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AEROSPACE NEWSLETTER

Su-30MKI fighter jets get refuelled mid-air by UAE Air Force tanker

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Only Air Power Can Defeat Air Power. The Actual Elimination or Even Stalemating of an Attacking Air Force can be Achieved Only by a Superior Air Force.

- Alexander P. De Seversky

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Opinions and Analysis

The Air War in Ukraine – Complexities and Challenges

Air Marshal Anil Chopra (Retd)

Director General, Centre for Air Power Studies | 15 June 2022

Source: Chanakya Forun | https://chanakyaforum.com/the-air-war-in-ukraine-complexities-and-challenges/

As the Ukraine conflict enters 112th day, the global attention continues to be focused on the conflict between the two largest nations of Europe, Russia and Ukraine. Russia is moving closer to achieving its aim of extending total influence, if not annexing eastern Ukraine. Despite the huge asymmetry in total air power between Russia and Ukraine, the relatively restricted use of air power by Russia is being debated around the world. Boasting of Su-57 stealth fighters, Su-35 Flankers, is Russia's 'Mighty Air Force' really failing to dominate Ukraine? While the final lessons will be drawn only when this extended war comes to an end, but initial lessons are becoming clear.

Russian Air Power

The Russian Air Force (RuAF) is the second largest in the world with nearly 3,800 aircraft. Eight Bomber squadrons operate Tu-22M3/MR, Tu-95MS, and Tu-160 bombers. 37 Fighter squadrons include variants of MiG-29, MiG-31, and Su-27. Russia has over 100 Su-35 aircraft. There are 27 Attack squadrons operating the Su-24, Su-25 and Su-34 variants. 10 Attack-cum-Reconnaissance squadrons operate Su-24s and MiG-25RB. They have only around 14 fifth generation Sukhoi Su-57 aircraft which are still under operational evaluation. Russia operates a squadron each of A-50/A50-U aircraft and FRA Il-78/Il-78M. At any given time, Russia has around 300 modern combat aircraft normally stationed in the Western and Southern Military Districts – within range of Ukraine. They had also relocated regiments from elsewhere in Russia as part of its military build-up prior to the invasion.

Ukrainian Air Power

The war has seen mostly identical aircraft and systems of once Russian origin pitted against each other. Ukraine had the world's 27th largest air force and the 7th largest in Europe. They had a significant domestic defence industry, including the original Antonov aircraft plant. The Ukrainian Air Force (UkrAF) is manned by 36,300 personnel and had 225 aircraft. These included nearly 100 fighters comprising MiG-29, Su-24, Su-25, Su-27, L-39, and some had also been modernized. These were used mostly in air defence operations. Ukraine has also been using American and Turkish UAVs. They had significant AD systems including S-300 missiles with nearly 500 missiles in addition to the Western Man Portable AD Systems (MANPADS).

Limited Air Power Initially

Russia did not deploy all its advanced weaponry initially, reportedly to conserve assets for a possible escalation of war involving NATO. But it is apparent that the RuAF has now turned up to the fight. They have significantly increased the number of sorties flown in Ukraine. They have also improved their ability to support

ground operations. Russia has finally begun combined arms warfare. They were initially committing forces piecemeal, without employing concentration of force, or unity of effort. The same has begun to change now.

Air Campaign in Ukraine

Russians had lot of preparatory time. They should have done enough Intelligence Surveillance and Reconnaissance (ISR). They should have hopefully known the Order of Battle (ORBAT) fully. Russia was expected to achieve air superiority, but that happened only partially and a little later in the conflict. The AWACS and AEW&C have hardly been seen. Maybe they don't want to expose to Ukrainian fighters or flying deeper in own territory. Fighter strikes were also limited. Air and ground launched Cruise missiles and Ground based Multi-Rocket have been used extensively.

Russia did strike military infrastructure at Ukraine's air bases and "suppressed" its air defences. Finally, UkrAF did get grounded and thereafter Ukrainian military action was mostly engaged in the ground-based air defence. Suppression of Enemy Air Defences success is being questioned by some analysts, as many radars and missile batteries remained intact. Some were moved from the untouched West Ukrainian military bases. Ukraine has large population which is against the Russians. It is not in Russian interest to get into urban warfare. That would bog them down.

RuAF could fly limited sorties in the north due to bad weather, but got hammered by MANPADS and lost significant number of aircraft. Helicopter Gunships were used for Counter Surface Force Operations (CSFO). We saw the video footage of a Russian Mi-25 being shot by a stinger missile. Surprisingly the Russian aircraft did not use Missile Warming System or the IR flares to ward off the missiles. Russian ISR and Electronic intelligence components also appeared to have been spread too thin. RuAF support was focused on Close Air Support (CAS) rather than extended SEAD.

Perceivable attempt to use unguided munitions by the Russians indicates either the Russians are running out of PGMs or conserving what they have. Russia lost at least one top-of-the-line Sukhoi aircraft to attrition when employed in basic strike role. The ATGM/ MANPADs success by the Ukrainians reflects that the tank is a baggage without an Active Protection System (APS), as are the airborne platforms a viable target without an integrated self-protection jammer. Both cannot carry out their core tasks without these layers.

Where are the Russian UAVs? Very limited use has been observed. Never saw UCAVs like the Orion. Lack of UAVs, especially for the protracted and persistent SEAD and interdiction missions may be hurting the Russians.

Meanwhile, Zelenskiy has confirmed that Ukraine has suffered 'serious losses' after Russian air strikes pounded many targets, damaged radar arrays and other equipment and Ukrainian military facilities. Russian missiles hit targets in many other cities, including Kharkiv, Kramatorsk, Dnipro, Mariupol, Odesa, and Zaporizhzhya. Putin has repeatedly said that the goal of the invasion was the "demilitarization and de-Nazification of Ukraine." Effectively it means Ukraine being part of NATO was unacceptable. Although the Ukrainian military has improved since 2014, experts disagree on how broad and deep these improvements are. Russia continues limited air and missile strikes across the rest of the

country to cause military and economic damages. Russia achieved its primary objectives but at a much higher cost than desired and through a fitful cycle of adaptation. Cyber warfare and electronic warfare are important. They seem to have been under-utilized. The Western world greatly supported Information Warfare through satellite communications, and internet that was kept live.

Aerial Combat Engagements

There have been air engagements. The Russian Defence Ministry has claimed that over 100 air defence systems and over 90 Ukrainian aircraft have been disabled or destroyed. Most UkrAF losses were on the ground. A few have been shot in the air. Most Russian aircraft losses have been to ground-based AD Systems. Many well-known top-notch Russian and Ukrainian pilots lost their lives in aerial engagements.

Combat Employment of Hypersonic Weapon

Russia claimed to have launched their Kinzhal (Dagger) hypersonic missile at, among other targets, a weapons depot in western Ukraine – making it the first country to ever to test this type of missile in combat. From a military point of view using a hypersonic missile to hit a stationary target made little sense. Why use a weapon this expensive when a traditional ballistic missile could do the job just as easily with less risk of failure? Maybe it was mostly to send a message to the West. Russia has also faced significant cases of precision-guided munitions failures.

Air Power in Naval Operations

Warships from all four of Russia's geographic fleets converged on the Eastern Mediterranean and the Black Sea in late January 2022. The Russian Navy was tasked to support resupply of ground troops, precision fires in support of military operations, and maintaining sea control. The Russian task force in the Mediterranean continues to deter the NATO Standing Maritime Group's assurance operations. Land strikes were carried out using 3M54 Kalibr cruise missiles and naval gunfire, and providing resupply to Russian ground forces advancing along the Sea of Azov coast toward Mariupol. Russia lost an Alligator Class LST while pier-side in occupied Berdyansk, possibly to a Ukrainian short-range missile strike.

But Turkey, a NATO member, implemented a partial closure of the Bosporus Straits. This mile-wide strait provides the sole connection between the Black Sea and the Mediterranean and the world's oceans, thereby restricting the passage of Ukrainian and Russian warships into the Black Sea and effectively trapping Russian naval units.

The large Russian Black Sea flagship cruiser 'Moskva' was hit by two Ukrainian 'Neptune' anti-ship cruise missiles which caused a major fire. These missiles had only entered service in 2019. Eventually the fire engulfed the ships 'Magazine' and blew up the stored armaments. It had to be abandoned by the crew. It is likely to go down in history as one of the most audaciously successful attacks in modern naval history. It will be the biggest warship lost since WW2, at 12,490 tons she is bigger than Argentina's General Belgrano, sunk by the Royal Navy in 1982.

The attack reportedly took place during a storm. The Ukrainians used a Bayraktar TB-2 drone to distract the Moskva. The Ukrainian Navy introduced TB-2s into service only in August 2021. It's also possible that the Ukrainians used a TB-2 to identify and target the Moskva for the Neptune battery. The Moskva had single main air defence radar – a 3P41 Volna phased array to guide S300 missiles. Problem is, it only has

a 180-degree field of vision. The 360-degree coverage is provided by MR-800 Voshkod/Top Pair 3-D long range air search radars for shorter-range SA-8 missiles. But it's likely that in the storm, they couldn't distinguish the sea-skimming Neptunes from the wave-tops.

Analysts are questioning as to why the ship was operating incredibly close to shore, more so when it is relatively old and has limited point defence capability. It is also difficult to explain why Russia would lose its flagship in the theatre where it has sea control.

Western Support to Ukrainian AD Operations

Since Ukraine is not part of NATO, none of its members can intervene directly on its behalf because that would expand the conflict. Ukraine's request for enforcing 'No Fly Zone' could not be actioned. However, NATO members have been supporting the Ukrainians in many other ways like providing satellite imagery to boost Ukrainian air defence operations. NATO owns and operates more than a dozen Boeing E-3A radar planes, with about six of its long-range "eyes in the sky" craft in the air at any time. NATO's Combined Air Operations Centre in north-western Germany, have been monitoring the east European airspace, and feeding to Ukraine's AD units to deter aggression from Moscow. Washington too shares intelligence with Kiev, but it officially says it is not providing data that would enable "real-time targeting" of Russians. NATO UAVs are also operating in the garb of strengthening their own defences and overall situational awareness. NATO is also carrying out surveillance over the Black Sea area. NATO F-35s jet from Norway are shadowing or monitoring Russian intelligence aircraft. NATO is also monitoring Russian Cruise missile launches. Many countries have supplied Stinger missiles. Some former Warsaw pact countries have given former Soviet air defence equipment such as S 300 missiles.

Lessons for India

The last bullet has still not been fired. The last sortie has still to be flown. While it may be premature to derive suitable military lessons at this stage, however, the conflict in Ukraine does flag some relevant initial thoughts for the armed forces of India, which are in the process of major reforms. The wars can linger. Supplies can be throttled. There is need for stockpiles of armaments. Just large standing armies are not enough. Hybrid war, electronic warfare and technology will play. Concepts and force structures require rethink. From this multi-prong global power-play, it is emerging clearly that there is no soft power without hard power. India needs to continue to build its hard power. Self-sufficiency in arms manufacturing, as much as possible, is an absolute necessity. It is time that Indian Air Force gets back to the authorized 42 fighter squadrons from the current low of 31, and the other services modernise their inventories..

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Deterring Aggression in Space

Tory Bruno | 22 June 2022

Source: Space News | https://spacenews.com/op-ed-deterring-aggression-in-space/

U.S. Space Force SPC 3 Michelle Skeets, a Space Operator for 4th Space Operations Squadron, provides security during a routine training exercise at Schriever Space Force Base, Colorado, in April 2022. Credit: U.S. Space Force Photo by Dennis Rogers

To keep peace on Earth, we must keep peace in space

The time has come for America to confront the reality that space has been weaponized by our adversaries. Space has long been a peaceful environment for research and commerce on Earth with conditions that deny tyrants the luxury of concealment, the advantage of surprise, and establishes parity on the battlefield.

But all of this has Changed

China and Russia have carefully studied how the United States is uniquely advantaged by, and dependent upon, space. For the last 20 years, they have invested heavily in developing anti-satellite weapons, deploying them here on Earth and in orbit.

There's a purpose for this — to enable aggression on Earth by denying America and her allies the advantages of space. Allies fight as one force, in communication, aware of the enemy's disposition, and maximizing our impact through coordinated action. Space gives us that. Russia and China know it. Taking space out of our reach would greatly disadvantage us, emboldening these authoritarian governments to act with coercion and violence to achieve their regional and global objectives.

To keep Peace on Earth, we must keep Peace in Space

We must deter aggression through a system of capabilities and norms that inspire restraint in our adversaries. There is no simple, single, and quick solution to this problem. It must be viewed within the classical context of nation-state deterrence in a peer environment. This means understanding the motivation for aggression, choosing a deterrent strategy, and fielding credible, obvious capabilities, with a dash of hesitancy inducing uncertainty.

Fundamentally, a nation attacks to achieve a beneficial change in the status quo. Our mission, as a peacekeeper, is to discourage hostile and destructive action.

To do this there are two approaches. One, a nation can allow the adversary the ability to attack, do harm, and achieve the benefit sought. However, to deter this action, we would need to make it clear that we would respond with an overwhelmingly destructive retaliatory cost that far outweighs any potential perceived benefit. This approach is known as the artificial imposition of a reciprocal cost, nuclear deterrence being the classic example.

Alternatively, a nation can seek to render any practical attack ineffective. In an environment where aggression will stimulate severe consequences, an adversary is discouraged from acting when no conceivable attack can succeed. This is clearly the correct approach for deterring aggression in space for several reasons.

An attack in space would not immediately threaten U.S. territory or involve the loss of life. A retaliation on Earth, however, would likely do so, making it morally ambiguous, and likely inspiring wide disapproval. A retaliation in space, meanwhile, would risk fowling the global orbital commons, potentially doing more harm to all involved than the adversary's initial attack. We must instead seek the means to render attacks upon our space assets ineffective.

There are three legs to accomplishing this goal. We must make our assets more resilient, able to absorb attacks and damage without immediately collapsing. We must also be prepared to rapidly replace critical satellites faster than the attacker can exploit their destruction, and finally, we must deny aggressors easy and unfettered access to our satellites while on orbit.

We can improve resiliency by several means. Firstly, by distributing functions across multiple spacecraft where possible. Next, we should network distributed satellites whenever practical. This ensures that capabilities degrade slowly as individual satellites are destroyed, creating a system that absorbs attacks while continuing to fight. Thirdly, it would complicate the aggressor's task if our satellites had more ability to maneuver away from threats. Last, but not least, protecting satellites from hostile cyberattacks will ensure they can continue to function, denying this easy attack vector.

Unfortunately, not all space functions can be distributed, networked, or proliferated. To safeguard these critical assets, we should deny the attacker access to them. Today, China and Russia are free to observe our launches and spacecraft with largely unfettered access to approach and attack them. Denying this easy targeting and access is critical.

We must also expect that an adversary will succeed in disabling or destroying some of our limited critical assets as well as clusters of contiguous proliferated low Earth orbit (pLEO) satellites, thus opening temporary windows of action. We can counter this strategy by replacing these with assets stored on the ground or in orbit before adversaries exploit their loss.

There is significant concern today about our adversaries' lead in developing, deploying, and improving anti-satellite weapons. This challenge has led some to pursue strategies that seek to match or catch up to potential adversaries as quickly as possible.

This is the wrong approach. We must leapfrog our adversaries. While their decades-long effort and massive investment might seem daunting, it is also an opportunity to leverage our most fundamental and enduring advantage — American innovation. This is only possible in a free and open society. Unlike authoritarian governments that stifle individual initiative, freedom of thought, and any challenge to the status quo, we celebrate these things.

The capabilities that Russia and China are using today to threaten the peace in space are many of the old ideas we abandoned at the end of the Cold War when we focused on prevailing in the Global War on Terror. They adopted them and have spent enormous treasure and time turning them into capabilities.

We must seek to make these space weapons irrelevant. In doing so, we will reset the clock. We will deter aggression in space, ultimately deterring violent territorial expansion here on earth.

Air Power

India's Su-30MKI Fighter Jets Get Refuelled Mid-Air by UAE Air Force Tanker

24 June 2022

Source: hindustan Times | https://www.hindustantimes.com/india-news/indias-su-30mki-fighter-jets-get-refuelled-mid-air-by-uae-air-force-tanker-101656073051614.html

UAE Air Force MRTT aircraft assists mid-air refuelling the IAF Su-30 MkI.(Twitter / @IAF_MCC)

The Indian Air Force (IAF) on Friday thanked the UAE Air Force for providing mid-air refuelling to its Sukhoi Su-30MKI fighter jets on their way to Egypt. The IAF said that the UAE's MRTT aircraft assisted the Su-30MKI formation to undertake nearly six hours non-stop ferry while proceeding to Egypt for a leadership program.

The air force also shared the breathtaking pictures of Sukhoi Su-30MKI jets and UAE's MRTT aircraft flying in a formation for the in-flight refueling.

"#IAF deeply appreciates the in-flight refuelling provided by Su-30MKI formation @ UAE Air Force MRTT aircraft which assisted the IAF Su-30 MkI formation to seamlessly undertake nearly 6 hours non-stop ferry while proceeding to Egypt for the Tactical Leadership Program," IAF tweeted from its official handle.

In aerial refueling, fuel is pumped from one aircraft to another while they fly in formation.

This is not the first time that UAE Air Force has assisted in mid-air refueling. In March last year, the air force tankers of the Arab nation provided aerial refuelling to a batch of three Rafale fighter jets during a non-stop flight from France to India. The IAF had then described the cooperation as another milestone in the strong relationship between the two air forces.

On Wednesday, a team of the Indian Air Force arrived in Egypt to participate in a bilateral 'Tactical Leadership Programme' with the Egyptian Air Force. The IAF said that the aim of the exercise is to understand and assimilate the best practices.

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Prithvi-II Missile Successfully Test-Fired During Night Time

16 June 2022

Source: The Hindu | https://www.thehindu.com/news/national/prithvi-ii-missile-successfully-test-fired-during-night-time/article65531221.ece

File photo for representation. | Photo Credit: PTI

DRDO says the Test off the Odisha Coast Met all Parameters

India on Wednesday successfully test-fired its indigenously developed, nuclear-capable Prithvi-II missile during night time as part of a user training trial from a test range off the Odisha coast.

The Defence Research and Development

Organisation (DRDO) said: "Prithvi-2 missile test-fired successfully and the test met all parameters".

The trial of the surface-to-surface missile, which has a strike range of 350 km, was carried out from a mobile launcher from the launch complex-3 of the Integrated Test Range (ITR) at Chandipur near here around 7.30 p.m., sources said, adding that it was a routine training trial.

Earlier, Prithvi-II also was successfully test-fired during night time on February 21, 2018 from the ITR at Chandipur. Later on November 20, 2019, two trials consecutively of Prithvi-II were conducted successfully during night time from the same base.

Prithvi-II is capable of carrying 500-1,000 kilogram of warheads and is powered by liquid propulsion twin engines. The state-of-the-art missile uses advanced inertial guidance system with manoeuvering trajectory to hit its target, officials said.

The missile was randomly chosen from the production stock and the entire launch was carried out by the Strategic Force Command (SFC) of the Army and monitored by the scientists of the DRDO as part of a training exercise, they said.

"The missile trajectory was tracked by radars, electro-optical tracking systems and telemetry stations by the DRDO along the coast of Odisha," said the source.

The downrange teams onboard the ship deployed near the designated impact point in the Bay of Bengal monitored the terminal events and splashdown.

In salvo mode, on November 21, 2016, two missiles were successfully test-fired in quick succession from the same base.

Already inducted into the armory of Indian defence forces in 2003, the nine-metre-tall, single-stage liquid-fuelled "Prithvi" is the first missile to have been developed by the DRDO under the Integrated Guided Missile Development Programme (IGMDP).

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Strategic Missile Agni-4 Successfully Test Fired

06 June 2022

Source: The Hindu | https://www.thehindu.com/news/national/strategic-missile-agni-4-successfully-test-fired/article65501475.ece

Photo used for representation purpose only

Routine User Training Launch Validated all Operational Parameters, Says Defence Ministry

India on Monday successfully tested the Intermediate Range Ballistic Missile (IRBM) Agni-4, which met all parameters.

"A successful training launch of an Intermediate Range Ballistic Missile, Agni-4, was carried out at approximately 1930 hours on June 06, 2022 from APJ Abdul Kalam Island, Odisha," a Defence Ministry statement said. The successful test was part of routine user training launches carried out under the aegis of the Strategic Forces Command, it stated.

The missile, one of many in the Agni series of

strategic missiles, has a range of over 3,500 km.

Stating that the launch validated all operational parameters as also the reliability of the system, the statement added, "The successful test reaffirms India's policy of having a 'Credible Minimum Deterrence' Capability."

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Russian S-70 Okhotnik Attack Drone Completes Precision Strike Test: Report

Clement Charpentreau | 01 June 2022

Source: Aero Time | https://www.aerotime.aero/articles/31184-russian-s-70-okhotnik-attack-drone-completes-precision-strike-test-report

Image : Ministry of Defense of Russia

The Russian S-70 Okhotnik ('Hunter') attack drone developed by Sukhoi successfully conducted a first precision strike test.

During the test campaign, the drone employed a variety of air-to-surface missiles used by the fifth-generation Su-57 fighter to strike small-sized camouflaged targets at different times of the day in any weather conditions, an industry source told Russian agency RIA Novosti. Tests were reportedly deemed successful.

Weapon testing of the S-70 began in December 2020. Since then, the drone has demonstrated its capacity to use air-to-air missiles and unguided bombs. This last test was particularly important as the S-70 is expected to eventually operate in collaboration with the Su-57 to extend the latter's radar field and strike capabilities.

The S-70 Okhotnik drone is powered by an AL-31 turbojet engine and is expected to fly at a speed of 1,000 kilometers per hour, with a range of 6,000 km. According to the Russian Defense Ministry, it is equipped with electro-optical targeting, radio, and "other types of reconnaissance equipment". Its two internal bays can carry up to 2.8 tons of weapons.

Serial production and delivery of the S-70 Okhotnik is due to begin in 2023. .

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Drones Included in Refit for China's Second Aircraft Carrier Shandong

Amber Wang | 03 June 2022

Source: SCMP | https://www.scmp.com/news/china/military/article/3180265/drones-included-refit-chinas-second-aircraft-carrier-shandong

The Shandong, China's second aircraft carrier, was commissioned in December 2019. Photo: ifeng

Drones have been spotted for the first time on China's aircraft carrier Shandong, in a video released by the PLA Navy's South Sea Fleet.

Seven unmanned aerial vehicles (UAVs) were briefly visible on the deck of the Shandong, China's second aircraft carrier and the first to be developed domestically. The drone types were not identifiable.

The Shandong is in its first scheduled maintenance and refurbishment after more than two years of active service, according to a report in April by the state-owned tabloid Global Times.

Experts quoted in the report said the carrier would come back stronger than ever in a few months.

This is not the first time the navy has deployed UVAs on China's large warships. A vertical take-off and landing (VTOL) fixed-wing drone was used by a Type 052C destroyer in a South China Sea exercise in 2019.

And UVAs spotted last year on China's Type 055 destroyer could be used for tasks including anti-submarine and reconnaissance, Chinese media reports said.

While the Shandong gets a refit, China's third aircraft carrier is expected to be launched soon. The Type 003 has a flat-top flight deck with three electromagnetic catapults, similar to the world's most advanced aircraft launch systems.

Last week, China unveiled the world's first drone carrier, which is in sea trials with delivery expected by the end of the year. The Zhu Hai Yun can be controlled remotely to navigate autonomously in open waters.

China is the world's leading drone manufacturer and has a wide range of systems in series production and in use across its army, navy, air force and rocket force – the military's strategic and tactical missiles unit.

The best-known Chinese military drones are the Wing Loong and CASC Rainbow families, both of which include multipurpose attack drones.

Countries are accelerating research and development of carrier-based UAVs, with the US Navy completing its first tests of the MQ-25 Stingray last year, which confirmed the aerial refuelling drone could be integrated into a carrier environment.

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Russian Air Force Struggling in Ukraine Because of Combat Losses

Isabel Van Brugen | 24 June 2022

Source: News Week | https://www.newsweek.com/russian-air-campaign-struggling-ukraine-war-combat-losses-uk-1718828

Russian Su-25 aircraft fly above Moscow on May 5, 2015 during a rehearsal for that year's Victory Day parade. Russia's air force is struggling to support Vladimir Putin's invasion of Ukraine because of combat losses, British intelligence said Friday.

Russia's air force is struggling to support Vladimir Putin's invasion of Ukraine because of combat losses, the U.K. Ministry of Defence said Friday.

In its daily intelligence update, the ministry said Russia is being forced to deploy retired pilots to operate warplanes because of high casualty numbers.

Russia has moved to using retired personnel who are now working as contractors for Wagner, a Russian private military company, to conduct close air support missions, the ministry said.

"Ukrainian forces have announced that the pilot of a Russian Su-25 Frogfoot ground attack aircraft shot down on 17 June was captured

shortly afterwards," its latest update said.

"The pilot has confessed to being a former Russian air force Major, who had taken employment as a Wagner military contractor and had flown several missions during the conflict."

The ministry said that the use of retired personnel, now working as Wagner contractors, indicates that the Russian air force likely is struggling to support the invasion of Ukraine with sufficient aircrew, and that this is likely due to a combination of Russia's insufficient numbers of suitably trained personnel and its combat losses.

"Whilst conducting his missions, the Russian pilot reportedly used commercial GPS devices rather than Russian military navigation equipment," the update said. "This likely indicates that Wagner aircraft are older models of the Su-25 and that the Russian air force is not providing Wagner with up-to-date avionics equipment."

The U.K.'s defense ministry said days earlier that Russia's air force has consistently underperformed throughout the Ukraine war.

Russia's failure to consistently deliver air power is likely one of the most important factors behind the Kremlin's "very limited campaign success" in the conflict, which began 120 days ago, the ministry's Monday update said.

Putin's air force has so far operated in a "risk [averse] style," meaning it has rarely penetrated deep behind Ukrainian lines and has not been able so far to "gain full air superiority," the ministry said.

Monday's update said that Russia's air combat training has for years been "heavily scripted and designed to impress senior officials, rather than to develop dynamic initiative amongst air crews."

Russia, therefore, has developed "an impressive roster of relatively modern and capable combat jets" within its air force but has failed to develop the "institutional culture and skill-sets required for its personnel to meet Russia's aspiration of delivering a more Western-style modern air campaign," the British defense ministry said.

"This has led to a greater than planned weight of effort falling to ground troops, who are becoming exhausted; and on advanced cruise missiles, stocks of which are likely running low," it said.

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IAF Conducts CAPSTONE Seminar for 1st Warfare & Aerospace Strategy Program

Manjeet Negi | 25 June 2022

Source: India Today | https://www.indiatoday.in/india/story/iaf-conducts-capstone-seminar-warfare-aerospace-strategy-program-1966529-2022-06-25

Air Chief Marshal VR Chaudhari. (Photo: India Today)

The Indian Air Force, on Friday, June 24, conducted the capstone seminar at the Air Force Auditorium in New Delhi, marking the culmination of the first Warfare & Aerospace Strategy Program (WASP). The seminar was conducted under the aegis of College of Air Warfare and Centre for Air Power Studies. Air Chief Marshal VR Chaudhari, Chief of the Air Staff, delivered the keynote address on the occasion which was attended by senior officers from all three services, air power scholars,

academia from principal think tanks and premier colleges of the country.

During his address, Air Chief Marshal VR Chaudhari enumerated that the aim of WASP is to generate strategic thought and understanding amongst IAF officers. He brought out that the program was designed to briefly expose the participants to key disciplines of a nation's Comprehensive National Power, which will enable them to understand the whole-of-government approach and generate independent opinions. He stressed upon the "need to reassess the IAF's strategic priorities" and to realign actions to ensure that the service doesn't get left behind.

Air Chief Marshal VR Chaudhari congratulated the participants and urged them convert the knowledge gained into workable strategies, and to remember that their thoughts would channel not only air power related strategies but also contribute in making coherent military and national strategies. He also highlighted the fact that while a well-crafted strategy may not guarantee success, absence of a coherent and sustainable strategy will surely lead to failure.

The participants in the seminar presented papers on contemporary topics concerning application of air power in recent conflicts and the changing doctrinal precepts that establish the dominant role of air power in national security. The seminar also included the release of the revised edition of IAF's Doctrine.

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'Coercion is New Strategy' — IAF Chief Chaudhuri Flags Cyber, Space Domains as 'New Battlefields'

Suchet Vir Singh | 24 June 2022

Source: The Print | https://theprint.in/defence/coercion-is-new-strategy-iaf-chief-chaudhuri-flags-cyber-space-domains-as-new-battlefields/1010586/

New Delhi: As the border stand-off in Ladakh drags on for over two years and the protracted war in Ukraine continues, Air Chief Marshal V.R. Chaudhari Friday said, "coercion is the new strategy, with cyber, information and space domains becoming the new battlefield".

Addressing a seminar of the IAF's first Warfare & Aerospace Strategy Programme, he cautioned that 'a military strategist must not lose sight of the primary objective — war fighting'.

Alluding to the new forms of engagement between states, the Indian Air Force (IAF) chief added, "Diplomacy, economy, and information are becoming the primary tools of engagement with the military instrument being used as a deterrent".

Addressing the capstone seminar of IAF's first Warfare and Aerospace Strategy Programme (WASP) in New Delhi, Air Chief Marshal (ACM) Chaudhari also spoke about the changing nature of the international system, indicating the emergence of a "complex multipolarity".

The air chief argued that within this multipolar structure, a world has developed with "little or no regard to rules or the traditional processes of geopolitical interplays. Therefore, we must reassess our strategic priorities and realign our actions to ensure we don't get left behind".

Explaining the rationale behind the WASP, Chaudhari said, "it was started with an aim to generate strategic thought and understanding

amongst our officers. The ultimate aim of this course is to inculcate a culture which promotes reading, a keen sense of analysis, and ability to produce well-drafted documents".

The WASP was organised by the College of Air Warfare in Telangana, which is the IAF's premier institute for Air Power studies.

Teaching Officers 'How to Think' not 'What to Think'

Essentially, the course aims to restructure critical thinking among IAF officers, enhance their intellectual capital, and teach them "how to think" rather than "what to think", said Chief of the Air Staff (CAS).

The course included classes on military and air power theory, strategy, national power and International Relations. The essence of the program was in "contextualising these concepts to suit our interests in the 21st-century paradigm", added Chaudhari.

Unpacking the long-term goals of the course, he said that they centre around "nurturing our medium-level officers to gain knowledge and contribute to building sound operational plans for the IAF".

Primary Objective is War Fighting

While developing a more nuanced understanding of the sciences, theories, and philosophies behind war is critical, Chaudhari cautioned that "a military strategist must not lose sight of the primary objective, and that is War Fighting".

"Thus, the essence is to focus on operational level critical thinking and strategy," the IAF chief said.

To leverage the gains from the WASP course and incorporate the learnings into the structure and functioning of the IAF, Chaudhari explained that they were looking at "employing WASP qualified officers on important deputations in the ministry, into operational Commands, think tanks, critical tri-service positions, directing staff at training establishments and as IAF spokespersons", amongst other positions.

Chaudhari said: "You must remember that while a well-crafted strategy may not guarantee success, the absence of a coherent and sustainable strategy will surely lead to failure."

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Space

Space Collisions: ISRO on Average Prevented 2 Each Month This Year; Work on Telescope at Hanle, RadariIn N-E Progressing

Chethan Kumar | 19 June 2022

Source: Times of India | https://timesofindia.indiatimes.com/india/space-collisions-isro-on-average-prevented-2-each-month-this-year-work-on-telescope-at-hanle-radar-in-n-e-progressing/articleshow/92311278.cms

Since 2015, the agency has carried out at least 70 CAMs. As part of its efforts to enhance space situational awareness (SSA), India is implementing project Netra

BENGALURU: The first five months of this year have already seen Isro perform at least 10 collision avoidance manoeuvres (CAMs) to prevent damage to Indian space assets, reiterating the increasing problem space debris pose to active, operational space assets.

"We had done more than 10 at the end of May this year and all have been avoiding debris," one source said, adding that most of them have been in low Earth orbit (LEO).

In 2021, the year Isro's directorate of space situation awareness and management (DSSAM) commenced fulloperations, Isro carried out 20 CAMs — 15 in LEO and five ingeostationary orbit (GEO). They were spread across nine ofthe 12 months, with the highest number performed in May2021.

In fact, the number of CAMs are only increasing with at least70 carried out since 2015. Of these, 31 have come in 2022 and2021 together, while 2020 saw 12. The number was at eight in2019 and 2018, five each in 2017 and 2016 and only three in2015.

As part of its efforts to enhance space situational awareness(SSA), India is implementing project Netra, which onceoperational will provide an early warning system in space todetect debris and other hazards to Indian assets.

According to Isro, "Netra will acquire indigenous capabilitiesto detect, identify, track and catalogue space debris objects.Under the project, Isro will have a control centre, multi-object tracking radar and optical telescope for space debrisobservation."

Netra optical telescope — capable of tracking objects of size40cm or larger at geostationary orbit (GEO) — is beingestablished at Hanle in Ladakh, in collaboration with theIndian Institute of Astrophysics (IIA).

While the activities for infrastructure development of thetelescope like topographical survey, site levelling, design andlaying of access roads and geotechnical investigations areunder progress, a senior official from Isro headquarters saidDSSAM, which would operate Netra, was in the final stagesof procuring the telescope.

"We had put out the tender about six months ago and weare now in the final stages of procurement. But it will takeseveral more months for it to be commissioned," the officialsaid.

The directorate has already commenced its activities fromthe SSA control centre at Peenya in Bengaluru, whereoperations related

to safeguarding space assets likeconjunction analysis for collision risk mitigation have startedafter deployment of relevant software and hardwareelements.

"A preliminary version of observational data processing andspace objects' orbit determination, data correlation andobject identification has also been deployed. Furtherdeployment of computational and networkinginfrastructure is in progress. The control centre is envisagedto function as a hub of all SSA activities in India," Isro said.

The multi-object tracking phased array radar under Netra —capable of tracking objects in size of 10cm or larger at arange of 2,500km — is expected to come up in the northeastregion of India. The activities related to finalising the land and realisation of radar has been initiated.

"It will most likely be in , but we are working out the modalities. It has been decided that the radar will come up in the northeastern region," the official added.

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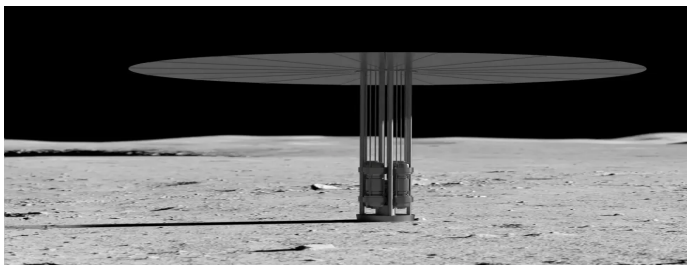
NASA Funds Nuclear Power Systems for Possible Use on the Moon

Elizabeth Howell | 24 June 2022

Source: Space.com | https://www.space.com/nasa-contracts-nuclear-power-systems-moon



Artist's conception of a nuclear fission system on the moon. (Image credit: NASA)

Three companies will demonstrate their potential to power lunar infrastructure using nuclear fission systems, under new joint NASA contracts announced on Tuesday (June 21).

NASA and the U.S. Department of Energy selected three design concept proposals that the government hopes could be ready for use on the moon by the end of the 2020s, to support the space agency's Artemis program of lunar exploration.

NASA also sees these contracts, valued at $5 million each, as potentially useful for the exploration of Mars and other deeper-space destinations.

"Developing these early designs will help us lay the groundwork for powering our long-term human presence on other worlds," Jim Reuter, associate administrator for NASA's space technology mission directorate, said in an agency press release(opens in new tab).

The selected teams are led by Lockheed Martin, Westinghouse and IX (a joint venture of Intuitive Machines and X-Energy). Their aim in the next 12 months is to "provide NASA critical information from industry that can lead to a

joint development of a full flight-certified fission power system," the agency stated.

These are Phase 1 awards; NASA did not outline in the press release what the timeline would be for a Phase 2 contract, if that indeed is part of the plan.

The newly announced contracts are joining a quickly growing group of nuclear space initiatives, mostly on the military side, to further U.S. government work in lunar exploration and deep space in general.

On May 17, for example, the U.S. Defense Innovation Unit announced two prototype contracts for spacecraft nuclear propulsion and power, aiming to have an orbital flight demonstration in 2027.

And on May 4, the U.S. Defense Advanced Research Projects Agency (DARPA) announced its next stage of a project to design, develop and assemble a nuclear thermal rocket engine for a flight demonstration in Earth orbit in 2026.

While the U.S. military is pursuing this work to monitor commercial and government activities in cislunar space, NASA is also thinking through nuclear opportunities for crewed exploration.

For example, NASA's fiscal 2023 budget request, not yet approved by Congress, includes $15 million(opens in new tab) to support nuclear propulsion. The agency is also collaborating with DARPA's Demonstration Rocket for Agile Cislunar Operations (DRACO) program, which aims to develop a nuclear thermal propulsion system for use in Earth-moon space.

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South Korean Rocket Puts Satellites in Orbit for The First Time in Second Flight

Park Si-Soo | 21 June 2022

Source: Space News | https://spacenews.com/south-korean-rocket-puts-satellites-in-orbit-for-the-first-time-in-second-flight/

KSLV-2 blasts off from the launchpad at Naro Space Center in Goheung, June 21. Credit: Ministry of Science and ICT

SEOUL, South Korea — South Korea's homegrown rocket KSLV-2 successfully put satellites into low Earth orbit for the first time in its second flight June 21. A performance test satellite, deployed from the rocket about 14 minutes after liftoff, exchanged its first signals with a ground station associated with South Korea's research center in Antarctica about 42 minutes after liftoff, according to the science and technology ministry. The satellite will deploy four smaller satellites developed by domestic universities in the coming days.

"We have arrived at a monumental moment not just in South Korea's science and technology history but for South Korea's history as well," science minister Lee Jong-ho said in a televised press conference at the Naro Space Center. "This is a milestone we achieved nearly 30 years after the country launched its first sounding rocket in June 1993." The minister said the government will conduct four additional KSLV-2 launches by 2027 as part of efforts to further advance the country's space rocket program.

President Yoon Suk-yeol hailed the success at his office in Seoul, saying, "the road to space from the Republic of Korea has opened."

The kerosene and liquid oxygen-fueled three-stage rocket KSLV-2 lifted off at the planned time of 3 a.m. EST from the Naro Space Center. Live footage showed the 47.2-meter rocket, emblazoned with South Korea's flag, soaring into the air with bright yellow flames shooting out of its engines. The first-stage booster, powered by a cluster of four KRE-075 engines, was separated at 3:02 a.m. Eastern as planned, according to the ministry. The separation of its payload fairing took place about one minute and forty seconds later, and the second stage booster with a single KRE-075 engine at 3:04 a.m. The third stage with a KRE-007 engine pushed the payload to the intended orbit of 700 kilometers above the Earth and deployed the performance test satellite at 3:14 a.m. at the orbital velocity of 7.5 kilometers per second, according to the ministry.

In the maiden flight last year, KSLV-2 reached its intended altitude, but its third-stage engine shut down 46 seconds early, releasing its 1,500-kilogram dummy payload at less than orbital speed. The dummy payload fell back to Earth south of Australia. The premature engine shutdown was later blamed on improperly anchored helium tanks inside the upper stage. The Korean Aerospace Research Institute (KARI), responsible for the rocket's development, fixed the flaw by reinforcing the structure anchoring the helium tanks.

KSLV-2's second launch was initially set for June 15, with a backup launch window spanning June 16-23. However, it was delayed to the following day due to strong winds. It was delayed again after engineers found a problem with a sensor inside the oxidizer tank of the rocket's first-stage booster during a final pre-launch checkup at the launch pad. KARI said readings on the malfunctioning sensor remained static when the tank was being loaded. To fix the problem, the rocket was pulled off the launch pad and rolled back to the hangar June 15. KARI confirmed that the problem was confined to the sensor and replaced it with a new one. Then it set June 21 as the rocket's launch date.

KSLV-2 — which cost South Korea an estimated 2 trillion won ($1.6 billion) to develop — is the first step for South Korea's ambitious space program, including the launch of the nation's first robotic lunar lander on a domestically developed rocket by 2030.

The country had previously launched a space launch vehicle from Naro Space Center in 2013, a two-stage rocket built mainly with Russian hardware. That launch came after years of delays and consecutive failures. The rocket, KSLV-1, reached the desired altitude during its first test in 2009 but failed to eject a satellite into orbit, and then exploded shortly after takeoff during its second test in 2010.

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ISRO to Launch SSLV by August

Shouvik Das | 24 June 2022

Source: Livemint | https://www.livemint.com/news/india/isro-to-launch-sslv-by-august-says-senior-scientist-11656062849497.html

The SSLV is expected to be an economical way for deploying small satellites into orbit.

New Delhi: The Indian Space Research Organisation (Isro), India's central space agency, will be launching its Small Satellite Launch Vehicle (SSLV) within "the next one or two months", said Victor Joseph, associate scientific secretary at Isro.

Speaking at his keynote at a conference by the Astronautical Society of India (ASI) on Friday, Joseph added that the SSLV will be one of India's key lightweight and reusable commercial rockets alongside those being built by private space startups in the country.

The SSLV is expected to be an economical way for deploying small satellites into orbit. The space agency has been conducting tests for the small launch vehicle for quite some time now, and has confirmed that it can carry up to 300kg payloads to sun synchronous orbits (SSO) at up to 800km above Earth, or 500kg to low Earth orbits at around 500-700km above Earth.

The development of Isro's SSLV was delayed due to the covid-19 pandemic, which led to its launch being deferred. In April this year, union minister of state for space, Jitendra Singh, had said that the SSLV could be launched by the third quarter of 2022, after its initial launch timeline of end-2021 was scrapped.

In March this year, Isro conducted a successful ground test of the SSLV's solid booster stage, which would propel it to orbit.

The Isro SSLV will be different from the agency's Polar Satellite Launch Vehicle (PSLV) and Geosynchronous Satellite Launch Vehicle (GSLV) rockets. The PSLV is Isro's mainstream workhorse, and is capable of carrying up to 1,750kg payloads to SSO, or lighter payloads up to 1,450km above Earth. The GSLV, meanwhile, is the heaviest rocket built by Isro, and can carry up to 4 tonnes of payload up to geosynchronous transfer orbit (GTO) at 37,000km above Earth.

Speaking at ASI's conference on the development of space startup ecosystem in India, Isro's Joseph said that the SSLV line of business for Isro will help establish a large production volume of rockets, which could be deployed on demand from businesses. Joseph also added that from 2030, the SSLV chain could help Isro launch up to 1,500 satellites from clients around the world – across multiple missions.

SSLV will be one of India's key lightweight and reusable commercial rockets alongside those being built by private space startups in the country.

Joseph also added that at present, India represents a 2% share of investments worth $447 billion made in the space sector. By 2030, collaboration with the private sector could see India take a 10% share of global investments made in the space sector. Such increases would occur through the deployment of the SSLV, as well as improving existing technologies – such as increasing the capacity of GSLVs from 4 tonnes to 6 tonnes, to deploy heavier payloads.

Global Aerospace Industry

Israel Says Laser Missile Shield to Cost Just $2 per Interception

01 June 2022

Source: Reuter.com | https://www.reuters.com/world/middle-east/israel-says-laser-missile-shield-cost-just-2-per-interception-2022-06-01/

Israeli Prime Minister Naftali Bennett attends a weekly cabinet meeting in Jerusalem, May 29, 2022. Gil Cohen-Magen/Pool via REUTERS

JERUSALEM, June 1 (Reuters) - A laser-based air defence system that Israel hopes to deploy from next year to neutralise enemy rockets and drones will cost just $2 per interception, Prime Minister Naftali Bennett said on Wednesday.

Israel currently depends on shoot-down systems that launch interceptor missiles costing between tens of thousands and millions of dollars to track such projectiles.

But the Iron Beam system, a prototype of which was unveiled last year, uses lasers to super-heat and disable aerial threats.

"This is a game-changer, not just because we are striking at the enemy military, but also because we are bankrupting it," he said during a visit to the system's state-owned manufacturer, Rafael Advanced Defense Systems.

Palestinian and Lebanese forces have in past wars launched thousands of rockets and mortar bombs at Israel, which has in recent years also intercepted drones it suspects were launched by Iranian-backed fighters near its borders.

"Until today, it cost us a lot of money to intercept each rocket. Today they (the enemy) can invest tens of thousands of dollars in a rocket and we will invest $2 on the electricity for intercepting that rocket," Bennett said in a video issued by his office.

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Germany Approves the Supply of IRIS-T Air Defense Missile Systems to Ukraine

01 June 2022

Source: Army Recognition | https://www.armyrecognition.com/defense_news_june_2022_global_security_army_industry/germany_approves_the_supply_of_iris-t_air_defense_missile_systems_to_ukraine.html

The launcher weapon station of the Iris-T missile can be mounted on tracked or wheeled chassis. (Picture source Dhiel Defense)

At the end of April 2022, Germany had promised to boost its aid to Ukraine with an increase of military support for foreign countries to €2 billion, of which a large share will go to Ukraine to help it purchase weapons, said the German Finance Minister Christian Lindner.

On May 14, 2022, Army Recognition reported that Germany was studying the possibility of delivering of the German-made Diehl Defence IRIS-T SLM air defense missile systems to

Ukraine.

Citing open source information, since the beginning of the war, Germany has already delivered or will supply to Ukraine 1,000 Panzerfaust 3 anti-tank weapons, 500 Stinger anti-aircraft missile systems, 2,700 Strela-2M ex-Soviet made anti-aircraft missile systems, 5,100 MATADOR anti-tank weapons, 1,000 anti-tank mines, 50 Gepard 35mm anti-aircraft armored vehicles, 7 PzH 2000 155mm tracked self-propelled howitzers as well as different types of drones and individual military equipment.

German Chancellor Olaf Scholz announced that Germany will provide Ukraine with the German-made IRIS-T Air Defense missile system manufactured by the company Diehl Defence.

The German Company Dhiel Defence has developed the surface-to-air defense missile system IRIS-T SL which is an upgraded version of the IRIS-T medium-range infrared homing air-to-air missile which is mounted on fighter aircraft.

The IRIS-T SL/SLM surface-to-air missile can be launched from tracked or wheeled platforms. The IRIS-T SLM system is an export version of the anti-aircraft missile system offered along with the IRIS-T SL missile, which is based on the IRIS-T air-to-air missile.

The IRIS-T SLM is a surface-to-air defense missile system designed and manufactured by the German company Diehl Defense. This air defense missile system has been optimized for 360° protection of objects, areas and mobile troop units in current and future mission scenarios in mobile and stationary 24/7 operation, in all weather conditions, with minimum personnel and least logistic effort.

The IRIS-T SLM air defense system is designed to engage and destroy a wide range of aerial threats including modern fighter aircraft, cruise missiles, drones, and tactical attack missiles as well as short-range ballistic missiles. Even helicopters and aircraft featuring small radar cross-sections and extreme maneuverability can be hit directly. High hit probability is achieved through precise control of the missile during terminal approach by a high-resolution, imaging IR seeker rendering countermeasures, including blinding lasers, ineffective.

The launcher unit of the IRIS-T SLM is based on 8x8 military truck chassis with a crew cab at the front and two blocks of four-tube launchers each able to fire one surface-to-air missile at a maximum firing range of 40 km and an altitude of up to 20 km.

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Commercial Providers of Satellite Services Face a Trust Gap With Military Buyers

Sandra Erwin | 05 June 2022

Source: Space News | https://spacenews.com/commercial-providers-of-satellite-services-face-a-trust-gap-with-military-buyers/

Ronald Birk, associate principal director at the Aerospace Corp. (left) speaks with Clare Grason, chief of the Space Force's Commercial Satellite Communications Office and Philip McAlister, director of the Commercial Spaceflight Division at NASA. Credit: Aerospace Corp.

WASHINGTON — Despite growing enthusiasm for new space internet services, some military buyers remain distrustful of commercial solutions as a replacement for government-developed systems, a senior procurement official said June 2.

"We see the LEO mania, and the new capability available … but customers have a bit of a trust issue," Clare Grason, chief of the Space Force's Commercial Satellite Communications Office, said during an online event hosted by the Aerospace Corp.

Services provided by commercial satellites from low Earth orbit are one item on a growing menu of options offered by LEO, medium orbit and geostationary Earth orbit satellite operators to fill military communications needs. Grason said her office — which is responsible for matching military satcom demand with commercial suppliers — is "trying to get DoD comfortable that commercial solutions are reliable and dependable. We are trying to build confidence."

Grason noted that most military buyers of commercial satellite capacity still prefer the traditional approach of using commercial bandwidth under short-term leases rather than buy fully managed services now offered by the industry.

An exception is a seven-year agreement DoD signed in 2019 with Iridium Communications for unlimited use of the company's mobile communications constellation.

Otherwise, the "majority of what we're procuring today is transponder capacity," Grason said. "They [military customers] want to own and control the terminals, the ground segment and the management of the network traffic."

Some users are warming up to commercial services, however, Grason said. The U.S. Army, for example, recently started a pilot program to evaluate commercial services, which is likely to be followed up with a managed service contract. The Marine Corps is looking to follow suit.

"The barrier in many cases is largely cultural," she said.

Commercial satellite communications acquisitions peaked in 2012, fueled by the wars in Iraq and Afghanistan. "After 2012 there was a slight decline," said Grason. "Now we're seeing our numbers rising."

Aerospace held the June 2 event to highlight a recent white paper that provides broad guidelines for government agencies to determine when it makes sense to buy commercial services.

The "commercial readiness assessment framework" lists recommendations for how government organizations can assess commercial

providers and commercial markets to meet national needs.

Ronald Birk, associate principal director at Aerospace and one of the authors of the assessment, said U.S. administrations for at least two decades have issued guidance to agencies to "use commercial as much as possible" but have not given guidance on "how to assess the appropriateness and readiness of providers."

"When making the decision to acquire a commercial capability, government agencies should determine the level and scope of assessments needed to match their risk tolerance," said the Aerospace paper.

A New Business Model

Grason said the Space Force "is laying the foundation to grow and prioritize commercial relationships." The space industry is leading in many areas "and we're seeing that in satcom."

Contracts like Iridium's that aggregate demand is a more efficient way of buying satcom, compared to having multiple contracts for different military customers, Grason said. Her office currently manages 175 different contracts for satellite communications.

"We believe that approach is a bit suboptimal," he said. But transitioning to full-service contracts will be difficult for DoD users because it's an unfamiliar business model.

Grason said her office is working with the consulting firm Deloitte to build an automated system to manage satcom procurements using the Salesforce customer relations management platform. "This should provide us with better information and promote better decision making and responsiveness," she said.

An effort also is under way to educate military program managers, said Grason.

"Space Force organizations are focused on building systems," she said. Some organizations are not familiar with the types of contracting methods that are now available that they could take advantage of, and worry that if they use commercial services, their needs will not be prioritized, Grason said.

"Our customers need to understand that making a transition makes sense economically and they can scale without having to add significantly more cost," she said.

It also would be helpful for commercial companies to make sure their business plans "match the budgets our customers have," she said. "And what are the terms and conditions? If DoD wants to lease terminals, what are the terms of replacing them? There are concerns that seemingly attractive models could become cost prohibitive."

Grason's message to commercial industry: "Never assume that the audience you're dealing with has a high level of understanding."

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Indian Aerospace Industry

India Emerges Frontrunner for Malaysian Fighter Jet Order

Sandra Erwin | 04 May 2022

Source: Economic Times | https://economictimes.indiatimes.com/news/defence/india-emerges-frontrunner-for-malaysian-fighter-jet-order/articleshow/92396099.cms?from=mdr

The Malaysian air force has been scouting for 18 new light fighter jets, with the Indian LCA emerging as a top contender given its low acquisition cost and high technical ratings.

New Delhi: India has emerged as the frontrunner for a Malaysian requirement of light combat aircraft, with a package deal on the table that would include maintenance and spares for the nation's Russian origin Su 30 fighter jets.

India has offered an attractive financial package for its Tejas Light Combat Aircraft (LCA) and has committed that it can keep Malaysia's fleet of Su 30 jets flightworthy, given the vast spares reserve and technical expertise available with Hindustan Aeronautics Limited (HAL).

India has offered an attractive financial package for its Tejas Light Combat Aircraft (LCA) and has committed that it can keep Malaysia's fleet of Su 30 jets flightworthy, given the vast spares reserve and technical expertise available with Hindustan Aeronautics NSE 1.14 % Limited (HAL).

Other contenders for the deal -- primarily South Korea and China -- are not in a position to offer this package as they do not have backend contracts with Russian manufacturers to work on the Sukhoi fighters. Malaysia has 18 of the Su 30 MKM fighters, which are very similar to the MKI version that is in service with the Indian Air Force.

It is learnt that detailed discussions on the dual package have taken place and a final decision may be possible under the government to government route. Several nations like Malaysia have been impacted by western sanctions on Russia that have made ordering spares and other supplies for legacy military equipment challenging.

The Malaysian air force has been scouting for 18 new light fighter jets, with the Indian LCA emerging as a top contender given its low acquisition cost and high technical ratings. India is offering the LCA Mk1A version with a modern AESA radar, new avionics and capability to integrate a variety of air to air and air to ground weapons. The Indian Air Force and Navy have also recently placed an order for indigenous Astra beyond visual range air to air missiles.

Senior teams from the Malaysian air force have visited India in the past to discuss the proposal. India is also offering to create a full maintenance, repair and overhaul facility for the LCA fleet in Malaysia to ensure a high rate of availability.

The Indian LCA is priced at around $42 million per unit, a price made possible given economies of scale after the IAF placed an order for 83 fighter jets under the Make in India initiative. In 2019, India had dispatched two of its LCA fighters for the LIMA show at Langkawi

as part of its efforts to pitch the jets for export order.

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India's GSAT-24 Satellite Launched, Entire Capacity Leased to Tata Play

23 June 2022

Source: The Hindu | https://www.thehindu.com/sci-tech/technology/indias-gsat-24-satellite-launched-entire-capacity-leased-to-tata-play/article65556291.ece

Arianespace launched GSAT-24 on-board Ariane-V VA257 flight from the Guiana Space Centre in Kourou. Photo courtesy: Twitter/@arianespaceceo | Photo Credit: Special Arrangement

Built by Indian Space Research Organisation for NSIL, the satellite was successfully placed into geostationary orbit by the Ariane 5 rocket, operated by French company Arianespace, from Kourou in French Guiana (South America) on Thursday.

NewSpace India Limited (NSIL) launched GSAT-24 in its first "demand-driven" communication satellite mission post space sector reforms, leasing the entire capacity on board to Direct-to-Home (DTH) service provider, Tata Play.

As part of "space reforms" announced by the Government in June 2020, NSIL was mandated to undertake operational satellite missions on a "demand driven" model, wherein it has the responsibility to build, launch, own & operate satellites and provide services to its committed customer.

The entire satellite capacity on-board GSAT-24 will be leased to its committed customer - Tata Play, the DTH business of Tata Group, for meeting their DTH application needs.

"The Ariane 5 has successfully placed two satellites into geostationary orbit: MEASAT-3d for the Malaysian operator MEASAT, and GSAT-24", Arianespace said after launching them on-board Ariane-V VA257 flight from the Guiana Space Centre, Europe's spaceport in Kourou.

"'Demand-driven' mode basically means when satellite is launched, one will know who the end customers are going to be and what's the kind of utilisation and commitment so that you have very effective utilisation of this satellite capacity once it goes into orbit", an NSIL official explained.

"Earlier, the mode was more supply driven, with capacity being leased after the launch with largely no firm commitment by customers before hand", the official noted.

"The entire mission is fully funded by NSIL -- satellite, launch, launch campaign, insurance, transportation, in-orbit maintenance and support. Once the satellite is up in orbit, this will be fully owned and operated by NSIL," NSIL Chairman and Managing Director Radhakrishnan Durairaj told PTI.

"So, we will be the satellite operator for this particular satellite," he said.

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ISRO to Launch PSLV-C53 Mission With Three Passengers from Singapore

23 June 2022

Source: India Today | https://www.indiatoday.in/science/story/isro-to-launch-pslv-c53-mission-with-three-passengers-from-singapore-1965732-2022-06-23

The spacecraft will carry three satellites in its launch fairing. (Representative Image)

The Indian Space Research Organisation (Isro) is set to launch three satellites from Singapore onboard its workhorse Polar Satellite Launch Vehicle (PSLV) on June 30. The PSLV-C53 mission will lift off from the Second Launch Pad at Satish Dhawan Space Centre, Sriharikota at 6 pm.

The Indian space agency said that the countdown for the mission will commence 25 hours ahead of launch at 5 pm on June 29. This will be the second dedicated commercial mission of NewSpace India Limited (NSIL), a corporate arm of the Department of Space.

While this will be the 55th mission of PSLV and the 15th mission using the PSLV-Core Alone variant, it is the 16th PSLV launch from the second launch pad. "The mission proposes to demonstrate the utilization of the spent upper stage of the launch vehicle as a stabilized platform for scientific payloads subsequent to the separation of the satellites," Isro said in a statement.

What is ISRO Launching?

The spacecraft will carry three satellites in its launch fairing DS-EO satellite and the NeuSAR, Singapore's first small commercial satellite carrying a SAR payload, which is capable of providing images day and night and under all weather conditions.

Isro said that the DS-EO is a 365 kg satellite and NeuSAR weighs 155 kg. While both spacecraft belong to Singapore, they have been built by Starec Initiative in the Republic of Korea. The Third satellite is a 2.8 kg Scoob-1 of Nanyang Technological University (NTU), Singapore.

DS-EO carries an Electro-Optic, multi-spectral payload with 0.5 m resolution imaging capability. Meanwhile, the SCOOB-I is the first satellite in the Student Satellite Series (S3-I), a hands-on student training program from the Satellite Research Centre (SaRC) at Singapore's NTU School of Electrical and Electronic Engineering.

About PSLV-C53

The second dedicated commercial mission of NSIL, PSLV-C53 has a lift-off mass of 228.433 tons and stands nearly 44.4 meters tall. The launch vehicle will inject DS-EO satellite into an orbit at an altitude of 570 km measured from the equator.

Isro will attempt a new experiment with the four-stage rocket and use the fourth stage (PS4) to perform PSLV Orbital Experimental Module (POEM) activity. Under this, the team will perform in-orbit scientific experiments using the spent PS4 stage as an orbital platform.

"It is the first time that PS4 stage would orbit the earth as a stabilized platform," Isro said adding that POEM derives the power from the solar panels mounted around the PS4 tank and a Lithium-Ion battery and navigates using four sun sensors, a magnetometer, gyros & NavIC. It also

carries dedicated control thrusters using Helium gas storage and is enabled with a telecommand feature.

POEM carries six payloads including two from Indian Space Start-ups M/s Digantara and M/s Dhruva Aerospace, enabled through IN-SPACe and NSIL.

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Cabinet Approves Transfer of 10 In-Orbit Communication Satellites from Government of India to M/S. New Space India Ltd.(NSIL)

08 June 2022

Source: PIB | https://pib.gov.in/PressReleasePage.aspx?PRID=1832160

The Union Cabinet chaired by the Prime Minister Shri Narendra Modi has approved the transfer of 10 in-orbit communication satellites from Government of India (GoI) to M/s.NewSpace India Ltd. (NSIL), a wholly owned Public Sector Enterprise of GOI under the administrative control of the Department of Space.

The Union Cabinet has also approved increasing the authorized share capital of NSIL from Rs.1000 crore to Rs.7500 crore.

Transfer of these assets to NSIL will further provide the desired financial autonomy to the company to realize capital intensive programmes/ projects and thereby offering huge employment potential and technology spin-off to other sectors of the economy. This approval is expected to trigger domestic economic activity in space sector and increase India's share in the global space market.

The Space Sector reforms mandated NSIL to undertake end-to-end commercial space activities and function as a full-fledged satellite operator. NSIL functioning as a single-window operator will also facilitate the ease of doing business in space sector. NSIL Board will now be empowered to price the transponders as per the market dynamics and global trends in the Satellite Communication sector. NSIL is also authorized to offer and allocate capacity as per its internal policies and guidelines.

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Army Opts for Chinese GPS Receivers Over Desi Ones

Chandan Nandy | 05 June 2022

Source: Indian Exptress | https://www.newindianexpress.com/thesundaystandard/2022/jun/05/army-opts-for-chinese-gps-receivers-over-desi-ones-chandan-nandy-2461843.html

Image used for representational purpose only. (File Photo)

NEW DELHI: By inaugurating a two-day drone festival in Delhi on May 27, Prime Minister Narendra Modi gave his stamp of approval to the indigenous NavIC or satellite navigation system that makes Indian-made drones perform their assigned functions. With the government focusing on the indigenous development of drones, it is expected that import dependence on such equipment would sharply reduce.

However, a few months ago, the Indian Army had purchased three GNSS (global navigation satellite systems) GPS receivers from a Chinese multinational technology company, among one

of the largest in the world, instead of relying on home-grown companies.

GNSS is a system of satellites that broadcast signals from space with both positioning and timing information. These signals are picked up by receivers which such information to determine their geographic location in terms of longitude, latitude and height. Multi-frequency GNSS receivers are used across many industries for accurate and reliable positioning right to the centimeter level. A simple GPS receiver only makes use of a single GNSS while multi-constellation GNSS receivers get information from many such systems at the same time.

According to Defence Ministry sources, the GNSS equipment was purchased from Baidu, specialising in Internet-related services and products and artificial intelligence. While the receivers, purchased for about `50 lakh, is to be used by the Pune-based College of Military Engineering (under the Department of Military Affairs) on survey stations, it is learnt that Baidu was given preference despite the bidding conditions stating that "preference shall be given to Class 1 local supplier" and "only Class-I and Class-II local suppliers…will be eligible to bid. Non-local suppliers…are not eligible to participate". Sources said the Army's preference for the Baidu receivers was objected to by a few Indian manufacturers, but these were brushed aside by the MoD and the Department of Military Affairs.

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In-Space Propulsion Startup Bellatrix Seals $8 Million Funding Round

Bharani Vaitheesvaran | 01 June 2022

Source: Economic Times | https://economictimes.indiatimes.com/tech/funding/in-space-propulsion-startup-bellatrix-seals-8-million-funding-round/articleshow/91939156.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

Bellatrix Founders Rohan Ganapathy (Left) and Yashas Karanam

Chennai: Bengaluru-based in-space propulsion startup Bellatrix Aerospace has concluded a $8 million funding round led by BASF NSE 1.05 % Venture Capital GmbH, the corporate venture company of BASF SE, and early-stage VC Inflexor Ventures.

The funding round saw the participation of StartupXseed, Pavestone Capital, Survam Partners, Karsemven Fund, the Mankind Pharma family office, and other prominent family offices and angel investors, said a statement.

Bellatrix, founded in 2015 by co-founders Rohan Ganapathy and Yashas Karanam, offers chemical and electric propulsion technologies. It runs a large research facility at SID-IISc for satellite propulsion. It also boasts of a strong IP portfolio in these technologies.

Recently, ET had reported that Bellatrix had tested an eco-friendly propulsion system for

satellites that cuts a new path from the hydrazine-dependent fuel systems and delivers fuel efficiency potential up to 20% for space satellites.

Bellatrix's CEO and CTO Ganapathy said the investment would aid in expanding product portfolio, and hire more people to broaden expertise, besides "augmenting our state-of-the-art infrastructure and focus on validation of our products in space." For the lead investor, the Bellatrix investment signifies an entry at the right time: "In India in particular, this industry is currently experiencing an unprecedented upturn," Markus Solibieda, MD at BASF Venture Capital GmbH, said.

Venkat Vallabhaneni, managing partner, Inflexor Ventures, said:"We see the space industry is growing exponentially, and Bellatrix's products will play a major part in democratizing access to the space industry with their cost-effective and power-efficient thruster systems, ideal for small satellite manufacturers."

Bellatrix operates in high-growth markets of in-space propulsion and orbital transfer vehicles, areas where a higher number of satellite launches has given rise to demand for green technologies and cost-effective satellite placement.

"Orbital Transfer Vehicles have become the new means of reaching orbit on rideshare missions for micro and small satellites," the statement said.

The company said the funds would be used for its 4-thruster modules slated to hit the market by year-end. Bellatrix also said it has bagged some contracts with ISRO and other customers. "The funds are also used towards the company's evolution into a full-fledged space transportation technology company with its unique Orbital Transfer Vehicle with capabilities to deploy customer satellites to their orbits quickly as well as perform missions to the geostationary orbit (GEO) and beyond," said the s ..

B V Naidu, Managing Partner, StartupXseed Ventures said, "As a Deep Technology fund and being one of the early backers of Space Tech through Bellatrix, we see them as a top player across Eurasia."

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Technology Development

Northrop Tests Laser Communication for U.S Army LEO Satellite Constellation

15 June 2022

Source: Defense Minor | https://www.defensemirror.com/news/32127#.Yrl9qRVBzIV

Northrop Grumman conducted ground demonstration of a secure networked laser communications system for proliferated-LEO constellations supporting the U.S. military.

Performed for Space Development Agency's (SDA) leadership, the demonstration validated compatibility between commercially developed laser communication and secure U.S. government encryption hardware, providing a baseline for Northrop Grumman's future proliferated space crosslink communications offerings including SDA's Transport and Tracking programs.

Northrop Grumman selected Mynaric as a strategic supplier for laser communications in space, and Innoflight for encryption, decryption and other key aspects of Northrop Grumman's architecture.

As the U.S. Department of Defense works to connect the joint force, Northrop Grumman's space networking capabilities seek to play a vital role in providing secure global connectivity. Another step toward enabling this vision to connect the joint force is the recent announcement of a collaboration with AT&T to research and develop a 5G-enabled digital battle network..

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Commentary

1. Paving the Way for 6G Commercialization - https://www.keysight.com/discover/bylines/paving-the-way-for-6g-commercialization

Further Reading

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2. These futuristic Chinese space denial weapons can disable or destroy opposing satellites - https://theprint.in/defence/these-futuristic-chinese-space-denial-weapons-can-disable-or-destroy-opposing-satellites/210212/
3. Taming the new field of space wars. - https://www.tribuneindia.com/news/features/taming-the-new-field-of-space-wars-403213
4. Russia Attempts To 'Hijack' A Western Orbiting Satellite; Experts Fear Moscow Could Damage The 'Equipment' - https://eurasiantimes.com/russia-attempts-to-hijack-a-western-orbiting-satellite-experts/?amp
5. Marines Handoff Loitering Munition Control Between Air, Sea, Land Platforms - https://www.thedrive.com/the-war-zone/marines-handoff-loitering-munition-control-between-air-sea-land-platforms

6. 'Unsustainable': how satellite swarms pose a rising threat to astronomy - https://www.nature.com/articles/d41586-022-01420-9
7. DRDO, Navy successfully test short-range, anti-air missile to protect ships - https://www.business-standard.com/article/current-affairs/drdo-navy-successfully-test-short-range-anti-air-missile-to-protect-ships-122062401002_1.html
8. Ukraine fired three Tochka-U tactical ballistic missiles at once - https://bulgarianmilitary.com/2022/06/24/ukraine-fired-three-tochka-u-tactical-ballistic-missiles-at-once/
9. New Milestone for China – World's 'Largest' Amphibious Aircraft AG600 Conducts Its First Flight With New Configuration - https://eurasiantimes.com/worlds-largest-amphibious-aircraft-ag600-conducts-its-first-flight/

"The term 'Aerospace' was introduced in 1958 by the USAF Chief of Staff, General Thomas D White, as a new construct that depicted air and space as a seamless continuum stretching from the Earth's surface to infinity."

The Centre for Air Power Studies (CAPS) is an independent, non-profit think tank that undertakes and promotes policy-related research, study and discussion on defence and military issues, trends and developments in air power and space for civil and military purposes, as also related issues of national security. The Centre is headed by Air Marshal Anil Chopra, PVSM AVSM VM VSM (Retd).

Centre for Air Power Studies
P-284 Arjan Path, Subroto Park, New Delhi - 110010
Tel.: +91 - 11 - 25699131/32 Fax: +91 - 11 - 25682533
Email: capsnetdroff@gmail.com
Website: www.capsindia.org

Supervised by : AVM Anil Golani (Retd)
Editor & Content : Gp Capt T H Anand Rao

Composed by Mr Rohit Singh
Tel.: +91 9716511091
Email: rohit_singh.1990@hotmail.com