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MARCH 2024

VOLUME 15 | ISSUE 06

GALATHEA GATEWAY INTERNATIONAL CONTAINER TRANSHIPMENT PORT



Campbell Bay National Park

Township and Area Development

GREAT NICOBAR ISLAND

Campbell Bay

Joginder Nagar

Power Plant

International Airport

International Container Transshipment Terminal

Galathea Bay

Indira Point



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14 YEARS OF STRATEGIC SAGA





MISSION

We endeavour to sound **ALERTS** and create **AWARENESS** about the myriad dimensions and manifestations of **DEFENCE** and **SECURITY** in India and around the world.



The power of a King lies in his mighty arms...

Security of the citizens at peace time is very important because State is the only saviour of the men and women who get affected only because of the negligence of the State.

- Chanakya



It is with great sadness that we inform you of a tragic incident involving our **Editor in Chief, Mr. Manvendra Singh.**

Last month, he was involved in a serious road accident, resulting in the loss of his wife, **Mrs. Chitra Singh,** and leaving him and his son badly injured.

The entire **DSA team** is deeply shocked and saddened by this news, and our thoughts and support are with **Mr. Manvendra Singh** and his family during this difficult time. We offer our sincerest condolences on their profound loss and pray for his swift recovery.

For the first time in 15 years, our **March 2024** edition will be published without **Mr. Manvendra Singh's** editorial, as he focuses on his health and recovery. However, we are confident that he will soon return to provide his invaluable insights and guidance to DSA.



An ISO 9001:2015 Certified Magazine

Volume 15 | Issue 06 | March 2024

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Defence and Security Alert is printed, published and owned by Pawan Agrawal and printed at SRG Traders Pvt. Ltd., B-41, Sector-67, Noida (U.P) and published at 4/19, Asaf Ali Road, New Delhi (India).
Editor: Manvendra Singh

OCEAN-MACY



As we reflect on the events unfolding across various oceans, it becomes imperative to assess the Ocean-Macy framework. While the significance of oceans has long been recognised in facilitating transportation, commerce, and global connectivity, recent developments signify the pressing need to reevaluate their importance. Oceans have served as vital conduits for international trade and cultural exchange, enabling seamless interaction among states. However, the emergence of new threats once again emphasises the necessity for a comprehensive overview of Ocean-Macy to safeguard the interests of coastal states and preserve the invaluable role of oceans in fostering cross-cultural activities

India is a State which is surrounded by Ocean from three sides in South, East and West and is surrounded by water bodies on three sides and land on the other; therefore it is a Peninsula. The Indian peninsula is surrounded by the Arabian sea on the west, Bay of Bengal on the east and Indian ocean on the south. And for this important reason Oceans for India are very important in all manner inclusive of its geopolitical importance. Recently we all have seen how the importance of our Andaman Nicobar Islands have become the talk of the town. And similarly all our Islands are very important for us and we need to secure our waters at the earliest possible.

The Galathea Transshipment Port at the Great Nicobar Islands represents a significant endeavor aimed at establishing a strategic maritime infrastructure hub in the heart of the Indian Ocean. Situated amidst the tranquil waters of the Great Nicobar, this proposed transshipment port holds immense promise in terms of economic development, trade facilitation, and strengthening India's maritime prowess.

At its core, the Galathea Transshipment Port seeks to streamline the movement of goods and cargo through efficient transshipment operations. By providing a central hub for the transfer of containers between large seafaring vessels and smaller feeder ships, the port aims to optimise logistics, reduce shipping costs, and enhance supply chain efficiency. This not only benefits domestic trade but also positions India as a crucial player in international maritime trade routes.

Furthermore, the establishment of the Galathea Transshipment Port is expected to catalyse economic growth and development in the region. As a key node in India's ambitious maritime infrastructure network, the port will attract investment, spur industrial activity, and create employment opportunities, particularly benefiting the local communities of the Great Nicobar Islands.

Beyond its economic implications, the Galathea Transshipment Port holds strategic significance in terms of enhancing maritime security and defense capabilities. Situated at a geopolitically critical juncture, the port offers India greater control and surveillance over vital sea lanes, bolstering its ability to monitor maritime traffic and respond to security threats effectively. Additionally, the presence of a modern transshipment facility strengthens India's naval presence in the Indian Ocean, furthering its strategic interests in the region.

As discussions progress and plans materialise, the Galathea Transshipment Port emerges as a symbol of India's maritime ambitions and its commitment to harnessing the potential of the oceans for economic growth and strategic advantage. With careful planning, investment, and collaboration, this ambitious project has the potential to redefine the maritime landscape of the Indian Ocean region for decades to come.

Team DSA is confident that recognising the significance of our waters and islands, our government will promptly move to establish a new seaport at Galathea, prioritising the safeguarding of our interests in the region.

Dear reader, we assure you that this March 2024 edition offers a compelling insight into this pivotal issue.

JAI HIND!

Pawan Agrawal
Chief Executive Officer



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FROM OUTPOST TO SPRINGBOARD

The text provides a detailed exploration of the historical context, strategic significance, and development challenges of the Andaman and Nicobar Islands, emphasizing their pivotal role in India's security and economic interests in the Indo-Pacific region.

Determinants of Security and Development

In his opening address to the Seminar on “Security and Development of the Andaman and Nicobar Islands” held at Port Blair under the aegis of the Andaman and Nicobar Command on 04 – 05 September 2009, the then Commander-in-Chief of the Islands, flagged four annotative perspectives for the assembly. Counselling that Security and Development were two sides of the same coin, he stated “We are aware that thus far the outlook of successive governments towards these Islands has been that of an Outpost, this to me is a strategic flaw. Rather we need to convert the Outpost to a Springboard for not just our economic but also for security aspirations” for indeed, “development without security makes the former vulnerable while security sans development is vacuous”. The second perspective was the persistent mismatch between the nation’s very obvious potential versus delivered reality. The third and fourth standpoints related directly or obliquely to the challenge posed by China’s Indo-Pacific game plan, namely,





VICE ADMIRAL (RETD) VIJAY SHANKAR, PVSM, AVSM

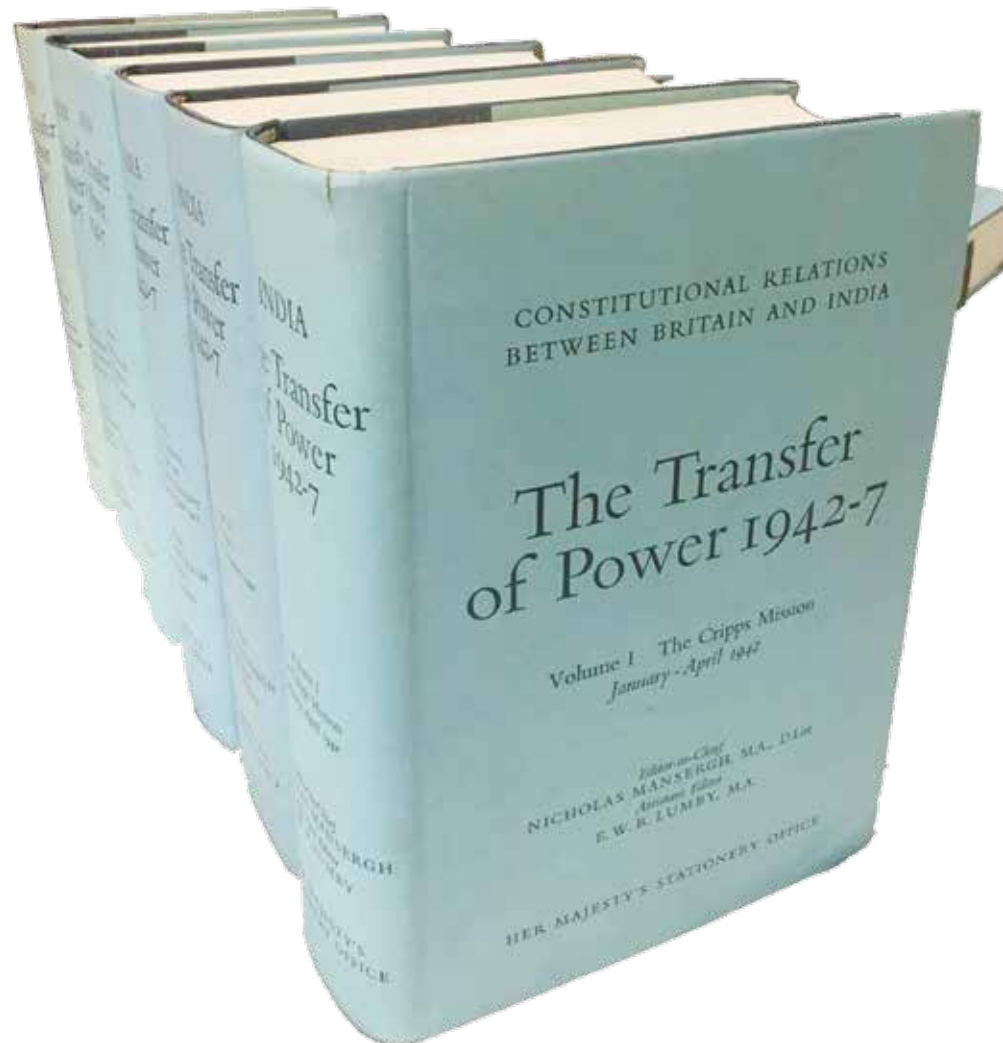
The author holds an MSc in Defence Studies and is a graduate of the Naval War College, Newport, Rhode Island, USA; the Naval Higher Command Course, Karanja and the Defence Services Staff College. He is the former Commander-in-Chief of the Andaman & Nicobar Command, Commander-in-Chief of the Strategic Forces Command and Flag Officer Commanding Western Fleet. His command and operational experience are comprehensive and include Command of INS Viraat, the aircraft carrier; he saw active service during the 1971 War against Pakistan, Op Pawan, the IPKF operations in Sri Lanka and Op Vijay operations to vacate the Kargil intrusion. He is the recipient of two Presidential awards: The Param Vishisht Seva Medal and the Ati Vishisht Seva Medal.

it’s “Island Chain” and “String of Pearls” strategies while all the time promoting “small groups with disproportionate powers to subvert and sabotage”.

A Quirk of History

Edward Penderel Moon, a former Indian Civil Service administrator in colonial India, wrote a book on the Partition of India titled “Divide and Quit” much of its contents were gleaned from a document put together under the patronage of the British India Office and edited by Moon. It was labelled ‘India: The Transfer of Power 1942-47’ and was published in 11 Volumes. Of particular interest are the confabulations of the British Cabinet, the imperial Chiefs of Staff Committee, Cripps Mission of 1946 tasked with the transfer of power and the concomitant “Mountbatten Plan” of 1947 that outlined the Partition of India.

Amongst the many tangled, artful, and often contentious issues associated with decisions leading to Partition was the fate of the Andaman and Nicobar Islands. Possession of the Isles had, through the Second World War, changed hands between the British and



Constitutional Relations Between Britain & India. The Transfer Of Power – 12 volume set.



British Indian Ocean Territories (BIOT).

the Japanese. And yet, at no time had Whitehall lost sight of the geo strategic value of the Islands. In July of 1946, the British Chiefs of Staff in India declared that “India was so internally rife with divisions that the Transfer of Power would, inevitably, lead to the intercession of the Soviets” in their quest for ‘Warm Water Access’ (ala Czar Peter!) This became a fundamental assumption for a grand strategic appreciation by the Chiefs of Staff Committee.

The Committee argued that at stake were the lines of communication between Great Britain and its Imperial interests in the Far East. While the British Indian Ocean Territories (BIOT) provided stepping stones that spanned half the Indian

Amongst the **many tangled, artful, and often contentious issues** associated with **decisions leading to Partition** was the fate of the **Andaman and Nicobar Islands.**

Ocean, there was an unbridgeable gap to Malaya and further East to Australia and the other possessions. They ruled that Partition would breach the grand global network of maritime communications, which in time would lead to the collapse of Imperial Control. The Committee

came to the conclusion that should the ‘Transfer of Power’ occur and strategic basing and logistics denied in mainland India, the Andaman and Nicobar Islands provided the only alternative. This became the case for decoupling the Islands from the transfer of power.



From left, Pandit Jawarharlal Nehru, Vice President of India's Interim Government, Earl Mountbatten, Viceroy of India and Muhammad Ali Jinnah, President of the Muslim League discuss Britain's plan for India at the historic India Conference in New Delhi, 02 June 1947.

Whitehall was quick to endorse this appreciation. The Secretary for Defence Mr Alexander and the Imperial Chiefs of Staff Committee exhorted the Government to retain sovereignty of the Andaman and Nicobar Islands. As a result of these urges the draft of the 'Indian Independence Bill', which made its appearance in May 1947, simply contained no reference to the Andaman and Nicobar Islands when the document came to the section on transfer of territories. The matter was leaked to the Press (source of the leak was never quite established) which on 11 June 1947 took note of the glaring omission and warned of the glaring omission and warned of the Bill's imminent rejection. Mountbatten, now the Viceroy, unyieldingly cautioned London of the country-wide uncontrollable and violent ramifications of such a move.

The Cabinet, on 17 June 1947, uneasy at the already simmering reaction to Partition on mainland India, decided eventually not

to progress the proposal despite the vigorous protestations of Mr Alexander, the 'grave anxiety' of the Chiefs of Staff Committee and the rather dilatory and specious claim by Jinnah on the Islands based on the vulnerability of the sea line of communication between East and West Pakistan.

Britain as late as 05 July 1947 could have adamantly persisted with their original decision; the Imperial Chiefs of Staff could have dug in their heels and the Cabinet could have mulishly bulldozed their verdict, but they did not through a sheer quirk of history. They had, most unexpectedly, blanched at the thought of further exasperating the very delicate nature of the Partition award and ceded the transfer of the Island territories of Andaman and Nicobar to India.

The 'Mummified' Outpost

An outpost, in the military lexicon, is a far flung remote station located on or near a nation's frontier that

is lightly garrisoned for purposes of providing a surveillance post, an armed perimeter or a 'trip-wire' to raise the alarm of hostile or uncharacteristic activity. During the years post-independence, the Andaman & Nicobar Islands despite its location, decidedly, did not serve India as a military outpost. On the contrary the local administration and the Central Government in their policy making and implementation were more concerned with "mummifying" its environment, which in a way was a policy of doing very little.

The author in 1973 commanded an inshore patrol vessel INS Panaji (ex-Soviet Poluchat Class, commissioned In 1967) based at Port Blair. She was one of three of class that were notionally deployed for coastal defence. However rarely was there an occasion when even two were available at a time. Port facilities were restricted to a rickety commercial wharf (equipped with

steam cranes) on Chatham Island which was also home to a 19th century colonial saw mill and the Western India Match Company's pulp factory. The Haddo Wharf (concrete on piles) was still under construction. No other port in the Islands had any significant infrastructure. Inter-island passenger movement was primarily by small ferries restricted to the fair weather season. Practically all logistics would come from the mainland on a monthly basis. Road infrastructure was restricted to the South Andaman much of which had been built by the Japanese during their occupation 1942-45; other inhabited islands (37 of 572) had rudimentary roads, very few of which were black-topped. Two airfields existed, one at Port Blair and the Air force base at Car Nicobar. Port Blair would handle a weekly commercial flight from the mainland in the fair weather season while the Air Force had a fortnightly courier. There were no commercial refrigeration plants and power outages were common. In short there

was no industry, no commerce, poor connectivity, very basic post and telecom facilities, little security and even less development.

Life ashore in 1973 was about survival and continuance. Sunken ships, listing derelict trawlers impounded in some distant past moored as flotsam and hulks of shipwrecks strewn across Phoenix Bay and Ranger Flat in Port Blair were reminiscent of some cast-off colonial roadstead out of the pages of a Conrad or Maugham novel! There were very few public utilities and most of the buildings and offices were log tenements sorely in need of repair. Evenings were spent at the Colonial Andaman Club where stories were traded of the wild beauty of the islands and escapades involving the indigenous tribes, while the billiards marker cum bartender, the timeworn 'Sher Khan', a shrivelled Pathan who had been incarcerated for serial honour killings, wafted silently in the shadows.

Formulation of a Strategy for Security and Development

Through the years of the Island Development Authority (1985) and the Look East Policy (1991 aimed to foster political, economic and security co-operation with ASEAN nations) there was inappreciable growth or progress to suggest a cohesive and long term blueprint for the transformation of the Islands to a strategic economic and security asset, it remained about continuance and a contrary posture towards change.

The Security and Development Seminar of September 2009 (the former President Kalam and other national luminaries in attendance) was rounded off by a strategy statement. This Declaration (moved to the PM's office by the Special Secretary to the PM, himself a participant) was keenly sensitive to the demands of three overarching considerations. First, interests and vulnerabilities of indigenous communities; second, climate change; and lastly the safeguard and conservation of



Haddo wharf harbour in Andaman.



International Container Transshipment Port (ICTP) at Galathea Bay, Great Nicobar Island.

the fragile ecology of the Islands. The approach was for building infrastructure through a combination of government investment, private entrepreneurship and establishment supervision. The sectors to be targeted were: eco-tourism, education, maritime and fishing industries, infrastructure development and security enhancements. The last included three dimensional surveillance; precision strike capabilities; intelligence sharing; capacity building for amphibious power projection in the Far East and failsafe cyber security. While each of these sectors became a subject of much greater study and discrete implementation, it is the matter of “the one big ticket project” central to the ‘strategy statement’ that will engage the remaining part of our scrutiny.

Container Trans-shipment Port at Galathea Bay

Great Nicobar is the southernmost and largest of the Nicobar group of islands. The land area covers 1044

What makes **Galathea Bay** strategically significant is its location, **proximity** to the one of the **busiest shipping lanes** in the world and the **nature of harbourage** it can potentially provide.

sq.km but is scantily populated. The terrain is undulating and covered by rainforest and is known for its diverse wildlife. The island has four significant rivers whose course conforms to the orientation of the main range that slopes from North to South. Mount Thullier in the North is the highest peak in the Nicobar group, altitude 642 metres. The Island is home to the Great Nicobar Biosphere, Campbell Bay National Park, Galathea National Wildlife Sanctuary and Megapode Island Sanctuary. The non-Biosphere

portions of the island are utilised for agriculture, forestry and settlements and are confined to the south-western and south-eastern coastal reaches. Galathea River originates in the central region of the island and runs 25 kms southward till it drains into the Bay that carries its name. Indira Point, at the western extremity of the Bay defines the southernmost geographic point of India. The Bay is about 8 kilometres in extent in the South-North direction and 5 kms at its mouth. The Bay has navigable soundings

(depths) in excess of 21 metres and is naturally protected from the south-westerly as well as the north-easterly monsoon winds that affect the region.

What makes Galathea Bay strategically significant is its location, proximity to the one of the busiest shipping lanes in the world and the nature of harbourage it can potentially provide. It is situated within 60 nautical miles (nm) from the approaches to the Malacca Straits and 40nm north of the 6 degree Channel, one of the densest shipping arteries in the world. The Channel connects the shipping routes emanating from the Persian Gulf the Red Sea and around the Cape of Good Hope transiting via the Arabian Sea, Indian Ocean and the Bay of Bengal to the Malacca Straits and on to the South China Sea and Western Pacific Ocean. This narrow and vulnerable Waterway is crucial to the flow of global energy and trade, and is strategically and

commercially significant for more than a third of humanity. It is also the shortest sea route between the Indian Ocean and Pacific Ocean and over one-third shorter than the closest alternative sea-based route. It also accounts for 60% of global trade. In 2021 on an average over 200 hulls passed every day through the 6 Degree Channel. The average per day composition was 44 tankers, 6 Very Large Container Ships/Ultra Large Container Vessels (VLCS/ULCV), 60 cargo ships, 86 passenger ships and 4 support ships.

Hitherto, containers bound for India and exported out embarked on-board VLCS/ULCVs had to be transhipped to Colombo, Singapore or Klang since no container terminal in India can handle VLCS/ULCV of draught in excess of 17 feet. Currently, these very ports outside India handle roughly 75% of the transhipped cargo from India. More than 85% of this cargo is handled at Colombo, Singapore, and Port

Klang, with 45% of it handled at the Colombo Port. The transit and turn around at the 'Relay-Port' adds substantial costs to the tune of \$500 to \$1000 per Twenty-foot Equivalent Unit (TEU load 28 tons) standard container. Relay-Port turn around tariffs and other services further hike-up costs.

From the economic perspective, construction of Galathea Bay Port is expected to provide savings, foreign direct investment, higher economic activity at other Indian ports, improved logistical infrastructure, job creation, and increased revenue share. Handling transshipment goods from all the nearby ports, including domestic ones, are expected to make the Port a significant hub for Asia-African and Asia-US/European container traffic.

The Geopolitical Impact

The term 'geopolitics' has historically been employed in reference to a nation's interests and stratagems adopted to secure them. This understanding is subjective; for it does not account for the full significance of the term and even bears negative connotations. In the run-up to the Second World War, both Germany and Japan's expansionist policies were justified using the 'geopolitical' argument garbed in bizarre concepts of Lebensraum and the Greater East Co-prosperity Sphere and today it is China with its unrelenting strategic urge towards "Rejuvenation". The study of the relationship between a nation's geography and its politics and how the former is leveraged to advance its national interests diplomatically is a far more elegant understanding of the term.

However, the reality of the international system is the place that power enjoys in the scheme of assuring stability in relations between nations. Uncertainty in



The Allied Reoccupation of the Andaman Islands, 1945. Vice Admiral Tiezo Hara signs the document confirming the formal surrender of Japanese forces in the Andaman Islands. The ceremony took place at 10 am on the Gymkhana Sports Ground, Port Blair.



The quadrilateral security dialogue **(QUAD)**, the **Australia-UK-US alliance** and **Japan's Free and Open Indo-Pacific** aim at maintaining prosperity, security and order in the **Indo-Pacific**.

leading democracies of the world converge on many aspects in the Indo-Pacific. At its core lies maritime security. India's Act East Policy, in addition to having economic, cultural and commercial goals, includes strategic interests. The quadrilateral security dialogue (QUAD), the Australia-UK-US alliance and Japan's Free and Open Indo-Pacific aim at maintaining prosperity, security and order in the Indo-Pacific.

relations queers the pitch, in view of the forces that can disrupt the status quo. In the absence of a security oriented cooperative impulse, the problem with competitive and often combative national interests is blindness to recognize that, we are in fact dealing with diverse regions, fast depleting resources and sea spaces that are the busiest of all the "vast commons". The

reluctance for collaboration on mutually acceptable terms makes the potential for friction high and the only consideration that could bring about change is the ability to attain a strategic posture that serves to deter, stabilise and preserve.

The Spring Board as a Conclusion

Strategic interests of India and

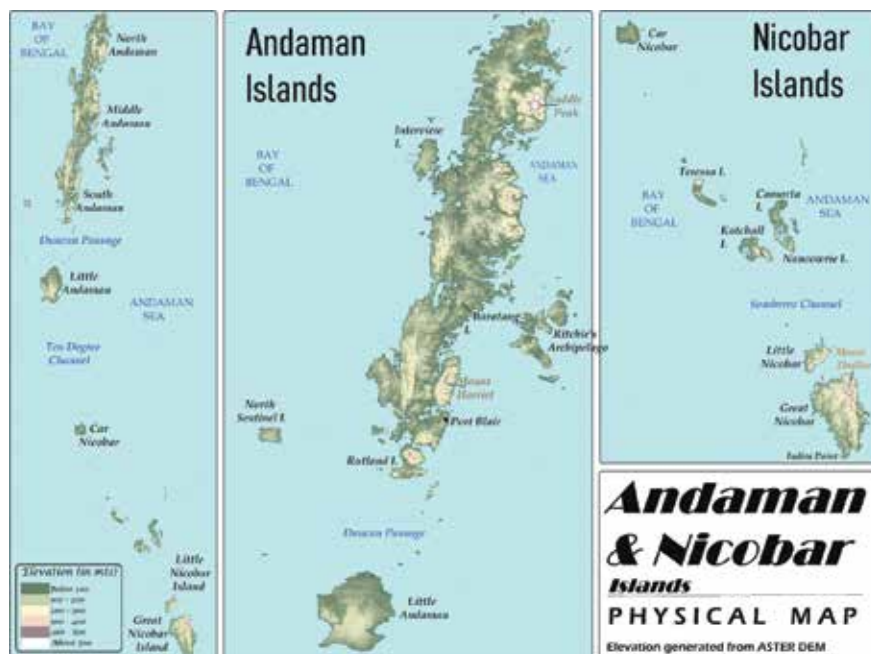
The large scale advancement of security measures in the Andaman and Nicobar Islands and development of Galathea Bay as a major hub for the management of container traffic, and indeed, strategic control; is a signal to China that attempts to side-line the existing rules based order and dislocate the status-quo will have consequences. **DSA**

GEOSTRATEGIC SIGNIFICANCE OF THE ANDAMAN AND NICOBAR ARCHIPELAGO

The Andaman and Nicobar Islands (ANI) emerge as a crucial frontier in India's strategic and geopolitical landscape, situated at the crossroads of East and Southeast Asia. With rich biodiversity and strategic positioning, they underscore India's ambition to assert maritime dominance while fostering economic development and environmental preservation. The islands' significance extends beyond India, shaping regional dynamics in the broader Indo-Pacific context.

The Andaman and Nicobar Islands (ANI) is a group of 836 islands/islets out of which only around 31 are permanently inhabited. The ANI covers an area of approximately 8,249 square km in the east of the Indian mainland between the Bay of Bengal and the Andaman Sea. It stretches over an area of 450 nautical miles with a total of 24 ports. The ANI consists of the Andaman Group with 550 islands and the smaller Nicobars with 22 separated by a ten-degree channel that is about 150 km wide. The ANI has a tropical climate with rich biodiversity making it ecologically significant.

It is 22 nautical miles away from Myanmar from the northernmost point and 90 nautical miles away from Indonesia from the southernmost point. Even though the ANI constitute only 0.2 per cent of the Indian landmass they account for 30 per cent of India's Exclusive



The location of **Andaman and Nicobar Islands** makes it a critical point in the **maritime** domain for **surveillance purposes** acting as a nodal point for the country's security



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the Indian Ocean with the South China Sea and the Pacific Ocean. Its location helps India to remain relevant in the maritime domain and realise its potential as an important maritime power. It provides India a great maritime access and potential which are seen as an important instrument of state power by Alfred Thayer Mahan, an American naval strategist. The location of ANI makes it a critical point in the maritime domain for surveillance purposes acting as a nodal point for the country's security. It is a gateway for South Asia to South-East Asia. The northernmost point of the archipelago is 22 nautical miles from Myanmar and 90 nautical miles from Indonesia serving as an entry point between the two regions. Its proximity to South-East Asia makes it critical to the ASEAN region which is central to India's Indo-Pacific vision and its Act East Policy.

The ANI is situated near the Malacca Strait, one of the world's busiest and critical sea channels between the Andaman Sea in the Indian Ocean and the South China

Economic Zone (EEZ) which is 200 nautical miles in total. Given its unique location, the ANI is of huge significance to India concerning geopolitics, military, security, economic, and ecological aspects. It is close to major sea channels therefore making it strategically significant to India's maritime strategy.

Geopolitical Significance

In particular the location of ANI, they hold massive geopolitical and strategic significance for India. The ANI is situated demarcating the Bay of Bengal from the Andaman Sea, both of which are critical maritime spaces for the country connecting





Admiral R Hari Kumar, Chief of the Naval Staff (CNS), accompanied by Mrs. Kala Hari Kumar, President of the Naval Wives Welfare Association (NWWA), embarked on a four-day visit to the Andaman and Nicobar Command (ANC) from February 6 to 9, 2024.

The **Andaman Nicobar Islands** has **India's first and only integrated tri-service command** of the armed forces Andaman and Nicobar Command (ANC) **established in 2001** for maritime surveillance and enhancing **India's strategic presence in the Indian Ocean**

Sea through Malaysia, Singapore, and Indonesia. It is at the crossroads of the Malacca Strait and serves as a checkpoint in the region for China's

assertive maritime capabilities to overcome its Malacca Dilemma, Beijing's fear of maritime blockade in the Straits of Malacca as it is

heavily dependent on the Malacca Strait for its oil and gas imports. Around 70 per cent of petroleum and LNG imports to China are through the Strait of Malacca. Around 60 per cent of China's total trade flow takes place through the Strait making it the most significant Sea Line of Communication (SLOC) for Beijing.

Military and Security Aspects

The ANI has India's first and only integrated tri-service command of the armed forces Andaman and Nicobar Command (ANC) established in 2001 for maritime surveillance and enhancing India's strategic presence in the Indian Ocean. The ANC serves as a focal



Singapore-India Maritime Bilateral Exercise (SIMBEX).

point to ensure the safety and security of the EEZ of India making it a net security facilitator in the region. It looks after maritime surveillance, humanitarian assistance and disaster relief, piracy, poaching, and narcotics smuggling in India's EEZ.

The ANC plays a vital role in monitoring the shipping routes and providing logistic and administrative support. It watches over the critical six-degree and ten-degree channels in the EEZ which accounts for major trade flow between China, Korea, Japan, and other countries. As it lies in the proximity of EEZs of other nations including Indonesia, Malaysia, Thailand, Myanmar, Bangladesh, Maldives, and Sri Lanka; it cooperates with other regional navies. India also conducts joint maritime exercises

with other countries in the ANC area. Bilateral maritime exercises including the Singapore-India Maritime Bilateral Exercise (SIMBEX) and Coordinated Patrols Exercise (CORPAT) with Indonesia, Thailand, and Myanmar. The ANC also conducts Exercise MILAN to foster maritime cooperation in the region with other navies. The QUAD members conduct Exercise Malabar between Australia, the US, Japan, and India in the ANC influence area.

So far, seven naval bases are in operation in ANI. INS Kohassa and INS Baaz are stationed at Shibpur and Campbell Bay. With a critical role in the military aspect, there have been growing demands to militarise ANI to its optimum potential. In 2019, an exclusive INR 5,650 crore military infrastructure development plan was finalised to

strengthen the capacity of the ANC including the addition of military forces, warships, and aircraft.

Indian Foreign Policy and the Islands

India has developed itself as a maritime power capable of providing security in the region and has focused on developing multifaceted relations with the island states. It has deepened its relations in terms of maritime security cooperation, humanitarian response and disaster risk reduction, economy, and development. Island states have become pivotal to India's maritime diplomacy and to maintain stability and peace in its maritime domain. Countering China in the region is another key factor for India's maritime strategy. India has undertaken a robust diplomacy with small island states in the

Indian Ocean Region (IOR) which is of key interest for geopolitical and economic sectors. Relations with small island states facilitate increased maritime presence for India in terms of their geographical proximity to the major sea lines of communications and as naval bases.

India has pushed for Security and Growth for All in the Region (SAGAR) to build a secured regional architecture in the IOR and maintain peace and stability in the region. ANI in the east and Lakshadweep in the west have helped India to enhance its maritime capabilities. Mauritius, Maldives, Madagascar, and the Seychelles have increased strategic significance for India. Indian Ocean Rim Association (IORA) was an effort by India in this line and has 21 member states in the region. Additionally,

the Indo-Pacific Oceans Initiative (IPOI) is an extension of SAGAR in the Indo-Pacific region which facilitates a collaborative approach among stakeholders to address shared challenges. IPOI aims to strengthen maritime security, ecology, and resources along with capacity building, disaster risk reduction and management, and trade connectivity. In 2023, PM Narendra Modi highlighted the importance of the Forum for India-Pacific Islands Cooperation (FIPIC) for India. Indo-Pacific Island states have increased strategic importance for India as it has been becoming a hotbed of geopolitics and key sea channels.

Economic Potential and Development

The region is critical for India's

economic and maritime cooperation, especially under the Act-East Policy, which aims to strengthen ties with East Asian countries and other maritime nations. The establishment of the Island Development Agency and the introduction of a submarine cable for better connectivity underscore the government's commitment to enhancing the archipelago's infrastructure and digital connectivity.

The islands have a diverse base, including sectors like fisheries, aquaculture, seaweed farming, and tourism, which are poised for growth with modern infrastructure advancements. The Indian government has also initiated high-impact projects focusing on sea-based, organic, and coconut-based products, aiming for sustainable development that aligns with the



Seychelles strengthens collaboration and cooperation during the 25th Committee of Senior Officials and 23rd Council of Ministers' Meetings of the Indian Ocean Rim Association (IORA).



The Union Cabinet recently approved the Pradhan Mantri Janjati Adivasi Nyaya Maha Abhiyan (PM-JANMAN), a monumental Rs 24,104-crore tribal welfare initiative aimed at uplifting Particularly Vulnerable Tribal Groups (PVTGs). This initiative will impact 40 lakh individuals across 75 tribal communities in 18 states and the Andaman and Nicobar Islands.

The **military and security** enhancements through the **Andaman and Nicobar Command** highlight India's commitment to safeguarding its **maritime borders** and interests, enhancing **regional stability**, and **fostering cooperation** with neighbouring countries and **strategic partners**

blue economy concept. Additionally, the islands have seen improvements in telecommunication and power supply, with notable investments aimed at transforming them into a significant hub for maritime and startup activities.

However, the development of the ANI's must navigate ecological

and environmental constraints, emphasising the protection of its unique biodiversity and indigenous tribes. The islands are home to Particularly Vulnerable Tribal Groups, whose preservation is essential amidst the development projects. There's a delicate balance between leveraging the islands' economic and military potential

and preserving their ecological significance.

The economic landscape of the ANI has witnessed a structural transformation over the last decade, with a shift towards the tertiary sector and a decline in the primary sector's dominance. This shift is partly due to restrictions on forest timber cutting and the impact of natural disasters like the tsunami. Despite these challenges, the islands have experienced higher growth rates than the national average, driven by the services and industrial sectors.

Challenges and Opportunities

The archipelago's isolation creates logistical hurdles for transportation, communication, and resource transportation. Even the high costs and limited connectivity hinder tourism and economic activity. As it is located in a seismically active region; the islands are vulnerable to

earthquakes and tsunamis, which requires infrastructure development and disaster preparedness planning and significant investment. The lush rainforests and coral reefs are sensitive to human intervention to balance the development with environmental protection is crucial to preserve the islands' natural beauty and ecological services. Similarly, the lack of adequate healthcare, education, and sanitation facilities hampers the quality of life for residents and restricts potential for tourism and knowledge-based industries. The indigenous communities have unique cultural identities and land rights that need to be respected and protected during any development endeavours.

Also, the opportunities at the pristine beaches, diverse wildlife, and rich cultural heritage offer immense potential for eco-tourism and cultural immersion. The sustainable development attracts high-end

tourists, boosting the local economy and creating jobs. However, the strategic location on key shipping lanes presents an opportunity to develop the islands as a maritime hub. The upgradation of port facilities offers logistical services which attract transshipment and storage businesses, contributing to regional trade. Also, the abundant sunshine and wind offer potential for harnessing renewable energy sources, reducing dependence on fossil fuels and promoting environmental sustainability. The vast EEZ offers potential for deep-sea exploration, sustainable fishing practices, and aquaculture, contributing to the national blue economy strategy. The islands are even a hub for marine research and development, focusing on oceanography, sustainable fisheries, and marine biotechnology, attracting talent and generating knowledge.

By carefully navigating the challenges

and seizing the opportunities, the ANI archipelago attracts a vibrant centre of sustainable development, ecological conservation, and economic prosperity. Achieving this vision would require a collaborative effort that balances the needs of the diverse stakeholders, prioritises environmental sustainability, and leverages technological advancements. The unique challenges presented by the island chain can, with careful planning and responsible action, be turned into stepping stones towards a brighter future for the archipelago and its inhabitants.

Conclusion

The ANI archipelago emerges as a critical frontier in India's strategic and geopolitical landscape, underscoring the nation's ambition to assert its maritime dominance and foster economic development while navigating the challenges of environmental preservation and sustainable utilisation of resources.



Indian Ocean earthquake and tsunami.



Maritime Conference SAGAR Discourse 2.0, in Goa.


The future of the **Andaman Nicobar archipelago**, therefore, not only holds significance for India but also for the **broader Indo-Pacific region**, embodying the **principles of peace, prosperity**, and sustainability in a rapidly evolving **geopolitical landscape**

The islands' strategic position at the crossroads of East and Southeast Asia enhances India's security apparatus, enabling surveillance and defence capabilities that are vital in a region marked by complex geopolitical dynamics and maritime trade routes.

The military and security enhancements through the

Andaman and Nicobar Command highlight India's commitment to safeguarding its maritime borders and interests, enhancing regional stability, and fostering cooperation with neighbouring countries and strategic partners. This military fortification complements India's diplomatic endeavours to engage with island nations and bolster the security architecture of the Indian

Ocean Region, reflecting a broader vision encapsulated in initiatives like SAGAR (Security and Growth for All in the Region) and the Indo-Pacific Oceans Initiative.

The challenges of development, security, and environmental conservation within the archipelago are emblematic of the global imperative for balanced and sustainable progress. Navigating these challenges requires a multifaceted approach that integrates strategic security interests with sustainable development and environmental stewardship, ensuring that the islands remain a beacon of India's maritime prowess, economic potential, and commitment to sustainable development and regional cooperation. The future of the ANI archipelago, therefore, not only holds significance for India but also for the broader Indo-Pacific region, embodying the principles of peace, prosperity, and sustainability in a rapidly evolving geopolitical landscape. 

SEAS OF OPPORTUNITY: GALATHEA GATEWAY - INDIA'S STRATEGIC INTERNATIONAL CONTAINER TRANSSHIPMENT PORT IN GREAT NICOBAR

India's strategic vision, spearheaded by Prime Minister Modi, aims to transform Galathea Bay in the Nicobar Islands into an International Container Transshipment Terminal (ICTP). Positioned just 40 nautical miles from the Malacca Strait, this project symbolises India's drive for self-reliance and global competitiveness. With its strategic location and ambitious goals, the Galathea Bay Port project promises to revolutionise India's maritime trade landscape and foster regional economic development.



The Government of India plans to develop the Galathea Bay Transshipment Port, alternatively

referred to as the International Container Transshipment Terminal (ICTP). ICTP is a proposed deep-water container transshipment facility slated for development

at Galathea Bay in the Nicobar Islands, located within the Indian Union territory of Andaman and Nicobar Islands. In alignment with the Maritime India Vision



PM to unveil 'Amrit Kaal Vision 2047' - long term blueprint for the Indian Maritime blue economy. PM inaugurates Global Maritime India Summit 2023 in Mumbai.



ANKIT KUMAR

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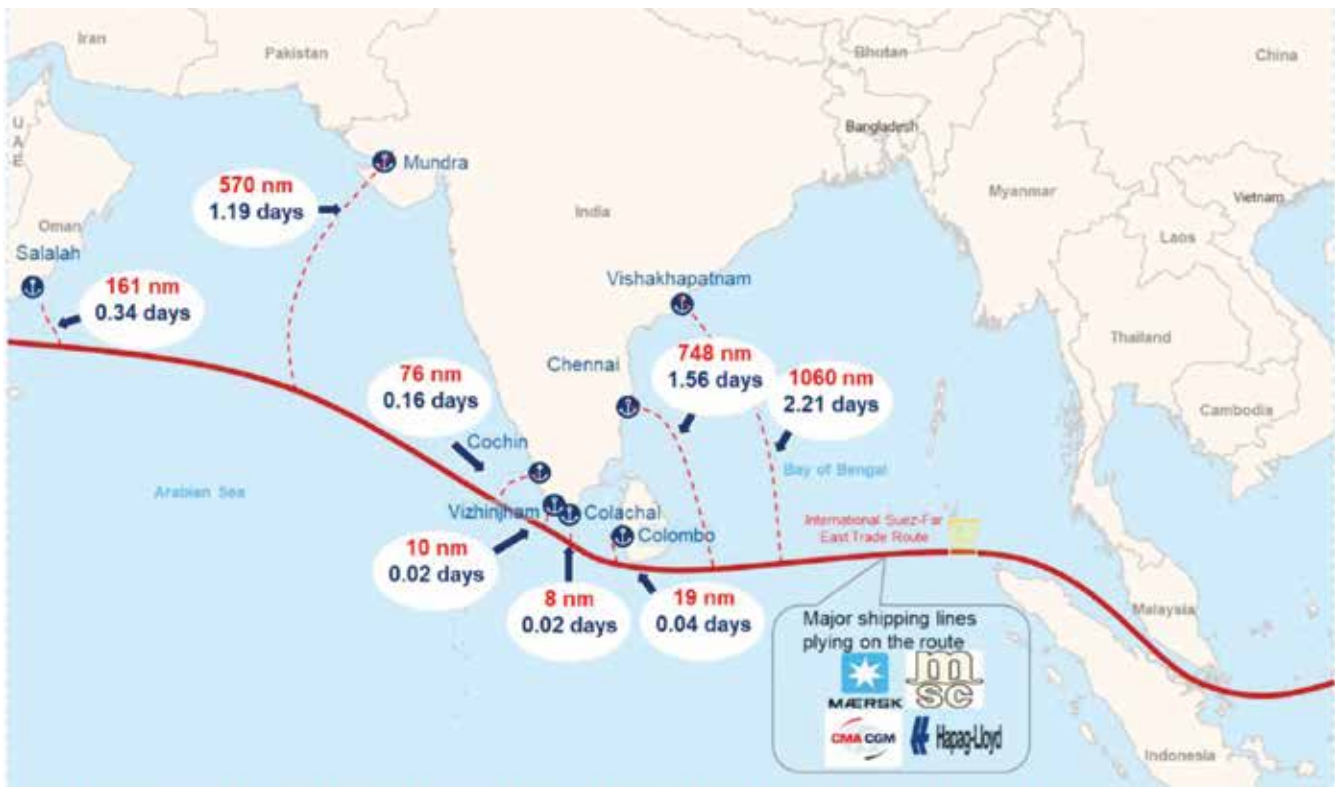
2030, under the visionary leadership of Prime Minister Modi, the International Container Transshipment Port (ICTP) project stands as a cornerstone in the ambitious Amrit Kaal Vision 2047.

Once completed, the Great Nicobar Port has the potential to

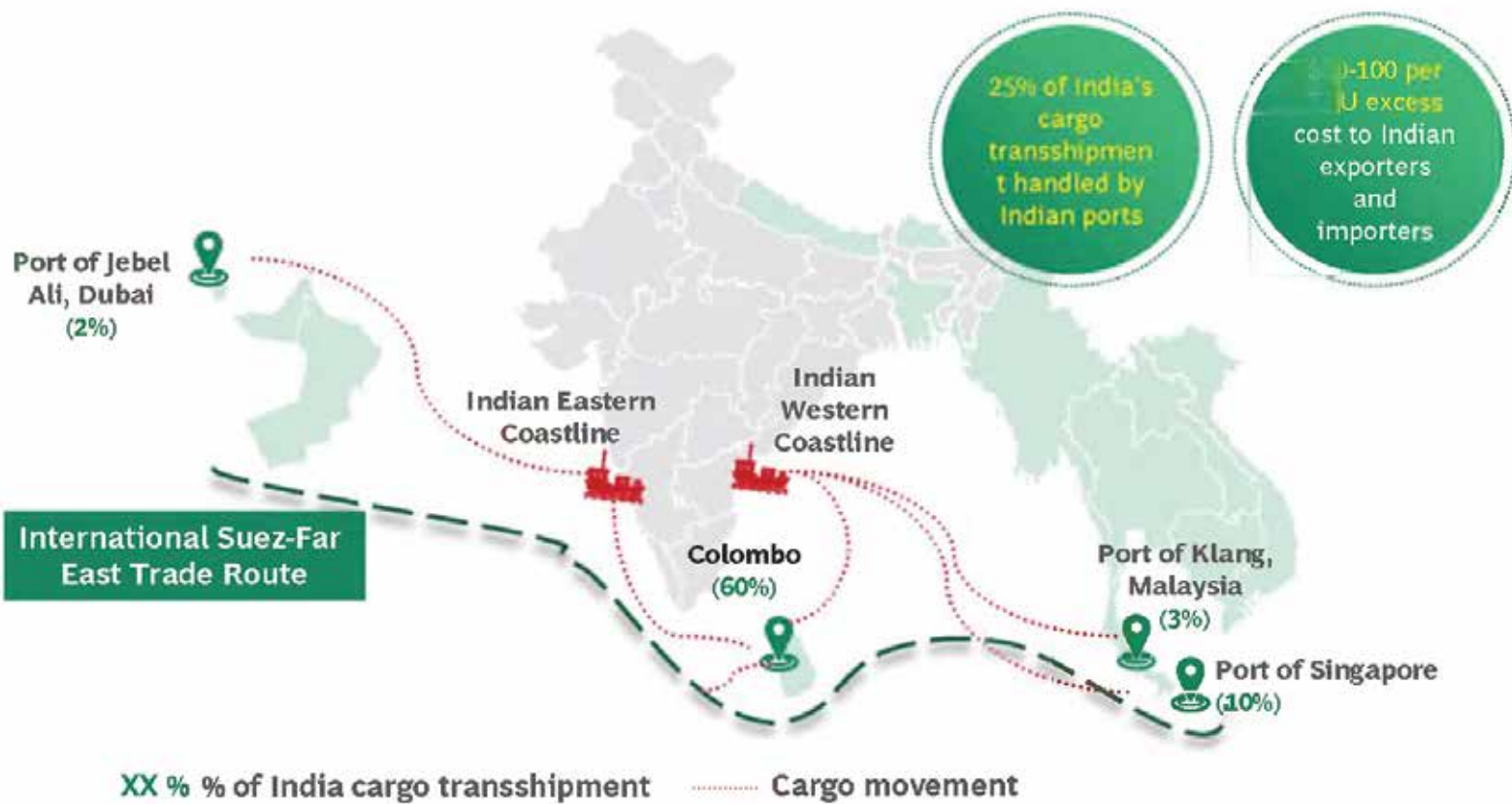
surpass India’s only international transshipment terminal at Kochi. The Phase I project will start in early 2024. The Great Nicobar (which is the southernmost island of India) has been chosen to develop four projects, including a port, an airport, a township, and a power plant, under the holistic

island development plan. The Environmental clearance for these projects has been granted.

The Great Nicobar Island is just 40 nautical miles from the Malacca Strait international shipping channel. Approximately 35% of the annual global sea trade



Locational Advantage of Great Nicobar. Source- (Holistic Development of Great Nicobar Island at Andaman & Nicobar Islands Pre-Feasibility Report March 2021, Page no-16).



The Ports of Colombo, Singapore, and Klang handle more than 85 per cent of this cargo, with 45 per cent of this cargo handled at Colombo Port, according to Ministry data.

passes through the Malacca Strait. The island possesses a strategic position that allows it to handle transshipment traffic from ports along the east coast of India, Bangladesh, and Myanmar, which are closer to the island than Port Klang and Singapore. There's a significant opportunity to establish a deep draft container transshipment terminal at Galathea Bay.

The project intends to be a top container transshipment port as it leverages three main factors: its strategic location near the international shipping route (just 40 nautical miles away), having a natural water depth that exceeds 20 meters, and with the capability to handle transshipment cargo from

The **International Container Transshipment Terminal** or **ICTP** is a proposed **deep-water container transshipment** facility slated for development at **Galathea Bay** in the **Nicobar Islands**, located within the Indian Union territory of **Andaman and Nicobar Islands**

neighbouring ports, which includes those in India. While this initiative will serve as a significant milestone in fostering India's journey towards

self-confidence and self-reliance, it will also contribute to the overall economic development of the nation.



The International Container Transshipment Terminal (ICTT), part of the Cochin Port, Kerala, India. Cochin Port is one of the largest ports in India.

Now, let's delve into the strategic motivations for the development of the Nicobar Island port.

1. Owing to geographical and logistical limitations, the ports on the East and West Coasts of India have not been equipped with deep-water berths capable of accommodating large inter-continental vessels that have drafts exceeding 15 meters. The primary transshipment hubs in South Asia, which are currently located in Colombo and Singapore, present deep-water ports for mainline vessels transporting cargo in the region and currently serve as the primary ports of mainline ships transporting cargo to smaller ports in the region. Therefore, feeder vessels visit Singapore and Colombo to load cargo destined for smaller ports in the Bay of Bengal, Andaman, and the Arabian Sea. As a consequence, India is experiencing significant revenue losses due to the absence of such facilities as well as a higher rate of landings.
2. The strategic significance of establishing this port lies in India's substantial potential to create mega ports and compete globally, as it outlined in the Maritime India Vision 2030. The intervention areas will encompass capacity augmentation, the development of world-class megaports, the creation of transshipment hubs in Southern India, and modernisation of infrastructure. Currently, India boasts 5 Major Ports and 2 Non-Major Ports with capacities exceeding 100 MTPA, highlighting the considerable opportunity for India to establish Mega Ports and compete with its global counterparts. As the Indian economy expands, the proportion of trade (both imports and exports) is expected to increase significantly. This emphasizes the need for more substantial ports, which can contribute to the development of the region.
3. The proposed Galathea Bay Port, which is strategically located near the East-West world-shipping corridor, is well-suited to attract both gateway and transshipped cargo. Currently, nearly 75% of India's transshipped cargo is handled at ports outside India. Colombo, Singapore and Klang handle the majority of more than 85% of this cargo, with

45% of this cargo being handled at Colombo Port. Therefore, the establishment of a new cargo transshipment terminal and supporting industrial facilities will enable India to capitalize on its unique exceptional access to crucial shipping routes that connect East Asia and South Asia. This positions India to secure a substantial portion of the regional maritime economy.

4. The strategic position of Galathea Bay provides a big advantage for India's import and export trade since it sits on a major international shipping route. By constructing the International Container Transshipment Port (ICTP) at Galathea Bay, it will enable Indian ports to draw in a greater share of this

transferred cargo. Furthermore, developing the Galathea Bay Transshipment Port will yield several advantages, such as saving money in foreign exchange, attracting more foreign investment, boosting economic activity in other Indian ports, improving logistics infrastructure, increasing efficiency, creating jobs, and raising overall revenue.

International Container Transshipment Terminal

The project will be completed in a total of four phases. The initial first Phase of the project is planned to start its operation in 2028, with the ability to handle around 4 million TEUs (containers). As the development progresses, the capacity is expected to increase

to 16 million TEUs reaching a capacity of 16 million TEUs by 2058. The approximate budget for the initial Phase of the proposed transshipment port is INR 19,000+ crores, covering various aspects such as building breakwaters, dredging, land reclaiming, construction of berths, and creating storage areas, erecting buildings and utilities, acquiring and installing equipment, as well as establishing the necessary infrastructure for the port colony. The government is expected to play an important role in providing support for the development of core infrastructure in this Phase.

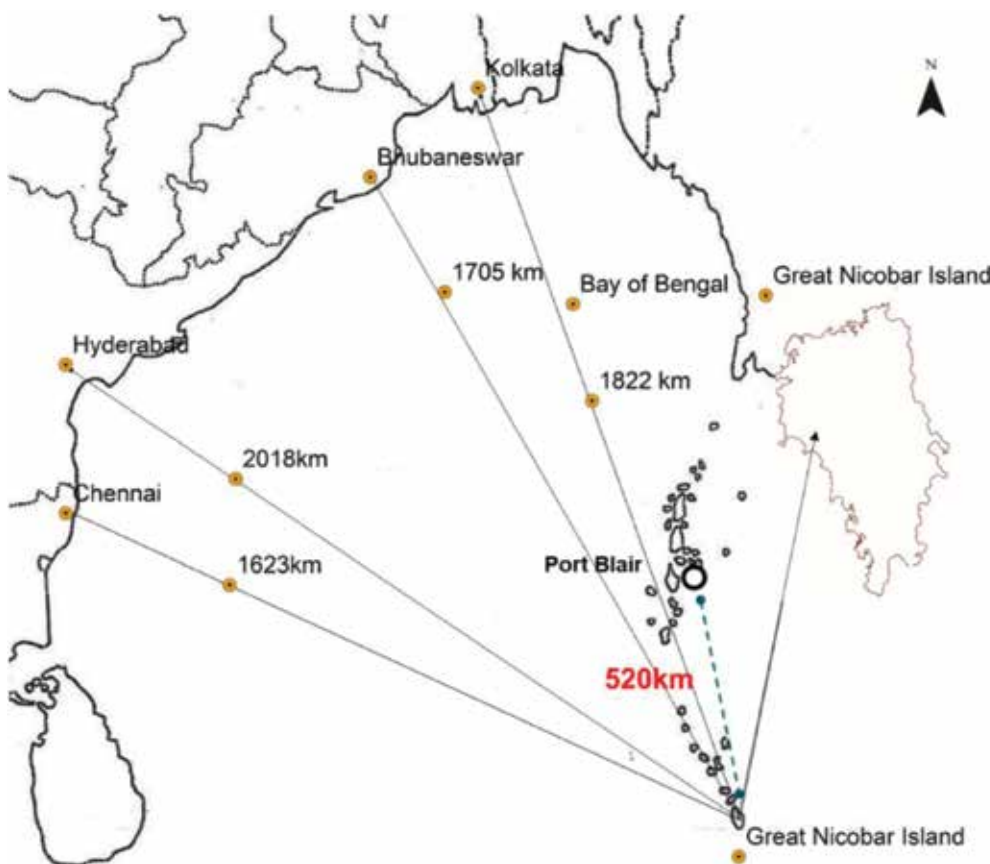
Landlord Model

The Ministry of Ports, Shipping and Waterways (MoPSW) aims to adopt the landlord model for port development. This model envisions a publicly governed port authority that will serve as both a regulatory body and as a landlord, overseeing the operations while private companies handle cargo-handling activities.

In this arrangement, the port authority will still retain ownership of the port, while the infrastructure will be leased to private firms and private entities. These private entities will then be responsible for maintaining their own superstructures and installing equipment for cargo handling. In exchange, the authority, which acts as the port authority, positions itself as the 'landlord' and will receive a share of the revenue generated by the private companies.

Development of Andaman and Nicobar

The development of Andaman and Nicobar provides a significant opportunity for India in terms of its development and strategic positioning. With a strategic location in the Bay of Bengal, Andaman and Nicobar constitute a vital



Locational setting of Great Nicobar Island with respect to major Indian ports
Source- (Holistic Development of Great Nicobar Island at Andaman & Nicobar Islands Pre-Feasibility Report March 2021, Page no-17).



Chennai Ports.

The **Ministry of Ports, Shipping and Waterways (MoPSW)** aims to adopt the landlord model for **port development**

link between the South Asia and Southeast Asia regions. Sitting atop and positioned on the Andaman Sea, the islands act as a gateway for maritime trade between countries such as India, Myanmar, Thailand, Malaysia, and Indonesia.

Apart from a strategic location, there are various factors that contribute to the development of the Andaman and Nicobar Islands. The region is rich in biodiversity and possesses its own unique ecosystem, which has the potential to attract tourists from around the world. Additionally, their location, being in proximity to the equator, gives


the islands an advantage in terms of favourable weather conditions and natural resources.

To tap into the immense potential of the region, the Government of India has launched various development projects in Andaman and Nicobar, including the establishment of the Galathea Bay Transshipment Port. Through these projects, the government aims to boost economic growth, enhance connectivity, and improve the overall living standards of the people residing in Andaman and Nicobar. Furthermore, the development of the region will not only benefit the locals but also

contribute to the nation's economy, trade, and tourism industry.

The development plan also includes several other sub-projects, such as the construction of an airport, the creation of a township, and the establishment of a power plant. These projects will further enhance the connectivity of the region and provide better infrastructure for residents and businesses.

Conclusion

In conclusion, the development of the Andaman and Nicobar Islands brings significant opportunities for India in terms of maritime trade, tourism, and economic growth. The strategic location of the Galathea Bay Transshipment Port, combined with coupled with the government's holistic island development plan, will help unlock has the potential to unlock the region's full potential and contribute to India's journey towards self-confidence, self-reliance, and overall economic development. 

CHARTING INDIA'S MARITIME FUTURE: THE AMBITIOUS GALATHEA BAY PORT PROJECT

India's maritime aspirations are reaching new heights with the ambitious Galathea Bay Port Project. Positioned as a pivotal hub for international container transshipment movements, this project embodies India's commitment to leveraging strategic partnerships and innovative infrastructure development to secure its maritime future.

What is the International Container Transshipment Port (ICTP) at Galathea Bay in the Great Nicobar Island?

India's pursuit of the International Container Transshipment Port (ICTP) at Galathea Bay in the Great Nicobar Island signifies a significant stride towards fortifying its maritime infrastructure and advancing national security

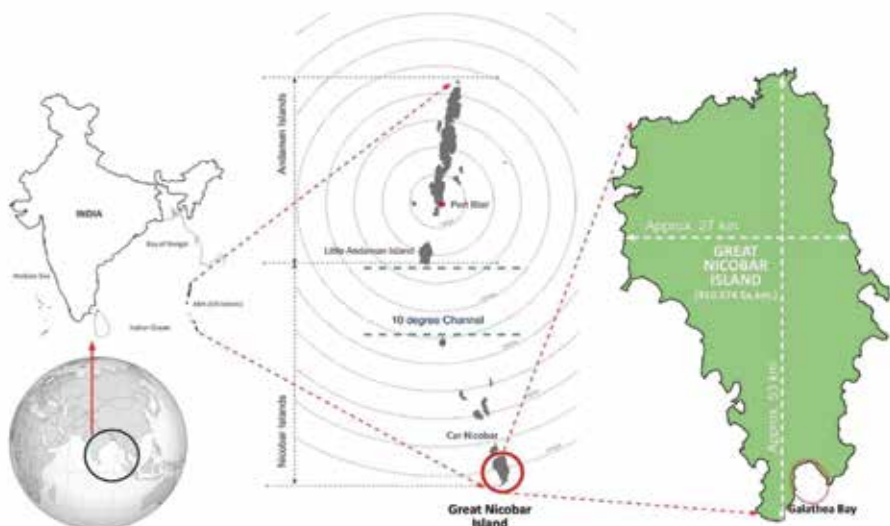
India's transshipped cargo is handled outside the country, predominantly by ports in Colombo, Singapore, and Klang. By establishing the ICTP at Galathea Bay, India seeks to reclaim control over its transshipment activities, reducing dependency on external ports and bolstering its maritime self-reliance.

Strategic Significance

Positioned strategically a mere 40 nautical miles from the international shipping trade route, this ambitious venture aims to optimise container transshipment operations among various ports, leveraging its strategic location and deepwater capabilities.

The Galathea Bay project, conceived as a monumental endeavor to establish a state-of-the-art transshipment hub, signifies to a great extent India's commitment to bolstering its maritime capabilities and strengthening its position in the global trade landscape. With the ICTP poised to emerge as a critical node in the East-West shipping corridor, nestled strategically between the bustling ports of Singapore and Colombo, its potential to enhance trade connectivity and stimulate economic growth cannot be overstated.

At its core, the ICTP initiative represents a strategic investment aimed at addressing India's longstanding reliance on foreign ports for transshipment operations. Currently, a substantial portion of



International Container Transshipment Port (ICTP) Project.



SREOSHI SINHA

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The project aims to bridge the gaps in infrastructure and improve economic opportunity for rapid increase in size for all types of vessels, from feeders to the large inter-continental carriers.

The strategic significance of Galathea Bay also lies in its positioning at the nexus of the East-West shipping corridor, nestled between the prominent transshipment hubs of Singapore and Colombo. This geographical advantage endows the port with unparalleled access to major shipping routes, rendering it a crucial node in the global maritime trade network. The deepwater capabilities and expansive berth areas of the port ensure efficient handling of cargo, positioning it as

a preferred transshipment hub for international trade flows. Moreover, by reducing India’s reliance on foreign ports for transshipment operations, the Galathea Bay port contributes to national self-reliance and strengthens maritime security.

India’s reliance on foreign ports for transshipment operations, with nearly three-quarters of transshipped cargo handled outside the country, has reemphasised the urgent need for it to bolster domestic infrastructure in this sector. The ICTP at Galathea

Bay aims to address this gap by attracting export-import trade and generating forex savings. Moreover, the project is expected to catalyse economic activity across Indian ports, attracting foreign direct investment, and fostering the development of logistics infrastructure, thereby spurring job creation and revenue generation.

The ICTP at Galathea Bay symbolises a transformative initiative that not only promises economic prosperity but also signifies India’s strategic acumen in the maritime domain. Through strategic investments, collaborative partnerships, and a steadfast focus on national security imperatives, India is poised to leverage its maritime potential to propel sustainable growth and regional stability. As construction commences, the Galathea Bay port project epitomises India’s vision of emerging as a maritime powerhouse, charting the course for enhanced connectivity and prosperity in the region for generations to come.

Development in phases

Apparently, the development of the Galathea Bay port is envisaged to unfold in four phases, with Phase 1 slated for commissioning in 2028. This

initial phase will focus on establishing critical infrastructure such as breakwaters, dredging operations, berths, storage facilities, and utility installations to accommodate approximately 4 million TEUs. With environmental clearance secured from the Ministry of Environment, Forests & Climate Change and Stage 1 forest clearance obtained, the project is poised to progress gradually, culminating in a handling capacity of 16 million TEUs by 2058. This collaborative approach underscores the government's commitment to leveraging private sector expertise and resources to realise the port's ambitious objectives. By harnessing the strengths of both sectors, the project aims to optimise efficiency, drive innovation, and ensure the timely and cost-effective development of world-class port facilities.

The decision to adopt a public-private partnership (PPP) model reflects a strategic alignment with global best practices in infrastructure development. By engaging private investors and operators, the project seeks to leverage their specialised skills, technological capabilities,

and financial resources to maximise the port's potential as a key hub for international trade.

Phase 1 lays the groundwork for the subsequent phases of the project.

Following the successful completion of Phase 1, Phase 2 will be initiated after a thorough assessment of demand and requirements. Separate tenders will be floated for Phase 2, reflecting a strategic approach to project management and resource allocation. While a maximum gap of seven years between Phase 1 and Phase 2 is anticipated, adjustments may be made based on fluctuations in demand. Should demand surge, efforts will be made to expedite the transition to Phase 2, ensuring timely expansion and optimisation of port facilities to meet evolving needs.

The phased development approach enables the project to adapt to evolving market dynamics and demand patterns. Each phase is designed to incrementally enhance the port's capacity and capabilities, ensuring scalability and flexibility in response to changing industry requirements.

Beyond its economic ramifications, the Galathea Bay transshipment port holds profound implications for India's national security apparatus. By diminishing dependency on foreign ports and enhancing maritime domain awareness, the project strengthens India's maritime security posture. Additionally, the emphasis on developing deep-draft ports aligns with India's strategic goal of fortifying maritime infrastructure to accommodate larger vessels, thereby augmenting its maritime security resilience and capabilities.

Conclusion

In conclusion, the development of the Galathea Bay transshipment port heralds a transformative milestone in India's maritime journey, promising to usher in a new era of connectivity and security. With strategic investments, collaborative partnerships, and an unwavering focus on national security imperatives, India is positioned to leverage its maritime potential and emerge as a dominant force in the global maritime arena.

As construction progresses on the ICTP at Galathea Bay, India



India is stepping up efforts to counter other established South Asian hub ports, such as Sri Lanka's Colombo, Singapore and Malaysia's Port Klang, which dominate the subcontinent transshipment activity.



India's conceptualisation of maritime security.

As **construction progresses** on the **ICTP at Galathea Bay, India** stands at the cusp of unlocking **unprecedented opportunities** for trade connectivity, economic prosperity, and **maritime security**

stands at the cusp of unlocking unprecedented opportunities for trade connectivity, economic prosperity, and maritime security. By reclaiming control over its transshipment activities and reducing reliance on foreign ports, India asserts its sovereignty and strengthens its maritime self-reliance. The port's strategic location, nestled between major international shipping routes, positions it as a critical gateway for global trade flows, facilitating seamless cargo transfers and enhancing trade efficiency.

Moreover, the Galathea Bay project holds the promise of catalysing

socio-economic development across Indian ports and the broader region. Beyond its direct economic benefits, such as generating forex savings and attracting foreign direct investment, the project is poised to stimulate ancillary industries, create job opportunities, and spur infrastructure development. As the port becomes operational, it will serve as a catalyst for economic growth, driving prosperity and improving living standards for communities in the vicinity.

In parallel, the Galathea Bay project reinforces India's commitment to maritime security and environmental sustainability. With enhanced

maritime domain awareness and advanced security measures, the port strengthens India's ability to safeguard its maritime interests and respond effectively to emerging security challenges. Additionally, the project's adherence to stringent environmental standards underscores India's dedication to preserving the ecological integrity of the Great Nicobar Island and its surrounding marine ecosystems.

As India forges ahead on its maritime journey, the Galathea Bay port project epitomises the nation's vision of emerging as a maritime powerhouse. By capitalising on its strategic advantages, fostering collaborative partnerships, and prioritising national security imperatives, India is poised to chart a course towards enhanced trade connectivity, sustainable economic growth, and maritime security resilience. The Galathea Bay port project is not merely a construction endeavor; it symbolises India's ambition, resilience, and determination to shape the future of maritime trade and security in the region and beyond. **DSA**

WOMEN IN THE ARMED FORCES: OPTIMISATION PATHWAY

The article delves into the ongoing challenges of achieving gender equality in the armed forces, examining current initiatives and trends in other countries. Despite strides in inclusivity, issues like sexual harassment and role definition persist, prompting a critical evaluation of future strategies for empowering women in military roles.

Gender Barriers

Gender barriers have always been prevalent in working entities of the government as also in the corporate world. For some time now, there have been several initiatives in trying to bring down the disparity as much as possible. Almost every sector has been opened to women. Yet the overall situation remains superficial. Just opening gates can never be considered as treating the women in an equal way as their men counterparts, but giving them meaningful roles, a conducive bias-free healthy work environment is essential. It means to give equal status and opportunities to women and also give what is rightfully theirs. There has been a contentious debate about the full opening of the armed forces to women with active involvement of the judiciary.

Gender equality is still a paramount challenge in the armed forces. The Supreme Court last year ruled that women could serve as army commanders further granting permanent commission and promotions equal to their male counterparts. This was in contrast to the government position that women were not suitable for commanding posts in the army because male



Women officers will be able to lead troops for the first time in the Indian Army, and their leadership abilities will be evaluated.



BRIG DR ANIL SHARMA (RETD)

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The **Supreme Court** last year ruled that **women could serve as army commanders** further granting **permanent commission** and **promotions equal to their male counterparts.**

forces is as follows; the Air Force 13.09%, the Navy 6%, the Army 3.80%.

The Armed Forces have opened an entry for women candidates in the National Defence Academy (NDA). The organisation is ensuring inclusive measures to carry out all necessary administrative, training and policy changes to enable the same

troops were not yet ready to accept their orders. However, women officers of the Indian Army are of the opinion that the trained soldiers should focus on the rank of the officer and not the gender. They further reiterate that performance should be a criteria to decide who rises in the ranks.

The contentious issue merits dispassionate examination, in terms of current status, trends in the other countries and the way forward keeping the paradoxes in mind.

Current Status

As per the recent data, women participation in the Indian armed



With the historic Supreme Court decision from February 2020, women officers were given permanent commissions with retroactive effect.



The Prime Minister, Shri Narendra Modi meeting the crew of INS V Tarini which successfully circumnavigated the globe, in New Delhi on May 23, 2018. The Chief of Naval Staff, Admiral Sunil Lanba is also seen.

In the Indian Armed Forces, there is no distinction in the deployment and working conditions of male and female officers in the Arms and Services in which they serve. The postings are as per organisational requirements. Training, postings, promotions, terms of engagement etc. are common for both women and men. The rules regarding employability in Indian Armed Forces are gender-neutral and provide equal opportunities to men and women. Brief salience is flagged below;

- **Army.** Permanent Commission (PC) is being granted to Women Officers (WOs) in 12 Arms & Services (in addition to Army Medical Corps, Army Dental Corps and Military Nursing Service) where they are commissioned. Indian Army has ensured parity amongst WOs

and their male counterparts with a complete gender-neutral environment existing in the 12 Arms/ Services they are presently serving in. A special board to screen all affected WOs has been held and the results have been declassified. In regular boards also, WOs are being considered for grant of PC along with their male counterparts. They can also serve as pilots in the Corps of Army Aviation. WOs are also being considered for Colonel (Select Grade) ranks and are being given command appointments with certain waivers. Provision for enrolment of women as Other Ranks (ORs) in Corps of Military Police in the Indian Army has been introduced in 2019.

- **Indian Navy.** In the Indian Navy, women are given

opportunities for spouse co-location, resettlement posting and compassionate grounds posting in a gender-neutral manner. Entry of women in all branches/Cadres/Specialisations (except Submarine specialisation) has commenced from June, 2023. Women officers are also being appointed on board warships in afloat billets and also as Specialist Naval Air Operations (NAO) officers to ship borne helicopters. Women officers can now join the Remotely Piloted Aircraft (RPA) stream and first women officer joined RPA Squadron in March, 2021. Women officers have also been deputed on Diplomatic assignments and other Foreign Cooperation engagements. Women cadets are now eligible to join through '10+2 B.Tech.' entry scheme from January 2024. As a part of the Agnipath Scheme, women



the Indian Army conducted a Table-Top Exercise (TTX) for Women Officers of ASEAN Countries at the Manekshaw Centre in New Delhi from December 4th to 8th, 2023. The exercise was designed specifically for women officers from the Association of South-East Asian Nations (ASEAN).

India has recently concluded a Female Military Officers Course for officers from ASEAN countries and the Indian Army

have been enrolled as Agniveers commencing from the first batch itself.

- **Air Force.** Recruitment of officers in the IAF is gender-neutral. Women officers are inducted in all the branches and streams of IAF. The experimental scheme to induct women officers in all combat roles, initiated by the IAF in 2015 was regularised in the year 2022 into a permanent Scheme.

Such a gender-neutral approach is facilitating the employment of women officers of IAF in all combat roles without any restrictions. IAF is continuously upgrading its environment and infrastructure for its personnel. Induction of women (other than officers i.e. Airmen) are being executed in a gradual manner to ensure that necessary facilities are available for women. The plan is to increase the number of women with every intake.

- **Military Diplomacy.** India has recently concluded a Female Military Officers Course for officers from ASEAN countries and the Indian Army. Spearheaded by the Indian Army's vision for gender neutrality and women empowerment, this initiative, themed on the UN framework, was organised by the Ministry of Defence. Such an initiative reinforces India's commitment to fostering deeper international collaboration while championing gender equality in the armed forces. This is especially pertinent in light of India's longstanding commitment to the ASEAN Defence Ministers' Meeting (ADMM) and the ADMM-Plus.

Are these steps enough or more needs to be done in this regard?

Women have been serving in the militaries of developed countries for a long time. These countries have acquired a deep understanding of all the issues involved and their long term effects. Trends prevailing in other countries have been summarised in the succeeding paragraphs.

Trends in Other Countries

More generally, the issue of women's representation in combat roles has been contentious across the world. Data on the gender composition in global Armed Forces is patchy, making comparisons with India difficult. In 2017, less than a fifth of all NATO active military duty personnel were women with Hungary, the US and Canada having the highest female representation. The percentage figures are; Turkey 19.3, Hungary 16.2, Canada 15.5, Greece 15.2, France 12.7, Germany 11.6, UK 7.1, Denmark 5, Italy 0.8.

- The United States is considered a pioneer and a trend-setter as

regards induction of women in the services. There are approximately 200,000 American women on active duty in the US armed forces. They constitute nearly 20 percent of its strength. They are forbidden to be placed in direct ground combat with the enemy. They, however, are assigned 'combat support' roles.

- Though Israel has conscription for women (as well as men), a large number of them are exempted for various reasons. Women are generally not allotted active battlefield duties. They serve in many technical and administrative posts to release men for active duty. Although they make excellent instructors as well, most women occupy lower and middle level appointments. Only a handful reach senior ranks.
- In Britain, women are primarily excluded from the duties which require battling enemy at close

quarters. There are about 9% women in British armed forces as against very high tenable (more than 70 %) positions.

- In Germany, women constitute almost 6 percent of the total strength. They are excluded from direct combat roles.
- In the Australian Army women are still not allowed in the field/ battle.
- In Russia, women generally serve in nursing, communications and logistic support functions. According to some estimates, their number is close to 95,000 in 2015, There were 39,000 servicewomen in March 2023, 5,000 of whom were officers. This constitutes less than 4% of Russia's force of 1.15 million.
- Pakistan's Armed Forces, comprise 936,000 serving soldiers, of which 4,000 are women. It comes to about .04%. They are



A female soldier from the Israel Defense Forces' Karakal Battalion during training near the Israeli-Egyptian border.



China's female fighter pilots.

Participation of **women** in the **armed forces** needs to be increased **at least upto 15%** or so. It can be done in **phases** with proper planning, infrastructure **development and sensitization** of the environment

mostly appointed and serve in the the military logistics, operational planning, staff development and the senior administrative offices, particularly in the regional and central headquarters.

- In China, demographics and mission accomplishment are the driving parameters for recruiting women in the PLA and assigning them various roles. They recognise the long-term issues for the PLA's

human capital that will result from demographic and societal trends, including rapid aging and poor health. They are trying to enhance women's participation to improve their external image. Beyond this pragmatic rationale, the decision is also influenced by the recognition that technological changes enhance the ability of women to contribute to modern warfare. For instance, given the unceasing development of

science and technology, future informationised warfare will probably require that more and more females participate. Also, some scholars believe that increased automation of modern combat has made the differences in the average physical strength of men and women no longer an important factor that influences participation in warfare. Rather, in information-age warfare, the perceived strengths of women relative to men—including their superiority in thinking ability, language ability, interpersonal ability, management ability, and patience—all become more critical. However, despite this recognition of the increased potential for women to contribute in future warfare, there are only 4.5% women in the PLA and not in the direct combat roles.

- In Japan's self defence forces the total number of military women

in Japan was 13707, only a little less than 6% of the total force.

It can be concluded that women do not contribute significantly to the combat forces of other militaries. They are excluded from the direct combat roles. Percentage of women in India's armed forces is quite low in comparison, although a lot of efforts are underway to enhance it.

Challenges Experienced by Women

Women in all militaries are confronted with social, behavioural and psychological problems at all levels. According to many surveys carried out women are not fully satisfied with the ethos of the military profession. Some of the major issues concerning women in all defence forces are discussed below.

- **Sexual Harassment.** This is one single concern that has defied solution so far – how to ensure safety and protect dignity of women in the forces. Almost all women view this as their major fear. The American and the British societies are highly emancipated and liberal with women having equal status in all fields. Yet, the level of sexual harassment of women in their forces is startling.
- **Low Acceptance.** Acceptance of women in the military has not been smooth in any country. Every country has to contend with sceptics who consider it to be a counterproductive programme or just a political liability.
- **Lack of Job Satisfaction.** Most women feel that their competence is not given due recognition and not involved in any major decision-making.
- **Poor Comfort Level.** Most women

accepted the fact that their presence amongst males tends to make the environment 'formal and stiff'. Mutual comfort level between male and female colleagues is low. It does affect the group cohesion.

- **Doubts about Role Definition.**

The profession of arms is all about violence and brutality. To kill another human is not moral but soldiers are trained to kill. They tend to acquire a streak of raw ruthlessness and coarseness. This makes the environment highly non-conducive and rough for women.

Employment of women in direct combat roles **should be avoided** as is **the trend world over** and for very many **good reasons.** They can be very usefully employed in **cyber security,** informatised operations, intelligence, **drone pilots,** and all the **logistic roles**



Several incidents of sexual harassment in the Armed Forces by senior officers, colleagues, and even subordinates have come up over the past few years.



Women will get the same opportunities as men, including ranks, promotions and pensions.

Way Forward

Participation of women in the armed forces needs to be increased at least upto 15% or so. It can be done in phases with proper planning, infrastructure development and sensitisation of the environment. It is not practical to raise and maintain gender-based units/subunits. Mixed units/sub-units, is a compulsion. The armed forces will have to create the necessary gender-based billeting infrastructure particularly in field areas. However, challenges experienced by women should be addressed effectively through detailed studies, reframing of rules and regulation and training of soldiers to enable them to psychologically adapt to the presence of women as comrade at arms amongst them.

Promotion policies and service conditions for both male and female soldiers have to be the same. For the armed forces, operational efficiency is sacrosanct. Women soldiers/officers should be encouraged to measure up

to the exacting physical, intellectual, psychological and performance standards, and the conditions of service. Equal opportunities based on gender neutral norms, demand equal performance. No quarter should be given and none should be asked.

Employment of women in direct combat roles should be avoided as is the trend world over and for very many good reasons. They can be very usefully employed in cyber security, informatised operations, intelligence, drone pilots, and all the logistic roles.

Armed forces have been constituted with the sole purpose of defeating / dissuading/deterring the enemy always and every time. They must not be treated as just another platform for gender equity for social justice. All other countries too are being guided by this overriding parameter. We cannot be an exception. Americans are having a relook at the modalities

of women participation in armed forces with the aim of optimising gender distinctiveness as against earlier much trumpeted factors of gender parity to ensure that mission outcome is not diluted. All matters concerning defence of the country have to be considered in a dispassionate manner.

Last and foremost, India faces the most challenging security environment in the world, where it is confronted by two hostile nuclear armed neighbours, one of them has irregular war as a doctrine and the other is carrying out warfare unlimited. On both the borders ugly stability prevails. No other country except Israel faces a threat of such magnitude. Our threat envelope is very fluid, and armed forces continue to remain deployed for operations throughout the year.

No decision therefore, be taken which even remotely affects the cohesiveness and efficiency of the military. **DSA**

WOMEN IN INDIAN DEFENCE: BREAKING BARRIERS, SHAPING THE FUTURE

Women in the Indian Defence sector have made significant strides, breaking traditional barriers to contribute to national security. They now serve in combat roles and hold leadership positions, reflecting a broader shift towards gender inclusivity and empowerment.



Women's role in the Indian Defence sector has evolved significantly over the years, breaking

traditional barriers and contributing to the nation's security and strength. This transformation reflects a broader societal shift towards gender inclusivity and empowerment. From serving in combat roles to taking up leadership positions, women in Indian Defence have made remarkable strides, paving the way for a more diverse and inclusive armed forces.

Historical Perspective

Historically, women in the Indian Defence forces were primarily limited to non-combat roles, such as medical, nursing, and administrative positions. However, the turning point came with the induction of women into the Indian Armed Forces Medical Services in 1927. Over time, the armed forces recognised the potential of women beyond these roles, leading to the gradual expansion of opportunities.

Evolution in Combat Roles

In 1992, the Indian Air Force (IAF) became the first among the three



Air Chief Marshal N.C. Suri & Mrs Asha Suri With The First Batch Of IAF Women Cadets (Diamond Jubilee Celebrations, Palam, New Delhi, 1992).

In **1992**, the **Indian Air Force (IAF)** became the first among the **three services** to **induct** women into the **flying branch**



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In 2020, the Indian Navy deployed its first batch of female pilots for operational duties on Dornier aircraft. These achievements exemplify the breaking down of gender barriers and showcase the competence and dedication of women in the armed forces.

The 75th Republic Day Parade in India was not only a celebration of the nation's sovereignty but also a powerful showcase of 'Nari Shakti' or women's power. The grand display featured women soldiers marching down the Kartavya Path, symbolising strength, resilience, and empowerment.



Commander Prerna Deosthalee will be the first woman officer of the Indian Navy to command Indian Naval Warship.

Various contingents from different branches participated, including the Armed Forces, Border Security Force (BSF), Delhi Police, and Agniveers. Their synchronised march down the Kartavya Path not only enthralled the guests and audience present but also resonated strongly with the theme of women's empowerment. As we open the portals of the NDA for women cadets, we expect you to welcome them with the same sense of fair play and professionalism as Indian armed forces are known world over. This year, Commander Prerna Deosthalee became the first woman officer of the Indian Navy to command the Indian Naval Warship. Meanwhile, Group Captain Shaliza Dhami became the first woman Air Force officer to take charge of a frontline combat unit. Here are other women who created history in 2023.

services to induct women into the flying branch. This marked a significant departure from the conventional roles assigned to women in the armed forces. The Indian Army and Navy followed suit, opening doors for women to serve in combat support roles. Today, women are an integral part of various branches, including the artillery, engineers, signals, and aviation.

Landmark Achievements

Several women have achieved notable milestones in the Indian Defence forces. Wing Commander Pooja Thakur made history by leading the ceremonial guard of honor during the visit of former U.S. President Barack Obama in 2015. Flight Lieutenant Bhawana Kanth became one of the first women fighter pilots in the Indian Air Force, inspiring a new generation of aspiring aviators.

The Indian Army has taken significant steps towards gender equality by granting Permanent Commission (PC) to Women Officers (WOs) in 12 Arms & Services, ensuring parity with their male counterparts. Special boards have been held, and results declassified, while regular boards now consider WOs for PC. Entry for women candidates in the National Defence

Academy has been opened, with measures for administrative, training, and policy changes. WOs can serve as pilots in the Corps of Army Aviation, and provisions for their enrolment as Other Ranks

in the Corps of Military Police have been introduced since 2019. The number of women working in various Defence forces across the country at present, service/wing-wise is given below:

Indian Army

SNo	Category	Held Strength of Women (as on January 01, 2023)
(a)	Women Officers (Excluding Army Medical Corps (AMC)/ Army Dental Corps (ADC))	1,733
(b)	Junior Commissioned Officers (JCOs)	00
(c)	Other Ranks (ORs)	100

Indian Air Force

S No	Category	Held Strength of Women (as on July 01, 2023)
(a)	Women Officers (Excluding Medical & Dental branches)	1,654
(b)	Airmen (Agniveervayu)	155

Indian Navy

S No	Category	Held Strength of Women (as on July 26, 2023)
(a)	Women Officers (Excluding Medical & Dental officers)	580
(b)	Sailors (Agniveer)	726

Medical and Dental Branches: Total number of women (cadre-wise & service-wise) in Armed Forces Medical Services (AFMS) are as under (as on July 01, 2023):

Service Corps	Army	Navy	Air Force
Army Medical Corps (AMC)	1,212	151	274
Army Dental Corps (ADC)	168	10	05
Military Nursing Service (MNS)	3,841	380	425



The first batch has three women - Fg Offr Bhawna Kanth, Fg Offr Avni Chaturvedi and Fg Offr Mohana Singh who will create history as India's first women fighter pilots.



Indian Navy got its first batch of women pilots for Maritime Reconnaissance (MR) missions on Dornier aircraft.

Challenges Faced

While progress has been made, challenges persist for women in the Indian Defence sector. Stereotypes, gender biases, and the perception of traditional gender roles can hinder the seamless integration of women into various branches. Balancing family responsibilities with the demands of a military career remains a challenge for many women in the armed forces.

In recent years, there have been discussions around the need for policy changes to ensure gender-neutral opportunities and a more inclusive environment. Addressing these challenges is crucial for attracting and retaining talented women in the Defence forces.



A contingent of Women Army Medical Corps take part for the Republic Day Parade 2024.

The **75th Republic Day Parade** in India was not only a celebration of the **nation's sovereignty** but also a powerful showcase of **'Nari Shakti'** or women's power

Initiatives and Support

Recognising the importance of gender diversity, the Indian government and the armed forces have taken initiatives to support women in Defence. The introduction of the Short Service Commission (SSC) for women in various branches allows them to serve for a specified duration. Efforts are being made to extend permanent commission to women, providing them with more long-term career options.

The Indian Army, in particular, has taken steps towards enhancing inclusivity by inducting women in the Corps of Military Police, paving the way for their involvement in investigations and law enforcement within the military.

Looking Ahead

The journey of women in Indian Defence is a story of resilience, determination, and breaking stereotypes. As the armed forces continue to evolve, the focus on gender

inclusivity is expected to grow. There is a need for sustained efforts to create an environment that fosters equality and provides equal opportunities for both men and women.

Conclusion

The role of women in Indian Defence has come a long way, from limited roles to breaking barriers and contributing significantly to the nation's security. As women continue to make strides in combat roles and leadership positions, their presence strengthens the armed forces and sets an inspiring example for the entire nation. The on-going efforts to address challenges, provide support, and create a more inclusive environment are crucial steps toward building a Defence sector that truly reflects the diversity and potential of the entire population. Women in Indian Defence are not just breaking barriers; they are shaping the future of the nation's security forces. **DSA**

HYPERSONIC MISSILE PROPULSION OPTIONS

A The usage of the hypersonic missile Kinzhal (Kh-47M2 ‘Dagger’) in the Ukraine conflict, which triggered a global debate, unveiled in 2018 by Russian President Vladimir Putin,

is renowned for its Mach 10 speed and a range of 2000 kilometers, earning it the labels ‘invincible’ and ‘unstoppable’. Russia has claimed to have employed the Kinzhal twice before in the ongoing conflict, and considers its latest strike a success, which resulted in the destruction

of five launchers of the US Patriot surface-to-air missile system in Kiev. Additionally, a multifunctional radar station was impacted, causing casualties, besides a temporary power outage at the Zaporizhzhia nuclear power plant.

However, conflicting reports from the United States suggested that the Patriot missile system successfully intercepted the ‘killer Kinzhal’, whereas Moscow dismissed these claims, but the American position was solidified after news reports of senior Russian scientists involved in hypersonic technology research, being arrested emerged, allegedly implying their failure to develop a genuinely ‘unstoppable’ missile. Both Washington and Moscow were engaged in a war of words, vying for a victorious narrative.

Hypersonic missiles are a relatively new technology, and their operational deployment in combat scenarios has not been reported or confirmed publicly, owing to their highly sensitive and classified nature, other than Russia’s deployment of its hypersonic missiles in Ukraine, being the only known example in recent times.



The Zaporizhzhia Nuclear Power Plant in the course of Russia-Ukraine conflict outside Enerhodar in the Zaporizhzhia region, Russian-controlled Ukraine, 14 October 2022.



SUMAN SHARMA

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Russia has claimed to have employed the **Kinzhal twice** before in the **ongoing conflict**, and considers its latest **strike a success**, which resulted in the destruction of five launchers of the **US Patriot surface-to-air missile system** in **Kiev**.

In the ever-evolving landscape of military technology, hypersonic missile propulsion has emerged as a game-changer. With their unprecedented speed and manoeuvrability, hypersonic missiles have garnered significant attention in defence circles worldwide. The importance of hypersonic propulsion lies in its potential to revolutionise military operations, as they can evade radars, penetrate heavily guarded targets and have no countermeasures as on date. These capabilities make them highly valuable for both offensive and defensive operations. Hypersonic missile propulsion refers to the technology that enables missiles to travel at speeds exceeding Mach 5 (approximately 3,800 miles per hour or 6,200 kilometres per hour).

Indian Air Force (IAF)’s Air Vice Marshal PK Srivastava (retd) says, “Missiles flying at hypersonic speeds crunch the OODA (Observe Orient Decide Act) loop timing in warfare, making defence against such attacks an impossibility. India is harnessing necessary technologies required through its HSTDV programme.”

Though only Russia boasts of possessing an operational hypersonic missile system, countries around



Patriot missile defence system.

the world are investing significant resources into research and development to gain a competitive edge in this field, by focusing on propulsion, materials, and guidance systems.

Propulsion Options and Alternatives

Discussed below are some notable options being explored to power hypersonic missiles.

- a. **Scramjet Engines:** Scramjet (supersonic combustion ramjet) engines are air-breathing engines specifically designed for hypersonic speeds. These engines rely on the compression and heating of incoming air for propulsion. Scramjet engines offer higher efficiency and improved performance at hypersonic speeds compared to traditional rocket motors.
- b. **Combined Cycle Engines (dual mode engines):** Combined cycle engines combine the features of rocket and scramjet engines. They operate as rockets during the initial boost phase and then transition to scramjet mode for sustained hypersonic flight. This hybrid propulsion system offers greater flexibility and efficiency, enabling missiles to cover longer distances.
- c. **Pulse Detonation Engines (PDEs):** Pulse detonation engines utilise detonations instead of deflagration, resulting in rapid, repetitive combustion cycles. These engines have the potential to provide higher speeds and increased thrust for hypersonic missiles, however there are technical challenges like controlling the initiation and propagation of detonation waves and managing the extreme temperatures and pressures generated during detonation.
- d. **Electromagnetic Propulsion:** Electromagnetic propulsion involves the use of electromagnetic forces, such as electromagnetic railguns or electromagnetic launchers, to accelerate projectiles to hypersonic speeds. Although still in experimental stages, electromagnetic propulsion shows promise in achieving hypersonic velocities with reduced reliance on chemical propellants.
- e. **Nuclear Thermal Propulsion (NTP):** NTP utilises energy released from nuclear reactions to heat a propellant, typically hydrogen, and generate thrust, providing its high specific impulse (Isp), and high thrust-to-weight ratio as its key advantages. However, major challenges include the design and engineering of a compact and efficient nuclear reactor that can operate reliably in the extreme conditions of space, as well as handling and containment of radioactive materials.

In the **ever-evolving landscape** of military technology, **hypersonic missile propulsion** has emerged as a **game-changer**



GE Unveils 'World's First' Hypersonic Dual-Mode Ramjet. GE Aerospace has successfully ignited a dual-mode scramjet engine subscale demonstrator that the company says could someday power crewed hypersonic flight.

Challenges

Hypersonic missile propulsion is a pivotal technology that has the potential to reshape modern warfare. Though ongoing research and development efforts continue to push the boundaries of propulsion systems, this highly advanced



Hypersonic Technology Demonstrator Vehicle (HSTDV) by the Defense Research and Development Organisation (DRDO).

technology is fraught with its own set of challenges, which are not specific to any country but are shared by many nations. The process involves overcoming technical challenges related to aerodynamics, thermal management, material science, and guidance systems.

Dr Arun Kumar, scientist with Larsen and Toubro (L&T) says, “The biggest challenge in hypersonics for any country is scramjet engine technology.

Ignition, combustion, and sustenance of scramjet is the technological complexity. Materials required for these engines are special and have limited sources. Manufacturing processes for these materials are complex and need to be carried out with ultra-high precision which makes them complex”.

Some of these challenges are

- **Thermal Management:** Hypersonic flight generates

intense heat due to the high speeds involved. Managing and dissipating this heat is a critical challenge in hypersonic propulsion. Extreme temperatures can lead to material degradation, structural integrity issues, and thermal stress on the propulsion system components.

- **Aerodynamics and Control:** Hypersonic flight introduces complex aerodynamic phenomena, including shockwaves, boundary layer interactions, and high drag. Maintaining stability and control of a vehicle travelling at such high speeds is challenging. Jayant D Patil, Director, L&T, says, “Higher the speed aimed, higher is the turning radius. Also, higher the speed, less is the time for hitting the target so the target can’t move much, and the manoeuvring ability does not become a limitation with a well-designed weapon.”

- **Propulsion Efficiency:** Hypersonic propulsion requires efficient engines that can provide the necessary thrust while operating at high speeds and altitudes. Designing propulsion systems that offer high specific impulse (Isp) and can operate in the hypersonic regime poses challenges in terms of fuel efficiency, thrust-to-weight ratio, and power requirements.
- **Materials and Structural Integrity:** Hypersonic flight exposes the vehicle to extreme aerodynamic loads, thermal stresses, and vibrations. The materials used in the construction of hypersonic vehicles need to withstand these harsh conditions while maintaining structural integrity.
- **Manufacturing and Testing:** Building hypersonic propulsion systems requires advanced manufacturing techniques capable of producing complex

components with high precision and reliability. Fabricating and assembling materials that can withstand the extreme conditions of hypersonic flight can be demanding.

- **Integration and System Complexity:** Hypersonic propulsion systems need to be seamlessly integrated with other vehicle systems, such as guidance, navigation, and control. Achieving optimal integration and coordination of these complex systems is a significant challenge.

About the tremendous high speeds of hypersonics lending them lethality and unstoppable due to non-detection, thereby posing a huge challenge for the enemy, Indian Army's Lt-Gen VK Saxena (retd) says, "The real challenge on ground is the detection of hypersonic weapons. Towards this, the national level air defence Battle Management Command and Control (BMC2) system, i.e., Integrated Air Command and Control System (IAACS) of the IAF with linkages with similar systems across the three Services and with civil aviation, needs to further grow in the years ahead into futuristic sensor capabilities based on satellite surveillance to be able to detect hypersonic class threat vehicles."

Why are nations pursuing this technology?

As missile defence systems advance, the effectiveness of ballistic missiles diminishes. Since many nuclear-armed nations rely on ballistic missiles for deterrence, this reduction in effectiveness poses a challenge. However, the development of manoeuvrable hypersonic missiles presents a potential solution, as they travel at extremely high speeds and follow unpredictable paths, making it almost impossible for

defence systems to intercept them. Therefore, hypersonic missiles offer an alternative to address the decreasing effectiveness of ballistic missiles in the face of improved defence capabilities.

Other reasons include military, strategic, technological, speed and range.

Militarily these weapons provide

an advantage through their ability to strike targets with great precision, with high speed and manoeuvrability.

A strategic balance is maintained if a nation's adversaries possess hypersonic weapons, as it creates pressure for other countries to develop similar capabilities to ensure they are not at a significant disadvantage.



Hypersonic air-breathing scramjet technology with the flight test of Hypersonic Technology Demonstration Vehicle (HSTDV).



Kh-47M2 Kinzhal.

Developing and possessing hypersonic technology showcases a nation's technological prowess and innovation, as it demonstrates the ability to push the boundaries of aerospace engineering, propulsion systems, and materials science, enhancing a country's global reputation and influence.

Hypersonic technology offers unparalleled speed and range and this capability allows for rapid response and the potential to strike targets thousands of kilometres away within minutes. Conventional applications include the ability to strike time-sensitive targets quickly and precisely, such as enemy installations or mobile military assets. Strategically, hypersonic weapons could be used to deliver nuclear warheads.

Several countries, including the United States, Russia, China, and others, have active programs focused on hypersonic technology due to its potential military and strategic benefits. Research efforts

are directed towards improving aerodynamics, reducing heat generated by high-speed flight, and enhancing control mechanisms for precise manoeuvring. Moreover, the development of hypersonic missiles also necessitates advancements in sensor technology, data processing, and command and control systems.

Russia

Post-Cold War Russia felt the need for a hypersonic weapon and commenced development work in 2004. Moscow has not just developed it but proved it for re-entry vehicles. Russia's advancements in this domain have raised concerns and garnered attention from global military powers.

At the forefront of Russia's hypersonic missile technology is the Avangard hypersonic glide vehicle, with an estimated range of up to 6,200 miles (10,000 kilometres) and speeds exceeding Mach 20, which is designed to carry nuclear warheads. The Avangard system combines a ballistic missile with a glider that can

manoeuvre and change its trajectory during flight. This feature makes it incredibly challenging for existing missile defence systems to detect and intercept the weapon. The glider is propelled by a combination of traditional rocket engines and scramjet engines, allowing it to sustain hypersonic speeds.

One key component of Russia's hypersonic missile propulsion technology is the scramjet engine. Unlike traditional rocket engines, scramjets do not carry oxidizer on board, but rather take in oxygen from the atmosphere during flight. This design significantly reduces the weight and complexity of the engine. Scramjets are particularly suited for hypersonic speeds, as they rely on the high velocity of the air entering the engine to compress and ignite the fuel, creating thrust.

Moscow's development of scramjet engines for hypersonic missiles has been a result of years of research and testing. The Tsirkon hypersonic cruise missile, for instance, utilises

scramjet engines to achieve speeds of Mach 9, making it one of the fastest cruise missiles in existence. This advanced propulsion technology gives Russia a significant military advantage, as it allows for rapid and precise strikes against both land and naval targets.

Apart from scramjet engines, Russia has also been exploring other propulsion technologies for hypersonic missiles. One such technology is the use of solid-fuel rockets combined with a ramjet engine. This hybrid propulsion system provides a balance between the simplicity of solid-fuel rockets and the efficiency of ramjet engines, enabling sustained hypersonic flight. By diversifying their propulsion options, Moscow is enhancing its technological capabilities and ensuring flexibility in its hypersonic missile arsenal. Russia's hypersonic missile propulsion technology, driven by advances in scramjet engines, has positioned the country at the forefront of military capabilities. The Avanguard and Tsirkon systems, among others, demonstrate Russia's ability to

develop hypersonic weapons that are highly manoeuvrable and difficult to intercept.

China

One of China's most notable achievements in hypersonic propulsion technology is the DF-17, a hypersonic glide vehicle that is capable of carrying conventional or nuclear warheads. The DF-17, with an estimated range of over 1,800 miles (3,000 kilometres) and speeds exceeding Mach 5-10, employs a combination of a ballistic missile and a manoeuvrable glider to achieve hypersonic speeds and unpredictable flight paths, making it highly challenging to intercept. The glider is powered by a scramjet engine, which is a key component of China's hypersonic propulsion technology. Beijing has also allegedly claimed that the DF-17 can sink a US aircraft carrier in the South China Sea.

China's DF-ZF, a hypersonic glide vehicle with an estimated range of over 1,200 miles (2,000 kilometres),

has been reported to reach speeds of Mach 10 or higher, making it one of the fastest hypersonic systems.

In addition to scramjet engines, China has also explored other propulsion technologies for hypersonic missiles, which comprises dual-mode ramjet and scramjet engines and solid-fuel rocket motors combined with scramjet engines. By diversifying their propulsion options, China aims to bolster the versatility and effectiveness of its hypersonic missile inventory. The development and deployment of hypersonic glide vehicles such as the DF-17 and DF-ZF demonstrate China's ability to produce high-speed, manoeuvrable, and elusive weapons. The Hong Kong-based English newspaper South China Morning Post reported the Chinese defence analyst Zhou Chenming stating that HGV technology had become a part of the nuclear strategy between the world's three big nuclear powers, adding that HGV warheads could be used with different type of ballistic missiles including ICBMs like DF 41.

Dr VK Saraswat, former Director General, Defence Research and Development Organisation (DRDO) says, "China did the first hypersonic glide test, which was an anti-ship missile, the idea being a moving ship with a large number of aircraft had to be destroyed without detection. After this the global defence community sat up seriously looking for ways to engage with a hypersonic glide against which a counter had to be built. The US did not have at that time, Russia had done enough work in both scramjet and glide."

USA

One of the notable achievements in the US hypersonic propulsion technology is the development of the X-51A Waverider. The X-51A is an unmanned, scramjet-powered



China's DF-17 missile has a hypersonic glide vehicle that can deliver both nuclear and conventional payloads.



The X-51A Waverider scramjet, which is affixed to an Edwards B-52H Stratofortress.

The **US' advancements** in **hypersonic propulsion technology** have not only been limited to **military applications** but also extend to various sectors, including **space exploration** and **commercial aerospace**

hypersonic vehicle that has achieved remarkable speeds, reaching Mach 5 or higher during flight tests. It utilises an air-breathing scramjet engine, which allows it to take in oxygen from the atmosphere for combustion, reducing weight and increasing fuel efficiency, enabling sustained hypersonic flight.

The X-51A Waverider has undergone successful tests, paving the way for further research and development

efforts, resulting in the ongoing pursuit of various hypersonic weapon systems.

The US is also actively working on the development of the Hypersonic Technology Vehicle (HTV), designed to deliver conventional and nuclear payloads at hypersonic speeds. The HTV employs a combination of rocket and scramjet engines to achieve extreme velocities. Its manoeuvrability and ability to

travel long distances within minutes make it a potent weapon capable of rapid strikes and prompt global reach.

Besides the HTV, the US is also believed to be investing in the development of the Hypersonic Air-breathing Weapon Concept (HAWC), which is a joint program between the Defence Advanced Research Projects Agency (DARPA) and the US Air Force, aiming to develop an air-launched hypersonic missile system. The HAWC program utilises scramjet propulsion technology to achieve sustained hypersonic speeds and manoeuvrability.

Furthermore, the United States has demonstrated its commitment to hypersonic propulsion technology through programs like the tactical boost glide (TBG). The TBG, with its estimated range of several hundred kilometres and speed exceeding Mach 5, is a hypersonic missile system that combines the

boost phase of a rocket with the glide phase of a manoeuvrable vehicle. This hybrid approach allows for high-speed and highly accurate strikes against time-critical targets.

The US' advancements in hypersonic propulsion technology have not only been limited to military applications but also extend to various sectors, including space exploration and commercial aerospace. Hypersonic passenger aircraft could revolutionise long-distance travel by drastically reducing flight times, making it possible to traverse continents in a matter of hours. Japan is said to be working in this area.

While the specific propulsion systems used in the American AGM-183A Air-Launched Rapid Response Weapon (ARRW), with its estimated range of over 1,000 nautical miles (1,150 miles or 1,850 kilometres), speeds exceeding Mach 5, and Hypersonic Conventional Strike Weapon (HCSW) having an estimated range of approximately

1,400 nautical miles (1,610 miles or 2,590 kilometres) and speeds exceeding Mach 5, it can be assumed that they incorporate advanced propulsion technologies designed to enable sustained hypersonic flight and achieve the desired performance characteristics for these missiles. The ARRW contract worth USD 480 Mn was awarded by the US air force to the American aerospace major Lockheed Martin in 2018.

It is important to note that other advanced propulsion technologies, such as rocket-based combined cycle engines (RBCC), may also be considered for hypersonic missiles. RBCC engines combine elements of both rocket and scramjet propulsion, allowing the missile to use rocket power during the initial stages of flight and transition to scramjet mode for sustained hypersonic operation.

India

India's state-owned defence agency, the DRDO has been at the

forefront of indigenous research and development in the hypersonic technology sector. In 2008, the then Chief of DRDO, Dr. VK Saraswat indicated a possible dual use of hypersonic technology being used for Low-Cost Satellite Launch Vehicles also making up for the hypersonic cruise missiles (HCMs). What followed was a wind tunnel imported from Israel's IAI to test various hypersonic related technologies.

India has had three tests so far, in which only two have been successful.

DRDO's maiden test of its indigenous Hypersonic Technology Demonstrator Vehicle (HSTDV) in June 2019 was unsuccessful. But the second test of the scramjet-powered cruise vehicle, HSTDV, at Mach 6 was a success, lasting 22 seconds, which had a solid rocket motor fuel of an Agni-1 ballistic missile, at 30-kilometre range, which was done in September 2020, followed by a third successful test in January 2023.

According to reliable sources, India is expected to go in for its fourth test lasting 1000 seconds at Mach 10.

India has demonstrated significant progress in the field of aerospace and missile technology. Besides DRDO, this technological competence is possessed only by India's Indian Space Research Organisation (ISRO).

Presently India possesses two wind tunnels utilised for its hypersonic tests. The hardware production for airframes for the HSTDV, the re-entry vehicle, crew capsule, and control surfaces of reusable vehicles are allegedly provided by the private Indian defence manufacturing giant Larsen and Toubro (L&T).

One of the notable developments in India's missile technology is the BrahMos supersonic cruise missile, an Indo-Russian joint venture. While



US hypersonic AGM-183A Air-launched Rapid Response Weapon.



A scale-model of BrahMos-II missile.

the BrahMos is not a hypersonic missile, it demonstrates India's capabilities in developing advanced propulsion systems. The missile utilises a ramjet engine, which allows it to achieve supersonic speeds and manoeuvrability. In 2018, India and Russia signed an agreement to jointly develop a hypersonic missile system, known as BrahMos-II, which is expected to achieve speeds of Mach 7 or higher. The BrahMos-II missile is anticipated to incorporate scramjet propulsion technology, similar to other hypersonic systems developed by leading nations.

Dr SK Mishra, former Director General, BrahMos Missile, has said in an interview, "India is the third country in the world to have a hypersonic wind tunnel facility. China has developed a hypersonic glide vehicle which has been put on a continental missile booster and then launched. A glide vehicle is more strategic in nature as China has

a maritime carrier-kill focus, while India's BrahMos-II is a hypersonic cruise missile, which has a different mandate than a glide vehicle."

BrahMos-II is expected to take a minimum of five years for its first test, as it awaits full funding and deployment from the Indian Government. Russia's NPOM (also the makers of the Kinzhal) is the Russian partner in the joint venture for BrahMos-II, which has DRDO and BrahMos on the Indian side. Further delay can be attributed to the missile technology control regime (MTCR) which prohibits Moscow from transferring the full technology to New Delhi. Dr Mishra adds, "While research and development are ongoing, a clear sanction for the BrahMos-II programme is awaited."

Other Nations

Australia's specific range and speed details of its Hypersonic International Flight Research

Experimentation (HIFiRE) program may vary depending on the specific test objectives and configurations.

Other countries developing hypersonic technology are France, UK, Turkey, Iran, and Israel.

In conclusion, the deployment of hypersonic missiles represents a paradigm shift in modern warfare, with Russia, China, the United States, and other nations actively pursuing advancements in this field. These missiles offer unprecedented speed, manoeuvrability, and lethality, challenging traditional defence systems and reshaping strategic dynamics on a global scale. However, the development of hypersonic technology also presents significant technical and geopolitical challenges, underscoring the need for continued research, international cooperation, and strategic dialogue to manage this emerging threat and ensure stability in the international security landscape. **DSA**



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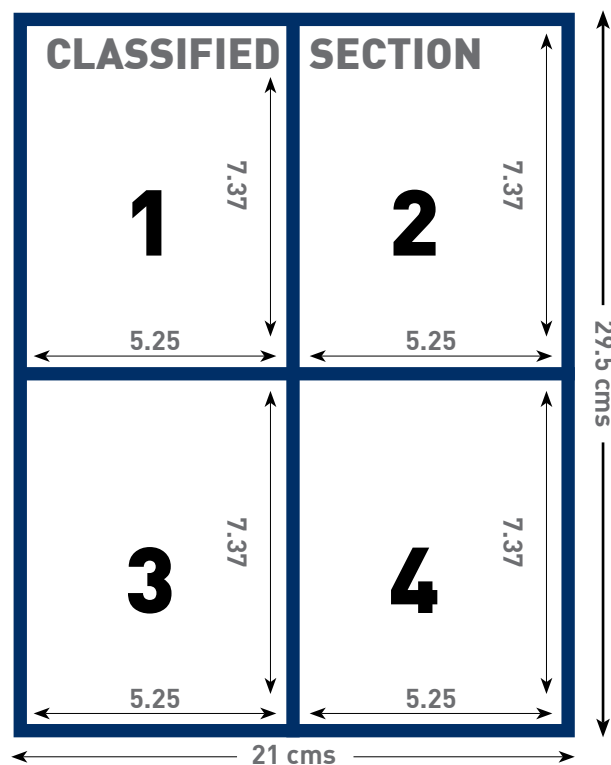
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