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Opinions

The China-Pakistan Partnership Continues to Deepen

Rajeswari Pillai Rajagopalan/ 09 July 2021

Source: The Diplomat |
<https://thediplomat.com/2021/07/the-china-pakistan-partnership-continues-to-deepen/>

The China-Pakistan military and strategic relationship continues to deepen. Recently, the Pakistan Army inducted its first batch of Chinese-made VT-4 battle tanks. The VT-4 tanks, built by the Chinese state-owned defense manufacturer, Norinco, were supplied to Pakistan starting in April 2020. Pakistan is the third country to procure the VT-4 tanks, after Thailand and Nigeria. Inter-Services Public Relations (ISPR), the media and public relations wing of the Pakistan Armed Forces, has said that “the VT-4 is compatible with any modern tank in the world integrating advanced armour protection, manoeuvrability, firepower capabilities and state-of-the-art technology.” The army further noted that these third-generation tanks will be used “in an offensive role by strike formations.” The sale and induction of the Chinese tanks are just another indication of the continuing consolidation of the strategic partnership in the face of the evolving international conditions in the region.

Similarly, Pakistan’s use of Chinese-made combat drones or unmanned combat aerial

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vehicles (UCAVs) against India cannot be ignored. After being an importer of drones, China today has emerged as a major exporter of civil and combat UAVs to a number of countries. In December, Chinese state media advertised a decision to sell 50 Wing Loong II UCAVs to Pakistan, claiming that it “would be a nightmare for Indian ground formations in high-altitude areas as India’s military does not have the ability to respond to the new-age stand-off weapons.”

Many security analysts, as well as the Indian military establishment, have underestimated the effect of drones on the India-Pakistan border along the Line of Control or the India-China border along the Line of Actual Control. In December 2020, commenting on the Chinese sale of the Wing Loong II, the Indian Air Force chief had stated, “Whether it is [the] Line of Control in Jammu and Kashmir or the Line of Actual Control in Ladakh, the airspace is very closely monitored by radars and hotly contested with fighters. The armed drones will simply

be shot down if they cross the lines.” Six months later, toward the end of June, the reality was different when there was a drone attack on the high security technical area of the Indian Air Force station at Jammu. It remains unclear, however, if the drone flew from across the LoC or was locally controlled.

The China-Pakistan defense trade is not new, but the latest arms deliveries are a sign of a mutual desire to deepen their strategic engagement. Toward this end, the Chinese defense minister, General Wei Fengshe, visited Islamabad in late November 2020

and the two countries signed a Memorandum of Understanding (MoU) aimed at enhancing defense cooperation between the Chinese People’s Liberation Army (PLA) and the

Pakistan Army. The Chinese Defense Ministry quoted Wei calling for a closer engagement, with a desire to “push the mil-to-mil relationship to a higher level, so as to jointly cope with various risks and challenges, firmly safeguard the sovereignty and security interests of the two countries, and safeguard the regional peace and stability.”

During his visit, Wei also met with the Pakistani president and the prime minister, both of whom conveyed their deep appreciation for China’s continuing support.

Wei remarked that “China is willing to strengthen strategic communication, enhance strategic mutual trust and strengthen strategic cooperation with Pakistan.” And Pakistan’s president, Arif Alvi, said that he hoped for the two countries to “further strengthen cooperation in the construction of the China-Pakistan Economic Corridor (CPEC), as well as the defense and security fields.” The fact that Pakistan completely endorses China’s position on its core issues including the South China Sea, Taiwan, Xinjiang, and Tibet will definitely be comforting to China.

The already deep Sino-Pakistani military and strategic relationship is set to deepen further for myriad reasons.

The growing number of China-Pakistan military exercises are a further sign of the deepening partnership between the two militaries. In one of the more recent engagements,

in May, the two militaries conducted a joint exercise close to the Line of Actual Control (LAC) in Tibet. The joint military drill came against the backdrop of the Galwan conflict between India and China and the prolonged military stand-off in eastern Ladakh. Many details are not available on the participating forces, but from the Chinese military side, the PLA 3 Air Defense Division is reported to have participated. Prior to this exercise, the PLA and the Pakistan military reportedly did a pre-exercise training in Sargodha in Pakistan.

In December, the Chinese PLA Air Force and the Pakistani Air Force participated in a joint exercise, Shaheen (Eagle) IX, in Sindh. These exercises were meant to “promote the development of China-Pakistan mil-to-mil relationships, deepen practical cooperation between the two air forces, and improve the actual-combat training level of the two sides.” Commenting on the exercise, Senior Colonel Tan Kefei, a spokesperson for China’s Ministry of National Defense, said that the two countries are “all-weather strategic cooperative partners” whose “bilateral relations can only get better in the future.” He went on to add that “the military ties between China and Pakistan serve as an important pillar for the two countries’ bilateral relationship. Since the beginning of 2020, the two militaries have maintained close high-level strategic communication and carried out pragmatic cooperation in related fields, testifying their brotherhood and friendship enabling them to go through thick and thin together.”

After inspecting the Shaheen IX exercise, which is the ninth in the series held between the air forces of the two countries, Pakistan’s Chief of the Army Staff General Qamar Javed Bajwa commented that these exercises would “improve combat capacity of both air forces substantially and also enhance interoperability.”

Pakistan has been an important partner to China for decades. Its importance may have increased further for a number of reasons. One, China has antagonized a large number

of countries with its wolf warrior diplomacy, from its neighborhood in the Indo-Pacific to Europe. This raises the importance of the few real partners it has, like Pakistan. Also, increasingly worsening relations with India have resulted in New Delhi becoming closer to Washington and its allies, including Canberra and Tokyo. India has, in addition, developed a web of security and strategic partnerships including the Quadrilateral Security Dialogue with the U.S., Australia, and Japan, (known as the Quad), and a number of trilateral strategic partnerships such as India-U.S.-Japan and Japan-India-Australia. All of these new partnerships are clearly designed to counter China, even if India is reluctant to say that plainly. But all of these also make China depend more on Pakistan to counter India.

Another reason for the growing Chinese dependence on Pakistan has to do with the evolving situation in Afghanistan. With the expectation of a Taliban takeover, China has multiple reasons to want workable relations with the Taliban. For one, China is clearly worried about the possibility of the spread of extremists from Afghanistan to Xinjiang. For the time being, the Taliban appear to be reassuring Beijing about their intentions on the Uyghur issue. A senior Taliban official is reported to have said that “We care about the oppression of Muslims, be it in Palestine, in Myanmar, or in China, and we care about the oppression of non-Muslims anywhere in the world. But what we are not going to do is interfere in China’s internal affairs.” The Taliban promise to not

interfere in China's domestic affairs must be soothing to Beijing, but it is an issue that China cannot ignore.

In addition, with the U.S. exiting the theater, China might want to have greater access to Central Asia through Afghanistan. All of this will be possible only through the good offices of Islamabad and the links that the Pakistani establishment has with the Taliban. And finally, China might also want to demonstrate its loyalty to close friends such as Pakistan and its capacity to maintain good relations with other countries at a time when its relations with many countries in the region are in trouble.

All of this suggests that the already deep Sino-Pakistan military and strategic relationship will continue to deepen.

India can help boost our air power: Afghan envoy

Rezaul H Laskar | 09 July 2021

Source: Hindustan Times |
<https://www.hindustantimes.com/india-news/india-can-help-boost-our-air-power-afghan-envoy-101625853570903.html>

With air power emerging as a key element in the campaign by Afghan security forces against the Taliban, Afghanistan is looking to India, the US and Russia to help bolster the country's fledgling air force, Afghan ambassador Farid Mamundzay said on Friday.

Amid reports of intense fighting in several parts of Afghanistan and the capture of a large number of districts and some crucial border crossings by the Taliban, Mamundzay rejected assessments by some Western powers about the possible collapse of Afghan security forces. He, however, acknowledged the situation is "very dire", with the fighting displacing more than 200,000 people and resulting in nearly 4,000 civilian deaths since mid-April.

The Afghan envoy ruled out the possibility of seeking Indian boots on the ground but said New Delhi could assist Kabul with military hardware, intelligence and logistics support and financial resources in the fight against regional and international terrorist groups, including a "big percentage of foreign fighters".

Describing air support as a "game changer", Mamundzay said: "Our assessment is [that] if we have the required air support, Taliban would never be able to capture any district. And just to give you one instance, should we have 15 to 20 Mi-35 helicopters, or 30 to 40 Black Hawks, they would not be able to hold ground."

He added, "Taliban have the same equipment, weapons and ammunition that we have. Our superiority lies in air support and we appreciate the support that the US has recently promised, that they would support us with more air support. We call on all responsible countries in the region, including Russia, Iran and India, to provide us the required air support."

Mamundzay said there is “active conflict” in almost 150 districts of the total of 400 districts in Afghanistan’s 34 provinces. “Taliban has been capturing a number of capitals of the districts, which has caused an outcry from the local population and the government. In the past three days, we have been able to recapture 10 districts. Now, this would continue for a number of months, we would capture districts, they would recapture it back,” he said.

The drawdown of US troops, he said, “could have been handled in a more organised and planned manner”.

Mamundzay described the assessment by some Western capitals about the possible collapse of Afghan forces and the government in Kabul in six to 12 months as “very unrealistic”.

He said: “We outnumber Taliban by five or six times, a force of 70,000 to 75,000 cannot face a force of around 400,000...We are going through a turbulent time, but the resilience of our people and the heroic patriotism of our forces is there to defend Afghanistan.”

The Taliban are delaying the peace process by not setting a time frame for returning to talks “because they want to gain more territory so that they would speak from a position of strength should we get to the negotiating table again”, Mamundzay said.

The Taliban also want to prove to “their foot soldiers, ground commanders and affiliates and associates that they are back in power. We have reports that al-Qaeda, Jundullah, ETIM, LeT and JeM are celebrating Taliban’s victories,” he added.

The situation has been further complicated because none of the processes aimed at kick-starting peace talks – from the “extended Troika” backed by Russia to the talks arranged by Iran and the process in Doha – have “delivered any results”, the envoy said.

“We feel that Taliban are buying time for themselves to continue with their military adventurism and capture more land. And then when we get to winter, they will propose peace negotiations when fighting is difficult.

And then they speak from the position of strength, that we hold XYZ percentage of the landmass, now agree to a peace deal on our terms, or else face defeat,” Mamundzay said.

Describing Pakistan as the “country in the region with the most influence over the Taliban”, Mamundzay said: “We expected Pakistan to play a very constructive role to bring Taliban to the negotiating table, use that influence that the Pakistanis used to help the Americans...We expected the government of Pakistan to help us in the same manner, in the same spirit so that

With air power emerging as a key element in the campaign by Afghan security forces against the Taliban, Afghanistan is looking to India, the US and Russia to help bolster the country’s fledgling air force

Kabul and Taliban reach a dignified and lasting deal.

“We sadly have not seen the kind of role that we expected Islamabad to play. I hope in the weeks ahead, that calculus will change and they will begin to play a more constructive role.”

Asked about what India could do to find a lasting solution in Afghanistan, Mamundzay said India could enhance the political and diplomatic support it currently provides, including helping at the UN Security Council with the listing and delisting of Taliban leaders and forging the required consensus in the region for the peace process.

India should continue its economic and development assistance and also look at the possibility of “security assistance should we not reach a dignified and lasting peace deal with the Taliban”, he said.

“If we get to a stage where war is imposed on the Afghan public, then we look at India for military and security assistance to protect our people and to fight terrorist groups. So we have not yet got to that stage, we’re still giving a peace a chance,” Mamundzay added.

Greece Must Equip Its Rafale Jets With Indian BrahMos Cruise Missiles – Greek Media

Apoorva Jain / 09 July 2021

Source: The Eurasian Times |
<https://eurasianimes.com/greece-must-equip-its-rafale-jets-with-indian-brahmos-cruise-missiles-greek-media/>

In a mission to overhaul its armed forces and military arsenal, Athens could partner New Delhi, saying India’s production of weapon systems “could change the course of things,” for the European nation.

The BrahMos missile would be a formidable weapon in the new French-made aircraft, which would cause panic in Ankara in combination with the ability of Greek pilots, Greek news portal Pentapostagma reported.

This development assumes significance as it comes amid deepening security and defense ties between Turkey and Pakistan.

In a recent visit to Pakistan, General Ümit Dündar of the Turkish Land Forces was conferred the Nishan-e-Imtiaz or “Order of Excellence”, a prestigious military award by Pakistan’s President Arif Alvi at the President House in Islamabad.

Earlier, the Greek media quoted Indian military analyst Maj. Gen. GD Bakshi (retd.) as saying that an alliance between Greece and India would help counter Turkey, China, and Pakistan.

The Acquisition Of Rafael Jets

In January 2021, Greece became the first European customer of the French Rafales when it signed a deal worth \$2.8 billion to procure 18 fighter jets.

Under the contract, Greece will procure 12 second-hand jets which will be taken out of the French Air Force inventory and 6 new ones to be delivered by the end of 2022.

In May 2021, a delegation led by the Defense Attaché of the Indian Embassy in Prague, Colonel Anupam visited Greece and held talks on boosting bilateral defense relations between Athens and New Delhi.

“Greece and India need to develop stronger ties. We see that there is an alliance between France, Israel, the UAE, Greece, and India. These countries can make Greece even stronger,” said Rajan Kochhar while targeting the Turkey-Pakistan alliance.

Last month, External Affairs Minister S. Jaishankar visited Greece in which the Greek Foreign Minister signed and handed over the Agreement on the International Solar Alliance (ISA) to India and both sides agreed to work towards the establishment of a strategic partnership.

India’s BrahMos Missile

The BrahMos cruise missile system is a joint venture between India’s Defence Research and Development Organisation (DRDO) and Russia’s NPO Mashinostroyeniya (NPOM).

The first supersonic cruise missile capable of flying at a speed of Mach 2.8 (almost

three times the speed of sound) in the world, BrahMos, has a two-stage missile system with a range of 290 km.

After developing land and naval variants, an air variant called BrahMos-A with an extended range of 500 km was successfully tested in November 2017 by the Indian Air Force from its Sukhoi-30 MKI fighter jet, completing the military triad.

To boost the missile as an export commodity, the development of a mini-version or BrahMos-NG (next-generation) is underway. It will be more powerful with a speed of Mach 3.5 and a similar range of 290 km but almost half the weight and 3 meters shorter than the original.

All three — land, air and sea variants — will be launched

between 2022-2024.

Moreover, several tests are being conducted to further extend the range to 400 km, 800 km and 1500 km. In November 2020, the Indian Army conducted live drills with a 290-plus BrahMos missile in Andaman and Nicobar Islands.

India and Russia are also looking to develop a hypersonic variant of the BrahMos missile, capable of flying five times the speed of sound (Mach 5) with a range of 800 km and 1500 km.

After acquiring French Rafale fighter jets, will Greece acquire Indian BrahMos cruise missile to enhance its deterrence capabilities and cement defense relations between the two countries.

BrahMos Goes Global

India has been keen to export the BrahMos missile to “friendly countries” to boost its image and reach the goal of \$5 billion defense exports by 2025.

Entering the Missile Technology Control Regime (MTCR) as a full member in 2016 has made India a credible global producer and exporter of advanced missiles.

MTCR is a 35-member multilateral export control regime that has indirect control of missile technology and export.

During the Aero India 2021, a list of 156 defense items cleared for export was released, including some of India’s most advanced weapon systems like BrahMos supersonic cruise missiles.

In March, India and the Philippines inked a significant defense pact that will ease the process of military exports. Known as the “Implementing Arrangement”, it is a critical step for the sale of “defense material and equipment”.

Other ASEAN countries which have displayed interest in the BrahMos missile include Indonesia, Thailand, Malaysia, Singapore, and Vietnam.

In other parts of the world, the Middle East (UAE, Qatar, and Saudi Arabia); South America (Brazil, Argentina and Chile) & Eastern Europe (Bulgaria) and South Africa, Egypt, South Korea have also shown interest

in the Indo-Russian Missile, according to reports.

India is also eyeing the Indian Ocean Region (IOR) countries as a potential defense partner to prevent China from entering the region. For this purpose, during the Aero India 2021, a separate IOR Defence Conclave was set up to engage researchers and high-level defense officials in Indian manufactured military products.

The coming of Greece on board will be a major milestone for India as it will be able to break into the monopoly of the European defense market.

India Strategic Impact

China Upgrading Fifth-Gen Fighter Capabilities

Jon Harper / 09 July 2021

Source: National Defense Magazine | <https://www.nationaldefensemagazine.org/articles/2021/7/9/china-upgrading--fifth-gen-fighter-capabilities>

Experts say U.S. fifth-generation fighter aircraft — the stealthy F-22 and F-35 — remain the best in the world. However, China is upgrading its J-20 “Mighty Dragon” to try to close the gap.

The J-20A, developed by Chengdu Aerospace Corp., is the People’s Liberation Army Air Force’s heavy twin-engine, single

seat, low observability, multi-role jet that made its first flight in 2011.

“The PLA’s planned fielding of a fifth-generation fighter force will bolster its air-to-air capability,” the U.S. Defense Intelligence Agency said in its most recent annual report to Congress, “Military and Security Developments Involving the People’s Republic of China: 2020.”

The aircraft has high maneuverability, stealth characteristics, an internal weapons bay, advanced avionics and sensors providing enhanced situational awareness, advanced radar tracking and targeting capabilities, and integrated electronic warfare systems, the study said.

Justin Bronk, a research fellow for airpower and technology at the United Kingdom-based Royal United Services Institute for Defence and Security Studies, said the J-20 is the “centerpiece” of the PLAAF’s modernization push.

Its combination of passive sensors, active electronically scanned array radar, low-observability features, range on internal fuel, and long-range missiles make the J-20 “a qualitatively greater threat than any previous non-Western combat aircraft,” he said in a RUSI report published last year, “Russian and Chinese Combat Air Trends: Current Capabilities and Future Threat Outlook.”

The aircraft leverages technology designs stolen from the United States through industrial espionage, analysts have noted.

“The design incorporates many features which have been copied from the F-22 and F-35, including nose cone shaping, the electro-optical targeting system (EOTS) under the nose, and the side-mounted [diverterless supersonic inlet] intakes,” the RUSI report said.

However, “the J-20 is no mere imitation and has several design features suggesting a

carefully weighted consideration of specific Chinese capability requirements,” the study noted.

The system’s internal fuel capacity and

ability to carry up to four external fuel tanks will allow it to operate as a long-range interceptor and hunt down U.S. tanker and intelligence, surveillance and reconnaissance aircraft far from the Chinese mainland, it said.

However, the J-20A has some shortcomings, analysts say.

The platform is the largest low-observability fighter currently in production, the RUSI report noted. “The downside is a heavier, less agile aircraft which will be more expensive to build and operate. It also cannot compete with the extreme

The PLA’s planned fielding of a fifth-generation fighter force will bolster its air-to-air capability,” the U.S. Defense Intelligence Agency said in its most recent annual report to Congress

performance or agility of the F-22” Raptor built by Lockheed Martin.

It also features forward canards which are suboptimal from a stealth perspective, and the planes have been powered by Russian AL-31 series engines without low-observability serrated nozzles. The engines leave the aircraft “somewhat underpowered” and unable to supercruise, and also increase their radar cross section, it noted.

China claims that the J-20A also features a variety of advanced sensors, as well as a fully digital glass cockpit and a helmet-mounted display.

However, “it is very difficult to assess the credibility of the sensor suite as claimed,” the RUSI report said. “The rate of iterative development, testing and production also remains extremely high, meaning that while it may be a reasonable assumption that Chengdu have not yet solved the many challenges inherent in true sensor fusion and seamless passive sensor integration, future J-20B/C variants will continue to close the technological gap with the U.S.”

John Venable, a defense expert at the Washington, D.C.-based Heritage Foundation think tank and a former U.S. Air Force pilot, said foreign observers can’t fully measure the J-20’s stealth.

There are several different aspects of stealth, he explained in an interview. One is the exterior design and how that enables radar evasion. Heat signature and electronic emissions are also major factors that affect observability.

The United States is almost certainly employing intelligence-gathering assets to try to learn more about the aircraft. However, those efforts may only yield “informed guesstimates.”

The downside is a heavier, less agile aircraft which will be more expensive to build and operate. It also cannot compete with the extreme performance or agility of the F-22

“Those all give us a better and better picture, but not until we get our hands on the platform will we really know what they’re capable of doing,” Venable said.

During the Cold War, the United States was able to acquire Soviet fighters from nations they had been exported to, and examine them up close, he noted. However, the J-20 is unlikely to be exported for the foreseeable future as China tries to protect the PLAAF’s best air superiority asset from prying eyes, according to the RUSI report.

Despite some unknowns, Western analysts say the United States is still ahead of China when it comes to fifth-gen fighters.

Aside from very-long-range air-to-air missiles, “there are few areas of capability where the PLAAF is yet directly able to

compete one-to-one with the best that the U.S. and European air forces can field,” the RUSI report said.

The F-22 is widely considered to be the best air superiority fighter in the world based on its flight performance characteristics and stealth.

However, the survivability of the F-35 in a dogfight has been called into question by some observers.

Richard Aboulafia, vice president of analysis at the Teal Group, said the F-22 is an “amazing” air vehicle, but the F-35 joint strike fighter — although stealthy — isn’t top notch when it comes to speed, acceleration, altitude and “time to climb.”

However, the Lockheed Martin-built F-35 has a “fantastic” equipment package, he added. Another major selling point is its sensor fusion, situational awareness and connectivity capabilities. It is designed to take out enemy aircraft long before they could get close enough to engage in a dogfight.

Retired Gen. Hawk Carlisle, president and CEO of the National Defense Industrial Association and former commander of Air Combat Command, has flown F-22 and F-35 simulators.

“Clearly the F-22 is the best air-to-ground [fighter] airplane in the world, in my opinion, except for the F-35. And the F-35 is the best air superiority airplane in the world except for the F-22,” he said during a recent podcast hosted by Francis Rose.

Venable believes the U.S. systems would come out on top in a head-to-head matchup with China’s platforms.

“The J-20, in my estimation, would be dead

long before it had the ability to maneuver against either the F-22 or the F-35,” he said. “It’s got enough spikes on it to where the radar returns on it are likely to be much more significant,

which means that the F-22 and the F-35 can see it a lot farther away.”

Because U.S. fifth-gen fighters are stealthier, “our ability to find, fix and be able to target the J-20 is going to be significantly more advanced than the J-20’s ability to target us,” Venable said.

So far, the PLAAF has operationally fielded “limited numbers” of the J-20, according to the DIA report.

The 9th Aviation Brigade was the first PLAAF combat unit known to be equipped with the system. However, an April 2021 satellite image indicates that the 1st Aviation Brigade may also be operating the jet,

Having another aviation brigade transition to the J-20 would suggest that ... the PLAAF is satisfied with, and confident in, the capabilities of the J-20, and that more combat units are likely to receive the J-20 in the future

according to a recent paper published by the U.S. Air University's China Aerospace Studies Institute, "Second Combat Brigade of PRC Air Force Likely Receives Stealth Fighter."

"Having another aviation brigade transition to the J-20 would suggest that ... the PLAAF is satisfied with, and confident in, the capabilities of the J-20, and that more combat units are likely to receive the J-20 in the future," the paper's author Derek Solen said.

In comparison, the U.S. Air Force has just over 180 F-22s in its inventory, but the platform is no longer in production. The service has more than 280 F-35As and is procuring dozens more each year. The Marine Corps and Navy are also buying variants of the aircraft.

Meanwhile, analysts expect China to continue improving its systems.

"The PLAAF is preparing upgrades for the J-20, which may include increasing the number of [air-to-air missiles] the fighter can carry in its low-observable configuration, installing thrust-vectoring engine nozzles, and adding supercruise capability by installing higher-thrust indigenous WS-15 engines," the DIA report said.

The growing fleet supported by advanced airborne early warning and control aircraft will enable longer range counter-air operations across the Western Pacific, it noted.

"The Chinese J-20A ... continues to rapidly mature and improve, with the production of the J-20B variant having reportedly begun in 2020," according to the RUSI report. "The J-20 family will be produced in the hundreds over the coming decade, constituting the

foremost existing aerial threat to Western air superiority."

The removal of canards combined with changes to the wing shape could improve the

stealth characteristics of the aircraft. Additionally, China is prioritizing the development of sensors and networks to improve its planes' passive-sensor tactics and "cooperative engagement" capabilities, to help the PLAAF compete head-to-head against U.S. forces, the study said.

"The pace of iterative improvement visible in PLAAF equipment — from aircraft and weapons systems to increasingly realistic training and exercises — is striking," the report said. "If China can continue the level of investment, production and iteration demonstrated over the last decade, then existing capability gaps will close significantly, and more areas of outright

The F-22 is the first operational multi-mission fighter aircraft that combines stealth, supercruise, maneuverability and integrated avionics to make it the world's most capable combat aircraft

Chinese advantage will emerge during the 2020s.”

However, the United States is not sitting still while China modernizes its fighter fleet.

The Pentagon is moving to give the F-35 Block 4 capabilities which officials say are needed for the jet to be effective in future high-end battles against advanced adversaries. The ongoing Technology Refresh 3 effort will enable about 70 upgrades, which includes 14 new weapons and a number of software-enabled systems, according to program executive officer Lt. Gen. Eric Fick.

The Air Force also plans to modernize the F-22, and it requested \$425 million in fiscal year 2022 for the effort.

“The F-22 is the first operational multi-mission fighter aircraft that combines stealth, supercruise, maneuverability and integrated avionics to make it the world’s most capable combat aircraft,” according to budget documents justifying the funding request.

F-22 modernization and sustainment programs invest in upgrades to the air vehicle, engine, and training systems to improve weapons, communications, and intelligence, surveillance and reconnaissance capabilities.

Modifications to the aircraft will help counter “determined attempts to deny U.S. air superiority from peer threats within the

Indo-Pacific region,” the budget documents said.

Meanwhile, the Air Force is already pursuing a sixth-gen platform that will replace the F-22 in the 2030s as part of its next-generation air dominance program, also known as NGAD.

Although the program is shrouded in secrecy, in September service leaders revealed that a prototype had already flown.

The Air Force and its industry partners are leveraging digital engineering to speed development and facilitate future capability upgrades, officials say.

“It’s not only what we build, it’s how we build it so we can stay ahead of the threat,” Air Force Chief of Staff Gen. Charles “CQ” Brown Jr. said recently at the McAleese & Associates annual defense programs conference. “That to me is an important aspect, because it is the air superiority fighter of the future.”

China’s Airforce has big plans for its biggest Planes

Christopher Woody | 08 July 2021

Source: Business Insider India | <https://www.businessinsider.in/international/news/chinas-air-force-has-big-plans-for-its-biggest-planes/articleshow/84215117.cms>

China's rapidly growing military has added dizzying numbers of ships and aircraft, but the fastest-growing platform may be its

airlifters, the heavy-duty planes designed to haul troops and supplies.

China now operates 11% of the strategic airlifters in service but is set to reach 18% by the end of the 2020s, making it the fastest-growing fleet in the world, according to Aviation Week.

Like other Chinese military hardware, the airlift fleet is based on Soviet-era designs. Since the 1990s, Beijing has used a small number of Il-76s and variants for transport and other missions.

China's airlift fleet is expanding "from a very low base," said Timothy Heath, a senior international defense researcher at the RAND Corporation think tank.

Given that China is now the world's second-largest military, "it's probably overdue, frankly, if you're a Chinese leader, to start building up this fleet," Heath told Insider.

Globally Present

China's first domestically developed heavy airlifter is the Y-20, work on which began in the mid-2000s. The Y-20 took its first flight in 2013 and entered service in 2016. The exact number in service isn't known, but it's believed to be less than 20.

The Y-20 is roughly 150 feet long and 50 feet tall with a 160-foot wingspan and a range just shy of 5,000 miles. It's officially codenamed Kunpeng, the name of a bird in Chinese mythology that flew thousands of miles, but is also called "Chubby Girl" because of its bulky fuselage.

Y-20s are intended to support airborne command-and-control, logistics and airdrops, aerial refueling, strategic reconnaissance, as well as humanitarian assistance and disaster relief, according to

the Pentagon's most recent report on the Chinese military. But "fundamentally," China's airlifters are "important for carrying troops long distances quickly," Heath said.

China only has one overseas base, in Djibouti, but its interests around the world are growing. Large transports give China's People's Liberation Army options "to respond to some crisis across a broad geographic range quickly" with operations ranging from troop transport to non-combat evacuations, Heath said.

"A lot of these missions are important for building influence," Heath added. "It will definitely help the PLA become more of a globally present military."

Y-20s are also going through "geographic familiarization," flying in western China,

China's rapidly growing military has impressed and worried its rivals.

near the disputed border with India, to test how they handle cold, mountainous environments and high altitudes, and in the maritime environment of the South China Sea, Heath said.

A Y-20 was seen on a runway on Fiery Cross Reef in December in what was reportedly the aircraft's first flight to the Spratly Islands.

In late May, Malaysia complained of a "breach" of its airspace over the South China Sea by a group of Chinese Il-76s and Y-20s. A Chinese military source told the South China Morning Post that the aircraft were building familiarity "with the weather and situations in the South China Sea."

Bigger Ambitions

The Y-20's missions are set to expand. Beijing has emphasized paratrooper operations, and it could replace older Y-8 and Y-9 aircraft doing special missions like airborne control and intelligence-gathering, Heath said. Aerial refueling may be the most significant addition, extending the reach and duration of Chinese combat operations.

China currently has some 25 aircraft - modified bombers and Il-78s - that do air-to-air refueling, but the Y-20U tanker is set to replace them.

A Y-20U reportedly conducted its first successful aerial refueling in December 2018, and satellite images published earlier this year suggest Y-20Us have gone into serial production.

Chinese analysts acknowledge that the Y-20U is not on par with Western tankers but say it is "key equipment to cope with our military's extremely urgent need for long-range combat capability."

Like other Chinese aircraft, engines are a shortcoming for the Y-20. It has been equipped with Soviet-designed engines but is reportedly being tested with a newer,

domestically designed engine that would give it more lift and a longer range, enabling it to carry payloads up to 150,000 pounds.

Reports indicate the Soviet-designed engines "are not terribly reliable and generally underperform" current Western and Russian engines, Heath said. "So these planes are a step forward for the Chinese, but they are still quite a ways away from really being premier aircraft." The pace of work on and range of missions envisioned for China's airlifters reflect Beijing's broader military ambitions, surpassing the Russians on whom China has relied for supplies and know-how.

"I think the Chinese are interested in going in directions the Russians never really went

China's strategic airlift fleet is the fastest-growing in the world. That fleet's expansion reflects Beijing's broader military ambitions.

too far in - for example, long-distance deployment of troops by aircraft," Heath said. "They've got the resources that the Russians simply don't have anymore, so in many ways they are building on the Russians but now starting to exceed a lot of what the Russians taught them."

Chinese latest Type 003 aircraft carrier is a threat to Indo-Pacific

Shishir Gupta | 09 July 2021

Source: Hindustan Times | <https://www.hindustantimes.com/india-news/chinese-latest-type-003-aircraft-carrier-is-a-threat-to-indopacific-101625826966663.html>

With China on the verge of the launching of what is billed as the world's largest non-American aircraft carrier in 2021 end, the Indian national security planners are worried

about the security of the Indian Ocean Region (IOR) as Beijing, as in the past in the South China Sea, is a practitioner of gunboat diplomacy with scant respect of global law.

Labelled as type 003, the third aircraft carrier after Liaoning and Shandong will be followed by two more Chinese carrier battle groups (CBGs) before the end of this decade as per western intelligence reports.

While western defence experts have tried to lowball the PLA Navy carrier development program citing Chinese perfidious access to technology, the Indian Navy knows that the third aircraft carrier will create instability at least in the Indo-Pacific.

"The question is not how the Chinese acquired the technology but how it will impact India and the IOR. The US narrative that CBGs can be targeted by long-distance ballistic missiles comes from a position of strength, where the US Navy has no less than 11 super carriers at its disposal," said a former Indian Navy admiral.

The PLA's type 003 carrier is expected to be more than 85000 tonnes with an

electromagnetic

aircraft launch system (EMALS), which will allow the ship to launch aircraft with more fuel and weapons as well as airborne radars, anti-submarine warfare

and aerial refuellers from the floating deck. This means that the range and strike of the aircraft carrier will increase manifolds. None of the Indian carriers has catapult aircraft launch system.

"In the Indian context, the Chinese carrier is a potent weapon and has to be treated as such. The security of IOR will be affected if two Chinese carriers come into the area. We must remember that the Chinese are using the US playbook in almost all their force

Labelled as type 003, the third aircraft carrier after Liaoning and Shandong will be followed by two more Chinese carrier battle groups (CBGs) before the end of this decade as per western intelligence reports.

application paradigms ... like the US carrier in Taiwan straits... what prevents that Chinese carrier in future from carrying out a freedom of navigation operations in Andaman Seas!, ” said a naval operations expert.

While India has developed a new intermediate-range ballistic missile Agni-Prime with the wartime objective of targeting CBGs, the PLA with four aircraft carriers by 2025 will more than a match for INS Vikramaditya (presently under maintenance) and INS Vikrant, which will be commissioned by August 2022. Under the circumstances, India has no options but to build its nuclear-powered attack submarines to deter the Chinese flotilla and have one aircraft carrier operational at all times as air power at sea is an operational necessity and cannot be provided by the land-based air force. Without a protective aerial bubble, the CNG is not only exposed to incoming missiles but also to enemy aircraft.

“Carriers are being looked at purely from a force on force perspective. Questions are being asked why should we not build submarines to counter the Chinese carrier groups. That is true, but then our own carrier can threaten something else and balance the operational equation. Why do we assume that one carrier needs to go into battle with only another carrier? CBGs are flexible and have a range of operations - other than addressing the enemy carrier. That must settle the Carrier or Submarine debate as

both are required for protecting the IOR,” an admiral said.

While many within the Indian national security set-up believe that an aircraft carrier is a World War II weapon and the era of stand-off weapon systems has dawned, the Chinese investment in building more such platforms clearly shows that the Indian Navy has a legitimate case for a third aircraft carrier.

World Strategic Impact

US Air Force detonates AARW hypersonic missile warhead

Ben Sampson | 09 July 2021

Source: Aerospace Testing International | <https://www.aerospacetestinginternational.com/news/defense/us-air-force-detonates-aarw-hypersonic-missile-warhead.html>

The US Air Force has detonated the warhead on its Air-Launched Rapid Response Weapon (ARRW) hypersonic missile for the first time during a test.

The AGM-183 Air-Launched Rapid Response Weapon (ARRW) was successfully detonated by the 780th Test Squadron, which is based at US Air Force Base Eglin in Florida, the US Air Force said in a statement.

ARRW (pronounced “arrow”) is an air-to-ground prototype missile that is launched from the B-52 Stratofortress aircraft. The

missile is based on the Defense Advanced Research Projects Agency's Tactical Boost Glide system, work on which began in 2015.

ARRW is a hypersonic glide vehicle, meaning it is launched from a rocket and glides to its target at hypersonic speeds, as opposed to hypersonic cruise missiles, which are powered by air-breathing engines, also known as scramjets.

AARW will be capable of travelling at average speeds of between Mach 6.5 and Mach 8 at a range of approximately 1,000 miles (1,600km).

The prototype missile successfully completed a series of captive carry test flights using a B-52 aircraft between June 2019 and August 2020. However,

ARRW's first free-flight test failed in April 2021, at Point Mugu Sea Range, off the coast of Southern California.

The recent test was the first time engineers have tested the AARW hypersonic missile's warhead to collect data on its lethality.

According to the test's manager, David Spiker from the 780th Test Squadron, the nature and shape of the warhead required "a lot of firsts for everyone involved", including a "new and unorthodox design and construction for the test arena, the test procedures and equipment, the warhead's

fragmentation data collecting and the post-test data processing to ensure the warhead's effects have been accurately characterized".

The 780th Test Squadron successfully designed and conducted the test to ensure the customer's data requirements were met using new and improved test tools, technologies, and techniques.

Hypersonic weapons programs

Conventional Prompt Strike, USA, Common Glide Vehicle with booster; Initial operating capability in 2028

Long-Range Hypersonic Weapon, USA, will use Common Glide Vehicle with booster; Flight tests planned through 2023

Tactical Boost Glide (TBG), USA, Glide vehicle; testing planned through at least 2021

Air-Launched Rapid Response Weapon (ARRW), USA, will use TBG; Flight tests planned through 2022

Operational Fires (OpFires), USA, ground-based missile Testing through 2021; transitions to weapon system integration planning and design in 2021

Hypersonic Air-breathing Weapon Concept (HAWC), USA, air-breathing missile; Complete flight tests in 2020; final program reviews in 2021

The US Air Force has detonated the warhead on its Air-Launched Rapid Response Weapon (ARRW) hypersonic missile for the first time during a test.

Avangard, Russia, glide vehicle deployed from a missile

3M22 Tsirkon (aka Zirkon), Russia; Ship-launched missile

Kinzhal (Dagger), Russia; air-launched missile (unverified)

DF-ZF (previously referred to as the WU-14), China; Glide vehicle deployed from missile

Starry Sky 2, China; Glide vehicle waverider type

Southern Cross Integrated Flight Research Experiment (SCIFiRE), Australia; Glide Vehicle

BrahMos II, India; Cruise missile

Hypersonic Technology Demonstrator Vehicle, India; Glide vehicle

V-max (Experimental Maneuvering Vehicle), France; Glide vehicle

ATLLAS II, EU (Germany); Glide vehicles

Hypersonic Cruise Missile – Japan

Future wars: Artificial Intelligence, drones and cyber weapons

Col SC Tyagi (Retd.) | 08 July 2021

Source: Financial Times | <https://www.financialexpress.com/defence/future-wars-artificial-intelligence-drones-and-cyber-weapons/2286333/>

Watching the videos of swarms of drones as autonomous aerial weapons reportedly used by Azerbaijan during last year's war with neighboring Armenia, in the disputed Nagorno-Karabakh region, and the recent Israelis – Hamas conflict using Artificial Intelligence (AI) to pinpoint and destroy the targets deep inside Gaza or the 'Iron Dome' successfully beating back the Rockets fire assaults, makes us believe the warfare has come a long way. Israel has shown the way how to use AI during the war and have even referred to it as the "The First Artificial Intelligence War" against Hamas during its operation Guardian of the Walls. Supercomputing was extensively used and they heavily relied upon machine learning and data collection. Instead of using the land army or even the air force, AI was the key component and force multiplier for the Israeli Defense Force (IDF) said the Jerusalem Post, quoting an IDF officer. These two recent examples exemplify the redundancy and obsolescence of many weapons of war and even impinge upon the traditional strategy and tactics world plans to fight the next war. Oft spoken phrase "we generally make plans to fight the last war" needs to be taken a serious note of and rather look ahead at what the future world war would look like. If we were to visualize what the components may be – certainly the AI will be one of the important ingredients and the others will include Cyber weapons, Drones, Loitering Munitions, Ballistic missiles and Space based satellites in

addition to the existing weapon platforms in the next world war.

Let's first look back at the path we have traversed. Wars have been fought ever since the idea of tribes was born. It has graduated from tribal wars to States fighting and nations going to war. Reasons for going to wars were either vanity, women, wealth, religion or grabbing a piece of rich and fertile land and thereafter to rule the land and its people. Arrows, lances, swords, machetes gave way to rifles and later to guns as the weapons of war. Two World Wars have been fought that devastated large swathes causing untold miseries to mankind. Emergence of tanks, artillery and rockets were extensively used by the end of the Second World War. Nuclear Bombs dropped at Hiroshima and Nagasaki capped the last World War. The Air Force and Navies have now started governing the aerospace and the seas respectively. But, one of the things common in all the wars is that the warfare is constantly changing, evolving and adopting innovative ideas and technology to be victorious. New dimensions, space and cyber, have already been added. Possibilities of use of chemical and bio war can't be easily denied today despite a number of treaties in vogue. Shape of the next world war, whenever it takes place, is looming

Israel has shown the way how to use AI during the war and have even referred to it as the "The First Artificial Intelligence War" against Hamas during its operation Guardian of the Walls.

large ahead of us and we must look ahead and prepare.

A perceptible change, in the way a war is conducted, is clearly visible on the horizon and we must look at and reset, reconfigure key components and key tactics or strategy. New dimensions, space and cyber, have already been added. Introduction of drones, loitering munitions and AI are the new game changers. Loitering munitions, Israel made Harop, was used in Armenia by Azerbaijan and it gives us an idea of their pinpoint destruction capability without the use of traditional weapons and the psychological effects these can cause.

Saudi Aramco oil processing facilities in the Abqaiq and Khurais were attacked with bomb-laden drones in September 2019 and Houthi rebels in Yemen claimed to have used them. Actually, the use of drones gained prominence when the USA started using it against its "war on terror". The USA extensively used drone strikes against targets as part of the 'War on Terror'. Most of us have seen the videos of such attacks widely circulated on social media. Successes achieved by the Americans, especially in Afghanistan and Iraq, and by the IDF in the regional wars added a new dimension to the concept of war and soon the research and developments and the process to acquire or possess these

weapons began in Russia and China, Turkey, Pakistan and India. None of these countries want to be left behind in the race for similar capability. Recent Army Day Parade held in Delhi has demonstrated India's willingness and its capabilities.

Advent of the era of swarms of drones in the AI enabled autonomous mode and other airborne Lethal Autonomous Robots (LARs), Israeli Iron Dome like capability to shoot down the incoming Rockets will completely change the battlefield. A new looking Infantry equipped with technologically advanced gadgets, weapons and modern logistics will appear on the scene for decision making when required or to consolidate the gain. Drones shooting down the enemy soldier are coming up and the days for hand to hand battle are fast receding into the background. Infantry will have a new avatar and new roles to play.

Does this mean the days of conventional wars are over? Not yet; the tanks, mechanized columns and artillery will still be useful but the role and employment will differ and it will not be set piece drills based upon the desired target or aim. Destruction of enemies' war making potential will need several means including the air force, navy and space based capabilities with AI leading from the front. Cyber intelligence and data

collection will go along hand in hand. Remember the Iranian nuclear facility destroyed in Natanz? It all began with the GPS coordinates uncovered through a picture taken in the desert with another known nuclear Scientist and posted on Social Media by one of the Iranian Scientists. The picture provided the GPS coordinates and the place was confirmed to be the nuclear facility in Iran. Natanz Uranium enrichment facility had air gapped the area with no Internet connections with the outside world. Air gap was breached by Stuxnet which destroyed centrifuges to burn themselves out: it is considered to be the first cyber weapon today. An enhanced version of it might be on the drawing boards.

Advent of the era of swarms of drones in the AI enabled autonomous mode and other airborne Lethal Autonomous Robots (LARs), Israeli Iron Dome like capability to shoot down the incoming Rockets will completely change the battlefield.

Trends Likely to dominate the next war

John Naisbitt once said, "Trends, like horses, are easier to ride in the direction that you are headed". Seeing the current trends, it is believed that the key trends in wars ahead would be the extensive use of AI, Drones, cyber weapons and use of killer apps, space based control of surveillance and creation of a defensive umbrella with offensive capabilities, Iron Dome like capabilities and the use of Lethal Autonomous Robots to kill. Let us see some of these key trends and extrapolate their images into future wars.

Artificial Intelligence (AI)

If the Israel-Hamas war is any indicator, AI will play a major role in the conflicts ahead. As per the media reports, Israel had gathered data for more than two years when it could be used in the latest war. The world over, gathering of mass datasets has already begun and data is considered to be the new gold. Countries like China are already believed to be gathering data for quite some time for future military use. It is believed that there is a company in the US which is only investing in the collection of data. Big data requires interpretation and predictive analyses. The results are then verified for its accuracy and then used in the AI algorithm. Let's look at one of the possible tasks in the current Indian context; the task of preventing crossing of the border by the terrorists or the enemy. A set of interconnected AI Bots deployed all along the Line of Control or at selected places on the border, with weapons under control placed on ground will make the arduous task simpler, off course man over riding the machine mix will have to be fused in. There will be 24X7 surveillance and the drones will come in handy for it and pass on the information to the bots for further action. Similarly, there will be AI enabled autonomous systems to conduct specific missions, all you need is to visualize them now and create autonomous systems. AI will

enable the military in automating tasks and assist in making them better and taking quicker decisions.

Drones

The latest war between Azerbaijan and Armenia witnessed the furious dance of loitering munitions and swarms of drones filling up the sky and causing havoc without sending out the Infantry, Tanks or Mechanized columns on ground in a large number; an unthinkable war scene a couple of years back. Unmanned Combat Aerial Vehicle (UCAV) or simply called Combat Drones carried bombs and missiles under varying levels of autonomy i.e. under real-time soldier controlled or programmed to

deliver the ordnance autonomously, thus assuming a standoff role and depersonalizing the decision to attack. Recently, a drone dropping a bomb in

Recently, a drone dropping a bomb in Jammu on the airport is an example of it; let us not relegate it to a mere terror act, it is a precursor to bigger changes coming into the battlefield.

Jammu on the airport is an example of it; let us not relegate it to a mere terror act, it is a precursor to bigger changes coming into the battlefield. Imagine an Infantry platoon attacking against a similar number of Combat Drones equipped with bombs, missiles and even automatic machine guns! Chances are that the latter would cause maximum damage with the least amount of casualties and execute it with greater precision and effects. This day is not very far off when it could soon be a reality.

Cyber Weapons

Stuxnet, widely believed to be jointly developed by the intelligence agencies of USA and Israel, was used against Iran's nuclear enrichment facility, and as such introduced cyber weapons to the war machinery. Similar weapons are not too far off and might be ready to go ahead. Also, Advanced Persistent Threats (APTs) pose a challenge to the effective and uninterrupted communication and surveillance mechanism, so vital to win a war. China has already got another Great Wall – the Great Firewall. PLA actively supports secret cyber intelligence units. If the communication equipment, radars, remote fire mechanism and controls are hacked or blocked, the war is already tilted in favor of the enemy. There are Supervisory Control and Data Acquisition (SCADA), a system of software and hardware elements that allows the military units to control the firing mechanism locally or at remote locations, when interrupted will cause enormous failure of the war efforts. The research and development is in the advanced stage in developing the Quantum Computing, once perfected it would perhaps provide considerable relief to the users of the cyber world.

China has already got another Great Wall – the Great Firewall. PLA actively supports secret cyber intelligence units.

Conclusion

The world is moving fast and there are other worrying trends such as the use of Crypto currency, which is allowing terrorists to transfer funds or pay for acquisition of weapons without a trace of who paid whom without using the well-established financial institutions like the Banks. Space based satellites and navigation setup are both useful as well as vulnerable and will play an important role in the future war. Today the technology is no more evolutionary from one version to another but it is leaping ahead, as Peter Warren Singer, a Cyber expert mentioned recently.

Disruptive technologies are changing the world rapidly. Good news is that ethical questions are being debated in San Francisco, the AI capital of the world, as to how far the technology should be allowed to be autonomous and whether the software designers and engineers need to have a code of conduct. But the day is not very far off when we see a new type of war clouds engulf us. A beginning is made, only the future will reveal how many of these trends will further change the shape of the next world war.

Aerospace Industry

How the B-21 Raider stealth bomber will define conventional and nuclear missions for the US Air Force

09 July 2021

Source: Wion News | <https://www.wionews.com/photos/how-the-b-21-raider-stealth-bomber-will-define-conventional-and-nuclear-missions-for-the-us-air-force-397068#b-21-raider-397050>

B-21 Raider

The US Air Force released an artist rendering of the B-21 Raider which is an "artist's interpretation of the B-21 design."

The US Air Force shows the new B-21 Raider with Edwards Air Force Base, California in the background. The B-21 Raider will reportedly be tested by the 420th Flight Test Squadron based at Edwards Air Force base.

"Nuclear modernisation is a top priority for the Department of Defense and the Air Force, and B-21 is key to that plan," Randall Walden, Air Force Rapid Capabilities Office director, said.

According to the US Air Force, it is set to incrementally replace the B-1 Lancer and

the B-2 Spirit bombers with two bomber fleets of B-21s and modified B-52s.

B-21 program is on track to deliver B-21s to the first operational base, Ellsworth AFB, South Dakota, in the mid-2020s, the report said.

B-21 Raider to operate in conventional and nuclear roles

The plane has been designed to perform long-range conventional and nuclear missions and to operate in "high end threat environment". The B-21 will be a visible and flexible component of the nuclear triad,

the US Air Force said.

The B-21 is currently in the engineering and manufacturing development phase before authorities begin low rate initial production.

The B-21 will be a visible and flexible component of the nuclear triad, the US Air Force said.

According to the US Air Force, critical design review conducted in 2018 had concluded the aircraft has a "mature" and "stable design".

The B-21 is intended to operate in both conventional and nuclear roles, with the capability of penetrating and surviving in advanced air defence environments.

B-21 'top three procurement priorities'

The "Raider" will be capable of operation by an onboard crew or piloted remotely. It is

projected to enter service in the mid-2020s, building to an initial fleet of 100 aircraft with a projected average procurement unit cost of \$550 million per plane.

The specific design remains classified, according to the Congressional Research (CRS) Service

B-21s will be based at Dyess Air Force Base (AFB), TX; Whiteman AFB, MO; and Ellsworth AFB, SD, with Ellsworth as the training base. The B-21 is one of the Air Force's top three procurement priorities, according to a report.

It has a large and flexible payload bay capable of carrying a full range of current and future armament.

China and Russia in Indo-Pacific

According to the Centre for Strategic and Budgetary Assessments (CBSA), low risk of air and missile attacks on theatre airbases would allow US Air Forces to maintain a high tempo of offensive operations.

The US military would continue to have an overwhelming advantage in many critical mission areas, including precision strike and electronic warfare, it said while adding that "competition between the United States and the revisionist governments of China and Russia has intensified over the last decade."

"China and Russia seek to erode regional and international norms to reshape the global order in their favor, in part by undermining the influence of the United States and its allies in the Indo-Pacific region and in Europe respectively," the report added.

China's military base in Djibouti

Although China's primary strategic focus has been on the Western Pacific, it also seeks to project power further afield. China has been procuring blue water multi-mission naval vessels and, likely foreshadowing future developments, has opened its first overseas military base in Djibouti, the Centre for Strategic and Budgetary Assessments said in its report.

Chinese and Russia area-denial threats will challenge the US military's ability to gain timely information on the disposition of enemy threats and forces located deep in contested and highly contested environments.

The report added that control of the air will be crucial to future multi-domain operations. Chinese and Russia area-denial threats will challenge the US military's ability to gain timely information on the disposition of enemy threats and forces located deep in contested and highly contested environments, it said.

Without layered airborne and ground-based defences, enemy missile salvos could greatly degrade the Air Force's ability to generate combat and other sorties during high-end conflicts with Russia or China, the report said.

Organic sensing systems

The report said "a family of capabilities" is needed for counterair operations in highly contested areas. A future air superiority family of capabilities, including a multi-mission PCA/P-EA and other capabilities to support multi-domain counterair operations, will need increased range, lethality, and the ability to operate in contested and highly contested environments in order to deliver timely effects, it said.

The report recommended air superiority aircraft to have multi-spectral, multi-phenomenology sensor suites to support an organic capability to detect, track, and target threats in degraded communication environments.

Future air superiority platforms will require organic sensing systems and the ability to share and receive information with other aircraft and weapon systems, both inside and outside of the highly contested environment, the report added.

4th generation fighters

Among its vital insights, the report said: "Successful targeting of most air-to-air and surface-to-air threats will require stand-in (penetrating) delivery platforms that can find, fix, track, target, and attack rapidly relocatable targets."

"A new delivery platform and effective kinetic weapons are needed for SEAD/DEAD operations in the highly contested environment."

"Non-penetrating bombers, 4th generation fighters, and UAS could be in high demand for conducting future standoff strikes and other operations," it said.

Long-range Hypersonic Conventional Strike Weapon

The US Joint Force will need to engage some high-value surface-to-air, air-to-air, and air-to-ground threats in tens of seconds or a few minutes at most, it said, while noting that time to engage targets will be critical.

The report pointed out that hypersonic weapons will be in high demand in both theaters with non-penetrating aircraft carrying the long-range Hypersonic Conventional Strike Weapon now in development could supplement penetrating strikes and create a more complex defensive challenge for Russian and Chinese forces.

Russia and China could seek to degrade the space-based sensor networks of the United States and other militaries opposing their efforts to seize and occupy areas on their peripheries by force, the report warned.

Non-penetrating bombers, 4th generation fighters, and UAS could be in high demand for conducting future standoff strikes and other operations

Rolls-Royce aims to turn electric dreams to reality

Murdo Morrison / 09 July 2021

Source: Flight Global | <https://www.flightglobal.com/aerospace/rolls-royce-aims-to-turn-electric-dreams-to-reality/144520.article>

Rob Watson is not excited by “interesting science projects”. For the director of Rolls-Royce Electrical, the company’s major push into developing electric propulsion technologies is about creating shareholder value by bringing certificated programmes to market.

For a business that has long been known for its large jet engines, R-R has recently embraced electrical propulsion and the initial opportunities it offers in general aviation, light commuter transport, and urban air mobility, not sectors that the Derby, UK-based company has traditionally specialised in.

“For the past three years, we have had a very strong focus on electrification,” says Watson. “We have set out to create a stronger role for ourselves in electrical propulsion. We are rapidly building up a capability and direct customer relations in the field.”

In October 2019, R-R took a major step when it acquired the electric and hybrid-electric aerospace propulsion activities of Siemens. The operation, with sites in Germany and Hungary, employed around 180 electrical designers and engineers. The two companies had been collaborating on the E-Fan X demonstrator alongside Airbus.

In August of that year, R-R launched a joint research programme with Norwegian regional airline Wideroe into zero-emission flying. This May, the two businesses said they will work with Tecnam to develop an

all-electric passenger aircraft based on the Italian manufacturer’s nine-passenger P2012, dubbed the P-Volt – a project R-R and Tecnam had launched in October

2020.

In March this year, R-R announced that its 100kW electrical system will power Vertical Aerospace’s VA-X4, which the Bristol-based developer believes could be the first certificated electric vertical take-off and landing (eVTOL) urban air mobility vehicle. Vertical Aerospace plans to fly the aircraft later this year, although without the R-R powertrain on board. Vertical Aerospace is also developing the aircraft’s batteries in house.

This year, R-R has also begun testing components for a hybrid-electric power-

In March this year, R-R announced that its 100kW electrical system will power Vertical Aerospace’s VA-X4, which the Bristol-based developer believes could be the first certificated electric vertical take-off and landing (eVTOL) urban air mobility vehicle.

generation system at a facility in Bristol. The system is intended to combine with an AE 2100 gas turbine engine to power a future regional aircraft.

In another initiative, the company is later this year aiming to break the world speed record for an electric aircraft with a modified Sharp Nemesis NXT, under a project part-funded by the UK's Aerospace Technology Institute.

The last of these – an experimental one-off – is the exception to Watson's rule that R-R will only invest in electrical propulsion developments for which there is a clear business case and potential market demand. "We made a choice. When we start R&T [research and technology] projects, we are designing with certification in mind," he says.

Watson believes the light commuter and eVTOL sectors will be the first to bring electrical aircraft into service. "I have absolutely no doubt the technology is coming," he says.

However, one of the biggest challenges for companies such as R-R in developing a business in such a relatively new field as electrical propulsion is that there is no supply chain. "A lot of our process is looking for partners," says Watson.

Watson is one of five technology heads taking part in a panel at Farnborough Connect on 14 July entitled "Sustainability: engineering the propulsion of the future".

He will be joined by Manish Dalal, vice-president of advanced technology at GE Aviation, GKN's chief technology officer Russ Dunn, and Michael Winter, senior fellow advanced technology at Pratt & Whitney.

Indian Aerospace

Hyderabad firm develops drone defence dome

V.Geetanath | 09 July 2021

Source: [The Hindu | https://www.thehindu.com/news/cities/Hyderabad/hyderabad-firm-develops-drone-defence-dome/article35227828.ece](https://www.thehindu.com/news/cities/Hyderabad/hyderabad-firm-develops-drone-defence-dome/article35227828.ece)

City-based 'Greene Robotics' claimed to have designed and developed a 100% indigenous 'unified, distributed and wide-area autonomous drone defence dome called 'Indrajaal' which can protect a large area of 1000-2000 sq. km per system against threats such as Unmanned Aerial Vehicles (UAVs), incoming weapons, loitering munitions and the like, autonomously.

The firm, working on the defence operating systems for the last eight years, says that Indrajaal's design principles are based on delivering autonomy to the defence forces leveraging a combination of 10 modern technologies powered by artificial intelligence, cybersecurity and robotics.

"Indrajaal is capable of identifying, assessing, deciding, acting and evolving

autonomously in real-time, round the clock. Whether the threat is single or multiple or a combination of UAVs, loitering munitions and such, the system is capable of countering all such threats. It can be integrated with the current weapons infrastructure,” said executive director Gopi Reddy on Wednesday.

In an exclusive interaction, Mr. Reddy said modern warfare was driven by AI and Robotics, hence, he was of the opinion that the Armed Forces should consider going for a holistic solution of defence shield to identify, assess and act an incoming weapons system either to neutralise, capture or stall them in real time with the commanding officer concerned having the command-control.

Recent drone attacks in Jammu & Kashmir and the developments across the China border are sufficient indicators of usage of cutting edge technologies like UAVs and smart swarms and the country can ill-afford to depend on manual weapons or ‘point based weapons alone’, he maintained.

About half a dozen or more Indrajaal systems with seamless connectivity can protect the entire western border from Rann of Kutch to Kashmir within a few months rather than install 300-point defence anti-UAV systems at a great cost. Grene Robotics has already simulated the models

to the defence personnel and talks are on with the public sector giant to scale up and implement the defence shield, explained Mr. Reddy.

“We have been working on Indrajaal for last two years. Once approved, we can set up a pilot plant covering 100-250 sq. km in 90-120 days and up to 2,000 sq. km in three months from there. We can work with legacy systems or deploy new ones using our data,” said the ED.

“Conventional defences will be overwhelmed in a swarm attack scenario and

an AI-enabled autonomous dome with its own ecosystem of sensors and processing is the way forward,” said CEO-defence Wg Cdr MVN Sai (Retd), involved in

design and setup of the Indian Air Force command and control system. The firm is currently partnering with Bharat Electronics Limited (BEL) to jointly develop an autonomous air defence technology.

HAL to partner with Bengaluru start-up to develop HAPS

The Hans India | 10 July 2021

Source: Defence Aviation Post | <https://www.defenceaviationpost.com/2021/07/hal-to-partner-with-bengaluru-start-up-to-develop-haps/>

About half a dozen or more Indrajaal systems with seamless connectivity can protect the entire western border from Rann of Kutch to Kashmir within a few months rather than install 300-point defence anti-UAV systems at a great cost.

The Hindustan Aeronautics Limited (HAL) will soon get the approval to develop a futuristic High Altitude Pseudo Satellite (HAPS). The programme is spearheaded by the HAL in partnership with a Bengaluru based start-up. It is learnt from the sources that the approval to fund the project is expected early this month.

Highly placed sources in the HAL told The Hans India, "The approval will come and it will take a minimum of 3-4 years to develop HAPS before it is inducted. HAL is already working on its design. It is a giant leap in technology. It will weigh more than 500 kg, will be solar energised and can fly at 70,000 feet and stay there for months."

The plan was revealed during the Aero India. HAPS are unmanned aircraft operating in the stratosphere at an altitude of 70,000 feet. The solar-powered aircraft are designed to act as a bridge between the Unmanned Aerial Vehicles (UAV) and the conventional satellites.

On being aligned with HAL developed unmanned warfare programme CATS, HAPS could coordinate in strike missions providing communication to the troops with live video feeds and images. This could also help in determining if the mission is successful

During Aero India, HAL said that it will be teaming up unmanned aircraft and vehicles with manned jets. The project will be such that a manned aircraft will operate within the boundary and the unmanned aircraft will

enter the enemy zone and can carry out strikes deep inside the enemy territory.

The Combined Air Teaming System (CATS) developed by the public sector giant Hindustan

Aeronautics Limited (HAL) will redefine aerial warfare.

Outer Space

The last voyage of NASA's space shuttle: Looking back at Atlantis' final mission 10 years later

Elizabeth Howell | 10 July 2021

Source: [Space.com | https://www.space.com/space-shuttle-final-mission-atlantis-10-years](https://www.space.com/space-shuttle-final-mission-atlantis-10-years)

NASA's final space shuttle mission, which launched 10 years ago this week, almost didn't happen.

The mission on space shuttle Atlantis, called STS-135, launched on July 8, 2011. It was initially planned as a backup flight and not officially authorized in NASA's budget until January 2011, just six months before launch.

That tight schedule caused a bit of scrambling for Atlantis' crew of four, not to mention the ground teams, but everything worked out well in the end, as the astronauts and some of their ground-based team leaders recalled in a NASA celebration of their flight on Thursday (July 8).

STS-135 mission specialist Rex Walheim had volunteered to be on "any of the last three flights," he recalled in NASA's 10th anniversary event, which was livestreamed on NASA TV. So imagine his disappointment when at first, the 30-year program was slated to end one mission earlier, with STS-134, and he was not named to any flight manifest.

"It's kind of like being in line for Space Mountain, and the line closes right before you get up there," said Walheim, referring to the popular Disney World ride just an hour's drive away from where shuttles launched and landed at NASA's Kennedy Space Center near Cape Canaveral, Florida.

On call for space

But Walheim and his crewmates were ready to go when the announcement came, having been in training for three months before STS-135 was finally officially authorized. It still was a quick turnaround with a nine-month training cycle rather than the usual year or more, said mission pilot Doug

Hurley, but the crew felt a sense of camaraderie that brought them through the intense experience.

The teamwork came to a culmination during their last night in orbit, when Hurley, Walheim, mission specialist Sandy Magnus and commander Chris Ferguson all sat on the flight deck silently drinking in the view of the nighttime Earth below.

"You just have to take it all in, because you never know if you're going to go back,"

Hurley said. He did end up going back, flying alongside SpaceX Demo-2 pilot and fellow NASA astronaut Bob Behnken in May 2020 on the first

crewed orbital flight from the U.S. since Atlantis' final launch. The pair spent two months at the International Space Station before returning home.

One last shuttle voyage

STS-135 was a major supply run for the International Space Station, an orbiting complex that relied on the space shuttle to bring up the major pieces. Among its milestones, the Multi-Purpose Logistics Module Raffaello made its final trip to orbit in the shuttle's payload bay, filled to the brim with its maximum of 16 resupply racks to exchange experiments in space.

It's kind of like being in line for Space Mountain, and the line closes right before you get up there

The empty middeck on the shuttle — as there were only four crew members on STS-135 instead of the usual six or seven people — also allowed the shuttle to bring home a little bit of extra trash and unneeded supplies from the space station, ahead of expected years of flights from the three-person Russian Soyuz spacecraft and a fleet of smaller cargo ships with less capacity than the space shuttle.

The shuttle's safe nighttime landing on July 21, 2011 marked the end of American-launched crewed missions to space for almost exactly nine years, until Hurley and Behnken launched on a SpaceX Crew Dragon on May 30, 2020. Now, with the 10th anniversary of STS-135's mission ongoing, the crew members and flight directors are using the milestone as a moment to reflect on where the space program was 10 years ago and where it is going today.

The space age is changing rapidly, not least in terms of the types of people going to space. For example, Virgin Galactic expects to make its fourth crewed suborbital spaceflight on Sunday (July 11), with founder Richard Branson and company personnel on board. Blue Origin plans to launch the first crewed mission of its suborbital New Shepard vehicle on July 20, with a crew including Mercury 13 female

aviator Wally Funk and company founder Jeff Bezos (better known for founding Amazon). Both Virgin Galactic and Blue Origin eventually plan to fly well-heeled space tourists in the coming years.

And crewed flights to the space station are happening regularly from the United States again. SpaceX's Crew Dragon is already up and running, and Boeing's CST-100 Starliner capsule may start carrying astronauts as soon as next year. Crew Dragon is being repurposed for other things, too; the all-civilian Inspiration4 flight plans to launch on a free-flying orbital mission later this year, while Axiom Space plans to use Crew Dragon for the first all-private astronaut visit to the ISS in 2022.

Meanwhile, NASA is planning out its Artemis program that may put humans on the moon as soon as 2024, if the Biden administration commits to that Trump-era deadline. The new administration has not yet said when the first crewed Artemis landings will happen, although it continues to sign Artemis Accord agreements with other nations and proceed with development of Artemis 1, an uncrewed trip that may launch for a round-the-moon trip at the end of 2021.

Magnus said this growing community of spacefarers should remember the painful "lessons learned" that NASA went through

The space age is changing rapidly, not least in terms of the types of people going to space.

with the space shuttle. While she did not allude to specifics, the space community usually refers to two tragic accidents that forever marked the shuttle program: the Challenger explosion of 1986 and the breaking apart of the shuttle Columbia during its return to Earth in 2003. Those two incidents killed 14 people and forced major redesigns of the shuttle program.

"Lessons in our industry are very painful," Magnus said. "We're going to be learning more as a community, as the community gets broader and broader, but I would just encourage people to keep their eye on the past, to inform their future actions."

For the STS-135 crew, another solemn moment was leaving an American flag on

the ISS for the next U.S.-launched crew to bring back to Earth. (Nobody knew at the time that Hurley would be on both crews, given the nine-year gap between the flag's dropoff and pickup.) The dropoff ceremonies included a call with then-President Barack Obama, and Ferguson said he was tasked with an important job: not to forget the flag on camera.

Ferguson — today a commercial astronaut for Boeing — recalled his reaction when he got a last stern reminder just prior to launching to space that the flag needed to be there: "I'm all over this." But shuttle missions were hectic affairs, and a blur of

spacewalks, science and maintenance activities had Ferguson successfully crossing off lots of checklist items — except for one important thing.

"Probably 10 days later, we're gathering for this interview, and it's President Obama and a few other distinguished individuals," Ferguson said. The cameras started rolling, he continued, and "about 30 seconds into this [call], I'm thinking to myself, 'My hands are behind my back, and the flag is not in either one. How is this going to go?' It ended up going fine, but that was one of my, you

know, more interesting memories."

Happily, at least the STS-135 crew was able to leave the space station on schedule on Atlantis,

which today is on display at the Kennedy Space Center. If pre-departure inspections had revealed problems with the shuttle's heat-shield tiles, Walheim said, the plan was to bring down the crew members one at a time on Soyuz spacecraft over the ensuing months. (Such inspections became routine after it was determined that tile damage incurred during launch was responsible for the loss of Columbia.) Hurley would have been stuck up there the longest, he said, making him the first American to go about a year in space, long before Scott Kelly marked that milestone in 2014-15.

For the STS-135 crew, another solemn moment was leaving an American flag on the ISS for the next U.S.-launched crew to bring back to Earth.

Less publicized at the time of STS-135's flight was the huge network of ground personnel who supported the mission, with many of those people facing unemployment due to the end of the space shuttle program once processing of Atlantis' landing was completed.

"The team ... stayed together and did the job right, knowing that the end was coming and some of them would be laid off," recalled now-retired launch director Michael Leinbach in a separate interview Tuesday on NASA TV. "But they all pulled together and did the right thing for the good of the crew."

Leinbach added that one of the safety lessons he tried to impart to his team was how "signing off" on mission items during planning and operations meant taking responsibility, and not just agreeing with colleagues or managers.

"If everyone held that mindset of being a responsible person for themselves first, then I think that would bleed over into the rest of the team and for the good of the program," he said, saying he urged team members to speak up and have "open conversations" at all times to protect the astronauts.

Joining Leinbach during the interview was Charlie Blackwell-Thompson, who served as the chief of launch and landing through the retirement of the space shuttle program. (Blackwell-Thompson is also the launch director of Artemis 1.) Knowing STS-135 was the last mission, she recalled, "you

couldn't quite bring yourself to leave" after the mission safely touched down.

She recalled walking back to the Orbiter Processing Facility a few hours after landing, while Atlantis was being towed there from the runway. "It was a hot day, and every now and then as we walked with Atlantis, I kind of ducked under the wing for a little bit of shade," she said.

"I remember thinking how special that was, how that was a memory that I would take with me through my entire career ... to know that that really was the final touchdown. The program was coming to an end. It had been a great program; it's been a great run. To be able to walk Atlantis back was just a really special, special thing for me."

Maneuver warfare in space: The strategic imperative for nuclear thermal propulsion

Christopher Stone / 10 July 2021

Source: DefenseNews | <https://www.defensenews.com/opinion/commentary/2021/07/08/maneuver-warfare-in-space-the-strategic-imperative-for-nuclear-thermal-propulsion/>

China's aggressive military space strategy, which views space warfare as "rapid and destructive," must prompt U.S. space leaders to rethink their approach to this growing threat. While defenses against Chinese ground-based anti-satellite missiles or on-

orbit weapons may include such methods as proliferation of numerous small-satellite constellations or hardening of satellites themselves, speed and maneuverability will remain key war-fighting attributes. A safe, reliable and effective way to achieve these attributes is through the use of nuclear thermal propulsion for our space vehicles.

When China started testing and deploying a limited number of anti-satellite, or ASAT, missiles, some space leaders sought to deny the benefit of an ASAT attack by planning to deploy numerous, disaggregated small satellites to complicate Chinese targeting and increase their numbers of targets. The theory then being the Chinese would run out of ASAT missiles without being able to destroy all the many satellites America had in orbit.

But now that China is building many more ASAT missiles, and adding other capabilities such as directed-energy and on-orbit weapons, disaggregation and proliferation alone become insufficient for survivability. While some of our current satellites have a limited ability to maneuver out of the way of threats, achieving space superiority will require the capability to maneuver in a quick, agile and sustained fashion.

Traditional chemical propellants used in current satellite designs are only designed to last for a limited life span, increasing the likelihood an adversary could “run them dry” by forcing more defensive maneuvers than their energy stores can sustain. Thanks to advances in technology, nuclear thermal propulsion would provide a solution to this challenge. Even though it sounds straight out of science fiction, advances in materials, testing and technology are now able to provide crucial space propulsion options for defense space applications.

The reality is that nuclear propulsion systems would be launched cold, meaning turned off with no radioactive hazards. The reactor onboard the spacecraft would then start after the system is on orbit.

Nuclear thermal propulsion provides much higher thrust and twice the propellant efficiency of legacy chemical systems. It works by transferring heat from the nuclear reactor to a liquid propellant. The heat converts the liquid into a gas, which expands through the engine nozzle to provide thrust for the spacecraft. An added benefit is the reactor can also electrically power mission payloads, greatly extending battery life and eliminating reliance on solar recharge.

This technology is not new: U.S. experts have been working on maturing these capabilities for the past 50 years. The field has now advanced to the point where nuclear propulsion will provide the rapid maneuver and presence needed for both defensive and offensive space applications

— the very attributes that speak to today’s threat-driven mission requirements.

As is often the case when discussing anything nuclear, people rightfully worry about potential safety concerns. The notion of nukes in space understandably gives people pause. The reality is that nuclear propulsion systems would be launched cold, meaning turned off with no radioactive hazards. The reactor onboard the spacecraft would then start after the system is on orbit. Following insertion into a nuclear-safe orbit — meaning at altitudes higher than low earth orbit — the reactor would automatically respond to thermal load changes and maintain safe operating temperatures.

Such advances in technology are why nuclear thermal propulsion is safe, reliable and efficient for operations in Earth orbit and between the Earth and the moon, a

segment of space the Chinese also prolifically write about dominating.

America faces rapidly emerging threats to our space assets in Earth orbits and beyond, and our strategic approaches must just as rapidly evolve to meet these challenges. We must move past a situation comparable to basing space defense upon a Civil War observation balloon, when we need the space equivalent of a modern fighter jet powered by nuclear thermal propulsion. The cost of inaction is high; China aims to build fleets of nuclear spacecraft in the next few years to achieve space superiority over the United States and its allies. As former President Lyndon B. Johnson said: “Control of space means control of the world.”

Beating our adversaries to a safe and effective nuclear propulsion system will retain the U.S. space power advantage in the ultimate high ground.



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