Centre for Air Power Studies (CAPS)

Forum for National Security Studies (FNSS)

Report

Centre for Air Power Studies conducted a seminar on " Space Security in the Changing Geo-Political Environment" on 01 – 02 November 2018 as a part of the annual Subroto Mukerjee Seminar series. The seminar was inaugurated by Air Mshl Anil Khosla PVSM AVSM VM, Vice Chief of Air Staff. Opening remarks were given by Air Mshl KK Nohwar PVSM VM (Retd), Director General, CAPS.

The seminar began with an ode to the late chief of IAF, Air Marshal Subroto Mukerjee, who is often called the Father of the Indian Air Force. He was the first Indian to hold the appointment of the Chief of the Air Staff of the Indian Air Force (IAF) and had an illustrious career with many honours until his accidental death in 1960. This seminar on *Space Security* was a tribute to his great contribution in the growth and success of the Indian Air Force.

Space and Cyber are two realms that have become part of modern day warfare. This could be adduced to two factors - advancement in the field of technology and reliance on the use of these technologies. The legalities, checks and balances and the link between them and space denote that in many ways nations are already in a zone of confrontation. Disruptive technologies have seen proliferation over the last few decades, from GPS satellites to space programs, and the pace at which they have grown is remarkable. It places the onus on mankind to ensure that future generations are ready to face the challenges that will accrue from these technologies as well as prepare them for the changing space realities. Today's science fiction may become a precursor to tomorrow's reality.

Issues that are of immediate concern are security of space assets as countries utilise space for military purposes and the growing fear of weaponisation of space to have a military advantage. Civilian utilisation of space assets has to be facilitated while ensuring freedom from debris and intentional disruption of space services. The 1967 Outer Space Treaty was signed by several countries and it is now time to rectify these treaties which did not cater to the kind of exploitation of space that is seen today.

The Indian space programme has enough scope for harnessing space technology for national security. India has already reached self-reliance in launch vehicles and satellites fabrication and operation. India is also amongst select countries to have developed cryogenic engines and is trying to achieve a manned flight mission in a couple of years. ISR technologies are giving a boost to national security by providing high resolution imagery. The IRNSS / NavIC constellations are already functional and the user segment would be operationalised soon. Interface between military and space programs is evolving. The Government of India has recently accorded approval for the formation of the Defence Space Agency - which will provide an interface between the military and the space programs. In future one could also visualise the setting up of a space command centre for dealing with space warfare.

The key aim of the seminar was to advance common space security interests, and help strengthen existing links among the relevant entities responsible for securing the space

environment. The seminar brought clarity on the extent of involvement of the armed forces in utilisation of space assets which is essential for formulation of a national space policy. The seminar succeeded in providing a common platform for the three services of the armed forces to deliberate on a space utilisation policy and discuss major areas of concern.

The session wise presentations by panellists and discussions that ensued is summarised below:-

Session I: Geopolitical Dynamics of Space Security

The post-cold war era is seeing an increasing number of space faring nations with some capable of harming others' space assets. Outer space is also becoming congested, contested and competitive. Under such circumstances, space security is an emerging concern. The session focussed on the geopolitical and legal dimensions of space security.

Outer Space Activity and International Security

Gp Capt (Dr.) Ajay Lele (Ret'd), Head, Centre of Strategic Technologies, IDSA

The speaker brought out the current activities in outer space and the contemporary issues affecting international security. Major activity in space is still restricted to 36000 km and we are beginning to see major pioneering space missions into deep space, e.g. the US conceptualisation of an orbital gateway - the Parker Solar Probe – and the Russian Asgardia mission. China is also coming out with ideas to launch artificial moons into space which would be eight-times brighter than the Earth's actual moon, creating an opportunity for the streets of Chengdu and similar cities to be illuminated by satellite instead of street lights. Debris mitigation using plasma beams, creation of solar power and asteroid mining are some of the new emerging concepts. The US has already started asteroid mining with an investment of US$83 billion.

This elicits the question of the legality of commercial use of outer space. Stability is required from an international security perspective to achieve the desired goals of peaceful exploitation of the resources in space. So far eleven organisations among the space-faring nations have been able to launch their satellites in addition to a growing number of private players who are able to make forays into space. Peace is desirable if one has to establish

security in space in view of the huge financial investments that are required for this. Space science is heading towards the ultimate goal of making human civilisation on Moon and Mars a reality which is enabled with the invention of 3D printing technologies that can help in establishing infrastructure on these planets.

Towards space security, the frequency and usability of the launch vehicles, activities in outer space and disposal of space objects needs to be governed by well-defined laws. Though there is a general adherence to space treaties, the space faring countries need to arrive at a common understanding on issues such as debris mitigation and ASAT weapons. Military benefits of space are many, although very few countries can develop space infrastructure. Weaponisation of space is slowly becoming a reality and the existing treaties do not forbid it. As a matter of fact the line between militarisation and weaponisation has become blurred with the growing exoatmospheric interception capabilities of BMD systems.

Space security is a problem area. Looking at the question whether Space could act as a common heritage to humankind it should be kept in mind that US is already permitting exploitation of asteroids. Private players are bargaining with NASA for unlimited access to asteroids, a move that NASA resolutely opposes. China has made inroads into space exploration inviting concerns from European powers. Most remarkably, a country's space power has become an integral part of the way its comprehensive national power is measured. There is, thus, a need to develop policies for responsible behaviour vis-à-vis space debris creation and mitigation, harmonise national policies with regional space organisations, manage national security objectives in the commercial space context, and engage in multilateral cooperation through mechanisms like the UN Group of Government Experts, International Code of Conduct (ICoC), draft treaty on the Prevention of the Placement of Weapons in Space, the Threat or Use of Force Against Space Objects (PPWT) etc.

Geopolitics of Space

Air Mshl (Dr.) M Matheswaran, AVSM VM (Retd), Founder Chairman & President, The Peninsula Foundation, Chennai

The rapid pace of technological developments in the last few years has resulted in globalisation of space. This can be seen as an extension of geopolitics into space, which has manifested into miniaturisation and expansion of communication satellites into LEO. The Apollo Lunar Legacy Act, which is currently before US Congress, aims to declare a National Park on the moon specifically to ensure the protection of US heritage sites. Space legal experts have pointed out that this is incompatible with the 1967 Outer Space Treaty (OST), to which the US is a signatory. Another Act on the moon heritage has already been enacted which seeks to legalise real estate purchases on Moon under the Space Resource entrepreneurship 2015 Act. Further, US President Trump has announced the establishment of a Space Force.

Increasingly, relations between states can be defined by what is coming to be seen as the rise of astropolitics – a relationship between outer space locations and military and political dominance. As a determinist political theory it highlights how states achieve the kind of dominance as stepping stones to hegemonic behaviours. If one could master the art of control of determinants in the earth orbit, the vast potential of space reserves could be optimised. The American attitude even represents a rise in space resource nationalism or the state's role in innovating and controlling certain kind of technologies from proliferation. The competition for mining of resources from the Moon and space not only invokes a technology race but also bilateral and multilateral relationships driven by both adversarial as well as cooperative tenets. Some of these tenets are completely military oriented manifesting in terms of a cold war for influence and prestige.

The 21st century space world order could even witness the formation of elite blocs or the revival of bloc politics where US, Russia, China and EU could play the role of an elite club, followed closely by India, Japan, France and UK, trailed along by Israel Brazil and South Korea, while Iran, North Korea and Indonesia also make some inroads. In sum, commercialisation and globalisation would continue to be the drivers spearheaded by the global GNSS systems and linking new initiatives to technological prowess, e.g the BRI-Beidou linkage to project influence on regions. Denial strategies are likely to strengthen further.

Legal Challenges in the Evolving Space Order

Ranjana Kaul, Space Law Expert, Partner, Dua Associates, New Delhi

The speaker started with a description of the existing space treaties and then evaluated the legal issues in the evolving space order.

Ever since 1963 when the principles of operation in outer space were declared, space has been a heavily militarised arena. The Outer Space Treaty 1967 deals elaborately with laws on the use of outer space and the vulnerabilities and the prohibitions of how much and in which manner outer space can be utilised and whether it can be referred to as 'a province of mankind'. The ICJ had taken a view that there is no embargo on weaponisation of space; the only restriction is for placement and testing of nuclear weapons in space. Moreover, the ICJ has upheld that there are no set rules in international law that prohibit the use of, development, testing and deployment on the moon and in outer space for nuclear power sources as is the case for ground based systems using nuclear energy. The US has taken a major lead by developing domestic federal laws on the use of outer space for commercial utilisation.

Though there have been several proposals by the European Union about the drafting of a Code of Conduct, no consensus has been reached so far. Especially, there have been efforts made by China and other emerging powers who with their ASAT tests have tried to address the conundrums posited by space exploitation. Even private players have become involved as states have good legal capacity to confer ownership rights to subjects, i.e. enactment of national legislation for private appropriations of resources extracted from outer space. This adds to the fact that even at the International Telecommunication Union (ITU) the states keep vying for resources, as allotments are based on first come-first served basis. However, there is an increasing consensus amongst various nations which prefer a spectrum allocation for each spectrum rather than frequency allocations within a spectrum to different users so that there is no harmful interference in that particular spectrum by anyone else. Surprisingly, though equitable sharing by all states has been the espoused goal, regional groupings led by leading space faring nations have emerged. However, it

remains to be seen in the future whether and how far sovereignty claims can be granted or substantiated in the outer space domain.

Special Address: Space Technology - Trends in Space Technologies

R Umamaheswaran, Outstanding Scientist and Scientific Secretary, ISRO

Shri. Umamaheswaran gave a brief description of the successes and strengths of ISRO followed by the path ahead. He acknowledged the role and vision of great leaders like Dr. Vikram Sarabhai who guided the Indian space program in the formative stage.

It was encouraging to hear that India is well placed in the comity of space faring nations, although its global share of launches needs to improve. Organisations like the ISRO continue to enrich their research and experience through close cooperation within its several departments (120) that are sharing data and applications to reach inscrutable domains. It is now estimated that very soon India will be capable enough to operate verticals in terms of space transportation, space infrastructure and use it for capacity building. So far, 15 communications satellites have been placed into the geo-stationary orbit and are providing data for disaster management, communication, Very Small Aperture Terminals (VSAT) communication, Data Relay Transponders (DRT) applications and mobile satellite services as well as connectivity in rural and remote areas. India is also planning several small satellite launch vehicle missions by May 2019. For Earth observation, India is giving a major thrust on improving the resolutions and revisits by combining two or more satellites. Several missions are slated for next few years like the ECOSAT missions, ADITYA L1 mission to the Sun, missions for polar regions and moon missions. Another mission to Mars is also being considered. The government intends to rejuvenate the national space programme by 2022. It is especially significant because China has made far greater advances in the space technology realm. Other countries like Japan are also catching up with dual use technologies for both military and civilian purposes. Meanwhile ISRO is also contemplating on ways to deal with the space debris menace and cyber-attacks by creating space situational awareness. Overall, a collective approach is required to deal with perceptible threats to nascent infrastructure and prevent it from being disrupted.

Preparations for the human spaceflight programme (Gaganyaan) are under control as far as ISRO is concerned. The astronaut selection process needs to be completed for training activities to begin as the timelines are stringent. IAM may not be fully equipped to handle the physiological requirements of astronaut training, though initial training would take place at IAM.

Future technologies by ISRO will focus on low cost access to space and will include Advanced Missions and Recovery Experiments (ADMIRE) and Hypersonic Air breathing Vehicle with Airframe integrated system (HAVA).

Session II: Safety Concerns in Space

Safety of spacecraft including satellites and crewed missions is a critical aspect to be considered for any space launch. These spacecraft share space with large amounts of space debris and could result in a collision. Improving SSA is therefore critical to the long-term sustainability of outer space. Also, safety norms for manned space missions are critical for crew safety. This session brought out issues concerning SSA and human factors for mission safety.

Space Situational Awareness in Space Security

Gp Capt TH Anand Rao, Senior Fellow, CAPS

The space environment in today's times can be broadly defined in three words: congested, contested and competitive. One does not have sufficient information about the kinds of space objects and it is very difficult to predict the collision of satellites with other objects in space. Currently there are around 4818 payloads and 1886 active satellites. With a trend towards small satellites and mega constellations, there would be an exponential growth in the satellite count. Besides satellites, around 95% of all outer space objects is composed of debris, all of which is not known. Therefore, there is a need for preventing collisions and tracking space objects, a need felt by most countries involved in the space regime. Crowding of outer space is a major concern. Besides the fear of collisions and debris in useful orbits, orbital crowding is also resulting in scarcity of the frequency spectrum.

Space Situational Awareness (SSA) is therefore seen as an essential component in space security. The Space Surveillance Network (SSN) managed by the Combined Space Operations Centre (CSpOC) under the USSTRATCOM is the only organised global SSA provider. Russia and EU also possess significant capabilities but do not have a system for SSA data sharing at a global level. Presently, the SSA data available is limited by the selective visibility offered by SSN. There are also several limitations leading to insufficient data. These limitations are attributable to sensor technology and their geographical distribution, which restricts the size and granularity of objects detected. Other limitations are attributable to fragmented databases and lack of integration between various agencies involved in space observation.

India's SSA capability is in the nascent stages with only positional data being available through telemetry tracking and control stations of ISRO. For situational data, India is largely dependent on the Space Surveillance Network. A Multi-Object Tracking Radar (MOTR) has been commissioned recently, which can scan up to a range of 1000 km. However, this is insufficient to cater for the evolving space environment.

India needs to consider enhancing its SSA capabilities by installing more Multi Object Tracking Radars (MOTR) in geographically dispersed areas, including friendly countries in the IOR, Africa and South East Asia. This picture of LEO could be shared with the SSN or any future global SSA organisation, which will give India better transparency in exchange and a larger stake in any SSA organisation. India can also contribute to a Space Traffic Management (STM) system which is being deliberated in the UN Committee on Peaceful Uses of Outer Space (UNCOPUOS). The armed forces and the Indian Air Force in particular are ideally positioned to adapt to the role of STM.

Life Support for a Manned Space Mission

Air Cmde A Agarwal, Commandant, Institute of Aerospace Medicine

Life support in space is often measured by some basic facts that assist in supporting life while in spaceflight. The complexity of the spaceflight makes designing extremely stimulating. Some possible areas of cooperation that emerge in the designing field pertain to personal hygiene products, food and water, medicines and first aid, cabin air analysis

and control, waste disposal (body waste), waste disposal (other waste), habitation requirements and controls and displays. Further areas dealing with emergency habitation requirements, clothing, headgear & footwear, boredom and entertainment, communication and monitoring, exercise requirements, radiation hazard amelioration, troubleshooting requirements, Extra-Vehicular Activity (EVA) requirements and performance optimization would need to be looked into.

Water recycling is one of the most significant areas where assistance is required, besides vapour compression distillation. Advanced exercise devices that could keep the humans fit and strong in space are also required to be developed indigenously since none of them are available off the shelf. Developing these systems is beyond the mandate of ISRO. IAM has been tasked with the astronaut physiological and medical training requirements and needs to work with the industry and overseas collaboration to achieve the task. This implies that well defined long-term plans need to be worked out and centres of excellence established on a priority basis. Astronaut selection for the Gaganyaan mission needs to be completed at the earliest as training is an elaborate and time consuming process.

Session III: Military Dimensions of Outer Space Activity

Military supremacy in outer space gives the advantage of freedom of operation in space and facilitates military operations over the land, sea and air. This requires a joint approach in planning and utilisation of space assets. The session deliberated on issues concerning space security, military utilisation of space and support to space operations.

Harnessing Space for National Security

Air Mshl (Dr) M Matheswaran AVSM VM(Retd) , Founder Chairman & President, The Peninsula Foundation, Chennai

As of April 2018, 170 Countries own, operate, rent or finance the development of satellites. There are 2877 defunct satellites in space out of the 4857 satellites that are currently orbiting the planet. This is an increase of 4.79% over last year. So far, a total of 8126 objects have been launched and 22 per cent of these have been launched in the last eight years. There are 1982 operational satellites operated by 80 countries, commercial

ventures, and other entities such as universities. Of these, US owns 859, China 250, Russia 146, Japan 72, India 55, UK 5, and others 448. In 2014, space economy stood at $ 330 billion. Presently, 65 countries are listed as currently operating satellites.

Advanced space technologies, especially when used for information services, are believed to be the means for a quick transition from a traditional underdeveloped society to an industrial and developed nation. Space technology is critical to development and national security of countries around the world. Today, the ability to deter war through a credible capability has become one of the main objectives of harnessing space for national security. Information dominance has also become the prerequisite to any war.

India has made substantial progress in the space arena. India's space agency - ISRO - has successfully launched a number of important missions till date. However, the progress made in utilising space for national security is to be put in the right perspective. Lack of Intelligence Surveillance & Reconnaissance (ISR) at the required level and inadequacy of satellite communications for military purposes is a challenge to India's security. Further, India needs to have a space vision and space utilisation policy. This will enable the armed forces to have clarity and draft a military space doctrine. The existing policies are linked to the historical evolution of India's space programme and are focussed on applications for national development. India needs to come clear on utilisation of space for national security which would encompass the military component. Externally, India needs a proactive role in global policies on space. Security should be seen as a cooperative model, therefore, international collaboration in space research and SSA should be emphasized. India needs to adopt a two-pronged approach: (a) National Security & Development Strategy, and (b) Push for space governance as a Global Commons Approach. Also, to be an effective player enhancement of capabilities is a must; this flows from synergy between the government, public sector and private sector.

Space Support to Operations, Support for Space Capabilities and Space Surveillance

Commandant Vincent Lochet, Director of Space Surveillance Operations, French Air Force

There are several ways of enhancing the efficiency of armed forces in their respective domains. Many of them count on space assets or services, directly or indirectly. SATCOMs,

Position Navigation and Timing, ISR, and early warning are a few examples where efficiency of armed forces is enhanced. France has gone ahead with a new generation of satellites for military use. "Syracuse IV" is an example of a next gen SATCOM system. This constellation of communication satellites is to be launched in 2021-2022. Positioning, Navigation, and Timing (PNT) Satellites such as the growing constellation of Galileo, which is due to reach FOC on 2020 (already 26 satellites in orbit out of 30), is also a critical space enabler for France's modern military operations. The French Navy uses a combined service of PNT and ISR to locate and fight against illegal maritime traffic, immigration, fishing, pollution or to protect sensitive areas. In the Surveillance Network area, France has a unique terrestrial footprint of Earth's surface. Besides optical sensors, synthetic aperture radar satellites help French armed forces in ISR support.

As countries advance in next-generation sensors and new capabilities, the safety issue of big data arises. To control and protect sensitive data of high-value assets and services, various system upgrades and protocols are being implemented. Space Situational Awareness (SSA) is an important tool for improvements in this area along with artificial intelligence, and data mining. Further, to be a powerful space actor, countries need to commit resources to space support which comprises of four main pillars - satellite manufacturing, launch capability, satellite operations and SSA. Further, the challenge of a growing number of space objects and debris cannot be denied. Considering an increased space dependency, both from a civilian and military perspective, there is an emerging need of a space traffic management organisation.

Countries require trained military experts working hand in hand with scientists and industry. So the analysis part of the technology shall be dealt at the scientific level whereas the threat assessment shall remain a military prerogative. France has some sharing agreements in place with two foreign partners namely the United States and Germany. France is also involved in an international SSA exercise, called Global Sentinel with several other countries. It helps it to keep abreast with technological advancements. France has arrangements for information exchange with some other nations who are also part of USSTRATCOM including Canada, UK, Spain, and Italy. It is important to note that countries

need to foster partnerships for SSA because without SSA a military operations centre would have limited visibility.

Space Requirements, Capability and Capacity

Prof. S Chandrashekar, JRD Tata Chair Professor, NIAS, Bengaluru

The speaker drew a comparison between space capabilities of China and India. Thereafter he enumerated the necessity to build capacities and capabilities in space to cater for the civilian and defence requirements.

In the last 20-25 years, space has moved from a 'sanctuary regime' to a 'weaponised regime'. Space has become a major factor in modern-day warfare. China is one prominent example in this regard. The 4th launch of new YAOGAN 30 series by China on Jan 25, 2018, displayed the Chinese capabilities in the space technology sector. China's space based surveillance capabilities are critical to its security. Its ELINT satellites are oriented over Taiwan**,** Guam Philippines, Japan, Korean Peninsula, Indo-China border and Central Asia. China maintains 24X7 surveillance over Taiwan with multiple sensors.

India's progress in space has primarily been for a civilian purpose. Considering the vulnerabilities, India needs to actively consider space defence issues. India was unaware of the Chinese ASAT test, and it took some time for India to know about the launch. Though India has made incremental adjustments to the challenges posed by the new political and space order and embarked on some dedicated uses of space for the Indian military, it needs to address the question whether this approach is adequate for meeting the challenges of today and tomorrow. This matter becomes more important because there are signs that India aspires to play the role of a major power in the world. While enhancing space capabilities is necessary, building capacity is also critical.

The feasibility of using the 'Agni' as a satellite launch vehicle for the growing requirement of small satellites and launch on demand requirement in LEO, needs to be examined.

Session IV: Space and the Indian Armed Forces

Satellites have expanded C4ISR capabilities, giving an edge over the adversary in fighting a conventional battle. Space enabled warfighting machinery is essential in today's network centric scenario. The speakers charted a vision for space utilisation by the armed forces. The session deliberated on the optimal utilisation of available space assets for the Indian armed forces.

IAF Vision for Utilisation of Outer Space

Air Cmde A K Bharti VM, Air Cmde Ops (IEW), Air HQ (VB)

The speaker brought out the ways in which the Indian Air Force was becoming increasingly dependent on space assets as an enabler and enhancer for its operational functioning. 'Control of space' is now being viewed akin to 'control of air' in air strategy. Space has now been recognised as a centre of gravity for future wars. The concept of network centric warfare and lessons of the Kargil War accentuated the transition of IAF into the space domain with active use of space applications for ISR, navigation, weather forecasting and communications.

While elaborating on the space vision for the IAF, the speaker enumerated the following:-

- An all-weather, 24 x7, multi spectral, high resolution capability for ISR.
- Extended satellite footprint for all applications.
- Versatile navigation satellite system for accurate, jam resistant data to the forces to reach, target or engage enemy in air battle & neutralise ground targets with precision
- Independent weather satellites to facilitate route forecast and target area forecast.
- Persistent ISR to shorten sensor - shooter loop.
- Resilient and redundant ground infrastructure.
- Launch on demand facility.
- Space situational awareness.
- Space weather and debris information.
- Capability for defensive and offensive operations in near and long term.

Naval Perspective on Space Requirements

Cmde Kartik Krishnan, Commodore (NSO) IHQ, MoD (Navy)

The speaker brought out the existing maritime environment and the role of space applications in Naval operations. Over the past few centuries, technological and maritime developments have significantly altered the role and influence of the maritime environment. The Indian Navy over the years has operated over a wide geographical expanse. India maintains continuous presence from the Gulf of Aden in the West to the Malacca Straits in the East. Indian Navy undertakes regular EEZ surveillance of friendly foreign countries. Against this backdrop, the Indian Navy has developed itself into a robust force, underpinned by reliable space applications to bolster its maritime domain awareness. Navy requires in-depth technology to deal with detection, Identification and tracking complexities in the oceans. The sea also observes a large number of illegal activities such as smuggling, poaching, arms-trafficking, piracy, robbery, and maritime terrorism. For maritime surveillance, space surveillance is hence vital.

The Indian Navy has been dependent on utilising the space-based assets for military operations. The launch of the indigenous military communication satellite, Rukmini (GSAT 7) provided an exclusive network that covers most of the IOR. From 2011-2016, India implemented Project Rukmini with satellite terminals on ships and submarines. Procurement of GSAT 6 based handheld and manpack systems is also being progressed. The network provided by the Rukmini integrated territorial networks are to provide seamless 24/7 connectivity between ships, submarines and aircraft with shore units. It has also enabled shore headquarters to securely and in real time conduct/monitor operations at sea. It has been designed with specifically configured satellite beams and secured with graded encryptions.

One of the primary challenges faced by the Indian Navy is that of identification of ships not transmitting on their Automatic Identification System (AIS) including those doing this deliberately (commonly known as 'dark ships)'. This challenge could be mitigated by complementing AIS with other space based inputs such as satellite based imagery and Synthetic Aperture Radars. This is being pursued by the Indian Navy through ISRO under

the indigenous 'Space Based Surveillance' programme and separately through the joint constellation of satellites for maritime domain awareness. Further, use of technologies like big data analytics in Maritime Domain Awareness (MDA) that could aid in detection of dark ships is also being pursued by the Indian Navy. Currently, space based AIS data is being obtained from commercial satellites/ sources. Since 2016, Indian Navy, through ISRO, has pursued the development of a low-cost satellite-based transponder for tracking fishing boats. In doing so, 1000 fishing boats are being fitted with the transponders in Gujarat and Tamil Nadu on a trial basis.

While Indian Navy has been able to integrate the efforts of some of the stakeholders in the maritime domain through the current NC3I network, there are significant efforts of national and international agencies which are yet to be integrated with this endeavour. The National Maritime Domain Awareness project, once established, would provide information including analytics and common operating picture. Finally, satellite-based assets will continue to remain critical to mission planning at the strategic, operational and tactical level and also continue to provide essential three-dimensional inputs to enhance maritime domain awareness and enable network-centric operations. A credible SSA needs to be developed with a proactive approach to ensure overall security.

Jointness in Space

Gp Capt Pramod Singh, Integrated Space Cell, HQ IDS

The speaker brought out the centrality of jointness to the success in military operations. Jointness has been recognised in the Indian Armed Forces from conceptualisation to operations. Today, jointness in space is accepted as inevitable by all advanced militaries. India requires to have a well-defined organisation structure, infrastructure, planning and deployment of available space assets. The speaker accepted the requirement of a nodal agency to conceptualise, coordinate and implement the space projects and applications. There was also a need felt to work within defined timelines towards having a space vertical as the global space powers are moving at a much faster pace. The speaker concluded by presenting a proposed space elements organisation structure for the armed forces and a plan for Network, Data and IT - Control and Operations Centre.