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EDITORIAL

Maj Gen Ravi Arora

India's Balancing Act

India has displayed a strong diplomatic character by choosing not to take sides in a situation involving the US-led NATO and Russia. Indian Prime Minister's telephonic talk with the Russian President and India's External Affairs minister's talk with the Russian foreign minister in early March, highlighted India's efforts to stop the war by taking the path of diplomatic negotiations and dialogues on one hand and a lasting solution for this problem on the other.

India's neutral stand is mainly because all the key protagonists in the crisis are India's close allies. Hence, India's unaligned and diplomatic efforts. Possible support to Russia might hamper India's relations with the NATO countries, including USA.

India's stand on Ukraine has been appreciated within the country and by other countries, notably Pakistan, whose prime minister Imran Khan too appreciated India's role and policies.

India-Russia relationship still continues to remain strong. Russia has been a significant supplier of military equipment. India is also procuring the S-400 Triumf Missile from Russia, despite strong US opposition. A new ten-year defence pact between the two countries was being discussed. India-Russia annual trade is also worth about $10 billion. India's support to Ukraine may mean Russia developing stronger ties with China and Pakistan. That can be a real-time threat to India's national security.

Ukraine has consistently taken anti-Indian position in the United Nations, be it in terms of voting against India in UNSC after 1998 nuclear tests, voting for UN intervention in Kashmir after abrogation of Article 370 or in terms of selling military equipment to Pakistan to use against India.

India wants de-escalation of the crisis, but only through arbitration or conciliation. Thus, considering all the angles to this crisis, India is adopting the strategy to solve this dispute keeping in mind that any country's national interest is above the overall global interest.

The US has managed to get most countries on its side, and the United Nations resolution condemning the Russian invasion has been supported by many countries. Countries like India chose to abstain from the vote due to a strong and continuing linkage with Russia, and due to considerations of what such a vote will imply to the geopolitics of the region.

The immediate impact is, of course, adverse due to high oil prices and investor nervousness. India has a very large oil deficit and also a current account deficit. The latter needs a continuous supply of foreign investor dollars to plug that deficit. On food security, India is on a strong footing. Its military capabilities are significantly inferior to China, mainly due to a resource constraint. But the level of preparedness and the advantage of terrain means that the asymmetry is considerably reduced.

The US will soon have to think about the more important geopolitical alignment and strategy around its bigger rival, China. So far, the Quad formation (with the US, India, Japan and Australia) has not delivered any tangible benefits to India. But the strategic importance of India could grow. It is conceivable that in a new configuration, the Americans will value an alignment with India more than the reverse. India, too, has a strong trade and investment relationship already. If its domestic economy shows steady and consistent high growth, it can become important to the US when dealing with a strong China.

Chinese Vice Foreign Minister Le Yucheng attacked the Quad thus, "No country should pursue its so-called absolute security at the expense of other countries' security." He drew a parallel between the situation in Ukraine — according to him, a result of "the NATO strategy of eastward expansion" — and the several provocations perceived by Beijing in the Indo-Pacific. The analogy does not hold. Amid recent geopolitical developments, India's foreign policy priorities and the ties fostered with members of the Quad are holding fast.

The Quad is a response to China's rising ambitions, which have manifested in the form of occupying islands and trying to control sea lanes in the Indo-Pacific, as well as its activities along the Line of Actual Control with India.

Both the Japanese and Australian prime ministers reportedly discussed the situation in Ukraine with prime minister Narendra Modi, and did not insist that India echo their position.

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COGES EVENTS

Russia's Doctrine and US Int Assessment is Ominous

Use of Nuclear Weapons by Russia Cannot be Ruled Out

Maj Gen Deepak K Mehta

Russia's invasion has killed thousands of people, displaced nearly 10 million, and raised fears of a wider confrontation between Russia and the United States - by far the world's biggest nuclear powers.

Within days of Russia's Feb. 24 invasion, Putin put the country's deterrence forces - which include nuclear arms - on high alert, citing what he called aggressive statements by NATO leaders and Western economic sanctions against Moscow.

Russia's deputy foreign minister said, on 10 May, that a decision on the possible use of nuclear weapons was clearly set out in Russia's military doctrine, when asked if Russia would rule out a preemptive tactical nuclear strike on Ukraine. "We have a military doctrine - everything is written there," Alexander Grushko was quoted by state news agency RIA as saying.

Russia's official military deployment principles allow for the use of nuclear weapons if they - or other types of weapons of mass destruction - are used against it, or if the Russian state faces an existential threat from conventional weapons.

The decision to use Russia's vast nuclear arsenal, the biggest in the world, rests with the Russian president, currently Vladimir Putin.

U.S. Central Intelligence Agency Director William Burns said, on 7 May, that Putin believes he cannot afford to lose in Ukraine and cautioned that the West could not ignore the risk of the use of tactical nuclear weapons by Moscow.

"We don't see, as an intelligence community, practical evidence at this point of Russian planning for a deployment or even use of tactical nuclear weapons," Burns said. He cautioned, though, that "the stakes are very high for Putin's Russia."

Russia's Yars intercontinental ballistic missile systems

Circumstances for Strike

Russia has accused However NATO countries of a "hybrid" confrontation that now "dangerously balances on the edge of open military clash.""Such a move would be able to trigger one of the two emergency scenarios described in our doctrine," as per Russian strategists, adding "if Western countries try to test our resolve, Russia will not back down."

Nuclear brinkmanship from Putin has been unprecedented. He ordered a snap nuclear wargame before the invasion and days later put his nuclear forces on high alert. And the Kremlin has repeatedly signaled it could resort to nuclear weapons if it determines the West's intervention in the conflict goes too far.

As the conflict drags on, and Russia's conventional forces suffer surprisingly heavy losses while its economy reels, the prospect that Putin might resort to using weapons of mass destruction is increasing. Moscow has already demonstrated that it is willing to use hypersonic missiles for the first time in a war.

A decree signed by Putin on June 2, 2020, said Russia views its nuclear weapons as "exclusively a means of deterrence". It repeats the phraseology of the military doctrine but adds details about four circumstances under which a nuclear strike would be ordered. These include reliable information of a ballistic missile attack on Russia and an enemy's attack "on critical state or military installations of the Russian Federation, the incapacitation of which would lead to the disruption of a response by nuclear forces."

US Intelligence Assessment

Putin could view the prospect of defeat in Ukraine as an existential threat to his regime, potentially triggering his resort to using a nuclear weapon, a top US intelligence official has warned. The warning came in an assessment from intelligence chiefs briefing the Senate on worldwide threats.

Haines, told the Senate's Armed Services Committee that Putin would continue to brandish Russia's nuclear arsenal in an attempt to deter the US and its allies from extending further support for Ukraine.

The Russian leader would not use a nuclear weapon until he sees an existential threat to Russia or his regime, Haines argued.

But she added that he could view the prospect of defeat in Ukraine as constituting such a threat, the report said.

"We do think that [Putin's perception of an existential threat] could be the case in the event that he perceives that he is losing the war in Ukraine, and that Nato in effect is either intervening or about to intervene in that context, which would obviously contribute to a perception that he is about to lose the war in Ukraine," Haines told the committee hearing.

She added that the world would probably have some warning that nuclear use is imminent.

The prediction for Ukraine is a long, gruelling war of attrition, which could lead to increasingly volatile acts of escalation from Putin, including full mobilisation, the imposition of martial law, and if the Russian leader feels the war is going against him, endangering his position in Moscow even the use of a nuclear warhead, the report said.

Putin, who has repeatedly expressed resentment over the way the West treated Russia after the 1991 fall of the Soviet Union, says Ukraine has been used by the United States to threaten Russia.

He justified his Feb. 24 order for a special military operation by saying Ukraine had persecuted Russian speakers and the United States was keen to enlarge the NATO military alliance in a way that would endanger Russia.

The Likelihood

IMR's assessment of the likelihood of Russia using nuclear weapons, most likely scenario and US response is given below.

Putin is more likely than not to use nuclear weapons in the war in Ukraine if he faces devastating defeat. Nuclear weapons are the ultimate tools of last resort; any rational leader would consider using them if his or her regime (or life) were on the line.

Putin presumably expects his threats will induce NATO to abandon Ukraine. However, if he believes he is facing defeat or a costly stalemate—or has a chance of success through sharp escalation—there is some risk he will carry out his threats.

If Russian forces suffered a humiliating defeat in the campaign to control Donbas, Putin could be pressed by hardliners to deliver on his nuclear threats; but he is unlikely to do so, since this would only galvanize a harsh US and allied response without providing any significant military advantage.

Russia's Salmat has a maximum takeoff capacity of over 200 tons, and attack range up to 18,000 kms

Most Likely Use Scenario

Washington and Moscow have walked away from several treaties to control the deadliest weapons, including one that outlawed intermediate-range nuclear missiles that could threaten Europe.The only remaining nuclear pact between the two sides is the New Strategic Arms Reduction Treaty, which limits deployed strategic weapons to 1,550 each. Biden and Putin agreed last year to extend it until 2026. The treaty does not cover any of the thousands of smaller, or "battlefield," nuclear weapons in their respective arsenals, including at least 2,000 in Russian stockpiles, according to public estimates.

Putin would seek to create fear instead of rage. Thus, nuclear weapons would be used in Ukraine rather than on NATO territory, and they would be used against military, not civilian, targets. Any attack would likely involve detonating half a dozen low-yield air bursts (in order to minimize fallout) against well-entrenched Ukrainian military positions.

Putin might begin with the ostentatious movement of nuclear forces, such as sending weapons to Russia's Baltic enclave of Kaliningrad. He could order a "demonstration" or possibly a detonation at a Russian test range.

Putin may hope that just by crossing the nuclear threshold, he would so shock Ukraine and its Western backers—and so terrify allied publics—that they would back down rather than risk further escalation.

The risk of nuclear use through a mistake or blunder is higher than through intent. Many Russian battlefield systems are dual-capable and also designed to unleash both conventional and nuclear or chemical warheads. It could be exceedingly difficult to know when the Russian military has decided to pursue a nuclear option. It is difficult to know if the S-300 battery packs a conventional warhead or a nuclear one.

Likely US and Allied Response

One possible response to Putin's nuclear use would be to negotiate some kind of resolution in which all parties could declare Potemkin victories and find a solution before nuclear weapons are used.

If the Russian attack caused little damage, NATO might first try to issue an ultimatum with the aim of reaching a settlement on the Alliance's and Ukraine's terms.

A non-nuclear military response (eg, conventional strikes on military bases and infrastructure in Russian territory) would probably not be decisive and would appear inadequate to many.

Defending Ukraine may simply not worth risking a nuclear escalation. But there are also serious implications of not doing it. Absence of a US nuclear response would gravely weaken the credibility among both friends and adversaries of the entire strategy of deterring nuclear attack through the prospect of US nuclear retaliation.

If Putin resorted to the use of nuclear weapons, the United States and its allies would need to respond quickly and decisively to ensure that Putin paid a heavy price for crossing the nuclear threshold.

A Possible Nuclear War Scenario

An IMR Assessment

The risk of nuclear war is greater today than at any other time since the Cuban missile crisis. In 1945, when the United States destroyed two Japanese cities with atomic bombs, it was the world's sole nuclear power. Nine countries now possess nuclear weapons, others may soon obtain them, and the potential for things going terribly wrong has vastly increased.

Before the attack on Ukraine, the five nuclear-haves under the Non-Proliferation Treaty (NPT) — the United States, the United Kingdom, Russia, China, and France — had reached agreement that the use of nuclear weapons could be justified only as a purely defensive measure in response to a nuclear or large-scale conventional attack. In January 2022, those five countries issued a joint statement affirming that "a nuclear war must never be fought and can never be won." A month later, Russia invaded a non-nuclear country, Ukraine, and threatened nuclear attacks against anyone who tried to help that country.

President Vladimir Putin and other Russian officials have been ominously threatening to use nuclear weapons in the war against Ukraine. The long-range ballistic missiles deployed on land and on submarines are Russia's only nuclear weapons available for immediate use.

In 2021, during a training exercise involving about 200,000 troops, the Russian army practiced launching a nuclear assault on NATO forces in Poland. An intentional or inadvertent Russian attack on a NATO country could be the beginning of World War III.

If Russia decides to attack Ukraine with "tactical" nuclear weapons, the transportation to military bases, mating with cruise or ballistic missiles, loading on planes, etc will observed by the US in real time.

President Joe Biden has made clear that any use of nuclear weapons in Ukraine would be "completely unacceptable" and "entail severe consequences."

Likely Scenarios

Russia might use a nuclear weapon by

- Detonation over the Black Sea, causing no casualties but demonstrating a resolve.
- A decapitation strike against the Ukrainian leadership.
- A nuclear assault on a Ukrainian military target.
- The destruction of a Ukrainian city, causing mass civilian casualties.

US Response

According to The New York Times, the Biden administration has formed a Tiger Team of national-security officials to run war games on what to do if Russia uses a nuclear weapon.

Biden administration's strategy is of "deliberate ambiguity." But everyone hopes that some form of back-channel diplomacy is secretly being conducted. The Russians have probably been given a message about how harshly the US might retaliate if they cross the nuclear threshold. But misunderstandings, miscommunications, and mistakes can lead to a nuclear catastrophe.

Some experts feel that if Russia uses a nuclear weapon in Ukraine, American nuclear retaliation should be the last resort. Instead, the US should opt for horizontal escalation, solely with conventional weapons. Russia's Black Sea fleet might be sunk in retaliation, and a no-fly zone could be imposed over Ukraine, even if it meant destroying anti-aircraft units on Russian soil.

During the summer of 2016, the US national-security team secretly staged a wargame in which Russia invades a NATO country in the Baltics and then uses a low-yield tactical nuclear weapon against NATO forces to end the conflict on favorable terms. The security team reached widely divergent conclusions about what the United States should do. Some decided that the United States had no choice but to retaliate with nuclear weapons. Choosing a suitable nuclear target proved difficult, however. One committee recommended a nuclear attack on Belarus—a nation that had played no role whatsoever in the invasion of the NATO ally but because it was a Russian ally.

Others argued that retaliating with a nuclear weapon would be a huge mistake. It would be more effective to respond with a conventional attack, they recommended, and turn world opinion against Russia for violating the nuclear taboo.

Any nuclear attack on Ukraine would inspire global condemnation, especially from countries in Africa and South America, continents that are nuclear-weapon-free zones. China has long supported "negative nuclear assurances" and promised in 2016 "unconditionally not [to] use or threaten to use nuclear weapons against non-nuclear-weapon states or in nuclear-weapon-free zones."

Others preferred "a muscular diplomatic response" to the nuclear strike, not a nuclear or conventional military response, combined with some form of hybrid warfare. The United States could launch a crippling cyberattack on the Russian command-and-control systems tied to the nuclear assault and leave open the possibility of subsequent military attacks.

Tactical Weapons

During the Cold War, the United States based thousands of low-yield tactical nuclear weapons in NATO countries and planned to use them on the battlefield in the event of a Soviet invasion. In September 1991, President George H. W. Bush unilaterally ordered all of America's ground-based tactical weapons to be removed from service and destroyed. The United States was developing precision conventional weapons that could destroy any important target without breaking the nuclear taboo. But Russia never got rid of its tactical nuclear weapons.

The weakness of Russia's conventional forces compared with those of the United States, Perry suggests, and Russia's relative advantage in tactical weapons are factors that might lead Putin to launch a nuclear attack in Ukraine. Russia may be able to destroy a military target without much radioactive fallout, without civilian casualties, and without prompting a strong response from the United States. There would be an international uproar, but it would not last long.

INDIA-RUSSIA

The Compulsion in India's Position on Russia

Large Bulk of Weapon Systems are of Russian-origin

An IMR Report

India-Russia relationship still continues to remain strong. Russia has been a significant supplier of military equipment. India is also procuring the S-400 Triumf Missile from Russia, despite strong US opposition. A new ten-year defence pact between the two countries was being discussed. India-Russia annual trade is also worth about $10 billion. India's support to Ukraine may mean Russia developing stronger ties with China and Pakistan. That can be a real-time threat to India's national security.

The Indian security establishment is keeping a close eye on the Russia-Ukraine developments and calculating the immediate and long-term impact on the country's defence capabilities.

About 70 per cent of Indian defence equipment are of Russian origin. However, India procures many parts of the Russian systems from Ukraine. This is because several manufacturing hubs remained with Ukraine after USSR disintegrated.

One of the main problems facing Indian forces has been servicing and maintenance of Russian military equipment since spare parts are in short supply and have to be imported not just from Russia and Ukraine but from other countries as well.

Indigenisation

Amid the ongoing Russia-Ukraine war, India issued a list of 107 sub-systems, on 24 March, that are to be banned from import and indigenised over the next six years. Several of the items on the list are meant for T-90 and T 72 tanks, warships, helicopters, infantry combat vehicles, missiles, ammunition and radars among others, all of which are procured from either Russia or Ukraine.

The subsystems or strategically-important line-replacement units – will now be "indigenised", or procured only from the Indian industry. The import of these products will be phased out from December 2022 to the end of 2028.

Incidentally, both India and Russia were already working on a deal to indigenously manufacture the spares here through tie-ups, something which had come up for detailed discussion in 2019 between Prime Minister Narendra Modi and Russia President Vladimir Putin.

The government had, in December 2021, issued the first positive indigenisation list of subsystems, assemblies, subassemblies and other components.

Two thousand and five hundred imported items from that list have already been indigenised and the other 351 will stop being imported in the next three years.

Russian-origin tanks

Amid the ongoing war between Russia and Ukraine where the anti-tank missiles have achieved significant success against armour, the Indian Army is going to incorporate the lessons of the conflict in the design of its futuristic main battle tank.

The Indian Army has been one of the biggest users of Russian armour including the T-90, T-72 and BMP-series infantry combat vehicles which are the mainstay of the force.

In the Ukraine-Russia conflict, reports from the war zone have suggested that the Ukrainians have extensively used anti-tank guided missiles to exploit the weakness of the Russian armoured vehicles and achieved significant success too.

Indian armed forces have been keeping a close eye on the developments on the battlefield as a lot of equipment is common including the tanks being used there.

The inputs are being analysed and the lessons would be incorporated into the design of the futuristic main battle tanks that would be produced and used by the Indian Army in coming years.

The Indian Army earlier used to deploy these tanks only along the desert and plain borders with Pakistan but they have now become the face of Indian resolve along the China border too as large numbers are deployed there from Ladakh to Sikkim.

In the Russia-Ukraine war going on for around 46 days now, a number of European and North American nations are supplying anti-tank and anti-aircraft equipment such as the Carl Gustaf anti-tank rocket launchers, NLAWs and AT-4.

The design of the tanks is at least three to four decades old but the anti-tank missiles and rockets have been designed as per the latest requirements and have an upper hand in the present scenario.

The Indian designers would make an attempt to offset that advance in the futuristic main battle tanks that would be built some years from now, they said.

Russian Military Equipment In the Indian Armed Forces

Smerch multi-rocket system
Grad multi-rocket system
M-46 artillery guns
T-55 Pillbox config
T-90 Tanks
T-72 Tanks
BMP-II
Konkurs ATGM
Kornet ATGM
OSA Surface-to-Air missile (SAM)
Pechora SAM
Strela SAM
Shilka anti-air gun
Tunguska anti-aircraft system
Dragunov SVD
Kalashnikov
OSV-96 rifles
NSV Machine gun
BrahMos Missile

Developing natural partnership

Defence Ties and Economic Pact Show Commitment

Dr D Bhalla, IAS

Dr. D. Bhalla, is Chief Enabler of iShakti Forum

The bilateral virtual summit held on 21 March — and the subsequent agreement on 2 April — marked a new phase in India–Australia relations, especially in the larger security and defence context. On 22 March, Australia committed to a landmark investment package worth $280 million with India to further grow the bilateral economic relationship and support jobs and businesses in both countries.

Commerce and Industry Minister Piyush Goyal with the INDAUS ECTA signed on 2 April 2022

Military Partnership

Since the 2000s, dialogue partnerships between India and Australia have seen a new phase of engagement. The signing of several bilateral agreements — such as the Memorandum on Defence Cooperation in 2006 and the Joint Declaration on Security Cooperation in 2009 — culminated in the binding 2020 Comprehensive Strategic Partnership. Regular defence engagements range from frequent prime ministerial visits to tri-service staff-level military dialogues, indicating political will for a future military partnership.

Militarily, in addition to the multilateral maritime Exercise Malabar, both countries participate in AUSINDEX, an exercise which ensures mutual interoperability. India and Australia have jointly taken part in 10 bilateral exercises and 17 multilateral exercises as of 2022, facilitated by the 2020 Mutual Logistics Support Agreement that enables reciprocal access to military bases — as exemplified by India's recent deployment of P8 surveillance aircraft to Darwin.

There is also institutional crossover between both countries, with Indian institutes training army personnel from Australia and vice versa. This remains significant in forging genuine friendships and trust for strategic partnerships. The recent summit also announced the establishment of the General Rawat India–Australia Young Defence Officer Exchange Programme. This will increase shared understanding of working culture and issues of strategic importance among military personnel.

Collaboration in defence-sector research and development is crucial — a joint working group between India's Defence Research Development Organisation and Australia's Defence Science and Technology Group has been in motion since 2018.

Increasing bilateral investment in the ongoing Australia–India Strategic Research Fund and the Australia–India Innovation and Technology Challenge is yet another positive development for defence, technological and commercial cooperation.

While India is focussing on defence manufacturing to better balance imports and domestic manufacturing needs, India's modernisation demands will continue to outstrip domestic supply. This opens the scope for cooperation, with India expressing interest in Australian defence equipment — such as the Bushmaster and Hawkei armoured light mobility vehicles, radar technologies and undersea applications.

Economic Cooperation

On April 2, Prime Minister Narendra Modi and and his Australian counterpart, Scott Morrison presided virtually over the signing of a bilateral Free Trade Agreement, negotiated in torturous detail over the last decade. The ECTA is expected to give a fillip to bilateral economic ties.

The INDAUS ECTA (India-Australia Economic Cooperation and Trade Agreement), reflects PM Modi's vision of the essential unity of the two countries and of their future being as strong, steadfast and resilient as the mighty Indus. While the second phase of the agreement will be in place by the end of the year, the ECTA deal is apparently fully in compliance with WTO rules and Article 24 of

GATT which, inter alia, allows countries to grant special treatment to one another by establishing a free-trade association, provided that "(1) duties and other trade restrictions would be eliminated on substantially all the trade among the participants, (2) the elimination of internal barriers occurred within a reasonable length of time...."

India–Australia cooperation on economic and strategic fronts can also be promoted by 'polylateral' actors — such as non-governmental organisations, academic institutions, businesses and think tanks. This includes cooperation between Indian and Australian private sectors and the incentivisation of multinational projects to engage Indian enterprises.

The deal with India removes tariffs on more than 85% of Australian goods exports to India, worth A$12.6 billion, rising to almost 91% over 10 years. Tariffs will be scrapped on sheep meat, wool, copper, coal, alumina, fresh Australian rock lobster, and some critical minerals and non-ferrous metals to India. It will see 96 per cent of Indian goods imports enter Australia duty-free.

The ECTA should give a boost to India's labour-intensive manufacturing sector, with a considerable leg-up to the pharma, textile, gemstone and jewellery sectors. Indian students in Australia will find an easier pathway to employment, and there will be greater ease of visa for a range of skilled human capital from India in demand in Australia, including chefs and yoga instructors. No less important, Australian coal will probably get relatively unfettered access to India.

"The perception gap between India's 'strategic autonomy' and Australia's concept-ualisation of national independence is a potential hurdle to deepening future security cooperation."

Quad and ECTA

Defence linkages seem to be a natural way forward, given the common threats both countries face in their maritime space. Apart from cooperation through the Quad and ASEAN frameworks, greater security cooperation in Indian Ocean littorals can be fostered through forums and partnerships such as the India Ocean Rim Association, the Indian Ocean Naval Symposium, and the Australia–India Indo-Pacific Oceans Initiative Partnership.

Critics are busy predicting the demise of the Quad because the central theatre of conflict has moved to Europe, and because of India's perceived "neutrality" over the war in Ukraine, but the ECTA signals that India's relations with Australia — two central pivots of the Quad — are as strong and resilient as ever.

Comments

The India–Australia relationship is not without its challenges. For example, the perception gap between India's 'strategic autonomy' and Australia's conceptualisation of national independence is a potential hurdle to deepening future security cooperation. The current trajectory of India's foreign policy — especially in defence relations — is more focussed on issue-based partnerships than comprehensive relationships, limiting the scope of relationships with partners. What is clear is that the relationship has the backing of the leadership at the highest levels.

It is time for India–Australia cooperation to go beyond 'cricket, commonwealth and curry' to form a stronger relationship that transcends nascent cooperation initiatives. The potential for the recently-signed ECTA should be considered in this larger context. India–Australia friendship is off to a good start, but it should never be solely reactionary to an ever-changing geopolitical landscape in the neighbourhood and beyond. Rather, it must continue in a self-sustaining manner.

Two multicultural, federal democracies that share concerns about stability in the Indo Pacific, are apprehensive about Chinese hegemonic designs, and are increasingly coordinating their policies, are natural partners of the future.

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PM Modi's meeting with French President Macron

India and France to Deepen Cooperation in Space, Defence

An IMR Assessment

India and France have agreed to work in close proximity in line with the Make in India initiatives to address challenges related to space issues, besides having deeper ties in climate change and defence-related matters. This was the outcome from Prime Minister Narendra Modi's visit to France on 4 May 2022.

Building on a great tradition of over 60 years of technical and scientific space cooperation, and in order to address the contemporary challenges that have arisen in space, in particular maintaining secure access to space for all, India and France have agreed on setting up a bilateral strategic dialogue on space issues.

"It will bring together experts from space and defence agencies, administration and specialised ecosystem to discuss security and economic challenges in outer space, the norms and principles applicable to space as well as unveil new areas of cooperation. The two sides agreed to hold the first dialogue this year at the earliest," the joint statement from the meeting revealed.

Prime minister Narendra Modi with French president Emmanuel Macron and Brigitte Macron, Paris, 4 May 2022

Defence Domain

During the meeting between Modi and French President Emmanuel Macron, both sides welcomed the ongoing intense cooperation across all defence domains. Joint exercises (Shakti, Varuna, Pegase, Desert Knight, Garuda) illustrate efforts towards better integration and interoperability wherever possible.

Meanwhile, maritime cooperation between India and France has reached new levels of trust and will continue through exercises, exchanges and joint endeavours throughout the Indian Ocean.

India and France underscored that the long-standing armament cooperation is testimony to the mutual trust between the two sides. The six Scorpene submarines built at MDL in Mumbai illustrate the level of transfer of technology from France to India, in line with the "Make in India" initiative.

> **"As seen in the timely delivery of the Rafale despite the pandemic, the two sides enjoy synergy in the field of defence. Taking forward this momentum, and based on their mutual trust, both sides agreed to find creative ways for France's deeper involvement in the "Atmanirbhar Bharat" in defence technology."**

As seen in the timely delivery of the Rafale despite the pandemic, the two sides enjoy synergy in the field of defence. Taking forward this momentum, and based on their mutual trust, both sides agreed to find creative ways for France's deeper involvement in the "Atmanirbhar Bharat" (Self-reliant India) efforts in advanced defence technology, manufacturing and exports, including by encouraging increased industry to industry partnerships.

Ealier, the two sides deliberated on various facets of the defence ties at the two-day India-France Joint Staff talks that took place in Paris from April 12 to 13 to focus on new initiatives under the ambit of existing bilateral defence cooperation mechanism and strengthening ongoing defence engagements.

The Indian and French navies in April 2021

carried out a mega wargame in the Arabian Sea. The French Navy deployed its nuclear-powered aircraft carrier Charles de Gaulle, and its entire carrier strike group in that exercise, reflecting growing congruence in naval ties.

Cyber Security

In an increasingly digitalised world, India and France have strengthened cooperation between their cyber security agencies. Based on a convergent outlook, they agree to join forces in promoting cyber norms and principles in order to counter cyber threats and agree to upgrade their bilateral cyber dialogue with a view to contributing to a peaceful, secure and open cyberspace.

Indo-Pacific

India and France have built one of the premier strategic partnerships for advancing peace, stability and prosperity in the Indo-Pacific region. They share a vision of a free, open and rules-based Indo-Pacific region, based on commitment to international law, respect for sovereignty and territorial integrity, freedom of navigation and a region free from coercion, tensions and conflicts.

Position on Ukraine

India expectedly did not join France, a key European and Indo-Pacific partner, in condemning Russia's aggression after the end of the Modi-Macron meeting.

Foreign secretary Vinay Kwatra said there was a clear and broad understanding between the two countries of each other's position on Ukraine.

The French President is learnt to have briefed PM Modi, the first leader he hosted in Elysee Palace after his re-election, about his latest two-hour long conversation with Putin on 3 May.

France reiterates its strong condemnation of the unlawful and unprovoked aggression against Ukraine by Russian Forces. India expressed serious concern at the ongoing conflict and humanitarian crisis in Ukraine. Both countries underlined the need to respect UN Charter, international law and the sovereignty and territorial integrity of states.

The joint statement said both sides were committed to enabling a coordinated, multilateral response to address the risk of aggravated food crisis because of the conflict.

On Afghanistan

France and India expressed serious concern on the humanitarian situation and violation of human rights and reiterated strong support for a peaceful, secure and stable

French aicraft carrier Charles de Gaulle with French and Indian Navy ships during Exercise Varuna 2021

> **"France-India partnership encompasses defence and security, trade, investment, connectivity, health and sustainability."**

Afghanistan, emphasizing respect for its sovereignty, unity and territorial integrity and non-interference in its internal affairs. They called for an inclusive and representative government, and respect for the rights of women, children and minorities. They also reaffirmed the UNSC Resolution 2593 (2021) and emphasized on zero tolerance for the use of Afghan territory for spreading terrorism in other parts of the world, and agreed to work together in this regard, including at the UN Security Council.

Counter-terrorism

Counter-terrorism cooperation is a corner stone of the France-India strategic partnership, particularly in the Indo-Pacific region. They strongly condemned all forms of terrorism including use of terrorist proxies and cross-border terrorism.

They reiterated their resolve to closely work together in the common fight against global terrorism including through combating the financing of terrorism, countering radicalization and violent extremism, preventing misuse of the internet for terrorist or violent extremist purpose, acting against internationally designated entities and individuals. Both sides expressed their willingness to coordinate actively in the run up to the third edition of the "No Money for Terror" international Conference to be hosted by India in 2022.

Comments

France and India have been strategic partners since 1998. The strategic partnership is anchored on the solid bedrock of deep and consistent mutual trust, abiding faith in strategic autonomy, unwavering commitment to international law; and belief in a multipolar world shaped by reformed and effective multilateralism. Both are committed to the shared values of democracy, fundamental freedoms, rule of law and respect for human rights.

France and India have built one of the premier strategic partnerships for advancing peace, stability and prosperity in the Indo Pacific region. They share a vision of a free, open and rules-based Indo-Pacific region, based on commitment international law, respect for sovereignty and territorial integrity, freedom of navigation and a region free from coercion, tensions and conflicts.

France-India partnership encompasses defence and security, trade, investment, connectivity, health and sustainability. Besides bilateral cooperation, India and France will continue to develop new partnerships in various formats with like-minded countries in the region and within regional organisations.

Advanced Medium Combat Aircraft

Prototype Development of 5th-Gen Fighter Approved

Maj Gen Ravi Arora

The process for obtaining Cabinet Committee on Security's (CCS) approval for design and prototype development of Advanced Medium Combat Aircraft (AMCA) has been initiated.

The AMCA will be the first fifth-generation fighter used by the Indian Air Force (IAF). This fighter will provide many advanced and futuristic technologies to the IAF.

Hindustan Aeronautics Ltd (HAL), Aeronautical Development Agency (ADA), and Defence Research and Development Organization (DRDO) are jointly developing AMCA for the needs of the IAF.

A model of the Advanced Medium Combat Aircraft

The Necessity

The AMCA project is critical for IAF, which is grappling with just 30-32 fighter squadrons and will not reach its sanctioned strength of 42 squadrons even with "planned inductions" over the next 10-15 years.

The IAF needs the AMCA for the following reasons:

- Most of the fighter aircraft of IAF are fourth generation fighters. IAF currently does not operate any fifth-generation fighter aircraft. Leading military powers of the world have either already developed their fifth-generation jets or are in the advanced stage of their development. The US has F-22 Raptor and F-35, Russia has developed Su-57. China has developed J-20. It is imperative for India to go for a fifth-generation fighter jet when its adversary China has it.
- China's fifth-generation fighter J-20 entered into service in 2017. Till now at least 40 units have been manufactured. As per reports, China may have around 200 of them by 2027. This is a serious concern for India. If a new more powerful engine is developed, the J-20 will achieve its full potential and become a major headache for India.
- Fifth-generation fighters offer a full spectrum of new technologies that are not there in fourth generation jets. These are stealth, supercruise, etc. Also, many futuristic technologies like Directed Energy Weapons, Flyby Optics can operate at their best in these fifth-generation fighter jets.
- An indigenous platform is the most logical decision. There are very few options available for import. The USA is not likely to offer such a platform to India as it has not yet given them to many of its closest allies. Procuring and operating the F-35 is already an economic burden for US air force itself. IAF cannot afford it. The F-35 is much bigger and heavier. But, the AMCA's technology and capabilities will be at par with any other fifth-generation fighter in the world.
- India was working with Russia on the fifth-generation fighter aircraft (FGFA) project. But it pulled back due to many issues like pricing and transfer of technology. Cost is a major issue while procuring foreign platforms. There are limitations on integrating indigenous weapons and technologies with foreign platforms.

Development of AMCA So Far

The programme was earlier known as Medium Combat Aircraft (MCA). It was re-framed in 2010 with its name as AMCA. The basic design configuration was finalized in 2015. In 2018, the defence minister declared that the feasibility study had been completed. It was also decided to complete this project in two phases. The detailed design phase of AMCA started in 2018. The process for government approval of the next phase has been initiated.

Expected Timeline

AMCA will be developed in 2 phases. They are called AMCA Mk1 and AMCA Mk2. AMCA Mk1 will be a fifth-generation fighter aircraft and AMCA Mk2 will be more advanced with some features of sixth-generation fighter aircraft. AMCA Mk1 will be rolled out by 2024.

Its first flight is expected in 2025. The induction in service may start from 2030. It may take another 10 years for the development of AMCA Mk2. A more realistic timeframe for the AMCA induction to kick-off, however, would be around 2035.

AMCA Numbers

It is expected that IAF will order 40 AMCA Mk1 and 80 Mk2. Thus, IAF is currently looking for total of 120 fifth-generation stealthy fighters. The AMCA is expected to replace Su-30 MKI in the future. But IAF operates over 272 Su-30s. With the AMCA's induction, the fourth-generation fighters with their upgraded versions will continue to play a major role in the coming years.

Costs

Fifth Generation fighter aircraft, due to very special features, are costlier than fourth generation fighter aircraft. Since AMCA is an indigenous Fifth Generation aircraft, it is less costlier than similar aircraft available outside.

The maintenance costs are high. No country can acquire costly niche capability in large numbers. The IAF has conceptualised its need for only seven squadrons of the AMCA (including the Mark-2 version). Maintaining the stealth features makes the aircraft more expensive.

As of now, the development cost of the 25-tonne AMCA is estimated to be around Rs 15,000 crore.

Learning from Tejas Experience

The Aeronautical Development Agency and other academic institutions together developed the stealth technology. Getting stealth material was another challenge. After years of dedicated work, the team managed to overcome those challenges.

Tejas LCA was the country's first venture into 4.5-generation combat aircraft. Nobody was ready to share knowledge. All core technologies were developed indigenously. All stakeholders have to be involved right from the beginning. Maintenance, ground support equipment, etc, have to be factored in along with proving the technologies and flying capability.

The AMCA is designed for future upgrades as its architecture allows it to incorporate new systems easily. Its basic airframe is stealth- and future-friendly.

Normally, the shelf life of an aircraft is 30 years, and the AMCA is designed to take care of upgrades for that period.

The AMCA can be teamed up with unmanned assets. There will be more unmanned assets with manned fighters controlling them.

AMCA comparison with F22 and Su-57

Features

The detailed AMCA designing, which was sanctioned in December 2018, meets IAF's "preliminary staff qualitative requirements" but the requisite powerful engine remains a major problem.

The AMCA will be available in stealth and non-stealth variants. The first two squadrons of AMCA Mark-1 will have the existing General Electric-414 afterburning turbofan engine in the 98 Kilonewton thrust class, while the next five mark-2 squadrons will have a more powerful 110 Kilonewton engine.

The advanced stealth features in the swing-role AMCA will range from "serpentine air-intake" and an internal bay for smart weapons to radar absorbing materials and conformal antenna.

The fighter will also have the supercruise capability to achieve supersonic cruise speeds without the use of afterburners as well as data fusion and multi-sensor integration with AESA (active electronically scanned array) radars.

The AMCA is envisioned as a twin-engine stealth aircraft with an internal weapons bay and Diverter-less Supersonic Intake, which has been produced for the first time and for which the design is now complete.

It will be a 25-tonne aircraft with an internal payload of 1,500 kg and an exterior payload of 5,500 kg in addition to 6,500 kg of internal fuel.

India and France are nearing a deal to collaborate on the development of a 125kN engine for the Advanced Medium Combat Aircraft (AMCA). DRDO and Safran are expected to jointly produce the advanced AMCA engine.

Safran and HAL already collaborate on the Shakti engine, which powers the indigenous Advanced Light Helicopter Dhruv and its variants, thus a future deal for AMCA engine between the two could be expected to be smooth.

Interim Plans

In the interim, IAF's planned inductions include 73 Tejas Mark-1A fighters and 10 trainers, which will be delivered in the 2024-2028 timeframe under the Rs 46,898 crore deal inked with Hindustan Aeronautics in February this year. Then there is the long-pending "Make in India" project for 114 new 4.5-generation fighters with "some fifth-generation capabilities" for over Rs 1.25 lakh crore, which has seven foreign contenders and is likely to get the initial "acceptance of necessity" next year. There are some discussions also underway about whether India should leapfrog from the Tejas Mark-1A directly to the AMCA.

Testing Technology

DRDO, in March 2022, a DRDO announcemen said, "Based on the design by ADA & DRDO, the fabrication of leading edge of AMCA initiated at HAL with special material for 5th gen design. The unit will undergo structural & other testing before putting it on the first prototype. An imp milestone for AMCA."

Special Purpose Vehicle

In February 2022, R Madhavan, chairman of HAL had said that the company was employing a special purpose vehicle (SPV) model with private partners to produce the next-generation AMCA and Indian Multi-Role Helicopter (IMRH).

The progress in the AMCA program would mark a major shift for India which stares as a shortage of combat aircraft against the requisite strength along with an aggressive neighbour at its doorstep.

Indian Multi-role Helicopter (IMRH)

A Game-changer in the Offing for Armed Forces

IMRH to replace all Mi-17, Seaking and Kamov helos

An IMR Report

The Indian Multi Role Helicopter (IMRH) is a medium-lift helicopter currently under development by Hindustan Aeronautics Limited (HAL). The ground work to produce a 10 -13 tonne attack helicopter by 2027 has already started. This helicopter will be at par with some of the best medium-lift military helicopters globally. This project is too enormous and is said to be the biggest project by HAL after the development of the Tejas military aircraft. Even the design work would be the largest helicopter design attempted by India.

The HAL project will substitute imports of more than Rs 4 lakh crore worth of military helicopters for the three services in the coming years. With a huge potential for export, the HAL intends to target the global helicopter market as well.

A full scale mockup of the Indian Multi-role Helicopter on display

Replacement Plans

The IMRH is being developed as an indigenous replacement for existing helicopters such as the Mil Mi-17 in the air force, which were imported from Russia and the Kamov and Seaking helicopters in the navy, which were imported from Russia and the UK, respectively. Depending on its configuration, the IMRH can carry either 24 or 36 troops. The air force's Mi-17 helicopters are slated for replacement starting from 2028 as per current plans. HAL is benchmarking the proposed IMRH against its contemporary helicopters, viz. Mi-17, S-92, AW-101, NH-90 & EC-725.

The Mi-17 helicopters are planned to be phased out by 2032. HAL is aiming to produce at least 500 helicopters of this type, but with more endurance than Mi-17s. An assured demand of at least 400 helicopters is offered by the HAL to selected partners.

There were as of 2021 around 240 Mi-17 helicopters of three variants operating in the inventory of the Indian Air Force, helicopters which, starting from 2028, will be progressively phased out. The Air Force has indicated a replacement requirement of 250 helicopters in the medium-lift category. The Army, which at present does not have any medium-lift helicopters in its inventory, has also indicated a demand of around 170 medium-lift helicopters, calling them Tactical Battlefield Support helicopters. The Navy, which operates 63 medium helicopters, has indicated a demand of 123 such helicopters. HAL projected a total requirement of 314 helicopters for the armed forces — 200 for the Air Force, 100 for the Army and 14 for the Navy — totalling an expenditure of around Rs.78,500 crore, with a further Rs.62,800 crore accruing by way of spares support over the life of these helicopters.

Design & Development

The preliminary design of the helicopter is complete. The first prototype set is expected to be ready by next year.

The IMRH is being developed at HAL's Rotary Wing R&D Centre (RWRDC) in Bengaluru, one of the oldest helicopter design and production agencies in Asia (if not the oldest). It was established in 1970 as Helicopter Design Bureau and later renamed RWR&DC in 1998. The IMRH was originally conceived as a 10-tonne class helicopter to meet the Indian army, air force and navy requirements. It has now grown into a 13-tonne class helicopter that will be able to undertake various roles for the armed forces such as support air assault, air transport, VIP transport, combat logistics viz. troop transport, combat search & rescue and

casualty evacuation operations, etc.

Defence Metallurgical Research Laboratory (DMRL), a premium laboratory of DRDO, has taken up a program to develop five sets (300 in number) of single crystal high pressure turbine (HPT) blades using a nickel-based super-alloy. Very few countries such as the USA, UK, France and Russia have the capability to design and manufacture such state-of-the-art Single Crystal (SX) components, which have a complex shape and geometry, manufactured out of Nickel based super-alloys, and are capable of withstanding high temperatures of operation.

DRDO has developed single crystal blades technology and supplied 60 of these blades to HAL as part of their indigenous helicopter development program for helicopter engine application.

Features

In 2021, details on progress were unveiled in Aero India. The helicopter is expected to have a maximum take off weight of 13 tonnes and will have 24 to 36 crews onboard in various configurations. The helicopter will have a five bladed main rotor with a diameter of 21.2 meters and a four-blade tail rotor. MRH will have 75% domestic content but will use an imported 2000kW turboshaft engine. Payload capacity at sea level will be 4 tonnes and 1.5 tonne at a height of 13,000 ft (4,000 m). Aircraft will have pair of weapons wings which will provide four hardpoints for up to 1,600 kilograms of armaments. First flight is expected four years after development project began while the introduction is scheduled for 2028.

The IMRH will have a service ceiling of 6.5 km, which is unlikely to be matched by any other helicopter in the 13-tonne weight class in the world. HAL quotes a flight endurance of three hours and a maximum cruise speed of 260 kmph. The new helicopter will have a payload of four tonne and crash-worthy tricycle landing gear. The IMRH will be equipped with an indigenously designed smart cockpit, state-of-the-art mission systems, advanced avionic systems and a 4-axis automatic flight control system. HAL RWRDC has now gained extensive experience using composites on the Dhruv, LCH and LUH helicopters, and as a result, the IMRH will feature a composite and modular airframe. The modular airframe will allow HAL to outsource production-related activities for the IMRH.

Private Sector Participation

HAL has begun the formal process for the selection of partners for design, development, and manufacturing of IMRH. This involves Public-Private Partnership (PPP) model via special purpose vehicle (SPV) model.

HAL is setting up a new Helicopter Factory at Tumkur that will produce helicopters of 3 ton to 12 ton category.HAL is also discussing with Safran Helicopter Engines for joint development and manufacturing of IMRH engine under strategic partnership model.

The Defence Ministry has decided to amend the Defence Acquisition Procedure (DAP) manual to allow private sector to collaborate with an Indian Defence PSUs with a majority stake and manufacture weapon systems. This collaboration will be tested in the development and manufacture of IMRH.

The private sector companies will also be allowed to export 25 per cent of their production to third countries and generate foreign exchange for the country. They have also sought an assurance from the Defence Ministry that the Indian armed forces should purchase the helicopter if the product is manufactured in the next five years by advancing timelines and saving money and man-hours.

The decision to allow the private sector to acquire 51 per cent stake and form a joint venture with Indian PSUs was taken as the latter were not being able to deliver in required time leading to cost overruns.

Development Costs

An estimated ₹11,000 crore will be required as development cost with six prototypes for seven years and another ₹12,000 crore for setting up production facilities.

HAL-Safran Joint Venture

The IMRH programme received a boost, with the HAL and Safran Helicopter Engines announcing an agreement, on 8 July, to create a joint venture dedicated to helicopter engine development, production, sales and support. The JV will look to develop an engine for the IMRH, continuing Safran's success in powering indigenous Indian helicopters in the ALH, LCH and LUH.

The company will also meet the requirement of future helicopter projects of HAL and Ministry of Defence. HAL will hold the type certificate for the engine after completion of the developmental project. The engine development will take three years to complete.

Deck-based Naval Multi-role Helicopter

In July 2021, the Indian Navy formally involved itself in the project, envisaging a customized naval multi-mission capability helicopter for Anti-Submarine Warfare (ASW) / Anti-Surface (ASuW) Special Operations / Search & Rescue (SAR) Utility / Vertical Replenishment (VERTREP), Command and Control (C2) called the Deck-based Naval Multi-role Helicopters (DBMRH). As the naval variant will not perform high-altitude operations, unlike Indian Army and Indian Air Force operations, it will have higher payload capacity and longer range with a more powerful engine.

HAL plans to build three IMRH and three DBMRH in the next few years that will be used for developmental and flight trials. As of now, the Sea King Mk.42B, which the HAL seeks to replace, is fulfilling the ASW requirements of the Navy. The DBMRH will also supplement the recently inducted Lockheed Martin MH-60R Multi Role Helicopters (MRH) fleet.

Comments

The development of the IMRH and the DBMRH will be a shot in the arm for HAL. The indigenous HAL Rudra Combat Utility helicopter, the weaponized version of the Advanced Light Helicopter (Dhruv) is already serving the Indian Army and Indian Air Force. This multi-role helicopter of 5.8 ton class is powered by two Shakti engines and can perform anti-tank warfare and can provide close air support for ground troops, besides the scout, fire support, armed reconnaissance and surveillance, escort and EW platform roles. These helicopters have proven their prowess in high-altitude operations in the Himalayas, where helipads are at an altitude of more than 15,000 ft, and in the desert sector on the western front.

The 13-tonne IMRH will be the largest helicopter designed and developed in India and is more than twice the weight of the 5.5-tonne indigenously developed Dhruv ALH. HAL anticipates the business volume related to IMRH production and Maintenance Repair & Overhaul (MRO) phases to be to the tune of over INR 160,000 crore.

Expected Characteristics

Crew: 2

Capacity	: 24 to 36 seated troops/ 4,500 kg
Length	: 25.16 m
Height	: 6.22 m
Max takeoff weight	: 13,000 kg
Powerplant	: 2 × Turboshaft engines, 2,000 kW each

Main rotor diameter: 21.2 m

Performance

Maximum speed	: 300 km/h
Cruise speed	: 260 km/h
Range	: 800 km
Service ceiling	: 6,500 m

Naval Group Pulls Out Of India's 75 (I) Sub Project

Submarine Plans Delayed

An IMR Report

Naval Group, a major French submarine maker, pulled out of India's Project 75 (I) in early May. It mentioned the conditions in the request for proposal (RFP) as the reason for exiting the project.

The RFP for the Project 75 (I) was sent to France's Naval Group-DCNS, Russia's Rosoboronexport, Germany's Thyssenkrupp, Spain's Navantia and South Korea's Daewoo. As this project will be completed under the Strategic-Partnership model. All three European and Russian companies have now pulled out of this project, leaving only Navantia and Daewoo in the race.

These five companies had to choose between two Indian companies, Mazagon Dock Shipbuilders Limited (MDL) or Larsen & Toubro (L&T), to manufacture these six submarines in India.

The provision was to build these six conventional submarines in the country only in a joint venture with a foreign company.

INS Vela (S24), the fourth Scorpene-class submarine designed by Naval Group and built at Mazagon Dock.

Scorpenes Under Construction

The Naval Group is making six Scorpène-class submarines in collaboration with MDL. Of these, four, the Kalvari-class submarines, have joined the Navy, the fifth is under sea-trial and the sixth Vagsheer was launched earlier this month.

These are six conventional diesel-electric submarines. AIP, ie, Air-Independent Propulsion system developed by DRDO will be retrofitted during mid-life upgrade. The advantage of AIP is that they will not need to get out of the sea again and again. That is, in a way, they are stealth-submarines. AIP allows non-nuclear submarines to operate without access to atmospheric oxygen. These stealth-submarines do not need to be taken out of the sea like the diesel-electric submarines.

Background

Vagsheer — the last of six Indian-made Scorpene-class submarines — was lowered into the water for trials in Apil. The Indian Navy has six new underwater boats, four of which (Kalvari, Khanderi, Karanj and Vela) are in service and the others (Vagir and Vagsheer) will be commissioned by early 2023.

Failure to conclude the construction of six more Project 75(I) conventional submarines with AIP will mean the assembly line will be idle. Technical skills to manufacture a submarine will be lost if a deal is not finalised soon.

India commenced getting its Foxtrot-class submarines from December 1967, from the then USSR. By 1974, it had eight such submarines. In 1981, New Delhi entered into an agreement with German HDW, to buy two Type 209 submarines. While these submarines — INS Shalki and INS Shankul — were being built the HDW scam broke out. The government did not use the 'option clause' in the agreement for the construction of two additional submarines.

By 2028-29 most of the Kilo-class submarines may be out of action. The Russian submarines have been the mainstay of the Indian fleet for the past two decades. As replacement for the old Foxtrots, India turned to Moscow and bought ten Kilo-class boats, commencing mid-1980s. The last of the Kilo-class boat – INS Sindhushastra – was commissioned in 2000. Of these, INS Sindhurakshak exploded and sank near Mumbai in 2013. India gifted the decommissioned INS Sindhuvir to the Myanmar Navy. Seven out of the eight remaining submaines have outlived their lifespan but are still functioning due to upgrades.

In February 1999, the Cabinet Committee on Security approved a 30-year plan that envisaged two production lines – P-75 and P-75I – to make 12 submarines at two Indian shipyards.

The UPA government signed the Rs 23,653 crore P-75 deal in 2005. As per the contract, the French supplier DCNS was to deliver all the six submarines — manufactured at MDL — by 2012. Though the 30-year plan envisaged two production lines operating simultaneously, the government decided to go for only one.

The first Scorpene submarine was handed over to the Indian Navy in 2017, five years late.

The defence ministry had, in April 2021, cleared the way for the construction of six new stealth P75I submarines for the Indian Navy amid the challenges being faced by China in the Indian Ocean. The Defence Acquisition Council had given the green signal under the Strategic Partnership Model. The ministry issued the RFP in July 2021. The cost of this project named Project 75 (India) is Rs 43,000 crore.

NAVY MODERNISATION

Boost for real-time Imagery capability in IOR region

Navy to acquire Dedicated GISAT-2 Satellite

An IMR Report

As part of its modernisation and network-centric warfare and communications programme, the Indian Navy is looking to acquire a dedicated earth imaging satellite — Geo Imaging Satellite-2 (GISAT-2) — during 2021-22. Once operational, the satellite is expected to enhance the navy's operational capabilities in the Indian Ocean Region (IOR), which is strategically and geopolitically important, especially in the backdrop of increasing Chinese presence.

The GISAT-2, is among 21 planned procurements, including some long-term acquisitions as per information from the ministry of defence (MoD). And, the capability development/modernisation of the navy is being undertaken in accordance with the long-term plans being put in place for the next decade.

While the MoD has listed GISAT-2 for procurement this fiscal, the timeline for development of the satellite and launch have not been firmed up yet. Among the armed forces, the Navy has been ahead when it comes to acquiring satellites.

GISAT Family of Satellites

Geo Imaging Satellite (GISAT) is an Indian imaging satellite class for geostationary orbit with a high temporal resolution, meant for providing near real time imaging with fast revisit capability and real time monitoring. Two satellites will provide resolution in the range of 42 to 318 m. It will carry multi-spectral (Visible and Near-InfraRed, and Short Wave-InfraRed), multi-resolution (42 to 318 m) imaging instruments. The first satellite was launched on 12 August 2021 but failed to reach orbit as cryogenic upper stage of GSLV could not ignite. The second satellite, (GISAT-2) will be acquired by Indian Navy and will differ slightly in capabilities compared to GISAT-1.

GSAT-2 capabilities

The satellite's final geostationary transfer orbit is of around 36,000 km. All Indian earth observation satellites have been placed somewhere around 600 km orbits so far and circle the earth pole to pole. The orbital slot where GISAT-1 will operate is 93.5° East this means that it will be collocated with INSAT 3A, INSAT 4B and GSAT 15.

> **"GISAT has a lifespan of 7 years. The earth observation satellite weighs 2,100 kg. It is powered by a deployable solar array and batteries. GISAT is built on a modified I-1K (I-1000) Bus."**

Known instruments to be carried on GSAT-2 are:

- Multi-spectral Visible Near Infrared (MX-VNIR)
- Hyperspectral Imager - Visible Near Infrared (HyS-VNIR)
- Hyperspectral Imager - Short Wave Infrared (HyS-SWIR)
- Multispectral - Long Wave Infrared (MX-LWIR)

The geo imaging satellite will help keep a check on natural hazards and disasters, keep a constant watch on the border areas, and monitor any geographical changes.

It will be able to carry out rapid surveillance. It will rotate the earth and return the same spot every two hours and when needed, it can spend a longer time on certain areas.

GISAT has a lifespan of 7 years. The earth observation satellite weighs 2,100 kg. It is powered by a deployable solar array and batteries. GISAT is built on a modified I-1K (I-1000) Bus.

The GISAT-2 will be designed to provide near real-time images of large areas of region of interest at frequent intervals, which will help the navy not only in surveillance but also operations planning. Operating from a geostationary orbit (GEO), the satellite will facilitate near real-time observations under cloud-free conditions too.

A 2+tonne class satellite, GISAT-2, like GISAT-1 will be configured around the modified I-2k satellite bus. The payload specifications of GISAT-2 will differ from that of GISAT-1 and that ISRO is working on various payloads. The first one (GISAT-1) was for civilian use, but GISAT-2 is for strategic purposes and the Navy has very specific requirements which they (ISRO) need to meet. ISRO will be launching the satellite on the GSLV-Mk2 after obtaining financial clearances for the same.

Military Satellites

Currently, India has only two dedicated military satellites. The GSAT (Geosynchronous Satellite) satellites are India's indigenously developed communications satellites. GSAT 7, launched in Aug 2013, enables the Indian Navy to acquire blue water capabilities and not depend on foreign satellites like Inmarsat, which provide communication services to its ships. GSAT-7A, launched in Dec 2018, is an advanced military communications satellite meant exclusively for the Indian Air Force.

On March 22, 2022, the Defence Acquisition Council (DAC) accorded acceptance of necessity (AoN) for GSAT-7B satellite for the Indian Army (IA). The GSAT-7B satellite would help the Indian Army enhance its surveillance in border areas.

In November 2021, the DAC had accorded AoN for a 2,236-crore proposal by the Indian Air Force (IAF) to buy GSAT-7C satellite and ground hubs for improved real-time communication.

Industry News

An IMR Report

Horizon Aerospace wins Boeing contract to maintain VVIP Boeing 737 fleet

Horizon Aerospace has won a contract with Boeing for the maintenance, repair and overhaul (MRO) of three key Boeing defence platforms in India — the P-8I operated by the Indian Navy, the C-17 Globemaster and VIP B737 transport fleet operated by the Indian Air Force. Horizon says this strategic collaboration aims to grow capabilities in India in the areas of wheels and brakes MRO of IAF and Navy maintainers.

Horizon Aerospace group president (Defsys Solution) Per Smedegaard said: "The collaboration with Boeing strengthens and enriches our existing relationship. The enhanced collaboration underscores the growing international recognition for Horizon's capabilities in the aerospace and defence domain. We are proud to partner with Boeing and excited, to have been chosen to work with them on such prestigious and critical projects that build as well as test India's indigenous MRO capabilities."

Horizon Aerospace (India) has been a part of the Safran SPOT network, and a part of Ecoservices (Pratt & Witney & S. T Aerospace JV) networks.

Boeing India director (supply chain management) Ashwani Bhargava said: "This collaboration enriches our partnership with Horizon Aerospace, brings them aboard our Boeing India Repair Development and Sustainment (BIRDS) hub initiative, and is an important milestone as we continue to grow supplier-partner collaboration in India, for India."

A Boeing 737 of the IAF VIP Squadron

Skanda Aerospace Technology to build helicopter gears

In a first for a private company in India, Skanda Aerospace Technology Pvt Ltd (SATPL), on 12 May, announced its plan to invest Rs 250 crore to set up a gearbox manufacturing facility at Hyderabad. SATPL is a joint venture (JV) between the Hyderabad-based Raghu Vamsi Machine Tools (RMVT) and Texas-based Rave Gears LLC.

This production facility will be India's first private company with the capability to manufacture helicopter gears and gearboxes.

Given the growing demand for helicopters manufactured by Hindustan Aeronautics Ltd (HAL), there is likely to be a significant demand for gearboxes and drive trains.

Rave Gears, which will function as technology provider, will hold 55 per cent of SATPL, while RVMT & Investors will hold the remaining 45 per cent. The JV company will invest Rs 250 crore and provide employment to 1,000 workers in the next 3-5 years. Rave Gears has also committed to provide Skanda Aerospace with assured annual orders to the tune of $9 million.

Marshall Aerospace expands global C-130 customer base with IAF

Marshall Aerospace has underlined its credentials as the world's leading Lockheed Martin approved C-130 Heavy Maintenance Centre for C-130J aircraft by securing a contract with Lockheed Martin to carry out the 12-year maintenance inspections on the Indian Air Force's fleet of C-130J Super Hercules.

The contract will see the company carry out the in-depth maintenance inspections on the Indian fleet of C-130J while further strengthening their long-term relationship with Lockheed Martin. The aircraft were delivered to the Indian Air Force under the US Government Foreign Military Sales programme in an outstanding example of both political and military cooperation.

First acquiring the platform in 2008, India has gone on to procure additional airframes through the US Government and Lockheed Martin in more recent years to support its tactical airlift requirements, now operating a fleet of 12 C-130J aircraft.

Zen Tech bags Rs 5.28-cr order from the J&K Police

The Jammu and Kashmir Police (J&K Police) has awarded Zen Technologies a contract worth about Rs 5.28 crore to supply Zen ShootEdge Systems (corner shot weapon systems).

This was Zen's first order for ShootEdge. The company said it won the bid due to superior product quality and competitive pricing.

This version of ShootEdge was developed in collaboration with Defence Research and Development Organisation (DRDO).

In addition to domestic demand, ShootEdge also has a huge export potential, the company said.

Zen Technologies provides defence training solutions, drones and anti- drones solutions. It has a track record in building training systems for imparting defense training and measuring combat readiness of security force.

155x52 calibre ordnance successfully tested by Field Gun Factory

Field Gun Factory Kanpur, now part of Advanced Weapons & Equipment India Ltd. (AW&EIL), has successfully proof fired 155x52 calibre ordnance today at CPE Itarsi, proving its capabilities to manufacture 52 calibre artillery fire power.

Ordance Factory was making spare barrels and other spare parts of the 155mm 39 calibre Bofors Guns imported from A.B Bofors of Sweden. The "Dhanush" is a 155mm x 45 calibre modern artillery gun system which is a qualitatively and technologically superior weapon system as compared to the 155mm x 39 calibre Bofors Gun.

Not only does it have a longer and metallurgically re-engineered barrel, a new muzzle brake and a larger chamber volume necessitated by the longer barrel, but mechanical and electronic upgrades make it an entirely different weapon on a number of criteria.

AWEIL has got its first export order from a European firm for major sub assemblies of artillery guns worth Rs 6 crore only.

AWEIL made a modest provisional profit of Rs 4.84 crore for 2021-22 overcoming ₹398.5 crore loss calculated over an average of six months during the last three years.

Bala Aatral Solutions wins MoD grants of Rs 3 crore for AR and VR solutions

Bala Aatral Solutions, a Chennai-based start-up in the serious gaming industry, has won grants worth Rs. 3 crore from the Ministry of Defence (MoD), under the Innovations for Defence Excellence (IDEX) platform to promote innovative technologies.

The grants are to work on developing Augmented Reality (AR)-Virtual Reality (VR) solution for airplane mechanics, and a VR-based training simulator for helicopter pilots, within two years, as per the MoD mandate.

A 155mm 52-calibre gun has been tested by the Field Gun Factory Kanpur

Bala's AR/VR solution for airplane mechanics eliminates the need for the technicians to spend hours reading through manuals with thousands of lines of instructions. The solution will display relevant audio/visual cues for the technicians through smart glass to aid their repairing task.

Bala's VR-based simulator will eliminate the need for a real helicopter for training and evaluation. The simulator will have a virtual cockpit environment to test various capabilities of pilots such as their emergency response and cognitive loads, serving as a highly economical and effective evaluation solution.

One of the focus areas of Aatral is 'digital twin' technologies that refer to virtual representation of physical objects or processes that would serve as the real-time digital environment especially for experiential learning.

Aatral has developed an industrial safety platform to create customised AR/VR training solutions for employees in construction, manufacturing and processing industries.

IIT-K signs MoU with DIO to nurture startups in defence

The Startup Incubation and Innovation Centre, IIT-Kanpur (SIIC IIT-Kanpur) recently signed an MoU with Defence Innovation Organisation (DIO) to nurture and support start ups and SMEs in the defence sector through its flagship programme iDEX Prime. To facilitate this partnership, the team at iDEX organised an awareness session on May 6 on the pool of funding opportunities available to the innovators developing solutions to serve the defence requirements.

iDEX was launched in 2018 with an agenda to cater to day-to-day requirements of the Border Services through technology solutions. The programme will foster product development for the Indian Military Services and expose innovators to the Defence infrastructure to achieve promising outcomes.

iDEX Prime has launched a total of six problem statements along with 38 challenges under DISC 6 that have been gathered from the armed forces, coast guards, DPSUs, and ministry of home affairs. Some of these challenges are Scalable Wireless Communication Network for autonomous mobile platforms, design of Active Hydro Pneumatic Suspensions with variable dampening characteristics to meet different road profiles, development of AI (Artificial Intelligence) enabled welder's helmet for real-time display of welding parameters like voltage, current, traverse speed, electrode stick out etc for immediate corrective control by welder during MIG & TIG welding processes, AI-Based Condition Monitoring System for yard assets.

Keel of Second Diving Support Craft Laid at Titagarh Wagons

Keel laying for the second ship of Diving Support Craft (DSC) project was held on 5 May at Titagarh Wagons, Kolkata. The contract for procurement of Five Diving Support Craft (Yards 325 to 329) for the Indian Navy was signed on 12 Feb 2021 with Titagarh Wagons Ltd., at a total project cost of Rs 174.77 crore.

On commissioning, these craft will provide diving assistance for IN ships inside and close to harbour, for underwater repairs, maintenance and salvage. The DSCs will be fitted with state-of-the-art diving equipment and tools for performing diving operations.

Successful trials of ATAGS howitzers carried out in Pokhran

Trials of indigenous Advanced Towed Artillery Gun System (ATAGS) were successfully conducted at Pokhran Field Firing Range (PFFR) between April 26 and May 2, Defence Research and Development Organisation (DRDO) officials said.

ATAGS is a fully indigenous towed artillery gun system project undertaken in mission mode by DRDO as a part of the artillery modernization programme of the Indian Army. ATAGS has been produced by two firms Bharat Forge and Tata Advanced Systems Limited.

The gun is expected to be the mainstay of the Indian Army tower howitzer fleet and may also be used to replace the Bofors howitzers.

Trials of the 155mm 52 calibre Advanced Towed Artillery Gun System have been completed

HAL seekimng partners to design multi-role and deck-based helicopters

Hindustan Aeronautics Ltd has issued an Expression of Interest (Eoi) for the selection of partners for the design, development, and manufacturing of Indian Multi-Role Helicopter (IMRH) And Deck Based Multi-Role Helicopter (DBMRH) on Public-Private Partnership model through Special Purpose Vehicle (SPV) model.

The new company will have private players' majority stake so that it does not become a full government entity. IMRH will replace the Russian Mi-17 helicopters in the Indian Army and Indian Air force fleet and DBMRH will replace the Sea King Mk.42B and supplement the MH-60R fleet in Indian Navy.

According to EoI, HAL plans to build 3 IMRH and 3 DBMRH in the next few years that will be used for developmental and flight trials. Selected partners will be assured of orders for nearly 400 IMRH and DBMRH with peak annual production capacities to be around 36 per year.

DBMRH will be a customized Naval Multi-Mission Capability helicopter that can perform Anti-Submarine Warfare (ASW) / Anti-Surface (ASuW) Special Operations / Search & Rescue (SAR) Utility / Vertical Replenishment (VERTREP), Command and Control (C2). While externally DBMRH will be similar to the IMRH, it will have a higher all-up weight of 1.2tons and a different engine that is more powerful and likely from a different vendor.

HAL & BEL Sign Contract for Indigenous IRST

HAL and BEL signed a contract for co-development and co-production of Long Range Dual Band Infra-Red Search and Track System (IRST) for Su-30 MKI, on 26 April, under the Make-2 procedure of Defence Acquisition Procedure (DAP) 2020, as part of the 'Make in India' initiative.

The proposed IRST system will be a high end strategic technology product in the field of defence avionics and technically competitive to existing IRST system in the global market with features of Television Day Camera, Infrared & LASER sensors in single window for air to air and air to ground target tracking and localization. The system will enhance the Indian Air Force's air superiority.

BHEL, GE Power Conversion to develop electric propulsion systems for Indian Navy

Bharat Heavy Electricals Ltd (BHEL) has inked a pact with GE Power Conversion for the development of integrated electric propulsion systems for the Indian Navy. Electric propulsion has been identified as a key technology for the Indian Navy on new construction platforms.

Meanwhile, a Joint Working Group on India-UK Electric Propulsion Capability Partnership has been set up with the goal of fostering military and industrial collaboration in maritime Electric Propulsion systems.

GE Power Conversion is a world leader in electric propulsion, with equipment installed on some of the latest platforms of the US Navy and the Royal Navy, including the Queen Elizabeth class of aircraft carriers.

These systems provide flexibility in selection and layout of power generation equipment and drive elements with enhancement of stealth features and fuel efficiency.

Tresa Energy to build electric inflatable boats for Indian Navy

A Bengaluru-based EV platform startup — Tresa Energy — has begun a 12-month pilot (prototype-stage) to build a Rigid Inflatable Boat (RIB) called the "EV.7M RIB". The lightweight, high-performance RIB, which can seat 18 people, will be useful for patrolling, interception, search and rescue, and transport by the Navy.

According to Tresa, the EV.7M RIB can do all of these with a higher stealth mode and cannot be detected by heat maps, as it does not generate heat or sound.

The firm has received Rs 3 crore as grant from the DIO under under MoD's open challenge- iDEX (Innovation for Defence Excellence) to build specific EV platforms. Later, the DIO (defence innovation organization) gave a use-case to build the RIB, which pushed them to build boats.

Tresa Energy hopes to do the initial prototype test by February 2023, and deliver it to the Navy by April 2023.

Tresa, a high-performance EV platform start-up building next-generation EV powertrains and platforms, is into research, design, and manufacture of high-precision components. Its high-energy dense EV powertrains can be customised exclusively for high-end cars, buses, trucks, aerial and marine vehicles.

DEFENCE RESEARCH

DRDO News

An IMR Report

AI will be incorporated in future platforms: DRDO Chief

Artificial intelligence (AI) will have a major role in defence technology and all defence platforms to be developed by the Defence Research and Development Organisation (DRDO) in the future will make use of AI, said DRDO chairman and secretary of department of defence research and development (DD R&D), G Satheesh Reddy, addressing media persons on 15 April.

"DRDO's priority is to become a leader in developing advanced technologies. AI has been introduced in all DRDO labs and it will be part of every system that comes out of DRDO in future. India is one among the few nations that have successfully developed and demonstrated anti-drone technology. The armed forces and security agencies have started placing orders to get the systems installed for them. Lot of trials too are underway with regard to anti-drone technologies," Reddy said.

Extended Range Brahmos tested from SU-30 MKI

India, successfully fired the Extended Range Version of BrahMos Air Launched missile from Su-30 MKI fighter aircraft on 12 May. It was the first launch of Extended Range version of BrahMos missile from Su-30MKI aircraft. With this, the IAF has achieved the capability to carry out precision strikes from Su-30MKI aircraft against a land/ sea target over very long ranges. The extended range capability of the missile coupled with the high performance of the Su-30MKI aircraft gives the IAF a strategic reach and allows it to dominate the future battle fields.

DRDO to get Kilo Submarine for research

DRDO will get a Kilo-class submarine from the Indian Navy to test the Electric Propulsion motor, Li-ion battery, AIP, and other Technologies. This sub will be used as a research vessel for the development of next-generation systems and components for the development of 12 indigenous submarines. These submarines will go into manufacturing in 2030.

A Brahmos cruise missile is released from a Su-30MKI aircraft

Formalities are being a workout for the transfer of a Kilo-class submarine that will be drydocked to be used as a test platform for the testing of the prototype Lithium-Ion battery system with a Battery Management system (BMS) to validate its energy output and various discharge rates.

DRDO's AIP technology is based on a Phosphoric Acid Fuel Cell that already has been demonstrated on a land-based prototype and DRDO had proposed Navy to loan them a Kilo-class submarine to be used as a research vessel for the AIP system but now it might be fully converted into as a research vessel for many of the systems. Indigenous 5MW Electric Propulsion motor might be next in line to be used for further experimenting with the propulsion system.

ARDE & L&T working on Pinaka-based anti-submarine rocket

ARDE and L&T are working on a Pinaka based extended range anti submarine rocket. L&T will soon start the integration of Extended Range Anti-submarine Rocket on a new launch platform.

The Armament Research & Development Establishment (ARDE) in association with the High Energy Materials Research Laboratory (HEMRL) has developed an extended range anti-submarine rocket (ASR) with a maximum range of 8.5km for the Indian Navy. Both laboratories are under the DRDO.

ARDE had recently demonstrated a new rocket technology to the Navy, who have issued a set of qualitative requirements to be achieved during the agency's internal trials.

Currently, the navy has vintage Russian rocket RGB-60 with a maximum range of 5.3km, which is an unguided area weapon for combating submarines. These rockets are fired from the RBU-6000 rocket launcher, which is fitted on-board certain Indian Naval Ships including the R-Class, Delhi Class and Talwar Class of Navy ships.

The Indian navy wants an extended range anti-submarine rocket which can engage an enemy's submarine from a distance of 8km.

IAF, Navy tie up with DRDO to acquire CHAFF

The Indian Air Force and the Indian Navy

have tied up with the DRDO to get the CHAFF technology, which protects the warship from an anti-ship missile during hostilities. India is now the second country after the United States to develop this ability.

The developed assumes significance as the Indian navy is currently studying the sinking of Russian missile cruiser Moskva and focusing on how to protect our warships from anti-ship ballistic missiles like the Chinese DF-21.

In simple words, CHAFF is a critical defence technology used to protect fighter aircrafts or naval ships from enemy radar-guided missile during war. The significance of this technology lies in the fact that very less quantity of CHAFF material deployed in the air acts as a decoy to deflect enemy's missiles to ensure safety of the fighter aircraft or naval ships.

The DRDO has developed this advanced CHAFF technology to defend naval ships and fighter aircrafts against modern day broadband (including high frequency) radar threat.

Developed by the DRDO, the technology includes all three variants of CHAFF rockets namely Short Range Chaff Rocket (SRCR), Medium Range Chaff Rocket (MRCR) and Long Range Chaff Rocket (LRCR), and have been inducted in the Indian Navy after successful user trials.

The DRDO has also developed advanced CHAFF cartridge-118/I for the Indian Air Force.

LRDE working on active protection system for MBTs

LRDE has initiated work on Radar units of active protection system for Next Gen Tanks.

The present population of T90 tks is qty 1074 and will reach qty 1193 by Sep 2020. By the end of 14th plan the total population of tank T-90 will be 1,657 and this equipment will be the mainstay of the Mechanised Forces up to 2040-50. Tanks T-90s are presently devoid of an Active Protection System and only equipped with ERA panels which provide limited survivability in present battle field scenario.

A requirement has been felt to acquire a Active Protection System capable of not only detecting an ensuing attack but also defeating it, thereby enhancing own survivability.

An active protection system is designed to prevent anti-tank missiles/projectiles from acquiring and/or destroying a target.

Electronic countermeasures that alter the electromagnetic, acoustic or other signature(s) of a target thereby altering the tracking and sensing behaviour of an incoming threat (e.g., guided missile) are designated soft-kill active protection measures ("SKAPS").

Measures that physically counterattack an incoming threat thereby destroying/altering its payload/warhead in such a way that the intended effect on the target is severely impeded are designated hard-kill active protection measures ("HKAPS").

T-72M1M Turret with Arena Active Protection System

DRDO issues guidelines on free access to patents

Over two years after the DRDO modified its Intellectual Property Rights (IPR) policy to grant the Indian industry royalty-free access to patents held for technologies developed by it, detailed guidelines on the subject have been issued.

The new rules stipulate that a license for the patent will be given initially for a period of five years based upon the manufacturing capacity. The number of licenses issued to a single firm shall not be more than five and can be renewed after five years depending upon compliance of the license agreement and other defined factors.

DRDO has also expanded the eligibility scope for licensees by including a clause stating that the applicant shall be a manufacturing entity or a system integrator and not a trading company. None of the promoters and directors of the applicant entity should have been wilful defaulters.

Applicants would be required to provide all necessary documentation including details of projects and supply orders successfully executed in the last two years, details of shareholders, promoters, associated firms and joint venture companies if any, as well as details of any vigilance actions, on-going investigation or suspension or blacklisting of the entity or any of its associates.

To boost indigenous production and give a fillip to the 'Make in India' policy, DRDO had, in November 2019, decided to grant free access to patents held by it to an Indian company, startup or MSME incorporated as per law. A DRDO screening committee would review the requests for licenses by taking into account the applicant's financial and technical capabilities as well as national security and strategic implications.

Under the policy, no licence fee or royalty will be applicable on the use of Indian patents held by the research agency and only a processing fee of Rs 1,000 would be levied. Earlier, licence fee for patents and royalty could range anywhere from several lakh rupees to over a crore depending upon the type of technology involved, the cost of the project, baseline price and post-production quantum of sales to non-defence sector.

There are about 450 patents covering missile technology, aeronautics, naval systems, life sciences, armaments, combat engineering, electronics and communication material, which can be used by the Indian industry for commercial production.

The license for the patent shall be given on non-exclusive basis with DRDO retaining complete title and ownership rights including unfettered rights to license the patents to additional parties.

While the license recipients will be able to manufacture and sell products covered under the patent, they will also be required to submit details about the commercial working of the licensed patent on an annual basis to DRDO, which would be forwarded to the Controller General of Patents, Designs and Trademarks, as mandated by Indian patent laws and rules.

NAVY MODERNISATION

Two Indigenous Frontline Warships Launched

Third ship each of Project 15B and 17A Launched

An IMR Report

Two indigenously built frontline indigenous warships of the Indian Navy - Surat, a Project 15B destroyer, and Udaygiri, a Project 17A frigate - were launched on 17 May 2022 at Mazagon Docks in Mumbai by defence minister Rajnath Singh.

The launch of a ship refers to it entering water for the first time. The process is carried out in tandem with the rising and receding tides. The next step after launch involves outfitting inside the ship, which is followed by sea trials. Once trials are done, a ship is commissioned.

Both 15B and P17A ships have been designed in-house by the Directorate of Naval Design, the fountainhead for all warship design activities in India, and during their building phase at the shipyard, around 75 per cent of the equipment and systems were sourced from indigenous firms including micro, small and medium enterprises, the statement added.

INS Surat, the third destroyer of Project 15B launched

Defence Minister's Speech

The defence minister, in his address after the launch, termed the two warships as "shining examples" of India's growing indigenous capability. "These warships will be among the most technologically advanced missile carriers in the world that will cater to the present as well as future requirements," he said.

After the concurrent launch of Surat and Udaygiri, Rajnath Singh said the two warships will add might to the Indian Navy's arsenal and represent to the world India's power of self-reliance. He exuded confidence that India will not only cater to its shipbuilding needs but also others in the coming days.

Singh said the ever-evolving security scenario in the Indian Ocean and the Indo-Pacific region demands a more important role for the Indian Navy in the times to come.

"The Indo-Pacific region is important for the economy of the whole world. India is a responsible maritime stakeholder in the region. We support consensus-based principles and peaceful, open, rule-based and stable maritime order. Being an important country in this region, it is the primary objective of our Navy to keep the Indo-Pacific open, safe and secure," he said.

Project 15B Ships

The Project 15B class of ships are the next-generation stealth, guided missile destroyers of the Navy being built at Mazagon Docks. Surat is the fourth of Project 15B destroyers. It heralds a significant makeover of the P15A (Kolkata Class) destroyers and is named after the commercial capital of Gujarat and also the second-largest commercial hub of western India, after Mumbai. Surat has a rich maritime and ship building history and vessels built at the city in the 16th and 18th centuries were known for their longevity (of more than 100 years).

The warship Surat has been built using the block construction method, which involved hull construction at two different geographical locations. The first ship of this class was commissioned in 2021. The second and third ships have been launched and are at different stages of outfitting or trials.

Following its traditions and policy guidelines, the Indian Navy has named the destroyer Surat after the commercial capital of Gujarat, which is famous for its rich maritime and shipbuilding history.

Surat is the fourth and last ship of the Indian Navy's Project 15B guided missile destroyers. The Rs 35,000-crore project is a follow-up programme of Project 15, which was launched in the 1990s to add guided missile destroyers to the inventory of the Indian Navy. It came to be known as the Delhi-class and was followed by Project 15A or Kolkata-class which

focused on advanced technology and equipment.

Project 15B or Vishakhapatnam-class, was launched to add four stealth guided-missile destroyers and was envisaged to incorporate technological advancements in the naval ships. The P-15B destroyers were to incorporate new design concepts for improved survivability, sea keeping, stealth and manoeuvrability.

In a statement earlier, the Indian Navy said enhanced stealth features were achieved through the shaping of hull and the use of radar transparent deck fittings which made these ships difficult to detect. On their special features, it said that ships of the P-15B programme will have state-of-the-art weapons and sensors, including a vertically launched missile system for long-distance engagement of shore and sea-based targets. These ships will be equipped to carry and operate two multiple role helicopters, it added.

The first ship of this class, INS Visakhapatnam, was commissioned in 2021. The other two—Mormugao and Imphal—have been launched but not commissioned yet. All three, including Surat, are likely to be commissioned between 2023 and 2025.

Project 17A Ships

Udaygiri, named after a mountain range in Andhra Pradesh, is the third of Project 17A frigates. They have improved stealth features, advanced weapons and sensors and platform management systems. Udaygiri is the reincarnation of the erstwhile Udaygiri, the Leander Class ASW frigate, which saw numerous challenging operations in its illustrious service to the country spanning over three decades from February 18, 1976 to August 24, 2007. Under the P17A programme, a total of seven ships are under construction–four at Mazagon Docks and three at Kolkata's Garden Reach Shipbuilders and Engineers.

Various novel concepts and technologies like integrated construction, mega block outsourcing, project data management/project lifecycle management etc have been adopted for the first time in indigenous warship design and construction.

The first two ships of P17A Project were launched in 2019 and 2020 at Mazagon Docks and Garden Reach Shipbuilders and Engineers respectively.

Frigates are named after mountain ranges. The ship Udaygiri gets its name from a mountain range in Andhra Pradesh.

Udaygiri, is the third stealth frigate of the P-17A class. The programme is a follow-up of Project 17 or Shivalik-class which was approved by the government in the late 1990s to build multi-role stealth frigates, a type of

An artisit's impression of a Project 17A warship

"Each Project 17A frigate will be equipped with 32 Barack, 8 Brahmos surface-to-air missiles, one BAE 5-inch 62 calibre MK-45 Naval gun, two AK-630M close-in weapon system and two RBU-6000 ASW rocket launchers."

Naval warship that comes below a destroyer.

Project 17A or Nilgiri-class, with an estimated cost of ₹45,000 crore, was envisaged to build seven advanced guided missile frigates with an improved degree of stealth features, improved anti-air and surface war capabilities in the form of advanced weapons, sensors and platform management systems.

The Project 17A frigates are being fitted with weapons and sensors along with an integrated platform management system. The project is said to have cost around Rs 45,000 crores.

The ships to be built under Project 17A are listed with Yard Nos as under-

INS Nilgiri	12651
INS Himgiri	12652
INS Udaygiri	12623
INS Dunagiri	12654
INS Taragiri	3022
INS Vindhyagiri	3023
INS Mahendragiri	3024

Characteristics. Project 17A frigates are 149m long and 17.8m wide. The ships are powered by two MAN Diesel 12V28/33D STC engine producing 6000 KW of power each and two General Electric LM2500 marine gas engine producing maximum power of 25060 KW.

The ship are equipped with EL/M-2248 MF-STAR S-band multifunctional radar developed by IAI ELTA, BEL HUMSA-NG bow sonar, and Ajanta Electronic warfare system.

Project 17A class frigate can accommodate two medium-sized helicopters such as HAL Dhruv or Sea king MK 42B.

Armament. Each Project 17A frigate will be equipped with 32 Barack and 8 Brahmos Surface to air missiles and these missiles will be fired from a vertical launch system. Each frigate will be fitted with one BAE 5 Inch 62 Calibre MK-45 Naval gun and two AK-630 M Close-in weapon system. Two RBU-6000 ASW rocket launchers will be fitted onboard the frigates for anti-submarine warfare.

Indigenous Projects

Falling in line with the government's Atmanirbhar (self-reliance) push to cut down on defence imports, the Indian Navy's efforts to indigenise its equipment and systems started early. In 2014, it implemented the Indigenisation Plan (INIP) 2015-2030 for indigenous development of its resources. It further ramped up its efforts with a focus on weapons and aviation-related equipment. As of April 2022, 39 of the 41 ships and submarines that were under construction were being built in Indian shipyards.

ARMY MODERNISATION

Theaterisation Plan and IBGs in Final Stage

An IMR Report

Chief of Army Staff General Manoj Pande, on 9 May, said the Army is fully committed to the tri-services theaterisation plan and is even ready to take the lead to make the ambitious initiative a success. He said the Army is in the final stages of completing the studies on the theaterisation plan, adding that there are certain issues among the three services that need to be addressed.

According to the plan, each of the theatre commands will have units of the Army, the Navy and the Air Force and all of them will work as a single entity, looking after the security challenges in a specified geographical territory under an operational commander.

"This exercise is in progress. While there are areas of convergence and common understanding among the three services, there are some issues that still need to be addressed. That I suppose will have to be taken up for resolution at the appropriate level," General Pande said.

The Department of Military Affairs headed by the country's first Chief of Defence Staff, General Bipin Rawat, had asked all the three services last year to carry out independent studies on the theaterisation plan for its rollout.

"In so far as the studies which the Army was required to undertake for the land theatre commands, these are in the final stages of completion and will be submitted in due course," General Pande said.

"But at the end of it, I must reiterate the Indian Army's commitment towards achieving this objective of theaterisation. I would want to state our full commitment and that we are prepared to sort of cooperating and taking the lead in any manner towards making theaterisation a success," he added.

At present, the Army, the Navy and the IAF have separate commands. Initially, a plan was firmed up for the creation of an Air Defence Command and a Maritime Theatre Command.

The theatre commands are being planned to integrate the capabilities of the three Services and ensure the optimal utilisation of their resources.

T72 tank column in the deserts

Integrated Battle Groups

The Indian Army is in advanced stages of putting together Integrated Battle Groups (IBGs) by reconfiguring its combat formations.

General Pande said the plan is to have one in the northern sector and another on the western front. "It is in the final stages of compilation," he said.

"Consultations with all stakeholders are more or less formalized and are now in the process of final compilation. Once this happens, we will see how we can take this forward and apply to perhaps other formations of the Army," the Army Chief said.

The IBG, which aims to integrate different components of the Army into the new formation, will include artillery guns, tanks, air defence and logistical elements.

"The purpose of restructuring our existing formations was to have forces which are lean, agile and tailor-made that would afford the commanders the flexibility and more options for their deployment," the Chief of Army Staff said.

The IBGs add punch to the ground forces by combining the strengths of each formation. The Army has already carried out extensive test-bedding of the IBG concept.

"We have identified a holding formation on the western front and a strike formation in the eastern or northern borders for the IBGisation to commence," said Gen Pande.

Once IBGs are rolled out, these will be comparatively smaller formations but will be able to execute their operations swiftly. They will add to the options of the theatre commanders. The IBGs will be bigger than a brigade (3,000-3,500) but smaller than a division (10,000-12,000).

In the first go, of the two IBGs planned, one is coming up under the 9 Corps mandated to operate on the western borders with Pakistan.

The other one is being raised under the 17 Corps raised as the sole strike corps to operate along the northern borders with China.

EoI Issued for 16 Major Ammunition Depots

Army to Upgrade Infra-structure at Ammo Depots

An IMR Repot

After having lost ammunition worth several hundred crore over the past years in various accidents, the Army has drawn up plans to upgrade the security and fire fighting infrastructure at 16 major ammunition depots across the country.

In an incident of major fire in the storage shed, containing over 130 tones of anti-tank mines and ammunition at central ammunition depot, Pulgaon on 31 May 2016, not only 19 defence personnel, including two senior army officers were killed and 17 military personnel injured, it also resulted in a huge loss of property to the Government. This exposed the chinks in the security aspects of the army ammunition depots. In past since last 25 years there were approx 20 such serious fire incidents at various ammunition depots in India.

"Increased security threats and recent incidents of fire in ammunition depots warrant an immediate upgradation of the existing archaic security and fire fighting infrastructure currently found in all the ammunition installations of Ordnance," states an expression of interest (EOI) issued in April 2022 by the Directorate General of Ordnance Services seeking project management consultancy from suitable agencies.

"There is a need to acquire force multipliers in terms of modern security and fire fighting systems, which would incorporate modern methods of ensuring security and fire fighting and will be potent to ward off any threat," the EOI adds.

The Army has 16 major ammunition depots, with the Central Ammunition Depot (CAD) at Pulgaon in Maharashtra that comes directly under the command of Army Headquarters, being the mother depot. CAD receives all ammunition from indigenous and foreign sources and then issues it to 15 Field Ammunition Depots (FADs) which sustain fighting formations within the geographical area of supply allotted to them.

Central Ammunition Depot Pulgaon entrance

These depots hold all kind of bullets, grenades, bombs, shells, mines, rockets and missiles used by the army. Some of the Air Force's ammunition storage facilities are also co-located with these depots.

Given the explosive nature of stores that they hold, ammunition depots are located and designed as per specific technical norms to ensure security and safety of the establishment, manpower deployed therein as well as the surrounding areas. The locations depend upon the operational and logistic considerations.

The security and fire fighting infrastructure include securing the perimeter and controlling access into the depot by means of armed guards, walls or fences, watch towers and CCTV cameras, technical officers, explosives inspection and disposal experts, keeping the premises clear of vegetation and wild growth, automatic fire detection and sprinkler systems, specialist fire fighting vehicles and equipment, safety lanes and static water tanks.

Every depot has an emergency plan and standard operating procedures in place to deal with any accident, explosion or fire. Technical officers and explosives experts are also required to inspect and audit the stores as well as handling storage procedures periodically to identify life expired or defective ammunition that can trigger an accident.

Over the past two decades, there have been several instances of fire breaking out in some ammunition depots, not only destroying a large quantity of ammunition and explosives, but also resulting in the loss of human lives.

After a massive fire at the Ammunition Depot, Bharatpur in 2000, the Army had embarked upon a major security and safety modernisation project plan to improve the storage infrastructure at all its depots. This included new design for ammunition sheds, converting temporary shelters into permanent

Various types of ammunition stored in ammunition depots

buildings, better packing and stacking facilities and a review of the safety standards and procedures.

The new modernisation project being planned will require a fresh look at the regulations of the Ministry of Defence's Storage and Transport of Explosive Committee, which are ratified by Defence Research and Development Organisation's (DRDO) Centre for Fire, Explosive and Environment Safety (CFEES), redesigning buildings and storage structures, state-of-the art inspection and testing facilities, automation, installation of contemporary warning and fire fighting systems.

Army Ordnance Services Role

The serviceable ammunition logistic and operations costs comprise up to 70-80% of a systems life-cycle cost. Managing ammunition stockpile involves proper storage as per holding capacity, turnover, inspection and timely disposal and if not adhered to will increase the risk of accidental explosion, fires etc. The ammunition deterioration during storage has considerable economic as well as catastrophic consequences. The ageing ammunition assets can turn in to liability in case not properly cared.

Ordnance Corp is responsible for provision, receipt, storage, issue and disposal of all Ordnance stores including ammunition and explosives, both in peace and field areas throughout the country. The Central Ammunition Depot (CAD) functions directly under Army HQ and acts as a mother depot and holds strategic reserves. The ammunition is received ex-Import/ factories in this depot and thereafter dispatched to other stocking echelons based on the releases made by Army HQ.

Operational commitments necessitates, that certain scale known as First Line ammunition (on weapon and unit reserve) is kept with the troops deployed on active operational duty. Most of this ammunition is loosely packaged and frequently moved. The Forward Ammunition Depots (FAD)/Ammunition Company/Division Ordnance Units near the borders hold ammunition which is required for training and in case of engagement with enemy. The other scales known as Second Line and General Staff reserve stock ammunition are held in various depots in varying quantity depending upon their location.

The Second Line Ammunition and various reserves which are required in case of prolonged engagements with enemy and training ammunition are kept at Central Ammunition Depots away from the border.

Ammunition has certain unique characteristics that necessitate quality and reliability evaluation during design, production and storage life. All ammunition has an assigned shelf life which depends on its design and chemistry of propellants/explosives used. These are high energy materials thus inherently unstable and prone to deterioration / decomposition even under normal storage conditions. The designed shelf life is given as per the life of the subsystem which has the lowest shelf life under normal conditions of storage.

Some basic issues specific to ammunition are:

- Ammunition contains high-energy material and is designed to be as lethal as possible during its use and as safe as any other equipment during its use and handling.
- It is designed for optimum performance and manufactured under controlled conditions.
- The system mostly comprises of a combination of electronic, mechanical, chemical or structural sub systems, which cannot be fully tested in the integrated forms without partial or full destruction.
- The functioning of ammunition consists of irreversible reactions or a process. There is need for testing even the sub-systems independently before integration.
- The ammunition deterioration during storage has considerable economic as well as catastrophic consequences. The ageing ammunition assets can turn in to liability in case not properly cared. Hence, the exceptions during each stage must be predicted, detected, identified, and mitigated to prevent unacceptable risk involving safety and performance.

The ammunition ideally should be utilized within the specified shelf life. Beyond this, deterioration in explosives is bound to take place, not only due to inherent property of the explosive but also due to storage conditions. The performance of the explosives in the ammunition cannot be predicted beyond the shelf life. The turnover policy has been formulated for this purpose. The periodic tests/proof during shelf life and thereafter are necessary to assess continued serviceability /safety. The responsibility for proper storage, maintenance and serviceability periodic checks during its shelf life cycle rests with the DGOS. Ammunition Maintenance Instructions and Proof Test Guide have been issued for this purpose.

The serviceability, safety and expected life of ammunitions is assessed through chemical, physical, stability, life assessment and safety test of the explosive components of ammunitions during various phases of evaluation. Depot proof is carried out to assess the balance shelf life of the subject ammunition and to assess whether the store is still in a serviceable state. Shelf life is extended beyond the assigned shelf life if the performance in proof is satisfactory and chemicals are still in stable condition.

A lot of ammunition is stored underground or in box-like structures called igloos in NATO countries. In India the ammunition is stored mainly in three ways i.e., in magazine, in covered warehouses and in open plinths covered only by tarpaulin sheets. The CAG had pointed out in its report in 2002 that about 60 per cent of Indian army ammunition lacked proper storage and were kept in the open.

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How is Pakistan's military equipment affected by the Russian invasion?

By USMAN ANSARI

ISLAMABAD — Despite having acquired key defense equipment from Ukraine since the 1990s, Russia's invasion of the country will not cause support issues for Pakistan, as this weaponry was already being phased out, an industry source has told Defense News.

The largest Pakistan-Ukrainian defense deal was for 320 T-80UD/Ob'yekt 478BEh tanks, built by the Kharkov Machine Building Design Bureau, or KMDB. The tanks were ordered in 1996 and delivered during the 1997-1999 time frame, according to the Stockholm International Peace Research Institute.

Ukraine's Malyshev Plant also supplied the 1,200-horsepower 6TD-2 power pack for Pakistan's Al-Khalid series of tanks, derived from Malyshev's 1,000-horsepower 6TD powering the T-80UD. Malyshev, like the Kharkov Machine Building Design Bureau, is in Kharkiv, a city under heavy Russian attack.

The International Institute of Strategic Studies lists more than 600 Al-Khalid and Al-Khalid I tanks in service manufactured by Pakistan's state-owned armored fighting vehicles manufacturer, Heavy Industries Taxila, or HIT. Therefore, one-third to half of Pakistan's entire tank fleet would potentially be rendered unsupportable if the two factories in Kharkiv are destroyed.

However, an industry source with knowledge of HIT's ongoing programs, told Defense News Pakistan was already replacing Ukrainian equipment before Russia's full-scale invasion, which began Feb. 24.

Speaking on the condition of anonymity for security reasons, he said longstanding supply problems had forced Pakistan's hand.

The main issue was the lack of an active production line at Malyshev for the 6TD and 6TD-2 power packs. It was reactivated on demand, but that inflated contract prices.

Additionally, though the engines are multifuel diesels and run on any fuel, they are optimized to function with a particular grade of oil lubricant only available from Ukraine.

Though possibly originally developed by the Galol Plant in Drogobych in western Ukraine, as it's known as "Galol oil" in Pakistan, it is currently supplied by Azmol.

Efforts to synthesize this grade of oil in Pakistan were unsuccessful, and an attempt to acquire supplies through a third party around the 2017-2018 time frame resulted in the test engines seizing up, as the oil had been mixed with another type.

Pakistan is now seeking supplies of suitable oil from Russia, which also operated the T-80UD.

Longer-term plans will see HIT install the same power pack from the recently acquired Chinese VT-4 tanks in all Al-Khalid variants. The VT-4 shares its design heritage with the Al-Khalid in terms of the simplicity of installing its power pack, something impossible with the more compact T-80UD hull.

Aamir Qureshi/AFP via Getty Images

Pakistan's armored, top-of-the-line tanks take part in a military parade in Islamabad on March 25, 2021.

"One-third to half of Pakistan's entire tank fleet would potentially be rendered unsupportable if the two factories in Kharkiv are destroyed."

The surplus 6TD-2 power packs will subsequently support the T-80UD fleet, which is being rebuilt by HIT. Eventually, Al-Khalid II tanks will replace that fleet.

The Al-Khalid II will also eventually replace the 236 HIT-built Al-Zarrar tanks, which are Ukrainian-designed upgrades of the Chinese Type 59.

Both the Pakistan Army's Inter Services Public Relations media arm and the Ministry of Defence Production, which handles procurement, did not return requests for comment.

An alternative to Ukraine

The loss of faith in Ukrainian defense products was underlined when the three Oplot-P tanks — developments of the T-80UD and subsequent T-84 — "miserably failed" during trials in Pakistan alongside the VT-4 and Al-Khalid I, the industry source said.

Author, analyst, and former Australian defense attaché to Islamabad Brian Cloughley says the switch to using Chinese engines is reflective of Pakistan's wider experience with Ukraine as a defense supplier.

"The disruption in Pakistan-Ukraine relations caused by the war is yet another factor spurring Pakistan's intention to rely on China for military equipment and development," he said. "The Pakistan defense establishment feels let down by Kiev all along the line, and consistent with this is the decision to scrap everything to do with Ukraine's tank power plants and all else."

If Pakistan turns to Russia to support some of its equipment, however, it faces the threat of Western sanctions.

In addition to four Il-78MP tanker/transport aircraft acquired from Ukraine, Pakistan purchased Mi-35P Hind attack and MI-17 Hip utility helicopters from Russia.

While the Pakistan Air Force did not respond to questions about this, author, analyst, and former Pakistan Air Force pilot Kaiser Tufail said the Il-78MPs "have recently been upgraded."

Cloughley does not foresee problems with these platforms. "Russian origin equipment is more easily serviced and maintained that most of that supplied by the U.S., and routine support for such aircraft as the Il-78 is not difficult," he said.

Speaking of the Il-78MPs, Richard Fisher, a senior fellow at the International Assessment and Strategy Center in Alexandria, Va., said there remains the threat that Russia sparks a wider war in Europe "that would immediately consume all Il-76MDs and support resources to advance Russian war objectives."

Nevertheless, short of full-scale war in Europe, Fisher said Russia could likely handle overhauls.

Wang Zhao/AFP via Getty Images

A Chinese VT-4 main battle tank is on display ahead of Airshow China in Zhuhai on Nov. 7, 2018.

"While Il-78s were produced at the Tashkent Aircraft Production Organization in Uzbekistan, Russia's United Aircraft Corporation has reclaimed production of the upgraded Il-76MD-90A at the Aviastar factory in Ulyanovsk, meaning that in theory, it should be able to support Il-78M users," the analyst explained.

According to SIPRI, Pakistan in 2006 ordered its Il-78MPs through Ukraine, which had inherited them in 1991 after the breakup of the Soviet Union. Those aircraft will eventually need to be replaced, and Fisher said Pakistan will likely look to China.

"China's Xi'an Aircraft [Industrial] Corporation Y-20U tanker is now in early service with the [People's Liberation Army] Air Force and should be available as the favorable option should Pakistan seek to replace its Ukrainian-sourced Il-78M tankers," he said. "A new version of the Y-20U with more powerful Chinese-developed WS-20 high-bypass turbofans could emerge quickly, as these engines are now flying on the transport version Y-20B."

Engine options

Pakistan also directly acquired the Klimov RD-93 turbofans for its JF-17 fighters from Russia. But even here, should the West target related supplies, China could step in by proposing a locally made alternative.

That option might come in the form of the Guizhou WS-13. But despite testing the engine on the FC-1 (the Chinese version of Pakistan's JF-17), it "has yet to be marketed as an option for this fighter, a strong indication that it may not be ready for prime time," Fisher said.

This does not necessarily mean Pakistan lacks faith in Chinese engines; Fisher noted Pakistan's recently acquired Firebird fighters are not only the first export of the type, but also of their WS-10 turbofan.

While China has enough confidence in the WS-10 to power three fighter types, he said, "there will be great curiosity in Pakistani assessments of the WS-10."

There may yet be more alternative JF-17 engines. Fisher said progress with China's J-35 mediumweight fighter as well as a "recent upgrade in its [the aircraft's] marketing campaign" potentially indicates the fighter will be powered by a new turbofan, "perhaps a version of the WS-13 or the WS-19, which may then become a Chinese engine option for JF-17."

He said this would better suit Pakistan, rather than relying on the RD-93 despite Islamabad's acknowledged satisfaction with the Russian engine. A Chinese turbofan, he said, "would mean less complicated logistics, [and] when combined with competitive low pricing, could result in greater sales success."

Still, Tufail said he expects wider repercussions related to Russia's invasion.

"The West is quite riled with Pakistan's 'soft' approach towards Russia, and I think we will be wading through rough waters for some time," he said.

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US nuc commander warns of deterrence 'crisis' against Russia and China

By BRYANT HARRIS

Drew Angerer/Getty Images

Commander of U.S. Strategic Command Adm. Charles Richard testifies during a Senate Armed Services Committee hearing March 8, 2022 in Washington, DC.

WASHINGTON — The head of U.S. Strategic Command, which oversees the nuclear arsenal, warned Congress May 4 that Washington faces a heightened nuclear deterrence risk when it comes to Russia and China.

"We are facing a crisis deterrence dynamic right now that we have only seen a few times in our nation's history," Adm. Charles Richard told the Senate's strategic forces panel. "The war in Ukraine and China's nuclear trajectory — their strategic breakout — demonstrates that we have a deterrence and assurance gap based on the threat of limited nuclear employment."

Richard sits on the Nuclear Weapons Council, and his appearance came during the first hearing assembled by the Senate Armed Services strategic forces subcommittee. The panel was set to hear testimony from the interagency panel's six voting members who are tasked with managing nuclear policy.

"The nation and our allies have not faced a crisis like Russia's invasion of Ukraine in over 30 years," said Richard. "President [Vladimir] Putin simultaneously invaded a sovereign nation while using thinly veiled nuclear threats to deter U.S. and NATO intervention."

He went on to note that China is "watching the war in Ukraine closely and will likely use nuclear coercion to their advantage in the future. Their intent is to achieve the military capability to reunify Taiwan by 2027 if not sooner."

Richard said China has doubled its nuclear stockpile within two years, despite expectations it would take Beijing until the end of the decade to do so.

"The biggest and most visible one is the expansion from zero to at least 360 solid-fueled intercontinental ballistic missile silos," he said, noting China has also made significant advances in its air- and submarine-launched nuclear-capable missiles.

Richard used the warning to reiterate his call for "a low-yield, non-ballistic capability that does not require visible generation."

He confirmed to Sen. Tom Cotton, R-Ark., this was a reference to the sea-launched cruise missile nuclear development program, adding additional fodder to the congressional debate over whether to proceed with the Biden administration's proposal to cancel the project.

Another voting Nuclear Weapons Council member, Under Secretary of Energy for Nuclear Security Administrator Jill Hruby, said the Biden administration would not meet its statutory requirement to produce 80 plutonium pits per year by 2030.

It's unclear what impact this would have on U.S. nuclear modernization efforts as Hruby noted scientists at the National Nuclear Security Administration have yet to determine the effects of using old plutonium pits in new weapons.

"We're making new pits because we're concerned about pit aging," said Hruby. "We don't want to put old pits in new weapons if we think in 30 years those weapons will be in the stockpile, they may have aging problems, but we don't know for sure."

Still, Sen. Elizabeth Warren, D-Mass., criticized the plutonium pit production program for running behind and over budget, while Richard and Angus King, I-Maine, who chairs the subcommittee, came to Hruby's defense.

"STRATCOM supports this or any other measure that [the National Nuclear Security Administration] can execute that minimizes the delay and ultimately reduces the operational risk that I'm going to have to carry because we can't meet the requirement," said Richard.

King acknowledged nuclear modernization efforts have meant a greater portion of the defense budget is going to maintain the nuclear triad — it now comprises 6.4% of the defense budget — but noted it's still drastically lower than the 17% of the budget it encompassed in 1962.

"That doesn't mean it's still not a lot of money," said King. "I refer to it as the pig in the budget python. It's a very large expenditure that we're going to have to cover over a few years."

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After Ukraine invasion, is U.S. deterrence strategy already outdated?

By STEPHEN LOSEY

Alexei Alexandrov/AP

A woman walks past tanks of Donetsk People's Republic militia in Mariupol, Ukraine, on May 4, 2022. The Russian invasion of Ukraine, despite U.S. efforts to dissuade Russian President Vladimir Putin from launching the war, has some questioning whether the administration's strategy of integrated deterrence had failed.

WASHINGTON — Deputy Defense Secretary Kathleen Hicks May 6 defended the Biden administration's strategy of integrated deterrence against adversaries such as Russia, despite its invasion of Ukraine.

Russia has not yet felt the full effect of the economic sanctions much of the world imposed shortly after the country launched its invasion in February, Hicks said at a Ronald Reagan Institute event discussing the National Defense Strategy. And Russia has not struck any NATO territory, she said as an example of how deterrence has worked in the Ukraine crisis.

Integrated deterrence is a cornerstone of the National Defense Strategy the administration sent to Congress in March, and seeks to dissuade adversaries from acting aggressively by using a wide range of tools available to the government. Those tools include joint military forces in all domains, a nuclear deterrent, sanctions, diplomacy, and a network of alliances and partnerships worldwide.

The classified strategy has not been shared with the public, except for a two-page summary the Pentagon released outlining its broad strokes.

But though the U.S. and allies loudly and repeatedly warned Russian President Vladimir Putin not to invade Ukraine, those warnings did not dissuade him, Reagan Institute director Roger Zakheim pointed out to Hicks.

"It's reasonable to say that deterrence didn't work," Zakheim said. "We anticipated this. … We tried to put the tools of deterrence into place. [But] we didn't deter him."

Hicks responded that the Defense Department focuses on "combat credibility" to provide a deterrent. The United States does not have the same security commitments with Ukraine it does with NATO allies, she said. The U.S. also has not historically provided to Ukraine the kind of military assistance it provides to Taiwan.

"What we focus on in the Department of Defense is bringing that combat credibility to the fore," Hicks said. "Note that Russians have not attacked NATO territory. And we continue to stand by that deterrent as quite effective."

Hicks also said the massive economic sanctions imposed on Russia will prove to be "tremendously powerful."

"They clearly were not convincing to Russia in advance," Hicks said. "It's not clear anything would have been convincing to Russia in advance; I'm not going to try to get into the head of [Russian President] Vladimir Putin. But what I can tell you is they will be devastated."

Russia is facing a massive drain in talent as businesses exit and highly skilled people depart the nation, Hicks said. She hopes those talented people will come to the United States or other Western nations.

Hicks also said the National Security Strategy will likely come "in the coming months."

In a roundtable discussion after Hicks' appearance, Rep. Elaine Luria, D-Va., said the U.S. needs to shift its deterrence focus to trying to deny adversaries from acting in the first place, which she referred to as "deterrence by denial," and away from the "deterrence by punishment" strategy she feels describes integrated deterrence.

And to be able to field an effective "deterrence by denial" strategy, Luria said, the U.S. needs to have the forces and presence overseas to make it credible.

The U.S. may not be building a force that can do that over the next couple of years, she added. Luria raised particular concerns about military plans to divest existing assets to free up resources to modernize.

"Rather than being creative, investing in the readiness and maintaining those platforms that we have now, that we can continue to use during that [near-term] window, we're just saying 'divest to invest,'" Luria said. "It's obsolete, we need to move on to new concepts that don't actually equal new weapon systems that exist.

"AI, quantum computing — certainly those are part of the mix in the future," Luria continued. "But we have to focus on the near term."

Michèle Flournoy, who served as undersecretary of defense for policy in the

Obama administration, said deterring China from invading Taiwan — an attack that would involve large numbers of quickly attacking Chinese ships and aircraft — could require more than just counting how many traditional platforms such as destroyers are in the U.S. arsenal. It may require different concepts of operations, she said, such as arming standoff Air Force planes with Long-Range Anti-Ship Missiles.

The U.S. also needs to address munitions shortfalls now being exacerbated by the need to provide assistance to Ukraine, she said.

"Services constantly trade off munitions to pay for shiny objects," Flournoy said. "We've got to focus here."

Luria said the nation needs to reassess the policy of "strategic ambiguity" that has for years governed the United States' commitment to helping Taiwan defend itself if China were to invade. Luria said the U.S. should shift to "strategic clarity" and explicitly say it will come to Taiwan's defense in an invasion.

Mac Thornberry, former chairman of the House Armed Services Committee, suggested Putin may have been considering issues besides raw military strength when he decided to invade Ukraine.

"You can argue that perhaps Putin … was [also] looking at our divisions domestically, and a whole variety of factors, and thought maybe this is a time when he could get away with it," Thornberry said. "Remember, deterrence is in the mind of the adversary."

A prolonged ceasefire may be the likely endgame in Ukraine

By HANS BINNENDIJK and ALEXANDER VERSHBOW

War aims are shifting on both sides of Russia's barbaric war against Ukraine, reflecting shifting realities on the battlefield. Unless one side can dominate the ongoing battle for the Donbas, those shifts portend a protracted war. With little prospect of a negotiated final settlement, the endgame may be a prolonged ceasefire or armistice rather than a durable end to the war. This might include a new military line of contact wherever the fighting stops, with final territorial settlements postponed until later. However this war ends, new forms of Western support will be needed to prevent peace from unraveling and to ensure that Ukraine retains the military capacity to defend itself if Russia goes back on the offensive.

Ukrainian success on the battlefield has enabled it to avoid defeat and focus energy on regaining lost sovereign territory. President Volodymyr Zelenskyy has defined victory as driving Russian troops back to their positions before the start of the war on Feb. 24, including the Line of Contact established by the unimplemented Minsk agreements. Refusing to legitimize Russian territorial conquests is a goal that the West should support, recognizing that it will require further major Russian battlefield defeats.

American goals have also evolved in step with Ukraine's remarkable battlefield successes. While U.S. officials assert that bringing down the Putin regime is not the objective, they seek to weaken Russia's military capability so that Putin is less able to attack Ukraine or others again. The administration has been less clear in defining what would constitute Ukrainian victory, but Washington is rightly unwilling to dictate possible peace terms to Zelenskyy.

Ronaldo Schemidt/AFP via Getty Images

A burnt van is pictured on the empty way to Popasna, Ukraine's Donbas region, on April 14, 2022, amid the Russian invasion of Ukraine.

The flow of American weapons and training has increased consistent with these evolved American goals to include combat helicopters, armored vehicles, towed artillery, counter-battery radar, advanced drones, anti-ship missiles and air defense systems. Some $4 billion worth of U.S. weapons have been transferred to Ukraine thus far with another $11 billion authorized in the emerging Ukraine Lend-Lease legislation. The U.S. is moving beyond the provision of Soviet legacy systems to include more advanced U.S. and allied technologies, supported by the necessary training and battlefield intelligence. That assistance is making a vital difference on the battlefield and could help further reverse Russian gains.

America's allies have more diverse goals. Some favor sustaining the flow of arms needed to achieve a clear Ukrainian victory, while others want an early ceasefire to end the killing and encourage a negotiated settlement, even if it leaves more occupied territory in Russian hands.

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But thus far they remain fairly united, willing to supply weapons similar to those provided by the U.S. and moving, albeit slowly, toward full sanctions on Russian oil and gas purchases.

Russian losses on the battlefield have forced it to reduce its immediate war aims correspondingly from an original decapitation strategy designed to topple the Zelenskyy government. Having failed to take Kyiv, Moscow's short-term goal now appears to be controlling Luhansk, Donetsk, the land bridge to Crimea along the Sea of Azov coast, and annexing the Kherson region to the west of Crimea. That is much more territory than Russia occupied before February 24. And Russia's long-term ambition to subjugate all of Ukraine has probably not changed.

During his Victory Day speech on May 9, President Vladimir Putin stated falsely that his troops are now fighting Nazis on historic Russian lands, but he did not declare war or call for a nation-wide mobilization as some had expected. He appeared more defensive than usual. He knows his military campaign is making only incremental gains and could soon grind to a halt. But if he is true to his rhetoric, Putin will fight hard to avoid further retreat. That might include threats to use of unconventional weapons in Ukraine.

Shifting war aims and the prospect of protracted war could lead to a potential dilemma for Ukraine. If Russian troops can hold off the Ukrainian counter-offensive and declare a ceasefire in place, Putin could still unfortunately claim some degree of victory hoping that war-weary U.S. allies will pressure Washington and Kyiv to accede. Calling for a ceasefire to halt the killing, as several Western leaders have done, is different from agreeing to what amounts to a permanent armistice and a new frozen conflict.

Should Putin seek to freeze the conflict permanently in this way, Kyiv would need to decide how to respond. The decision would be primarily theirs. Kyiv may view a prolonged ceasefire as a defeat and continue the fight. But Russian forces, though depleted, may remain too strong and the potential costs for an exhausted Ukraine too high. So a prolonged ceasefire with a new line of contact that defers a final decision on the fate of the remaining occupied territory might be all Ukraine can achieve.

NATO nations will need to support Kyiv whichever decision it makes. It is their country and they are doing the fighting. Given diverse views in Europe, strong

"Russian losses on the battlefield have forced it to reduce its immediate war aims correspondingly from an original decapitation strategy designed to topple the Zelenskyy government."

American leadership will be needed to maintain cohesion in the alliance.

However this war ends, the West will need to provide Ukraine with a package of at least five postwar security, diplomatic, and financial measures designed to reconstruct Ukraine and prevent Russia from again breaching a deal and renewing its attacks.

First, Ukraine's future security will need to be guaranteed more successfully than in the past. NATO membership will be difficult to achieve immediately given opposition from several members, but after Russia's serial violations of Ukrainian sovereignty, NATO's door should remain open. Under the right circumstances Ukrainian membership could strengthen the alliance's military posture and bolster stability in Central and Eastern Europe. If Ukraine is admitted to the European Union, it would gain additional guarantees from the collective defense provisions of the EU Lisbon Treaty. Individual nations also might provide various levels of bilateral security assurances, and the United States will need to decide how firm a commitment it wishes to make.

At a minimum, a continued, high level of weapons transfers, training and intelligence sharing will be needed to fortify the Ukrainian military and deter further Russian aggression over the long term.

Second, a massive new postwar Marshall Plan will be needed to reconstruct Ukraine's destroyed infrastructure, using as much as possible confiscated Russian assets as reparations. The bill to repair Ukraine's destroyed infrastructure is estimated at about $100 billion, with another $500 billion in related economic damage. And Europe will need to ease the return of the six million refugees that fled to other countries in the fighting, as well as another six million who are internally displaced.

Next, Ukraine's long-term economic prosperity will need to be secured. Its GDP has collapsed by 35% or more. Massive short-term economic assistance will also be needed to keep Ukraine's economy afloat. Whatever barriers there were to European Union membership should quickly be lifted in deference to Kyiv's heroic stand in defense of European values. And the naval imbalance in the Black Sea must be redressed to ensure that Kyiv has guaranteed access to the sea through its remaining ports and that NATO is able to maintain a persistent deterrent presence.

Fourth, the West must unite in a diplomatic effort to deny recognition of any Russian occupied territory, including the imminent annexation of the Kherson region. Another United Nations General Assembly resolution will be needed rejecting Russian claims to occupied territory and condemning all attempts at annexing Ukrainian lands. All sanctions, especially on oil and gas, need to remain in place until Moscow returns at a minimum all territory taken since Feb. 24 so that Putin and other revisionist powers see that violating international law does not pay.

And finally, Russian war crimes must be prosecuted vigorously. The United States has asked the International Criminal Court to prosecute Russian leaders and Washington supports a separate United Nations efforts to investigate. All America's allies should join this chorus.

Having underestimated the Ukrainians' determination to defend their freedom, the United States and its allies should work for a Ukrainian victory as long as Kyiv remains ready to continue the fight. When the war ends, these five measures will provide Ukraine with the ability to thrive in a post-war environment.

Hans Binnendijk is a Distinguished Fellow at the Atlantic Council; he served previously as NSC Special Assistant to the President for Defense Policy; as Acting Director of State's Policy Planning Staff, and as Director of the Institute for National Strategic Studies.

Alexander Vershbow is a Distinguished Fellow at the Atlantic Council; a career US diplomat, he served as NATO Deputy Secretary General, Assistant Secretary of Defense for International Security Affairs, and Ambassador to NATO, Russia, and the Republic of Korea

DefenseNews

Winning 21st century wars requires directed-energy capabilities

By COL. MARK GUNZINGER (ret)

Courtesy of Lockheed Martin

Artist's rendering of the HELIOS system.

China and Russia have developed unprecedented arsenals of precision-guided missiles and UAVs designed to overwhelm our military's defenses, just as Russia is now doing in Ukraine. The sheer scale of these threats means that traditional kinetic systems like Patriot missile batteries will not have the capacity to defend U.S. forces operating in harm's way. Integrating non-kinetic, directed-energy systems like high-energy lasers with kinetic defenses will be essential to defeating these threats.

DE systems are already capable against UAVs, artillery and rockets, and they are reaching power levels needed to counter cruise missiles. Delays in creating and fully funding DE acquisition programs risks the U.S. military falling behind in another critical technology, leaving it without a game-changing means to defeat attacks that prevent them from generating decisive combat power in the Indo-Pacific region and Europe.

The Air Force Research Laboratory's DEKE DEUCE war game demonstrated how DE systems combined with kinetic defenses will be key to defending U.S. air bases from missile attacks. Likewise, Chief of Naval Operations Adm. Mike Gilday has defined DE as nothing less than the Navy's future. This year, the Navy will fit an Arleigh Burke destroyer with the High Energy Laser with Integrated Optical-dazzler and Surveillance, or HELIOS, alongside its Aegis missile defense system. HELIOS will increase the destroyer's capacity to counter UAVs, fast-attack craft and other globally proliferated threats.

While a good start, DE defenses must become a wider-spread reality. Our military's ability to defend the homeland by defeating aggression overseas require them to operate within range of overwhelming numbers of armed UAVs and precision-guided missiles. Are they ready for this? No, but they can be if the services integrate DE systems throughout their forces. The benefits are too significant to ignore.

First, since DE weapons like lasers are powered by electricity, they do not require large, complex supply chains like those needed to reload missile batteries. This can greatly increase our military's capacity to counter threats and free it from logistical tails that limit their ability to generate combat power forward, especially units that must operate within range of an enemy's missiles. These tails include large, sophisticated facilities to maintain stores of surface-to-air missiles and other kinetic weapons. Since electrically powered DE systems do not need similar facilities, incorporating them into the force would reduce our military's footprint that can be targeted by an enemy. Moreover, pairing DE with a mobile energy source, such as the one envisioned by the Army's Project Pele, would make them near-infinitely renewable resources that make our forces far more resilient.

Second, DE weapons will alter the cost curve since they can counter incoming air and missile threats at far less cost than kinetic options. Defeating threats for the few dollars — literally — that it takes to generate electricity to power a laser "shot" compares well with kinetic interceptors that cost millions each. DE is an especially affordable means to defeat low-cost threats like small UAVs. In 2020, the Department of Defense requested $11.3 billion for tactical missiles; any reduction in missile procurement could produce significant savings.

Third, workable DE solutions will reduce personnel costs since fewer people are needed to operate and sustain them compared to kinetic weapons. The DoD's cost to recruit, train and maintain highly qualified military personnel currently knows only one vector: up. Developing a more lethal force with a smaller personnel footprint will help free resources to modernize the DoD's aging weapon systems.

DE efforts underway within the DoD include the Army's Mobile Short Range Air Defense system, or M-SHORAD, that integrates a laser and sensors onto a Stryker vehicle. While a good effort, the Army should integrate M-SHORAD with its air and missile defense battle command system. Plus, while the 50-kilowatt-class lasers scheduled for Strykers may be enough to defeat small drones, dramatically higher-power lasers are needed for cruise missiles and other higher-end threats. This is critical for Army forces defending forward bases that are vulnerable to China's voluminous missile salvos. Secretary of the Air Force Frank Kendall has said addressing missile attacks on the

DefenseNews

service's Indo-Pacific air bases is a top priority.

These higher-power lasers are well within reach. There are now essentially two laser technologies competing to transition to weapon systems.

One approach combines multiple small-fiber laser amplifiers — similar in appearance to strands of fiber-optic cables — to create a single laser beam.

A second design takes a "distributed gain" approach that simultaneously pumps light through a large number of sheets of "laser gain" material to create a laser beam. The distributed gain approach promises to scale laser defenses to the higher powers needed to defeat a broader array of threats, including cruise missiles.Using either laser system with the Army's Integrated Air and Missile Defense Battle Command System to shoot down incoming missiles — that's 21st century warfare. No projectiles. No resupply.

The DoD and Congress should invest in DE capabilities while maximizing already proven systems, just as they are doing with hypersonic weapon technologies. However, unlike hypersonic weapons, the DoD can steal a march on China by being the first to widely field game-changing DE systems. Military history reminds us of the dire consequences of allowing our enemies to beat us to the punch — and those consequences could be existential in a peer conflict.

Retired U.S. Air Force Col. Mark Gunzinger is the director for future concepts and capability assessments at the Mitchell Institute. He previously served as deputy assistant secretary of defense for forces transformation and resources within the policy office of the Office of the Secretary of Defense.

US Navy memo warns of cyber risks amid global tensions

By COLIN DEMAREST

WASHINGTON — The deputy chief of naval operations for information warfare recently warned sailors and other military officials they are marks for hacking attempts, especially at a time of international hostilities.

"Cyberattacks against businesses and U.S. infrastructure are increasing in frequency and complexity," Navy Vice Adm. Jeffrey Trussler said in an unclassified memo, dated February. "DoD and federal law enforcement report adversary interest in our remote work infrastructure. This means that you are a target — for your access and your information."

Hackers have exploited mistakes on Navy and private, at-home networks by stealing or guessing weak passwords and other credentials, furtively installing malware, and posing as service members or veterans to pry information out of people, according to the message.

"With heightened tensions throughout the world, ensure your team understands how the actions of a single user can impact our global force," said Trussler.

The memo arrived amid an avalanche of cyberattacks in Ukraine and as Russia again pressed its western neighbor. Distributed denial of service attacks, which rely on overwhelming traffic to render something useless, paralyzed Ukrainian websites throughout January and February.

The White House National Security Council has blamed some of the attacks on the GRU, a Russian intelligence agency. Moscow has denied responsibility; the Russian Embassy in the U.S. on Feb. 18 said Russia "has never conducted and does not conduct any 'malicious' operations in cyberspace."

Artist's rendering of the HELIOS system.

Vice Adm. Jeffrey Trussler, deputy chief of naval operations for info warfare, speaks in the "Cyber: Today's fight, Tomorrow's Capabilities" panel at the Sea-Air-Space 2021 exposition.

Mass Communication Specialist 2nd Class Almagissel Schuring/U.S. Navy

While Ukraine was not specifically mentioned in the February memo, a long-term strategy for competition with Russia and China was.

Trussler has stated the Navy is investing in cyber, and last year said "cyber protection and operations" must be "culturally embedded in everything we do, and that will take a bit of education."

"I think we have to get better at partnerships and putting creative teams together to test systems in order to tell you what's safe and what's vulnerable, using people who are capable of thinking like the adversary," he said at the Sea-Air-Space 2021 conference, according to a Navy narrative.

Mind Control Through Internet (Part 1)

Psyche Behind the Internet, Information Superhighways

Devsena Mishra

"War is not an act of the will aimed at the inanimate matter, as it is in the mechanical arts.... Rather, it is an act of the will aimed at a living entity that reacts," Prussian general and military theorist Carl Von Clausewitz (1780-1831).

Devsena Mishra is a technology and startup promoter

A US tech tycoon bids ($44 billion) for a social networking platform, with a claim to protect 'free speech' and the function of 'democracy' and millions became his followers overnight, including many countries like India, ignorant of the fact that his idea of 'democracy' was more aligned with the 'Referendum' mindset of separatist and pro-Khalistani elements.

Musk has some other interesting concerns and creative solutions for the future of humanity, too (which rarely make headlines in India), such as helping humans to become 'multi-planet species' and implanting a 'fit bit' in their skulls to prepare them to fight against their 'extinction' from the rise of artificial intelligence (AI).

In April 2021, Musk's Neuralink Corporation released a video in which a monkey was playing the video game MindPong via the Bluetooth-enabled chips inserted into his brain. The video was shared widely and propagated as a landmark step toward merging human consciousness with AI. By December 2021, Musk announced his plans to start testing his chip with the humans too. As of Feb 2022, there were reports that those tests killed 15 out of 23 monkeys, including the one that played the video game, due to 'extreme suffering.'

Musk, the savior of humanity, also used his Starlink Internet as a weapon against Russian forces in the Ukraine War, and when told to be held accountable for his actions as an "adult" by the Russian Space chief, he immediately started playing "If I die under mysterious

"Cognitive Warfare is no more some covert or indirect operation, where Maskirovka has any role to play. It is a live stream stunt of 280 characters or 60 seconds shorts that hit directly and precisely to its targets."

circumstances," kind of tweets, which stormed the social platforms.

Such is the character of 21st-Century Cognitive Warfare! It is no more some covert or indirect operation, where Maskirovka has any role to play. It is a live stream stunt of 280 characters or 60 seconds shorts that hit directly and precisely to its targets and trigger their dopamine release, in other words, makes them 'feel good about being targeted!

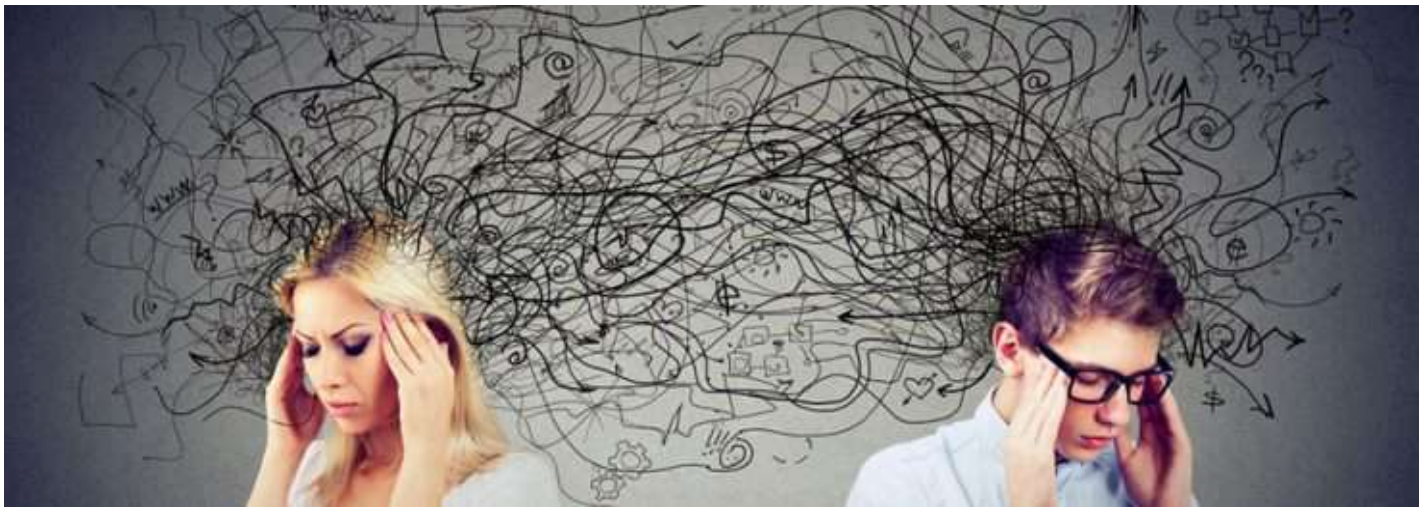
Background to psyche behind the 'Internet'

Roscosmos (Space Corporation of Russia) chief Dmitry Rogozin stated that Elon Musk's Starlink terminals "were delivered to the militants of the Nazi Azov Battalion and the Ukrainian Marines in Mariupol by military helicopters," and Musk is, thus, involved in "supplying the fascist forces in Ukraine with military communication equipment." The use of Starlink's Internet terminals as a weapon in the Ukraine War and a recent verbal exchange between Musk and Rogozin refreshed the memories of the Internet's background in people's minds.

On 4 October 1957, Soviet Union inaugurated the 'Space Age' with the launch of Sputnik 1 - the first artificial satellite of the world. There are enough documents that suggest that the launch of Sputnik created a big political and moral chaos in the USA and the American society's reaction (military, government, and public combined) to the Sputnik launch is considered an important juncture in America's history.

Circling the globe every one hour and 35 minutes, Sputnik was traveling on the north to the south orbital path that brought it over the USA, seven times every twenty-four hours, and its steady "beep beep" sound thrilled and terrified the listeners. The popular term 'Sputnik Moment' signifies exactly that. It is said that in many senses, Sputnik hysteria sparked the creation of the Internet.

On 7 February 1958, five months after the Sputnik crisis, President Dwight D. Eisenhower created the Advanced Research Projects Agency (ARPA). ARPA was established to catch up with the Soviets in the space race and to lead in three key areas of research: Space



technology, ballistic missile defence (BMD), and solid propellants, but very soon (by the early 1960s) it started venturing into the new research areas, including command and control.

There is no doubt that it was the urgency of war (both limited and nuclear) that led ARPA to develop a technology that Rogozin aptly referred to as 'military communication systems,' but when we trace the history of the Internet and its different stages of development, from Joseph Carl Robnett Licklider's "Intergalactic Network" memo in 1963 to Al Gore's "Information Superhighways" speech in 1994, the first question that comes to mind is what motivated the Pentagon to hire experimental psychologists like Licklider to develop the technology?

There are several historical documents like Charles Bray's paper "Toward a Technology of Human Behavior for Defence Use" published in 1962 and Ellen Herman's book "The Romance of American Psychology" (1995) that suggest that throughout the Cold War phase, exploring the 'Psychology' and human behavior aspects, was one of the key interest areas of the US military experts. Highlighting some numbers in her book, Ellen writes that "Between 1940 and 1970, the number of psychologists and psychiatrists climbed astronomically," and "membership in American Psychological Association grew by more than 1,100 per cent, from 2,739 in 1940 to 30,839 in 1970." She noted that "psychological experts' rise to power was due initially to the benefits of war, World War at first and then Cold War" and "military imperatives during World War II, provided psychological experts with their first encounter with the policymakers."

It was during this period and in this background, that the idea of the Internet was developed and Licklider and other experimental psychologist professionals

"Experimental psychologist professionals contributed to [Internet] design, not to promote the ideas of liberty, democracy, equality, one world, innovation, and freedom of speech kind of fancy ideas but for the objectives of the 'War' and to win the 'battles of the mind.'"

contributed to its design, not to promote the ideas of liberty, democracy, equality, one world, innovation, and freedom of speech kind of fancy ideas but for the objectives of the 'War' and to win the 'battles of the mind.' Their focus was to provide solutions to loosely defined military problems from the broadest possible perspective. That generation was tasked with waging the psychological warfare, 'man-machine' engineering problems, experimenting with the 'sensation and perception' aspects and exploring the mysteries of human motivation, attitudes, and behavior.

So, this idea that wars could be won by advancing weapon technologies and killing one's opponents was repeatedly identified as naïve and incorrect!

While on one hand, these sociologists, anthropologists, political scientists, and psychologists of the Pentagon tried harder to be seen as 'scientific,' as possible, on the other hand, they reached the conclusion that there could be no higher military priority than the "control of human subjectivity."

It is a bit hard to imagine that if these experts from the Pentagon would have pitched their products/ ideas directly to the third countries, with a promise to help in their economic progress, children's education, knowledge/ information sharing, and to make their democracies strong, given the track record of such claims, which country on earth would have accepted that deal!

So for Licklider's "intergalactic network" vision to be fulfilled, the private sector's financial support, a pinch of humanitarian approach, some democratic jargon, and the narration industry's backing were needed, and from here the idea of "Information Superhighways" was born.

Information Superhighways

In his famous (March 21, 1994) "Information Superhighways" speech, Al Gore, the 45th Vice President of the USA said: "This GII (Global Information Infrastructure) will circle the globe with information superhighways on which all people can travel. These highways or, more accurately, networks of distributed intelligence will allow us to share information, to connect, and to communicate as a global community." It was Al Gore who promoted the legislation that funded an expansion of ARPANET and lobbied aggressively in favor of privatization and globalization of the Internet. Gore is currently a member of Apple's board of directors and a senior partner at venture capitalist firm Kleiner Perkins (the firm which has been an early investor in more than 900 high tech/social media companies in the US, including Amazon, Google, and Twitter).

In April 1994, Netscape Communications Corporation was born, and Microsoft created a web browser for Windows 95. In the same year, Amazon.com was launched as an online

Top Social Platforms by Monthly Active Users

Rank	Platform name	Parent company	Country	Monthly active
#1	Facebook	Meta	U.S.	2,910
#2	YouTube	Alphabet	U.S.	2,291
#3	WhatsApp	Meta	U.S.	2,000
#4	Messenger	Meta	U.S.	1,300
#5	Instagram	Meta	U.S.	1,287
#6	WeChat	Tencent	China	1,225
#7	Kuaishou	Kuaishou	China	1,000
#8	TikTok	Bytedance	China	1,000
#9	Telegram	Telegram	UAE	600
#10	Qzone	Tencent	China	600

marketplace for books. In 1995, Yahoo was incorporated and a search engine function Yahoo search was introduced. Then came the era of Netflix (1997), Google (1998), Facebook (2004), YouTube (2005), and Twitter (2006).

Internet witnessed a phenomenal expansion in its new avatar, from only 16 million users in 1995 to 5 billion users (63% of the world population) in 2022. It is interesting that in their earlier pitch for Information Superhighways, Al Gore and Clinton both projected the idea as an educational tool, virtual library of the future, knowledge/ information exchange utility and virtual research facility, etc., designed to harvest local and global knowledge economy and innovation culture. But we have seen in a very short period of time, that things shifted to dating, entertainment, shopping, live streaming, social experiments, activism, psychological, and political campaigns!

"The fate of information in the typically American world is to become something which can be bought or sold." mathematician Norbert Wiener, 'The Human Use of Human Beings (1950).

Convenience of driving "Mass Surveillance"

In 2013, an American intelligence contractor turned whistleblower Edward Snowden revealed the secret wide-ranging information-gathering programmes conducted by National Security Agency (U.S. intelligence agency), and the stories of those leaks were published in The Guardian and Washington Post newspapers. In the article "NSA Prism program taps in to user data of Apple, Google and others," published in The Guardian, (7 June 2013), it was highlighted how the NSA has obtained "direct access to the systems of Google, Facebook, Apple, and other US internet giants." It revealed that "some of the world's largest Internet brands are claimed to be part of the information-sharing programme (code name PRISM) since its introduction in 2007." The article says that Microsoft was the first, with a collection beginning in December 2007. It was followed by Yahoo in 2008; Google, Facebook, and PalTalk in 2009; YouTube in 2010; Skype and AOL in 2011; and, finally, Apple, which joined the programme in 2012. And "collectively, the companies cover the vast majority of online email, search, video and communications networks."

"LifeLog was a bit ahead of its time, it was tasked to perform everything that smartphones, Facebook, Google, Amazon, Twitter, YouTube, WhatsApp, and other apps do these days!"

In 2014, while interacting with Edward Snowden virtually on a Russian TV show, Russian President Vladimir Putin said that Russia is not carrying out mass surveillance programmes of the kind Snowden exposed in the USA, and "we don't have as much money as they do in the US," he added sarcastically. A few days later, while speaking at a media forum in St. Petersburg Putin said that the Internet was originally created as a 'CIA project' and "it is still developing as such."

LifeLog Project - DARPA

In 1972, ARPA gained the 'Defense' prefix and was renamed DARPA, but in 1993 it reverted to its original name ARPA (as this acronym suits more to commercial applications), and finally three years later, in 1996, again renamed as 'DARPA,' to re-emphasize agency's original focus. In 2002, DARPA launched the Personalized Assistant that Learns (PAL) programme, a cognitive system to "make military decision-making more efficient and more effective at multiple levels of command." (This research led to the launch of Siri Inc in 2007, which, three years later, was acquired by the Apple).

In mid-2003 something more interesting happened. DARPA launched an ambitious project called LifeLog, which officially was aimed at recording essentially all of a person's movements and conversations and everything that they listened to, watched, read and bought. The idea was to create a permanent, searchable, electronic diary of the entire lives, of the entire population of the planet. LifeLog was a bit ahead of its time, it was tasked to perform everything that smartphones, Facebook, Google, Amazon, Twitter, YouTube, WhatsApp, and other apps do these days! The idea was to trace the 'threads' of an individual's life in terms of events/ states/ relationships, deducing behavioral patterns from monitoring people's daily activities, and to gather in a single place just about everything an individual says, sees, or does.

It cannot be a mere coincidence but it is said that the exact date (3 February 2004) on which Facebook was launched, Pentagon revoked its LifeLog project!

The real log of DARPA's fascinating research is a bit long! But the question is – after developing dozens of interesting commercial tools, where does DARPA is focusing its energy these days?

'AI-Next' Campaign

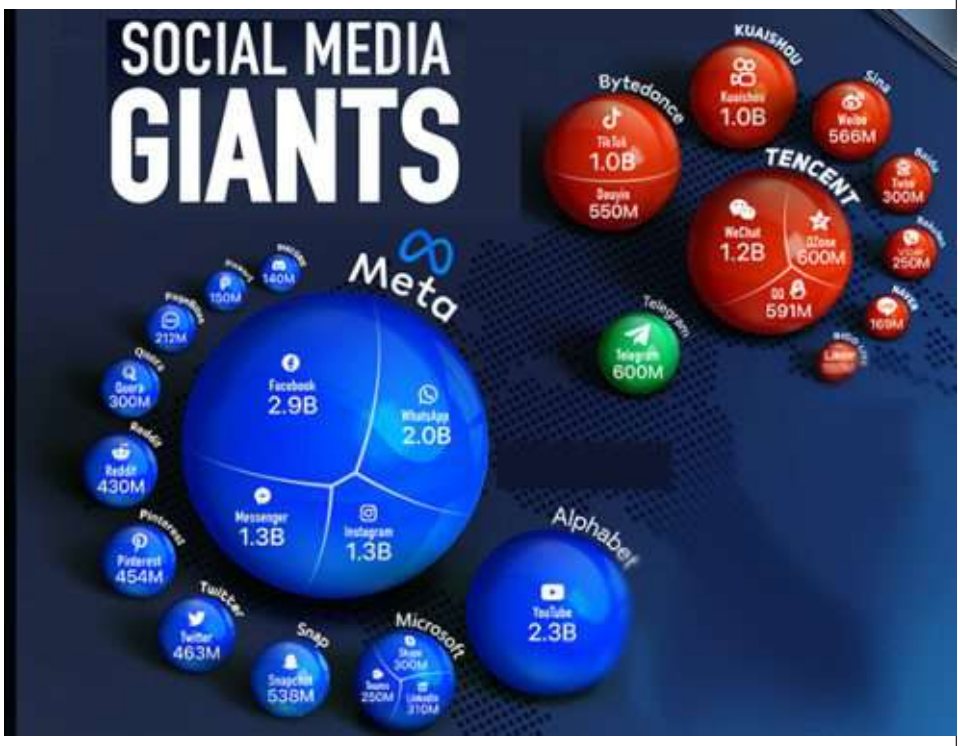
In September 2018, DARPA launched a multi-year investment of more than $2 billion (in new and existing programmes) called the "AI Next" campaign. According to its official statement: "AI Next builds on DARPA's five decades of AI technology creation to define and to shape the future, always with the Department's hardest problems in mind." DARPA is investing in the third wave of AI to develop machines that "understand and reason in context." In Feb-March 2019, the agency started exploring ways to improve how AI systems like Siri/ Alexa teach themselves language and the Competency-Aware Machine Learning programme too. In a nutshell, the

approach is quite simple, as they often say - "the best way to avoid surprises is to create surprises."

Stunts on 'Information Superhighways'

"War is never merely about victory on the battlefield or the simple conquest of land; it is about the pursuit of a policy that cannot be realized in any other way than through force." Carl von Clausewitz (1780-1831)

There are three important elements of the idea of "Information Superhighways": Investment, Infrastructure, and Public Participation. While the first two are in absolute control of their makers, it is the third one, which belongs to us, the rest of the world that is traveling on these highways. Without 'Public Participation,' a highway is of no use, be it physical or virtual and it is this third and most crucial element of Information Superhighways, which is a matter of concern for democracies around the world, too.



Misinformation/Disinformation

Misinformation/ Disinformation is one of the most popular global concerns of our time. From Musk to Obama to Kissinger to white-haired architects of Information Superhighways, a flood of 'free speech absolutists' and guardians of 'democracy' is emerging in the Western world and it seems that almost every important person on earth is nowadays issuing a 'wake-up call' for democracy/ humanity and fighting the battle for a 'safer' Internet!

"People are dying because of misinformation," said former US president Barack Obama in a recent speech. While the EU has passed Digital Services/ Digital Market Acts, the USA is forming the "Disinformation Governance Board," too, but despite such enormous human efforts/ concerns the information superhighway, on the contrary, is becoming more and more chaotic, unsafe, and disordered with time.

With a similar kind of urgency the world was debating terrorism and counter-terrorism, until a few years ago, it is now discussing the issues of Misinformation and Disinformation. It is important to note that global forums like the UN are yet to develop a common consensus on the definition of 'Terrorism,' so devising an effective strategy is a far cry.

"You cannot defeat the enemy you can't define," often says national security adviser (NSA) Ajit Doval. Similar to the issue of terrorism, what is missing in all these global deliberations/ campaigns against Misinformation/ Disinformation is the affirmation of the basic fact that on the matters related to social, economical, religious, regional, and national consequences, spreading misinformation/ disinformation is a crime, cause of crime or a motive of the crime, and it needs to be tackled that way.

Misinformation is not a simple 'spam,' content that can be laughed at or ignored. In the case of India, we have seen how under the broader flag of 'Misinformation/ Disinformation' there are dedicated channels/ actors who promote anti-national/ anti-system and anti-establishment sentiments, and create social divide in the name of caste, community, regionalism, language identities, etc. We have seen how from abrogation of Article 370 Act to Citizenship Amendment Act (CAA) to Farms Laws, and even for those future bills/ moves that are yet to be drafted by the government like National Register of Citizens (NRC), a mass level damage to people and property was done, across the country, within a matter of few minutes of misinformation spread.

Last year, the number of imposed Internet shutdowns crossed over 106 in India. A few days back in May 2022, the Ministry of Information and Broadcasting (MIB) banned some 16 YouTube channels (under the IT Rules) for spreading misinformation on India's national security and foreign relations matters, stirring communal discord and disturbing the law and order situation in the country. In April, MIB banned over 22 YouTube channels, and a number of similar actions were taken in the past. These channels/social media accounts usually hold millions of subscriptions/ followers and, by the time the ban is initiated, the damage is already done. A ban cannot automatically trigger a 'delete all' command on millions of devices where such content is already copied/downloaded. Misinformation/ disinformation spread on social media sometimes transitions to much larger audiences when picked up by traditional media - print or electronic too!

A new study by MIT scholars on Misinformation, published in 2018, found that on social media "falsehood diffuses significantly farther, faster, deeper, and more broadly than the truth, in all categories of information, and in many cases by an order of magnitude." Many such types of research are being conducted on the issues of Misinformation and Disinformation, and they often talk about things like novelty hypothesis, transmission chain, Machiavellian intelligence/ Social Brain, laws of human nature, etc., but interestingly, none of these researches ever attempt to reach the root of the problem!

"Everything is very simple in war, but the simplest thing is difficult." Carl von Clausewitz (1780-1831)

If Al Gore's 'Information Superhighways' analogy was right then social media platforms/ apps can be seen as the vehicles on those highways and misinformation/ disinformation as the fuel that runs those vehicles (after all, these companies make enormous profit out of misinformation/ disinformation). But then the question comes - who is sitting on the driver's seat and who is performing stunts on the information highways?

Part 2: Counter Cognitive Warfare Strategy, in the next issue

Unmanned Aerial Systems News

An IMR Report

Hawking Defence ties up with Australian UAV Technologies

Defence tech startup Hawking Defence Services, on 19 April, said it has signed a memorandum of understanding (MoU) with Australian UAV Technologies, an unmanned aerial vehicle (UAV) and electronics company based out of New South Wales in Australia.

The two companies have partnered to establish a joint venture company which would enable technology transfer, joint research and development and licensed manufacturing of unmanned systems between these two entities.

The MoU was signed at the Austrade office in the Australian Consulate in Chennai and is one of the first such partnerships between defence industry companies since the Australia-India Free Trade Agreement came into effect.

Vijayanarayanan Rapalli, MD, Hawking Defence Services, said he has a vision of building an environment for advanced R&D of defence products through investments into critical areas such as Machine Learning, Artificial Intelligence and chip development.

Timely investments into the above-mentioned areas would enable India to become an epicentre for research thereby increasing its global share of defence exports, he added.

HAL to stat production of first Rustom-II Drones

Hindustan Aeronautics Limited (HAL) is slated to start the production of the first five Rustom-II TAPAS Drones. The flight control systems, avionics and data-linked systems for the first 5 Tapas drones are ready. Rustom-II medium-altitude long-endurance (MALE) unmanned aerial vehicle (UAV) can reach the required altitude of 28,000 ft.

In an official communication ADE also confirmed the TAPAS drones to be armed. Work on this is progressing fast.

Most of the components required for the production of the drone is expected to go to private defence agencies, HAL's role would be that of a lead integrator. The avionics, electronics, sensors, and ground control systems is likely to be manufactured by the state-owned defence sector behemoth BEL. DRDO's Defence Electronics Application Laboratory, Dehradun, is responsible for developing and integrating the data links for Rustom-II.

DRDO's Rustom-II (TAPAS) drone

Unmanned, Rustom-II has an overall length of 9.5 m and a wingspan of 20.6 m. It is powered by two Saturn 36T turboprop engines, each rated at 74.57 kW (100 hp). Also known as TAPAS-BH-201 (Tactical Advanced Platform for Aerial Surveillance-Beyond Horizon-201), Rustom-II weighs 1,800 kg and has a cruising speed of 135 kt.

It is designed to carry payloads of up to 350 kg. The mission payloads are reportedly Israel-sourced and include electro-optic (EO) and infrared (IR) sensors, synthetic aperture radar (SAR) and maritime patrol radars, communications relay, and electronic intelligence (ELINT) and communications intelligence (COMINT) packages.

In November 2021 the DRDO demonstrated Rustom-II's ability to take off and land autonomously as well as its ability to utilise India's satellite-based navigation system – GPS-aided GEO augmented navigation (GAGAN) – that has been jointly built by the Indian Space Research Organisation (ISRO) and Airports Authority of India (AAI).

Lohia Aerospace to make aerostructures for Drones

Kanpur-based Lohia Aerospace Systems has emerged as India's first manufacturer of aerostructures - including wings and fuselage - for loitering munitions, which are in high demand globally following the seminal role played by such weaponized drones in the ongoing Ukraine War and recent conflicts in Armenia-Azerbaijan, West Asia and Africa.

The company will supply aerostructures and launch tubes for a range of loitering munitions - also known as suicide drones – with cross-sections ranging from 90 cm to 3 metres and more following the demand surge.

Market estimates put the value of such

aerostructures between $5,000 to $10,000 per unit. Lohia Aerospace is said to have already hit a turnover of about Rs 100 Crore ($13 Million) in this segment alone.

Market sources also suggest that Lohia Aerospace could be addressing loitering munitions aerostructure requirements for multiple Israeli OEMs such as IAI, Elbit and Uvision.

The Kanpur company entered the aerospace composite business by acquiring the Israeli entity Light & Strong in 2019, and is known to provide aerostructure sections for UAVs/drones made by leading Israeli OEMs like IAI, Blue Bird and Uvision, leveraging Light & Strong's client base and technological capability. Israel is a lead player in the drone category in the Indian market. The Indian armed forces operate fleets of Searcher and Heron drones and Harop and Harpy loitering munitions.

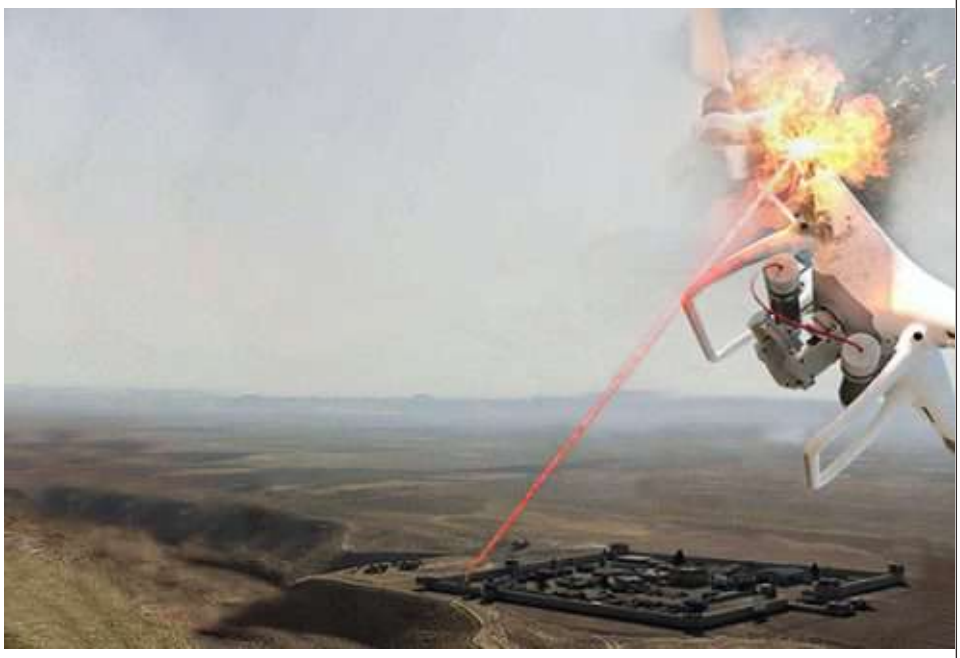
While networking with global supply chains, Lohia is also poised to deliver aerostructures for drones the Indian armed forces may buy or refurbish in the near future.

DRDO issues RFI fo drones to test DEW

DRDO's Centre for High Energy Systems and Sciences (CHESS) issued an RFI, in April, for the operation and field maintenance & repair for a fixed wing UAV to be used for the demonstration of Directed Energy Weapon (DEW) systems.

Fixed Wing Unmanned Aerial Systems (FWUAS) will be used for various field experiments and demonstration of capabilities of DEW systems, being developed by CHESS. It is proposed to award a job work for operation and field maintenance and repair of the Fixed wing Unmanned Aerial System (FWUAS) during such experimentations and demonstrations of the DEW systems.

DRDO has identified DEWs as among key thrust technologies for the next decade. The effort is to develop and transform superior technology into affordable and critical military capabilities. Perhaps the greatest technical challenge for the DRDO would come in the form of finding reliable and affordable system integration meeting military platform requirements. Presently, India's DEWs system are in the research and development stage, and the earliest timeline for them to move out from the laboratory to the battlefield for operational testing and subsequent deployment, going by current trends, should likely be before this decade is out.



DRDO wants to test DEW system using drones

ideaForge raises $20 mn from Florintree, Infosys

Drone manufacturer ideaForge has closed its Series B funding round of $20 million led by Florintree, a company led by Mathew Cyriac, the former private equity co-head for Blackstone India.

The round also saw participation from the company's existing investors Celesta, a prominent technology investment fund, Infosys, Qualcomm and Infina, along with the Exim Bank of India.

Founded in 2007 by IIT Bombay alumni, ideaForge has over 15 years of research and development (R&D) history and it owns more than 20 global patents. Its customers include the Indian military, Adani group, L&T, Indian Oil, Survey of India, Indian Railways, among others.

"ideaForge has grown 10X in the last two years and we will use this funding to invest in R&D, international expansion and building a world-class team. We want to continue to create high performance, reliable and autonomous drones that inspire the adoption of this technology," Co-founder and CEO Ankit Mehta said.

Indian Army explores quadcopters for surveillance

The Ministry of Defence released an RFI, on 4 May, to identify vendors who can deliver high-altitude surveillance quadcopters to the Indian Army. More than 500 systems are expected to be purchased.

The RFI calls for a mission radius of at least 5km, and two versions are envisaged – one for deployment above and the other below 4,000m. The RfI says the quadcopter should not weigh more than 10kg but that the 'weight of the equipment should be suitable to withstand strong high-altitude winds up to 20 knots'.

Furthermore, the surveillance quadcopter must be capable of being launched at altitudes above 5,500m.

High-level committee formed to decide on Predator drone deal

Amid a strong push by Prime Minister Narendra Modi government for 'Make in India' in defence, the defence ministry has formed a committee under a three star-rank officer to decide on the curtailed deal for buying predator drones from the US.

As per the plans, India was earlier planning to acquire 30 of these high-altitude long-endurance drones equipped with strike capability, including missiles, which were to be equally distributed among the three services.

Sources said the three services have requirements for these drones which can be used for surveillance as well as attacking enemy targets from standoff distances.

Almost all the defence deals planned through the import route had either been scrapped or put on hold by the defence

Second edition of the 'Mehar Baba' swarm drone competition for stat-ups to develop a swarm drone-based system was launched on 6 April

ministry on the directions of the Prime Minister's Office in favour of indigenous weapon systems.

India is operating two predator drones which were hired on lease from an American firm and they have been helping the Navy to keep track of activities in the Indian Ocean Region.

In line with the Prime Minister's directions, the Indian Navy is now charting an indigenous roadmap for all its requirements of weapon systems and equipment.

Second edition of swarm drone competition for start-ups launched

Defence Minister Rajnath Singh unveiled the second edition of the 'Mehar Baba' swarm drone competition by the Indian Air Force (IAF) for Indian start-ups to develop a swarm drone based system to detect foreign objects on aircraft operating surfaces.

This was unveiled at the IAF Commanders Conference, which began on 6 April.

As per the conditions, the swarm drone system should be able to scan and detect sub-centimetre size foreign objects on aircraft operating surfaces. The specifications of the surfaces have been defined.

The system should be able to carry a range of payloads and sensors, have image correction ability, provide alerts and provide accurate location and discernable image of foreign objects.

The system should also be able to operate in GPS denied environment, complete operating cycle within 30 minutes and operate day and night and in reduced visibility as well as light windy conditions.

14 firms shortlisted for production-linked incentive

Adani's joint venture company with Israeli firm Elbit as well as IdeaForge Technology are among the 14 drone companies that have been selected as beneficiaries of the production-linked incentive (PLI) scheme to boost drone manufacturing in India, the aviation ministry said on 20 April. The ministry released the names of 14 drone companies selected as beneficiaries of the PLI scheme.

Under the PLI scheme that was announced last year, the incentive for a manufacturer of drones and drone components will be 20 per cent of the "value addition" made by the company during the next three years. The value addition is calculated as the annual sales revenue from drones and drone components (net of GST) minus the purchase cost (net of GST) of drone and drone components.

Dhaksha Unmanned Systems, IdeaForge Technology, IoTechWorld Aviation, Omnipresent Robot Technologies and Raphe Mphibr are five drone manufacturers selected as beneficiaries, it mentioned.

Absolute Composites, Adani-Elbit Advanced Systems India, Adroitec Information Systems, Alpha Design Technologies, Inventgrid India, Paras Aerospace, SASMOS HET Technologies, ZMotion Autonomous Systems and Zuppa Geo Navigation Technologies are nine drone component manufacturers selected for the PLI scheme, it noted.

The ministry had announced the PLI scheme on September 16, 2021 and allotted Rs 120 crore spread over three financial years.

The ministry said the eligibility criteria for the PLI scheme includes an annual sales turnover of Rs 2 crore for drone companies and Rs 50 lakh for drone components manufacturers; and value addition of over 40 per cent of sales turnover.

Garuda Aerospace to export 12,000 drones

Drone manufacturer and drone-as-a-service provider Garuda Aerospace will ship out about 4,000 drones to African countries and is also the lowest bidder in the RITES Ltd's tender for LiDAR based survey, said a top company official.

Meanwhile, Garuda Aerospace has raised an undisclosed sum as Pre-series A funding from investors led by Ocgrow Ventures.

According to Jayaprakash, the investors include prominent super angels from the global Investment banking circles.

This investment round would serve more so as a primer before the startup's larger $30 million Series A Round scheduled in June 2022.

NSG designated to equip CAPFs with anti-drone systems

National Security Guards (NSG) has been designated as the nodal agency by the Union Home Ministry to equip other paramilitary forces and state police departments with anti-drone capabilities.

The NSG, was tasked, in April, with providing training and other support to police organisations in dealing with drones which are increasingly being weaponised across the globe, posing serious security threat.

NSG, which has acquired specialised skillsets domestically, has already trained police forces from Jammu and Kashmir and Punjab in anti-drone warfare.

Indian security establishment woke up to the serious threat posed by drone when two bombs were dropped through the aerial platform at a Jammu airbase last June. Other than that, Pakistan has been using drones to air drop consignments of arms and contraband mainly in Jammu and Kashmir, and Punjab.

There are private players which are manufacturing individual equipment but not the complete anti-drone system as a whole.

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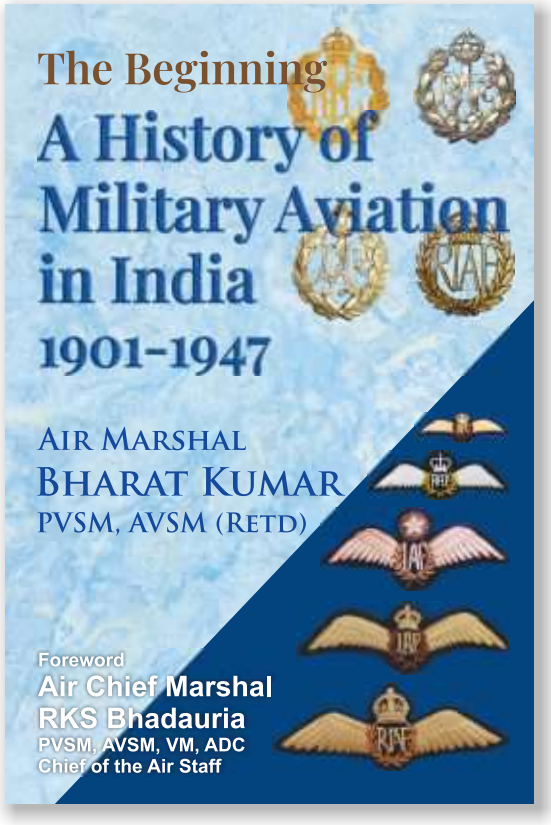

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Air Chief Marshal RKS Bhadauria (centre) flanked by Air Chief Marshal Vivek Ram Chaudhari and the author Air Mshl Bharat Kumar, releasing the book "A History of Military Aviation in India 1901-1947" on 28 Sep 2021 at Air HQ.

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Unmanned Aerial Systems India 2022

IMR Special Report

Unmanned Aerial Systems India 2022 is being organised on 13 Sep 2022 to include the whole range of unmanned, unattended and remotely controlled or autonomous vehicles for military uses. An overview is given below.

Nature of Warfare

Over the past few decades, there have been many prophecies about how drones will transform the nature of warfare and how "drone swarms" could overwhelm enemies in combat. While there is no doubt that unmanned warfare is evolving fast, the "era of the drone" is yet to arrive because countries that use them often do not deploy enough of them, or are afraid to lose them in battle. Despite widespread employment, drones did not stop the Taliban in Afghanistan.

When Russia invaded Ukraine, it put a renewed spotlight on the use of armed drones in conventional wars. The world saw how armed drones might work when both countries have them — and both have air defences that can shoot them down.

Turkish Bayraktar drones showed they can change the "nature of warfare" in the Nagorno-Karabakh conflict. But contemplating air war based on the Nagorno-Karabakh conflict or the Ukraine-Russia war needs closer analysis. In the latter, the success of the Bayraktar was unclear. Even kamikaze drones did not turn the tide in Ukraine. The limits of drone warfare appeared to be on display.

Any air war, more so in the context of the subcontinent, would involve an entire array of aerial operations and combat air support campaigns. To counter drones, the capabilities of the enemy drone assets need evaluation before countering them through anti-drone measures and other means.

Unmanned Aerial Vehicles (UAVs)

The stand-off at the Line of Actual Control (LAC) with China has accelerated the acquisition of more drones. Impressed with the performance of the two leased Sea Guardian drones, the Navy, Army and the Air Force are considering procurement of combat drones.

Military Applications of UAVs.

Some of the important uses include:

- Information, Surveillance, Target Acquisition, and Reconnaissance (ISTAR).
- Unmanned combat aerial vehicles (UCAV).
- Radar and Communication Relay.
- Mapping Military Logistics.
- Nuclear Cloud Surveillance.

Armed Drones. ADE has completed the development of the Rustom-2 TAPAS (Tactical Airborne Platform for Aerial Surveillance) MALE UAV (a MQ-1 category drone). Hindustan Aeronautics Limited will soon start the production of first five units of TAPAS drones. The optimally armed drone has already met all its revised qualitative requirements. It can fly at an altitude of 28,000 feet and has an endurance of 18 hours.

In total 76 units of this UAV will be ordered by forces. There will be 60 drones for Indian Army, 12 for the Indian Air Force and 4 for the Indian Navy.

Drone Technology

What information technology was in the 90s, drone technology is today. Technologies that the nation needs to invest in, are:

- Powertrain Technology - Brushless Direct Current (BLDC) Motor.
- Powertrain Technology - Fuel-Run Motor
- Powertrain Technology – Electronics
- Flight Controller
- Battery Technology
- Datalink Technology
- Making Bandwidth Available For Civilian Use

Some emerging technologies have the potential to enhancing effectiveness of drones, viz,

Artificial Intelligence. AI can help machines perceive and learn from Big Data to mimic and improve upon human cognitive functions like learning and problem solving.

Internet of Things (IoT). A network of connected devices, robots and instruments, embedded with sensors can communicate with

other objects to exchange data and information over the internet. Drones can act as first responders to an accident site and transmit real-time information to rescue agencies.

Indian Air Force

A Combat Air Teaming System (CATS) is a planned unmanned and manned combat aircraft air teaming system being developed by HAL, which is of interest to the IAF. An armed stealth drone will team up and fight alongside IAF fighters to hit high-value enemy targets. It is designed to carry out MUM-T Operations.

The Unmanned Wingman will be connected to a heavily upgraded IAF Jaguar fighter bomber; pilots onboard which will assign specific tasks to each of the unmanned drones which fly alongside the fighter. The drone will also operate with other platforms.

HAL is designing & developing AI powered, stealthy autonomous swarm drones known as ALFA-S. Sheer numbers of the swarm would overwhelm enemy defences such as surface-to-air missile units to ensure a high probability of mission success. The drones are meant to be launched from any Indian Air Force aircraft - fighter jets and transports.

DRDO is developing the Ghatak which is an UCAV for the IAF. The Aura UCAV will be a tactical stealth aircraft capable of delivering laser-guided strike weapons.

Indian Army

The army's existing unmanned systems' fleet comprises Heron medium-altitude, long-endurance (MALE) UAVs, and the smaller Searcher Mark II tactical drones.

The Army plans to buy high-tech unmanned aerial vehicles (UAVs) to strengthen its intelligence, surveillance and reconnaissance (ISR) capabilities and improve the effectiveness of its military operations.

Indian Navy

The Indian Navy currently operates Israeli-origin Heron and Searcher Mk-II UAVs, but neither is shipborne. It also has Sea Guardian drones on lease.

The Indian Navy announced its plans, in June 2022, to acquire 40 Naval Unmanned Aerial Systems (NUAS) for more than 100 meters long warships. The NUAS would be used for surveillance activities, including signals intelligence (SIGINT), target acquisition, surveillance, and maritime domain awareness surrounding a naval task forc as well as Search-and-Rescue (SAR), anti-piracy, and anti-terrorist operations.

The Indian Navy once partially funded a joint effort by Hindustan Aeronautics Limited and Israel Aerospace Industries (IAI) to convert the Chetak helicopter into an autonomous drone platform due to its need for the capabilities over time. The project, named naval rotary UAV (NRUAV), failed due to technological difficulties.

Ground Control Stations (GCS) for UAV, Drones

Research & Development

DRDO tested, in early-July 2022, the Autonomous Flying Wing Technology Demonstrator, which is a major step ahead of developing unmanned aerial combat vehicles (UCAV), primarily for the Indian Air Force. A deck launched version for the Indian Navy is also said to be in the pipeline. The UCAV will be capable of launching missiles and precision-guided munitions.

Countering Drones

Drones are hard to detect, do not have a significant visual, radar, infra-red or noise signature, and require minimal infrastructure to launch and control. Drones are best countered by effective jamming and laser systems.

DRDO's D-4 anti-drone system can provide both “soft kill” (jamming of hostile drones) and “hard kill” (a laser-based destruction method) options to the military to tackle fast-emerging aerial threats. It has been used for VIP protection on National Days' events.

Adani Defence & Aerospace has linked with DRDO and Israel's Elbit Systems to begin deploying counter-UAS equipment in some of the country's major airports.

UAV Industry

According to the Civil Aviation Minister, by 2026, the Indian drone industry will achieve a turnover of over Rs 15,000 crore. India is home to 270 startups in the drone technologies business. He has stated that the country will be a global leader in drones by 2030.

PLI Scheme. The government announced the Production-Linked Incentive scheme on 16 Sep 2021 which provides for funding 20 per cent of the “value addition” made by the company during the next three years. The value addition is calculated as the annual sales revenue from drones and drone components. 14 drone companies have already been selected as beneficiaries.

Joint Ventures. The first private UAV manufacturing complex has been set up at Adani Aerospace Park in Hyderabad to assemble unmanned aerial platforms including manufacturing of Hermes 900 Unmanned Aerial Platforms and marketing it to international customers.

Training

Rashtriya Raksha University (RRU) signed a MoU, in July 2022, with a private drone service provider and training organisation, to set up a 'Remote Pilot Training Centre' (RPTC) to teach drone flying to defence/security forces personnel as well as citizens on a private partnership model near Gandhinagar. The RPTC will have DGCA certified drone trainers teaching the trainees regarding quadcopters with strict adherence to certification necessities.

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Best wishes from IMR for anniversaries in June 2022

1 June
Guards Regimental Centre
Army Education Corps Day
612 (I) Mechanised Air Defence Brigade
614 (I) Mechanised Air Defence Brigade
616 (I) Mechanised Air Defence Brigade
401 Light Air Defence Regiment
405 Light Air Defence Regiment
11 Field Regiment
659 Recce & Observation Squadron
660 Recce & Observation Squadron
4 Corps Army Aviation Base
15 Recce & Observation Flight
3 Recce & Observation Flight
502 CAMS (Engineers)
11 Guards
27 Madras
16 Grenadiers
14 Maratha Light Infantry
15 Maratha Light Infantry
19 Maratha Light Infantry (Kolhapur)
7 Maratha Light Infantry
27 Rajput
2 Mahar
4 Jammu & Kashmir Light Infantry
17 Jat
11 Sikh
22 Grenadiers
21 Sikh
8 Sikh Light Infantry
11 Sikh Light Infantry
10 Dogra
12 Garhwal Rifles
16 Kumaon
10 Bihar
11 Bihar
20 Jammu & Kashmir Rifles

7 June
5/8 Gorkha Rifles (Tanbingon)
9 Bihar (Jappar Day)

15 June
Assam Regimental Centre
2 Engineer Regiment (Bishenpur Day)
1 Assam

19 June
Madras Regimental Centre
419 Assault Engineer Squadron

20 June
651 Engineer Plant Unit
812 Combat Engineering Training Camp
813 Combat Engineering Training Camp

22 June
252 Bomb Disposal Company

23 June
3 Jat
5/5 Gorkha Rifles (Mogaung Day)

25 June
Mechanised Infantry (Recce & Support) Wheeled

26 June
661 Recce & Observation Squadron
16 Sikh Light Infantry

28 June
17 Rajputana Rifles (Sawai Man) (Ledigali Day)
2/3 Gorkha Rifles Pirknthi (Uri Day)

29 June
2 Guards (1 Grenadiers) (Gurais Day)
29 Infantry Battalion (Territorial Army) Jammu & Kashmir Light Infantry

30 June
815 Combat Engineering Training Camp

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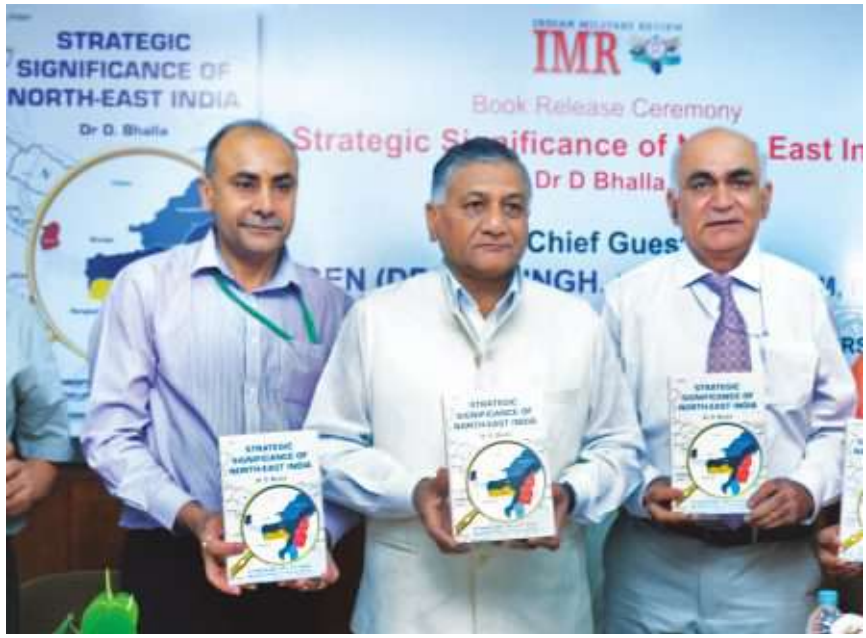

Minister of State for External Affairs, Gen (Dr) VK Singh releasing the book "Strategic Significance of North-East India" on 8 July 2016 at New Delhi. The author Dr D Bhalla is on the left and the publisher Maj Gen Ravi Arora on the right.

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Foreword by
Gen (Dr) VK Singh, Minister of State for External Affairs

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