystem must leverage commercial satellite solutions while building a sovereign, real-time intelligence network.”

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# Exhibition at a Glance


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