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“There is something more important than any ultimate weapon. That is the ultimate position — the position of total control over Earth that lies somewhere out in space. That is ... the distant future, though not so distant as we may have thought. Whoever gains that ultimate position gains control, total control, over the Earth, for the purposes of tyranny or for the service of freedom”.

- Lyndon B. Johnson, (Then) Senator, quoted in U.S. News & World Report magazine, 1958.

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“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.”

Opinions and Analysis

Accidental Missile Launch: What India Should Do Next

Air Vice Marshal Anil Golani (Retd)

Additional Director General, Centre for Air Power Studies | 21 March 2022

Source: Hindustan Times | <https://www.hindustantimes.com/opinion/accidental-missile-launch-what-india-should-do-next-101647877675018.html>



On the evening of March 9, a supersonic missile crashed into a cold storage in Mian Channu village in Pakistan. (Reuters)

“Beware the Ides of March” — the famous lines from Julius Caesar signify doom and gloom experienced between March 13 and 15 as it was when Julius Caesar was assassinated by a group of rebellious senators led by Brutus and Cassius. These famous words spoken by a soothsayer served as a warning to Julius Caesar of impending gloom, which he ignored to his own peril. Just like words once spoken cannot be taken back, certain events in the history of nations may inadvertently lead to regrettable unintended consequences.

In the light of recent developments between India and Pakistan, the unintended launch of a supersonic cruise missile would continue to be debated on till some viable solution is found to prevent such an incident from happening again. Given the state of India-Pakistan relations, the

absence of dialogue since the last overtures by the current government in 2015 came to nought following the Pathankot terror attack in January 2016, and there has been a steady downward spiral in bilateral relations.

An initial reports in the Pakistan media claimed that a private jet trainer aircraft crashed and the pilot had ejected safely. There was no injury or loss of life and the area had been cordoned off by the army.

On March 11, the director-general of the Inter-Services Public Relations (DG-ISPR) in a statement said that it was a supersonic flying object, most probably a missile, had been tracked by Pakistan flying at 40,000 feet before it fell down in a cold storage without any loss to life or property. The Indian government issued a press release on the evening of March 11, which stated, “On March 9, 2022, in the course of a routine maintenance a technical malfunction led to the accidental firing of a missile. The Government of

The need for dialogue cannot be undermined and much more needs to be done by both governments to facilitate the same. Crises may pose threats to nations, but they also provide opportunities for peace

India has taken a serious view and ordered a high-level Court of Inquiry. It is learnt that the missile landed in an area of Pakistan. While the incident is deeply regrettable, it is also a matter of relief that there has been no loss of life due to the accident.”

Public statements by both governments took time to come, but it would be reasonable to assume that existing hotlines between the two countries must have been used immediately after the firing. The restraint and maturity used by the leadership in both countries are commendable. This, however, cannot be taken for granted for even a small incident in the future could lead to a conflagration with bitter consequences.

The need for dialogue cannot be undermined and much more needs to be done by both governments to facilitate the same. The conflict between Russia and Ukraine serves as a classic example of what could be the consequences, wherein innocent citizens pay the price for the absence of dialogue and lack of trust between the leaders of nations. While parallels cannot be drawn between Russia-Ukraine and India-Pakistan, the pandering to domestic constituencies must be calibrated keeping national interest foremost.

In times of crises, neither other nations nor international institutions, in their current format, can be relied on to prevent conflict in case the situation inadvertently goes out of control. This has been corroborated time and again in the conflicts that our country has faced since Independence, as also the war in Ukraine which is in its third week wreaking havoc and destruction, despite multiple meetings and resolutions of the United Nations Security Council.

There are no substitutes to hard and soft power, and no nation can ill-afford one at the cost of the other. There also is little merit in external dependence for the nation's security needs and, therefore, India has already started the long march to self-sufficiency or *atmamirbharta*. The journey will be arduous and painstaking, but it is important not to lose focus and stay on course.

However, conflicts in the interim have to be managed in the neighbourhood, as any conflict would not only extract a heavy toll on lives, but also set the nation back by a few years if not decades. The continuity of dialogue, therefore, becomes important in the India-Pakistan scenario. Whether "dialogue" stalls over Kashmir or terrorism, as has happened in the past may not be as important as the need to continue the same and make renewed

efforts to build mutual trust in the present scenario. Fifteen rounds of military-to-military talks with China since the Eastern Ladakh crisis two years ago may not have yielded the desired results, but they have precluded another clash.

Crises may pose threats to nations, but they also provide opportunities. The famous quote by William Shakespeare, in *Julius Caesar*, could not be more appropriate for India, when Brutus talks to Cassius telling him, "There is a tide in the affairs of men. Which, taken at the flood leads on to fortune; omitted all the voyage of their life is bound in miseries. On such a full sea are we now afloat, and we must take the current when it serves, or lose our ventures." India and Pakistan would do well to "Beware the Ides of March" and seize this opportunity to make amends to past mistakes and steer towards peace and prosperity.

Power For Projection

Air Vice Marshal Anil Golani (Retd)

Additional Director General, Centre for Air Power Studies

Source: Force India | <https://forceindia.net/cover-story/power-for-projection/>

A strategic force can be defined as a military force capable of assuming command of its own medium by its own resources. Until the advent of the aeroplane, the army and navy were valid expressions of the nation's ultimate military power on land and sea respectively. With the development of aircraft, however, that ceases to be true — Lord Trenchard

'The bomber will always get through.' This phrase used by Stanley Baldwin in his speech A Fear for the Future given to the British Parliament in 1932 had its essence in the fact that the man on the street cannot protect himself from a relentless bombing campaign from the air. True to the times that were then prevalent there was very little air defence could do until the invention of radars before the second world war.

The nature of war continued to change and evolve with the growth of technology, however the three basic characteristics of war i.e., firepower, mobility and the freedom to exploit the same remained. Firepower increased with modern precise munitions, mobility increased from mechanised forces on the ground to fast attack crafts, frigates, submarines and carrier strike groups on the high seas and supersonic stealth fighters and bombers in the third dimension. Until the advent of air power, warfare remained two dimensional and therefore air power in its initial years was treated as an adjunct of land or maritime power. It was only when the effects of

utilising the third domain gained salience that a gradual and reluctant admission of the air force as an independent and separate fighting force was acknowledged.

In an amorphous and changing global environment the concept of national security has also evolved from the ancient kingdoms and civilisations to the present-day nation state. Major wars on the scale of the world wars in the last century may have been averted in the last seven to eight decades but inter and intra state conflicts continue to challenge national, regional and global powers in their quest for peace. National security has come to encompass varied components from environment, energy, economy, food, health, cyber, demography, physical infrastructure etc. The threats to a nation's security also increasingly emanate from diverse domains of space, cyber, information, economic, biological and perception/cognitive warfare domains. As technologies continue to mature and innovations challenge the strategists and policy makers the salience of air power or aerospace power as the key enabler to achieve national security objectives remains unchallenged.

Emerging as a growing economy despite the Covid pandemic, India continues to increase its GDP year after year. Surpassing the United Kingdom, India is today the fifth largest economy in terms of nominal GDP even as its per capita GDP remains low because of the size of its population. The latest Global Firepower Index ranks India in the fourth position among the 140 countries considered in the survey.

Having unsettled borders with two nuclear armed neighbours who pose a collusive threat, India has no option but to have a strong and resilient military capability that can deliver in the

hour of need. As one of the largest democracies that takes pride in its strategic autonomy by not being a part of any military alliance, India also has the moral obligation of being a net security provider in the region. Aerospace power forms an essential and inescapable component of the nation's comprehensive national power equation without which peace would not only be difficult, but well-nigh impossible to maintain and sustain.

Air Power As A Deterrent

The key to maintaining peace is to ensure that you have a strong capability with the national resolve to utilise it when required. India has come a long way from the limitations imposed upon the employment of air power in the 1962 Indo-China war to the punitive strikes carried out by the IAF in February 2019. The air strike carried out by the IAF early in the morning on 26 February 2019, by Mirage 2000 aircraft on a terror training camp across the border in Khyber Pakhtunkhwa province of Pakistan took the adversary by surprise. Carried out at a time and place of its choosing, in retaliation to the Pulwama terror attack a few days earlier, the message was loud and clear.

Air power had demonstrated its key attributes of precision, surprise, stealth and shock effect by these air strikes. Even though there was retaliation by the PAF a day later, the reality had probably dawned that the risk of escalation would probably be a heavy price to pay. The retaliatory strike and the capture of the IAF pilot Wg Cdr Abhinandan after his MiG-21 had been shot down was proclaimed as victory by the PAF, terming it 'Operation Swift Retort' largely for the domestic audience in Pakistan. With India on the 'moral high ground' international opinion was against Pakistan and air power had proved itself a valuable

coercive and deterrent tool, forcing Pakistan to change its behaviour. The punitive strike carried out by the IAF ensured that Pakistan would think twice before aiding and abetting terror strikes across the Line of Control.

The IAF capability since then has increased with the induction of Rafale fighter aircraft equipped with long range precision stand-off weapon capability. The nation's air power capability would need to continuously train, equip and demonstrate its prowess to remain the preferred political instrument of choice for the application of military power.

Air Power In HADR

With the acquisition of C 17 Globemaster and C 130 Hercules aircraft, IAF's strategic reach has increased manifold. Operations undertaken to deliver drinking water to Maldives in September 2014 to the rescue of Indian nationals and those of other countries from strife torn Yemen in March 2015 have time and again demonstrated the IAF capability and rapid response in aid of its diaspora and friendly foreign countries. IAF C 17 moved heavy earth moving equipment to Visakhapatnam to aid in rescue and relief work after the cyclone Hudhud struck the east coast near Visakhapatnam, in October 2014.

After the Nepal earthquake in April 2015, the first Hercules C 130J took off from Delhi, four hours after the earthquake had struck Nepal. During the Covid pandemic the IAF transport fleet was extensively used to deliver vaccines to neighbouring countries and import oxygen for domestic requirements. The helicopter fleet of the IAF has been extensively used within the country from the Uttarakhand flash floods in June 2013 when eight different types of helicopters were positioned within 48 hours, operating from

various locations to the Kerala floods of 2018, when stranded people were rescued from flooded areas under inclement weather, food supplies carried out over inaccessible areas and medical teams flown to bring succour and relief to the people.

Cheetah and Chetak helicopters of the IAF have carried out innumerable daring rescue missions over glaciers and high-altitude areas, rescuing stranded foreign nationals and carrying out casualty evacuation (casevac) missions beyond the call of duty. The Mi 17 helicopters with Bambi Buckets have doused fires in jungles and over built-up terrain in cities, and Cheetah helicopters have assisted the Power Grid Corporation to help repair HT cables over inaccessible terrain. With a versatile fleet of Chinook heavy lift helicopters to the medium lift Mi 17V5 and ALH Dhruv and Cheetah helicopters the IAF helicopter fleet deployed across the country is always the first responder to any crisis.

Power Projection Through Air Power

The IAF carries out a fire power demonstration called 'Vayushakti' every three years at the Pokhran firing range in Rajasthan. This day and night display of multi-spectrum capability of the IAF is witnessed by the President, Prime Minister, defence minister, chiefs of the army and navy apart from other dignitaries and defence attaches of friendly foreign countries based in New Delhi.

Exercise 'Vayushakti 2022' scheduled for 7 March 2022 will have more than 150 aircraft of the IAF participating and displaying their operational capability to undertake offensive air operations, air defence and special ops in a network centric environment. Simulated enemy targets on the ground would be targeted and destroyed by a variety of precision guided munitions, missiles,

rockets and bombs by the entire fighter fleet of the IAF which would for the first time include the Rafale aircraft. Indigenous capability would also be on display by the weaponised version of the Advanced Light Helicopter 'Dhruv' and the Light Combat Aircraft 'Tejas.'

Special Heliborne Operations (SHBO) troop insertion by low hover jump with the Garud Special Forces carrying out simulated anti insurgency operations in urban terrain would also be showcased. The indigenously developed 'Akash' surface to air guided missile and 'Astra' air to air missile would also be on display. The last Vayushakti exercise carried out in 2019 was just two days after the deadly Pulwama terror attack in which 40 CRPF soldiers were martyred, and ten days before the IAF struck the Jaish-e-Mohammed terror training camp across the border in Balakot. This kind of an exercise carried out by the IAF gives a sneak preview of its capability to hit the adversary hard and with precision, in conventional operations, in an urban warfare anti-terror operations scenario and counter insurgency operations including the insertion of special ops forces by helicopters and fixed wing aircraft.

Air Power In Diplomacy

The IAF which had largely been insular and inward-looking post-Independence, till the end of the last century, was faced with hard choices as it fought wars with both its neighbours. The process of consolidation took time and its outlook changed post-economic reforms of 1991 and its engagement with the United States of America leading to the Next Steps in Strategic Partnership in 2005 and the Indo-US Civil Nuclear Cooperation Agreement 123 signed in 2005-06.

India's isolation by the international community and the sanctions imposed post- 1974

nuclear tests forced the country to remain non-aligned and prevented it from being a part of any military alliance, with the aim of maintaining its strategic autonomy. The first bilateral exercise of the IAF took place with the USAF in February 2004 when their F-15 aircraft came to Gwalior and operated in joint exercises with the MiG-21 Bison, Su-30K and Mirage 2000 aircraft of the IAF. This was followed by Exercise Cooperative Cope Thunder in Jul 2004 when six Jaguars of the IAF flew to Alaska to take part in the exercise with the USAF. This was the first time that IAF fighter aircraft had crossed borders other than for war.

The growing recognition of IAF's prowess has led India to actively participate in bilateral exercises on a regular basis with France, United Kingdom, USA, UAE, Oman, Singapore, Japan, Thailand, Russia, Egypt and Israel along with a couple of multilateral exercises. These exercises provide an opportunity to understand each other's training, operational and maintenance philosophies apart from building strategic partnerships.

Professional military interaction in live exercises differs significantly from training courses in each other's academies and institutions as these exercises help in forging bonds between the participating forces that would greatly benefit joint operations in a conflict or HADR scenario. The IAF in the last five years has carried out more than thirty bilateral/ multilateral exercises with Air Forces of friendly foreign countries in all the regions of the world. In the neighbouring countries tabletop exercises have been carried out to practise simulated disaster relief operations. The IAF has also carried out exercises in coordination with the Indian Navy while they carried out exercises with the Carrier Strike Groups of USA, France and

United Kingdom. The IAF aerobatic teams Surya Kiran and Sarang have performed in displays at the leading air shows in Singapore and Dubai.

Air Power In Future Restructuring

As the Indian armed forces look at restructuring or reorganising its commands in order to fight future wars, the primacy of air power must not be lost sight of. The core competency and the capability of the IAF in terms of lethality, precision, reaction time and network centric ability to operate in a multi threat environment must be capitalised to achieve the desired results in the shortest possible time frame. The IAF in the maritime security/ threat environment with its short sensor to shooter time, in coordination with the maritime patrol aircraft of the Indian Navy can be the game changer in the Indian Ocean Region (IOR). The proposed organisation structure should be able to capitalise on the IAF's strengths with its new generation aircraft and modern weapon systems by ensuring that the opening salvo and the decisive blow is given by air power. In the Indian scenario, with limited availability of fighter aircraft, albeit with modern, precision stand-off weapons the unity of command for optimal utilisation of these assets must be ensured.

Air Power Capability

The Light Combat Aircraft 'Tejas' designed and developed by the Aeronautical Development Agency (ADA) in collaboration with HAL is a fourth generation, single engine multi role combat aircraft. The aircraft has been recognised as a potent platform for air combat and offensive air support missions with the ability of undertaking reconnaissance and anti-shipping roles as well. This agile fighter aircraft capable of operating in a high threat environment has showcased its skills

at the Dubai Airshow in 2021, in Sri Lanka the same year to commemorate the 70th anniversary celebrations of the Sri Lankan Air Force and the Singapore Airshow in February 2022.

Being developed as a 'Flagship' made-in-India fighter aircraft which has already been inducted into the IAF, the fighter has attracted interest worldwide with the probability of exports to some friendly countries in the neighbourhood. With an edge in its performance in terms of avionics and Beyond Visual Range missiles the aircraft, if exported, would lead to a further strengthening of its ties with the concerned countries, apart from giving a significant boost to indigenous defence industry.

Advanced Light Helicopter (ALH) 'Dhruv' is an indigenously built multi role, multi mission helicopter produced by HAL. With more than three hundred already built by HAL and being operated by the Indian armed forces, the helicopter has also been exported to Nepal and Mauritius. The maritime version of the Dhruv is being evaluated and actively being considered by the Philippines security forces for marine policing duties. The ALH Dhruv also forms the 'Sarang' helicopter display team of the IAF; one of the only two helicopter aerobatic display teams in the world. The team has performed in a number of airshows, from Al Ain in UAE to MAKS in Russia, Berlin, Waddington, Farnborough and Bahrain apart from displays in Sri Lanka and the series of Aero India shows in Bengaluru. Performing an aerial ballet in the sky, the team with its professionalism and flying skill have mesmerised onlookers repeatedly, serving truly as the 'Brand Ambassadors' of the IAF and the country's indigenous capability.

Conclusion

The medium of air and space will continue to retain its primacy as the preferred option to not only wield destructive power as a coercive or deterrent force but also respond with alacrity for Humanitarian Assistance and Disaster Relief operations as and when the need arises. The IAF has over the years continued to build its capability and capacity along with India's growing economy and its stature as a mature and responsible democracy. The country has in the recent past, shaking itself from the shibboleths of yesteryears, lived up to the adage 'speak softly but carry a big stick' by demonstrating its ability to use the IAF as the political instrument of choice to convey its intentions unequivocally.

The fire power demonstration exercise carried out by the IAF at the Pokhran range in Rajasthan is an unambiguous display of the capability and might of the fourth largest and one of the most professional air forces of the world. The increasing engagement of the IAF in bilateral and multilateral exercises with other air forces from all the regions of the world stands testimony to its recognition as a professionally competent force. These exercises also help in building strategic partnerships with other nations thereby increasing India's diplomatic clout on the world stage. Any reorganisation/ restructuring of the commands of the Indian Armed Forces to fight future wars must take into account the sensitivities of the IAF to capitalise on its strengths and future ready network centric capabilities. The primacy of air power in a joint organisation must be ensured to retain the edge in any future conflict. The agility, lethality and utility of India's indigenously developed Light Combat Aircraft, Tejas, and the Advanced Light Helicopter, Dhruv, have aroused interest from potential buyers in the region. The

ALH has already been exported to Mauritius and Nepal while Malaysia has evinced interest in the LCA.

The nature of war will continue to evolve and change with the growth of technology. Hybrid, cognitive, cyber, electronic and informationised warfare are the new buzzwords that military strategists and policy makers use on a daily basis. While the effort to win the battle without firing a single shot remains, the efforts to innovate and produce precision munitions with lasers and directed energy also continue simultaneously. Be that as it may, the fact remains that in case a conflict is inevitable, the medium of air and space, through aerospace power will continue to remain the political instrument of choice thereby retaining the salience of air power.

Analysis: Ukraine Crisis Threatens China's Discreet Pipeline In Military Technology.

Greg Torode | 03 March 2022

Source: Reuters | <https://www.reuters.com/world/china/ukraine-crisis-threatens-chinas-discreet-pipeline-military-technology-2022-03-03/>



Pilots operate a JL-10 advance trainer jet of Chinese People's Liberation Army (PLA) Air Force at the China International Aviation and Aerospace Exhibition, or Airshow China, in Zhuhai, Guangdong province, China September 28, 2021. REUTERS/Aly Song/File Photo

Hong Kong, March 3 (Reuters) - Russia's invasion of Ukraine is likely to threaten one of China's most discreet but important strategic relationships in recent years: its use of Ukraine as a source of technology for the expanding Chinese military.

Military analysts and diplomats say that although the Ukraine-China link has come under increased pressure from the United States, the current conflict could largely scupper a trade that has helped China's military modernise over the last two decades.

Ukrainian frustration over Beijing's growing ties with Moscow and uncertainty over the shape of its post-war economy and government could threaten the relationship, they say.

"It's always been a good hunting ground for Chinese military technicians. There is a lot there, and it has been in some cases easier to get than getting it from Russia," said Moscow-based

Chinese military analyst Vasily Kashin of HSE University.

"The relationship as it was will be completely destroyed," he said, noting Ukrainian government anger at China's diplomatic support for Russia amid other post-war uncertainties.

Beyond the high-profile acquisitions of the partially built hulk of one of the Soviet Union's last aircraft carriers and the airframe of a carrier-capable Su-33 fighter jet, China has purchased engines for its training aircraft, destroyers and tanks as well transport aircraft, according to arms transfers tracked by the independent Stockholm International Peace Research Institute.

Asia-based military attaches say, less visibly, Ukraine has long been suspected to be a source of some command-and-control systems and other technology used in missiles. Ukrainian technicians have worked on a private basis inside China.

This work is expected to continue even if the official relationship sours or becomes difficult, they said.

"One traditional advantage for China in Ukraine is generally the security situation is more fluid than Russia, so it is possible to do things unofficially," one envoy said.

China's Ministry of Defense did not respond to a request for comment.

The SIPRI data does not put a value on every deal it lists, but based on figures provided over the last decade, China has on an annual basis spent at least between \$70 million-\$80 million.

Long-running programmes include a \$317 million-\$319 million deal to provide amphibious assault vehicles and \$380 million for turbofan

engines for Chinese JL-10 combat aircraft trainers, the SIPRI data shows.

Another important deal was the sale of 30 gas turbines for 15 Type-052D destroyers - engines that China is now producing under license and may have also adapted and improved for more modern ships, envoys say.

To be sure, the technology China's military technicians and engineers have acquired has enabled the growth of the country's own indigenous design and manufacturing abilities, making it less reliant on Ukraine than it once was.

"China was very dependent on Ukrainian technology in the 1990s and early 2000s, but that has diminished more and more, particularly as China has developed its own design and manufacturing capabilities," said Siemon Wezeman, a senior arms transfer researcher with SIPRI.

"There still may be some technology the Chinese are after, particularly aerospace and missile related... and traditionally they (Ukraine) produce quality, it is cutting edge," Wezeman told Reuters.

Russia remains China's most important source of military technology, but Ukraine has provided some items that Moscow can be reluctant or slow to give, reflecting its Soviet-era role as a military shipbuilding and aerospace hub.

SIPRI data shows a significantly larger Russia-China trade, encompassing more advanced turbofan engines for its aircraft, radars and advanced surface-to-air, anti-ship and anti-tank missiles as well as naval guns and transport aircraft.

But a habitually suspicious Moscow has not

always provided its latest technology to its large neighbour, the envoys say. As an example, China's rival South China Sea claimant Vietnam was able to obtain far more advanced Kilo diesel electric submarines from Russia over the last decade.

"My guess is that Ukraine for some years filled an important niche for China, in that it might have easier to get certain products and technologies that Russian might have been less keen to sell them," said Singapore-based strategic consultant Alexander Neill. "But China's own indigenous design and manufacturing capacities have improved and to a large extent Ukraine has probably served its purpose."

Any intensifying U.S. involvement in post-war Ukraine could also complicate the trade.

Already, pressure from Washington has had an impact. The Ukrainian government confirmed last year that it would halt the takeover of local aircraft engine maker Motor Sich by Chinese aerospace company Skyrizon due to U.S. concerns of forced technology transfers.

Air Power

Russia Says It Used Hypersonic Missiles In Ukraine Again

20 March 2022

Source: *IMR Media* | https://imrmedia.in/russia-says-it-used-hypersonic-missiles-in-ukraine-again/?utm_medium=email&utm_source=getresponse&utm_content=Indian%20Military%20Review%20Newsletter%2021%20March%202022&utm_campaign=



The Kinzhal hypersonic missile is capable of striking targets 2,000km (1,250 miles) away at 10 times the speed of sound

Russia's defence ministry says it attacked Ukraine with cruise missiles from ships in the Black and Caspian Seas, and with hypersonic missiles from Crimean airspace.

Russian defence ministry spokesman Major General Igor Konashenkov said on 20 March that the Kinzhal (Dagger) hypersonic missile hit a Ukrainian fuel depot in Kostiantynivka near the Black Sea port of Mykolaiv.

He added: "Kalibr cruise missiles were launched from the waters of the Black Sea against the Nizhyn plant that repairs Ukrainian armoured vehicles damaged in fighting."

The attacks marked the second day in a row that Russia used the Kinzhal, a weapon capable of striking targets 2,000km (1,250 miles) away at 10 times the speed of sound.

Konashenkov added that another attack by air-

launched missiles hit a facility in Ovruch in the northern Zhytomyr region where foreign fighters and Ukrainian special forces were based.

The previous day, the Russian military said the Kinzhal had been used for the first time in combat to destroy an ammunition depot in Diliatyn in the Carpathian Mountains in western Ukraine.

‘Kamikaze Drones’

Russia prides itself on its advanced weaponry, and President Vladimir Putin said in December that Russia was the global leader in hypersonic missiles, whose speed, manoeuvrability and altitude make them difficult to track and intercept.

The Kinzhal missiles are part of an array of weapons unveiled in 2018. Russia first used the hypersonic missile during its military campaign in Syria in 2016.

Putin has called the Kinzhal missile “an ideal weapon” given its speed and ability to overcome air-defence systems.

“This is a missile capable of carrying nuclear warheads and is believed to be undetectable by western air defence systems,” said Al Jazeera’s Dorsa Jabbari, speaking from Moscow. “It is being called an unstoppable ballistic missile.”

Putin announced an array of new hypersonic weapons in 2018 in one of his most bellicose speeches in years, saying they could hit almost any point in the world and evade a US-built missile shield.

The following year, he threatened to deploy hypersonic missiles on ships and submarines that could lurk outside US territorial waters if Washington moved to deploy intermediate-range nuclear weapons in Europe.

The US has actively pursued the development

of hypersonic weapons – manoeuvring weapons that fly at speeds of at least Mach 5 – as a part of its conventional Prompt Global Strike programme since the early 2000s, according to a new congressional report.

These weapons could enable “responsive, long-range, strike options against distant, defended, and/or time-critical threats [such as road-mobile missiles] when other forces are unavailable, denied access, or not preferred”, said former Commander of US Strategic Command General John Hyten.

Pakistan Air Force Inducts New ‘Dragon From The East’ J-10C Fighter Jet

13 March 2022

Source: Defence Aviation Post | <https://defenceaviationpost.com/pakistan-air-force-inducts-new-dragon-from-the-east-j-10c-fighter-jet/>



The Pakistan Air Force received the Chinese-built J-10C fighter on Friday. China operates the J-10C, which is an export variant of the J-10 fighter. The inauguration ceremony at the Pakistan Air Force base in Kamra featured Prime Minister Imran Khan as the chief guest. Pakistan’s state-run broadcaster, PTV News, also posted a video of five J-10C jets in flight and on the tarmac.

The Pakistan Air Force dubbed the J-10C the “Dragon from the East” during the induction

ceremony. In June of last year, the Pakistan Air Force claimed to have signed a deal with China to purchase the J-10C. The plane was described as “omni-role,” with “unrivalled manoeuvrability” and advanced electronics and weapons, according to the company. Dassault refers to the Rafale as a “omni-role” aircraft.

Despite claims that Pakistan had purchased the J-10 or a variant of the fighter for over a decade, the purchase was only confirmed late last year. Pakistan’s Interior Minister, Sheikh Rasheed Ahmed, announced the induction of 25 J-10C fighters into the Pakistan Air Force in late December.

He described the purchase as a reaction to India’s introduction of Rafale fighter jets. Rasheed had previously stated that the entire fleet of 25 J-10C jets would fly at the Pakistan Day military parade on March 23.

The J-10C is Pakistan’s first new aircraft since the JF-17, which was also developed by China, was delivered to the Pakistan Air Force.

The J-10C is significantly larger than the JF-17 and can carry a larger payload of weapons and fuel. The aircraft received by Pakistan were equipped with an infrared search-and-track (IRST) system on the nose, according to a video shared by PTV News. The heat signature of aircraft or missiles can be detected by IRST. Unlike radars, IRST does not reveal the host jet’s location, increasing its survivability.

The J-10C is the Pakistan Air Force’s first aircraft to be equipped with an IRST, giving Pakistan a capability that India has had for decades thanks to the MiG-29, Su-30, and Rafale.

China may also supply Pakistan with the PL-15 air-to-air missiles for the J-10C, according to

reports. The PL-15 is thought to be capable of hitting targets up to 200 kilometres away.

India To Integrate Mechanised Forces With UAVs

Aditya | 25 March 2022

Source: *Overt Defence* | <https://www.overtdefense.com/2022/03/25/india-to-integrate-mechanised-forces-with-uavs/>



Indian Army’s Directorate General of Armoured Corps has released a brief, providing proposed details of an Integrated Surveillance and Targeting Platform for Mechanised Forces (ISTP-MF). This was among the projects offered to the Indian industry for design and development, by the Ministry of Defence on March 3.

ISTP-MF will be a combination of surveillance drones and loitering munitions, both launched from tanks. The operational need for such a system arises from the limitations of mechanised warfare in irregular terrain, which reduces manoeuvre space for mechanised forces and makes them vulnerable to anti tank weapons. The performance of mechanised forces in Syria and Armenia-Azerbaijan were studied by the Army which notes that close infantry support is no longer an adequate remedy. ISTP-MF is proposed as an alternative whose potential ‘has been amply demonstrated in the recent conflicts’.

The surveillance drone may be VTOL, tube or cannon launched and controlled from within the tank. The range of the drone should be at least

15km with an endurance of 90 minutes. It must have day, night and autonomous operation modes with EO/IR sensors.

The loitering munition should be a tube launched system with man on the loop control. It must have modular warheads and top-attack capability. The range should be at least 15km with an endurance of 75 minutes.

The system should be capable of recovery and reuse and operate at high altitudes. It should have a secure communication link with ability to operate under GPS denial and electronic warfare conditions. AI enabled target identification algorithms must be present for target identification. The provisional need is for 600 systems, each with one surveillance drone and one loitering munition. 440 systems would go to armoured regiments while the rest would be used by mechanised infantry battalions.

The Indian armed forces have placed a number of orders for drones, counter drone systems and loitering munitions in the past few months. The army has also expressed interest in procuring over 1,750 tracked Futuristic Infantry Combat Vehicles (FICV). 20% of the vehicles are to be equipped with loitering munitions while 25% of the vehicles must have loitering munitions in addition to a VTOL surveillance drone system. Quick development of ISTP-MF would aid projects like FICV, reducing program risk and enabling timely induction. It would also help the Indian Army to combat obsolescence in its fleet of predominantly Russian armour, even as efforts to indigenize components are ongoing.

3 Ways Ukraine's Outgunned Air Force Has Kept Russia From Controlling Ukraine's Skies.

Peter Weber | 23 March 2022

Source: The Week | <https://theweek.com/russo-ukrainian-war/1011660/3-ways-ukraines-outgunned-air-force-has-kept-russia-from-controlling>

A month into Russia's invasion, "one of the biggest surprises of the war in Ukraine is Russia's failure to defeat the Ukrainian Air Force," The New York Times reports. "Military analysts had expected Russian forces to quickly destroy or paralyze Ukraine's air defenses and military aircraft, yet neither has happened."

Russia invaded Ukraine "with an arsenal of advanced fighter planes, bombers, and guided missiles, but significant combat losses in more than three weeks of fighting raise questions whether Moscow will ever fully dominate the skies," The Wall Street Journal adds. How did Ukraine's Soviet-era fighter jets and air defense systems deny Russia aerial impunity?

First, Ukraine has been nimble and creative with the air defense systems they have, a mixture of decades-old S-300 long-range missile-defense units, Turkish Bayraktar TB-2 drones, and portable U.S.-provided Stinger anti-aircraft missiles. Ukraine's long-range anti-air batteries have forced "Russian pilots to fly lower to escape those systems, but that put them within range of the shoulder-fired weapons," like the heat-seeking Stingers, the Journal reports. The heavy losses inflicted by these weapons have limited Russian sorties.

Second, despite having only about 55 working fighter jets, Ukraine utilizes its home-field advantage. "Ukraine has been effective in the

sky because we operate on our own land," says Ukrainian Air Force spokesman Yuriy Ihnat. "The enemy flying into our airspace is flying into the zone of our air defense systems."

The Russians "have almost full air superiority," because Ukrainian has limited air defense and aircraft, a Ukrainian fighter pilot using the call sign "Juice" told CNN's Anderson Cooper on Monday. But "Russians have a lot of losses, and they have a fear of our air defense."

Third, in the eight years since Russia annexed Crimea and stealth-invaded Ukraine's eastern Donbas region, "we have developed different techniques to give the enemy a punch in the teeth," Ignat tells the Journal. Ukraine's air defense has also likely "benefited from new approaches to fighting that the military embraced as it reorientated toward NATO and abandoned its Soviet-era centralized command," the Journal reports.

Ukraine's air force is greatly outnumbered, but its jets can take off from partially destroyed runways or even highways, the Times reports. "I only have to use my skills to win," a fighter pilot name Andriy tells the Times. "My skills are better than the Russians. But on the other hand, many of my friends, and even those more experienced than me, are already dead."

Ukraine's Pilots Are Exhausted. But Its Drones Are Still Going Strong

David Axe | 23 March 2022

Source: Forbes | <https://www.forbes.com/sites/davidaxe/2022/03/23/ukraines-pilots-are-exhausted-but-its-drones-are-still-going-strong/?sh=43ed9e205793>



A Russian Su-25 over Donetsk.

Photo Via Telegram User Chdambiev

Russia has had nearly a month to gain control of the air over Ukraine. It has failed.

With the wider war in Ukraine about to enter its second month, Ukrainian fighter jets and drones are still flying, still fighting and still notching victories over a much larger and more technologically sophisticated Russian force.

"The Ukrainian air force and air-defense forces are continuing to effectively defend Ukrainian air space," the British defense ministry stated Saturday.

How much longer the Ukrainian air force's fighter pilots can keep fighting is an open question. Kyiv so far has failed to acquire additional jets to bolster its dwindling fleet. Perhaps more importantly, the air force is struggling to husband its fuel stores.

However, the Ukrainians reportedly have topped off their holdings of Turkish-made TB-2 armed drones. The attrition of Kyiv's manned fighter fleet and simultaneous expansion of its drone fleet is hastening an evolution that was all

but inevitable even before Russia escalated its war on Ukraine starting on the night of Feb. 23.

The Ukrainian air force is becoming a drone air force. And arguably a better one for that. Kyiv's propeller-driven TB-2s, loitering over Ukraine's highways, have proved devastatingly effective against Russian air-defense vehicles, tanks and trucks. More effective by far than MiGs and Sukhoi's.

Ukraine began the war with around 125 active manned warplanes, including 30 or 40 Su-27 fighters and 50 or more MiG-29s plus a few dozen Su-24 and Su-25 attack planes. Additional airframes were in storage. The TB-2s numbered around 20 until Turkey reportedly shipped in more airframes.

In the hours before the initial Russian bombardment, Ukrainian squadrons scattered, away from their big bases. Some of the bigger aircraft such as airlifters, whose transponders were active, were visible on flight-tracking websites as they dispersed.

Setting up at small airfields or even roadways—mostly if not entirely west of the Dnieper River—the squadrons survived the rocket barrages.

Ukraine's manned planes quickly flew into action, tangling with Russian jets and bombing Russian formations on the ground. The TB-2 operators, meanwhile, took a few days to set up their control stations, radios and—apparently—links to Turksat satellites that help the drones fly farther from their austere bases.

Kyiv's aerial losses were acute in those first few days. Russian air-defenses shot down a pair of Ukrainian Su-25s in the span of a minute near Kherson in southern Ukraine, killing both pilots. A Russian long-range missile battery swatted a

Ukrainian Su-27 patrolling over Kyiv, killing the pilot.

The Kremlin claims it has shot down scores of Ukrainian aircraft. Foreign analysts have confirmed just 13 losses—three Su-27s, three MiG-29s, five Su-25s, an Antonov transport and one TB-2.

The defense ministry in Kyiv has made its own bold claim—this its pilots and air-defense crews have downed at least 99 Russian aircraft. Observers however have confirmed 14 shoot-downs—six Su-25s, four Su-34s, three Su-30s and an Antonov.

Even counting only the verified losses, it's clear Russia is losing a lot of planes to a numerically and technologically inferior foe. "I would say that Ukrainians have been extraordinarily effective at preventing the Russians from achieving air superiority by the agility and the nimble way in which they are marshaling their own air-defense resources," Pentagon spokesman John Kirby said Monday.

But the Ukrainian air force gets weaker every day the war grinds on. On March 11, a senior U.S. defense official said Kyiv was down to 56 active fighters—roughly half its pre-war total. An effort to source used MiG-29s from Poland ended in diplomatic disarray.

The air force could run out of aviation fuel before it runs out of MiGs. "The Russians are continuously targeting fuel depots of major Ukrainian air bases with their ballistic missiles," wrote Tom Cooper, an author and expert on the Russian military.

By week four, the Ukrainian air arm was flying just five to 10 sorties a day, versus the 200 or more sorties the Russian air force was launching

in or around Ukraine. “Every time when I fly, it’s for a real fight,” Andriy, a Ukrainian Su-27 pilot, told The New York Times. “In every fight with Russian jets, there is no equality. They always have five times more” fighters in the air.

The Ukrainian fighter force might not remain relevant much longer. But that doesn’t mean Kyiv’s troops can’t contest the air. The Ukrainians are getting shoulder-fired anti-aircraft missiles from half-a-dozen countries, and putting them to good use against low-flying Russian jets.

And Ukraine’s drone fleet still is going strong. Once their operators had reestablished operations at their dispersed bases, the TB-2s systematically began dismantling Russia’s front-line air-defenses on the highways around Kyiv in the north and Mykolaiv in the south.

After plinking a dozen or more air-defense systems, the drones began targeting tanks, trucks and supply trains. “TB-2s are also wrecking the Russians’ nerves,” Cooper wrote. “We’ve seen several videos shown entire Russian [battalions] turning around and fleeing after losing only a few vehicles to TB-2s.”

A year ago, Cooper proposed that the Ukrainian air force give up on far-fetched plans to acquire new manned fighters and instead evolve into an all-drone force strongly supported by ground-based air-defenses.

The TB-2s’ recent successes over the war zone only underscore that argument. For Ukraine, manned jets are “neither economic, nor makes sense,” Cooper said. Drones are the Ukrainian air force’s present—and its future.

Space

Defence Ministry Clears Indian Army’s Rs 4,000 Crore Proposal For Surveillance Satellite To Keep Eye On China, Pak Border

22 March 2022

Source: *The Print* | <https://theprint.in/india/defence-ministry-clears-indian-armys-rs-4000-crore-proposal-for-surveillance-satellite-to-keep-eye-on-china-pak-border/884020/>



New Delhi [India], March 22 (ANI): In a major capability boost for the Indian Army, the Defence Ministry on Tuesday cleared a Rs 4,000 crore proposal for a dedicated surveillance satellite to keep an eye on the activities along the borders with China and Pakistan.

“The Defence Acquisition Council meeting on Tuesday cleared the proposal for a made in India dedicated satellite for the Indian Army. The project for the satellite GSAT 7B will be carried out in partnership with the Indian Space Research Organisation (ISRO) and would help the Indian Army enhance its surveillance in border areas,” government sources told ANI..

The Indian Navy and Air Force already have dedicated satellites of their own and the approval to this will help the Indian Army to achieve the capability.

Post military standoff with china since April-May 2020, the Indian Army has been working towards upgrading capabilities along with strengthening its surveillance assets including drones along the Line of Actual Control (LAC) with China.

The satellite built by ISRO would also help the Make in India programme initiated by Prime Minister Narendra Modi to develop indigenous industry in the country, defence officials said. (ANI).

Defence Ministry Clears Proposal For GSAT-7C Satellite For IAF: A Look At Other Military Satellites In India

24 November 2021

Source: First Post | <https://www.firstpost.com/india/defence-ministry-clears-proposal-for-gsat-7c-satellite-for-iaf-a-look-at-other-military-satellites-in-india-10160861.html>



File photo of Indian Space Research Organisation's PSLV-C45 carrying EMISAT and 28 other satellites lifting off from the Satish Dhawan Space Center in Sriharikota. PTI

The Ministry of Defence on Tuesday approved a proposal to procure a GSAT-7C satellite and related equipment for the Indian Air Force (IAF) at a cost of Rs 2,236 crore. The decision to clear

the procurement was taken at a meeting of the Defence Acquisition Council (DAC) chaired by Defence Minister Rajnath Singh.

In a statement, the defence ministry said that the induction of the GSAT-7C satellite and ground hubs for software-defined radios (SDRs)

The GSAT-7C, which will be launched in another two-three years, will enhance the Indian Air Force's global operations and network-centric warfare capabilities.

will enhance the ability of our armed forces to communicate beyond Line of Sight among one another in all circumstances in a secure mode.

Here's a look at some of the other Indian military satellites.

GSAT 7A

Launched on 19 December 2018, this is a dedicated communication satellite for the Indian Air Force and Indian Army. The satellite helped in expanding the communication capabilities of the IAF in many ways. Firstly, it allows cross-connectivity between different ground radar stations, airbases and Airborne early warning and control (AWACS) aircraft like the Beriev A-50 Phalcon and DRDO AEW&CS. It also gave a big push to drone operations in the Indian military by helping the Navy reduce its reliance on ground-based control stations and switch to satellite-controlled unmanned aerial vehicles (UAVs).

Cartosat-2E Satellite

Known as 'the eye in the sky', the Cartosat-2E satellite was designed to collect high-resolution, large scale imagery. Launched by ISRO in 2017, the satellite provides India with an edge in warfare with clearer images -- it can accurately spot objects within a square of 0.6 metres by 0.6 metres. However, the Cartosat-2E isn't a dedicated military satellite and is also used for urban planning, infrastructure development and

traffic management.

Electromagnetic Intelligence Satellite (EMISAT)

The Indian Space Research Organisation gave India's military a huge boost when it launched the Defence Research Development Organisation-designed Electronic Intelligence Satellite, EMISAT, on 1 April 2019. EMISAT detects electronic signals on ground, especially hidden enemy radars. This capacity will help India in surgical warfare. EMISAT is primarily based on the famous Israeli spy satellite called SARAL (Satellite with Argo and Altika) and conduct sharp electronic surveillance across the length and breadth of India. It has been developed under DRDO's project Kautilya which aims to boost India's space surveillance capacity. The satellite can detect and gather electronic intelligence from enemy radar across the borders as it circles the globe roughly pole to pole every 90 minutes.

RISAT 2BR1

Part of India's RISAT series of SAR imaging satellites, the RISAT-2BR1 was launched on 11 December 2019 from the Satish Dhawan Space Centre in Sriharikota. It is an Indian radar reconnaissance satellite, giving India the capability to accurately identify two objects separated by just 35 cm.

Hyper Spectral Imaging Satellite (HySIS)

HySIS, launched on 29 November 2018, provides the country with hyperspectral imaging of agriculture, forestry, coastal zones, and inland waterways. Its data is also accessible to defence forces.

Microsat-R Satellite

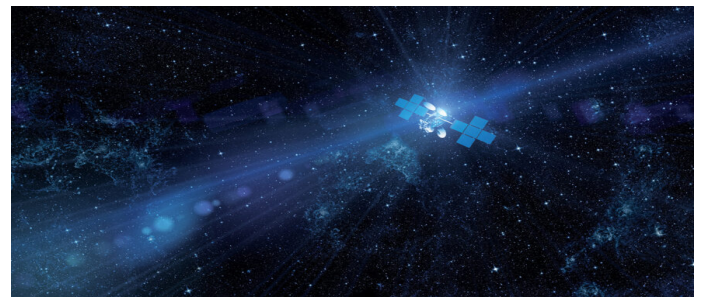
A dedicated military satellite for the Indian Armed Forces, it was launched on 24 January

2019. The 760 kg imaging satellite was launched using PSLV C-44 rocket. It later served as a target during India's anti-satellite weapon experiment, Mission Shakti. With Mission Shakti, India became the fourth country in the world — behind the United States, Russia and China — to have an anti-satellite weapon.

Cyber Warfare Gets Real For Satellite Operators

Sandra Erwin | 20 March 2022

Source: Space News | <https://spacenews.com/cyber-warfare-gets-real-for-satellite-operators/>



Rendering of Viasat-1 communications satellite. Credit: Viasat

WASHINGTON — The U.S. government on March 17 advised satellite operators to put their guard up in the wake of a cyberattack that disrupted internet services in Europe provided by Viasat's KA-SAT.

“Given the current geopolitical situation, the Cybersecurity and Infrastructure Security Agency requests that all organizations significantly lower their threshold for reporting and sharing indications of malicious cyber activity,” said CISA, an organization within the Department of Homeland Security.

Following CISA's advisory, the Satellite Industry Association on March 18 issued a statement of “commitment to cybersecurity best practices” and expressed concern about “evolving

attacks by criminals, terrorists, and nation states.”

The February cyberattack on Viasat’s network, first reported by Reuters, is being investigated by French, U.S. and Ukrainian intelligence services as a potential act by Russian hackers.

Viasat in a statement last week said the company believes “this was a deliberate, isolated and external cyber event” and customer data was not compromised. Because the attacks directly targeted modems, the company is providing some customers over-the-air updates and replacing other customer modems.

“Our commercial network is very well secured and we’ve learned a lot of lessons over the last few weeks,” Craig Miller, Viasat’s president of government systems, told SpaceNews.

Miller said he could not discuss details of the KA-SAT incident. Any attack on a network is a reminder of why satellite operators pursue “multifaceted strategies” to protect their systems, he said.

“Any network is only as strong as its weakest link. In some cases, that may be the satellite, in some cases that may be the terminal. In some cases, it may be the ground infrastructure. Or it may be the cyber posture of the system,” Miller said. “So you have to protect against every one of them because you’ll get attacks across the whole spectrum.”

Government Concerns

The resilience of satellite networks is becoming a major concern for the Defense Department, which relies on a mix of government-owned and commercial satellites for internet and global communications.

Miller said military communications services

are resilient by virtue of using multiple providers that operate satellites in different orbits. “I think resilience through diversity is going to be a hot topic,” he said. “I’m encouraged to see that the DoD is investing in geostationary, medium and proliferated low Earth orbit satcom simultaneously. I think it’s important that you don’t throw all your eggs in one basket and that’s going to be an important conversation.”

While the KA-SAT disruption was caused by a cyber attack, a different type of satellite internet system, SpaceX’s Starlink in low Earth orbit, experienced “signal jamming” in user terminals in Ukraine, according to CEO Elon Musk.

Electronic radio-frequency jamming is typically done from the ground when a jammer sends a signal to the satellite that’s more powerful than the terminals. “A simple analogy is two people are in a room whispering to each other. If someone next door to them is screaming and you can’t hear the two people whispering because someone is much louder, and that’s how jamming works,” Miller explained.

The U.S. military has to worry about all types of threats, he noted. Not just cyber and jamming attacks but also kinetic threats such as ground-to-air missiles that can blow a satellite to pieces.

“It’s virtually impossible to build a single system that is resistant to all threats simultaneously,” said Miller. “Some systems may not be as resistant to jamming but may be very resistant to cyber. Even the military’s most exquisite satellites “can be destroyed with an ASAT [ant-satellite] weapon and you only have to shoot out a couple of satellites and the whole system’s gone.”

Viasat is working with the Air Force Research Laboratory under a seven-year \$50.8 million

contract to develop concepts for “hybrid networks” of commercial satcom and government-owned satellites.

DoD wants hybrid networks because it allows them to take advantage of commercial systems and gives them options especially in a crisis, said Miller. “DoD is embracing the concept of using lots of different services at different orbits and at different frequencies and that’s really the key to resilience, it’s having optionality and freedom to maneuver.”

Under the AFRL contract, Viasat will conduct demonstrations of hybrid networks. “They will see how difficult it is to disrupt these types of communications, and how difficult it is for an adversary to even know if their effects are working, because you don’t even know what networks users are on.”

Stronger Security In Commercial Satellites

Ryan Reid, president of Boeing Commercial Satellite Systems, said commercial operators have the same concerns the government has about resilience.

Boeing builds jam-resistant satellites for the U.S. military and many of the technologies are being applied on the commercial side, Reid told SpaceNews.

Techniques like beam shaping and frequency allocations give a commercial operator the ability to actively manage interference, said Reid.

The military is increasingly interested in using commercial assets so it’s incumbent on commercial operators to provide “protected features” to add resilience, he said.

To ensure commercial satcom networks that support the military are cyber secure, the U.S.

Space Force started a program called Infrastructure Asset Pre-Assessment Program (IA-Pre).

The military has always demanded cybersecurity in satcom systems but “they are increasing the level,” said Rick Lober, vice president and general manager of defense and intelligence systems at Hughes Network Systems.

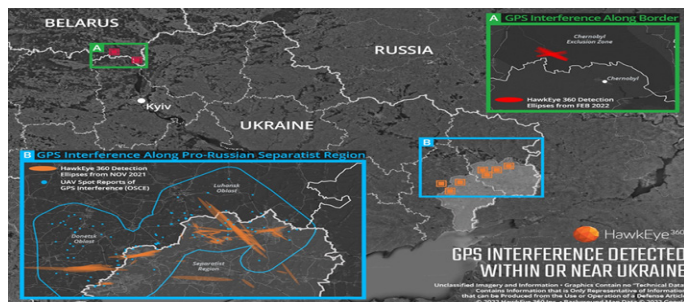
The recent network attacks in Ukraine have been “an eye opener for everybody,” Lober told SpaceNews. “A lot of government networks that are using commercial satellites do have a higher level of protection built into them. But certainly, everyone wants to make sure that they are applying all the latest techniques to protect these systems.”

The use of hybrid networks with multiple transport options is gaining traction not just in DoD but also in private industry because of the added resilience, said Lober. “We in the commercial industry call it software defined networking, where we can put different traffic types over different satellite links or terrestrial links, and that does give you a degree of protection.”

Counterspace Efforts In Russia's Military Action In Ukraine

Gp Capt TH Anand Rao | 15 March, 2022

Source: Centre for Air Power Studies | <https://capsindia.org/counterspace-efforts-in-russias-military-action-in-ukraine/>



www.he360.com

Space has long been an enabler of military functions, and it goes without saying that modern wars cannot be fought without utilising space assets by the land, sea, and air forces. The Gulf War (Op Desert Storm) demonstrated how the US forces could make use of the Global Positioning System (GPS) to have an advantage in unfamiliar overseas terrain. The air war over Kosovo is perhaps a fine example of how satellites played a vital role in intelligence gathering and targeting, which improved the precision factor in aerial strikes and reduced collateral damage. Successive military conflicts since the Cuban missile crisis of 1962 have seen a rising component of satellite usage. Military satellites can be employed for multiple tasks that have a direct bearing on operational capabilities, such as early warning, intelligence, surveillance, reconnaissance (ISR), communication, data relay, navigation, and weather prediction.

As for the Russian special military operations in Ukraine, it was expected that military operations would be preceded by cyber-attacks, electronic warfare, and space support prior to any movement of military troops and equipment

across the borders. How much of that has happened is still to be discovered, though there is evidence of some electronic interference and cyber activity from both sides and disruptions in the use of space resources.

Disruption of Communications

The initial evidence of loss of data services and communication in some parts of Ukraine surfaced when Ukraine's Minister of Digital Transformation, Mykhailo Fedorov, appealed to Elon Musk on Twitter, saying, "while you try to colonize Mars -- Russia try to occupy Ukraine! While your rockets successfully land from space -- Russian rockets attack Ukrainian civil people! We ask you to provide Ukraine with Starlink stations and to address sane Russians to stand." There was a sense of desperation in the tweet, which called for an urgent action. The response from SpaceX CEO Elon Musk was swift, and the Starlink satellite internet service was extended to the Ukraine region within a day. The satellite terminals required to make the data service operational were also shipped to Ukraine to restore essential communication and data services. However, end-users in far-flung areas will still remain blacked out unless they import Starlink satellite dishes or improvise with locally available dish antennae to receive signals from the service. Even though additional consignments of satellite receiver equipment have been sent by SpaceX, it is unclear how those supplies will reach the Ukrainian people when the battle has reached the streets. The Ukrainian government has made innovative use of the messaging application Telegram, to keep its citizens informed of various information required during the war. The availability of the internet is the backbone of their messaging services.

With the Starlink network being the only non-Russian communications system operating in Ukraine, there are high chances of it being targeted. Despite the robust Starlink satellite network and the use of the latest software update to bypass the jamming, some Starlink terminals near conflict areas have experienced jamming for several hours at a time. Viasat's KA-SAT satellite in geostationary orbit, which provides broadband service to Ukraine and other parts of Europe, has suffered service disruptions since the military operations started on February 24, 2022, which has been attributed to cyber-attacks.

Prior to the war, connectivity in Ukraine was provided by the Inmarsat and Iridium satellite constellations. Many of these services are still intact but may be unreliable due to outages. Terrestrial mobile connectivity has still eluded the Russian forces in some areas. Starlink remains the only non-Russian communications system still working in some parts of Ukraine affected by military operations.

GPS Interference

Given the dependence on it for navigation and targeting, interference of GPS signals is perhaps the simplest of all means of disrupting adversaries' tactics. It has become a ubiquitous military action towards shaping the battlefield since the conflict in Kosovo. It was anticipated that Russia would undertake GPS interference, given its wide-ranging capability to jam and/or spoof GPS receivers. The Russian military is known to have routinely jammed GPS in Eastern Ukraine since the Crimean conflict in 2014 and often spoofs GPS. As enumerated by Brian Weeden of Secure World Foundation, Russian soft kill counter-space capabilities are fully integrated into their warfighting tactics at the doctrinal and

operational levels.

A US-based radio frequency spectrum geo-analytics company, HawkEye 360 Inc, which has the capability to detect and geolocate GPS interference, claims to have examined Ukraine through space-based geo-analytics over the months preceding the Russian special military operations. They discovered a high level of GPS interference across the region. The data analysis indicated extensive GPS interference in November 2021 in the regions of Luhansk and Donetsk. It was later confirmed through open-source intelligence that Ukrainian Unmanned Aerial Vehicles (UAVs) operating in the area faced disruptions due to erroneous GPS signals. Later, in February 2022, the company detected GPS interference along the border between Ukraine and Belarus (near Chernobyl), shortly before the Russian military operations started. These inputs further confirmed the integration of electronic warfare and counter-space tactics into Russian military operations, which degraded Ukraine's defences.

What Next!

Besides the SpaceX Starlink network support for internet and data services, Ukraine is dependent on western sources for imagery intelligence on Russian troop movements. This real-time tactical intelligence has been a vital link in bolstering Ukraine's military counter-offensive operations, which has resulted in heavy losses for the Russian forces. There are speculations that these satellites could be targeted by Russian anti-satellite weapons, but that would be an act of escalation. Russia may not resort to the targeting of NATO's space infrastructure unless provoked. In contrast, the head of Russia's space agency made a statement to caution that Russia will treat

any hacking of its satellites as a justification for war.

Russia has significant counter-space capabilities like kinetic ASAT weapons, laser directed energy weapons, electronic interference, and cyber warfare tactics. These could be used in full measure to blunt the space support to Ukrainian armed forces. However, Ukraine enjoys space support of American and European origin. Any attempt to disrupt this space support would invoke a collective response from NATO in terms of Article 5 of the North Atlantic Treaty. In 2019, NATO allies adopted a space policy recognising space as a new operational domain, alongside air, land, sea, and cyberspace. Therefore, any escalation of the war over Ukraine is certain to extend into space.

Ukraine Hackers Target GLONASS For Cyberattacks

Tracy Cozzens | 06 March 2022

Source: GPS World | <https://www.gpsworld.com/ukraine-hackers-target-glonass-for-cyberattacks/>



Photo: EvgeniyShkolenko/iStock/Getty Images Plus/Getty Images

Ukraine's hacker underground named GLONASS as one of its top priorities, according to media reports that cite a post on the "IT army" Telegram channel.

The IT army, formed on Saturday, is a collective of volunteer hackers. "We need to mobilize and intensify our efforts as much as possible," the IT army posted.

Besides GLONASS, hackers are focusing on Russian telecom companies and the railway network in Belarus — a key staging area for Russia's invasion of Ukraine.

The Belarusian Cyber Partisans, a hacking team focused on Belarus, told Reuters it had disabled railway traffic systems in Belarus. Another target is the electrical grid.

Global Aerospace Industry

Russia Ready To Consider Selling S-500 To India

18 March 2022

Source: IMR Media | https://imrmedia.in/russia-ready-to-consider-selling-s-500-to-india/?utm_medium=email&utm_source=getresponse&utm_content=Indian%20Military%20Review%20Newsletter%2021%20March%202022&utm_campaign=



S-500 Russian Prometheus air Defence system

Russia is prepared to closely study the possibility of selling its newest air defense systems S-500 to India, should New Delhi display interest in such a deal, Russian ambassador in New Delhi, Denis Alipov, told Russian media on 18 March.

“I can confirm that if India displays interest in acquiring S-500 systems, we will study this possibility in the closest way,” Alipov said. “But, as far as I know, no concrete talks are on the current agenda,” he added.

Russian Deputy Prime Minister Yury Borisov said last December that India might become the first foreign purchaser of the Russian missile defense system S-500 Prometheus, should it display interest.

Earlier, in July 2021 the Russian Defense Ministry said that the S-500 had undergone live firing tests at the Kapustin Yar proving ground. All of the expected parameters were confirmed.

The S-500 system – a product of the Almaz-Antey group – was designed to intercept any of the existing or yet-to-be developed aerospace attack weapons of a hypothetical enemy in the entire range of altitudes and speeds. The S-500 is seen as a successor to the S-400 Triumph system.

12 Sukhoi-30 MKI Fighter Aircraft Order On The Anvil

16 March 2022

Source: IMR Media | https://imrmedia.in/12-sukhoi-30-mki-fighter-aircraft-order-on-the-anvil/?utm_medium=email&utm_source=getresponse&utm_content=Indian%20Military%20Review%20Newsletter%2021%20March%202022&utm_campaign=



The Defence Acquisition Council is likely to consider the purchase of 12 Sukhoi-30MKI from Russia

The Indian Air Force, desperately short of fighter aircraft, is ordering 12 Russian-designed Sukhoi-30 MKI very shortly. Its bid for the fighters, a Rs 10,000 crore package, is expected to be cleared by the Defence Acquisition Council (DAC) shortly.

The fighters, though Russian designed, include indigenous and also, Israeli systems and are built in India by Hindustan Aeronautics. The purchase of the additional Sukhois has come up as the IAF is short of fighters, its squadron strength down to the early 30s, instead of the allotted 40. A dozen fighters will give two-thirds of a much-needed

squadron. The IAF had just two squadrons of the Rafale, but it still flies older aircraft, including the upgraded MiG-21 Bison.

Also on the agenda for the DAC are 70 HTT-40 basic trainer aircraft for the IAF. These have been indigenously developed by Hindustan Aeronautics and are also, badly needed as the IAF faces shortages in basic trainers. This deal is worth several thousand crores of rupees. In recent times, the IAF had bought the Pilatus, but a plan to buy a second tranche did not go through.

The DAC could clear about 50 suites of electronic warfare equipment made by Bharat Electronics, valued at about Rs 2,000 crore. All three projects involve a level of indigenisation, keeping in mind the government's desire for atmanirbharata or self-reliance.

Germany to Buy F-35 Warplanes For Nuclear Deterrence

Sebastian Sprenger | 15 March 2022

Source: *Defence News* | <https://www.defensenews.com/global/europe/2022/03/14/germany-to-buy-f-35-warplanes-for-nuclear-deterrence/>



An F-35 is pictured on the tarmac during the 2018 Berlin Air Show. After initially ruling out the jet, leaders in Germany announced plans in March 2022 to buy up to 35 of the planes. (Lockheed Martin)

WASHINGTON – Germany will buy up to 35 copies of the U.S.-made F-35 fighter jet, reversing years-long plans that saw the fifth-generation warplane eliminated from consideration, defense leaders announced Monday.

The planes will take over by 2030 the niche, but crucial, nuclear-weapons mission from the aging fleet of Tornado aircraft, Defense Minister Christine Lambrecht said during a joint statement with Air Force Chief of Staff Lt. Gen. Ingo Gerhartz in Berlin.

The decision means Germany will continue to provide suitable aircraft for carrying U.S. nuclear weapons stored in the country into a hypothetical atomic battle, as prescribed under NATO doctrine. Previously, officials were planning to buy new versions of the the F-18 for that role plus the job of electronic attack and suppressing enemy air defenses.

The Tornado-replacement decision, talk of which has amounted to a parlor game in Berlin policy circles for more than a decade, removes the

Super Hornet from the table altogether, instead positioning a modernized Eurofighter aircraft as the weapon of choice for electronic combat. That line of thinking is sure to please manufacturer Airbus, which had all along proposed its plane as a kind of sandbox platform leading to the French-German-Spanish Future Combat Air System by 2040.

The decision in favor of the F-35 comes in the context of Germany's defense strategy adjustment following Russia's assault on Ukraine. Berlin's new spending and modernization plans prize off-the-shelf systems that can quickly plug readiness holes in the armed forces.

"There is only one response to [Russian President Vladimir] Putin's aggression: unity within NATO and a credible deterrent," Gerhartz said. "That's why there is no alternative to the decision in favor of the F-35."

Gerhartz and Lambrecht touted cooperation opportunities surrounding the Lockheed Martin-made plane, which other European nations have already bought or plan to buy. Most recently, Switzerland and Finland picked the stealthy aircraft to replace legacy warplane fleets. The U.K., the Netherlands, Belgium, Italy, Denmark and Norway also are among the customers on the continent.

Meanwhile, Germany remains committed to the FCAS program, according to a German Defense Ministry statement. Lambrecht said she had told her French counterpart, Florence Parly, about the F-35 decision during at March 9 visit to Evreux Air Base in northern France, where the two countries are operating a joint air-transportation unit built around C-130J aircraft.

A spokesperson at the French Ministry of Defence was not immediately available for comment.

The FCAS program is at a critical juncture, as key contractors Dassault and Airbus Defence and Space are unable to reach an agreement covering workshare and intellectual property rights for the futuristic program's central fighter jet.

Earlier this month, Dassault CEO Eric Trappier spoke dismissively about the prospect of Germany buying the F-35, suggesting Berlin was being pressured by the United States into buying the jet for the nuclear mission while paying lip service to the mantra of buying European.

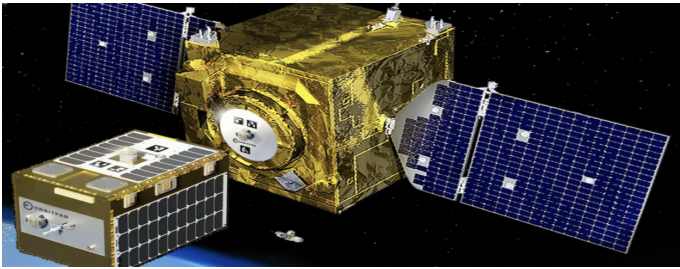
With Dassault's order books filled for its cash cow product, the Rafale plane, the company may have little incentive to compromise on its leadership claims for the next-generation fighter, German analysts have said. Unless, that is, French President Emmanuel Macron intervenes in the spirit of saving the program.

Orbit Fab Gets \$12 Million to Integrate Refueling Port With Military Satellites

Sandra Erwin | 17 March 2022

Source: Space News | <https://spacenews.com/orbit-fab-gets-12-million-to-integrate-refueling-port-with-military-satellites/>

Orbit Fab developed a refueling port for satellites called



RAFTI, short for Rapidly Attachable Fluid Transfer Interface. Credit: Orbit Fab

WASHINGTON — Orbit Fab, a venture-funded startup offering a refueling service in space, announced it has won a \$12 million deal to ensure its fueling interface works with U.S. military satellites.

The funding includes \$6 million from the U.S. Air Force and U.S. Space Force, and \$6 million from Orbit Fab's private investors. The contract is for the integration of Orbit Fab's fueling port, called RAFTI — short for rapidly attachable fluid transfer interface — with military satellites. The port allows satellites to receive propellant from Orbit Fab's tankers in space.

This is the largest government contract won by the company to date, Jeremy Schiel, founder and chief development officer, told SpaceNews March 17.

"It's another huge indicator that people really want refueling," he said. "The government over the last two years has been pushing refueling efforts really hard. People want assurance that we are going to be able to provide that fuel in the

orbit that they need."

The Air Force last year awarded Orbit Fab a \$750,000 Small Business Innovation Research (SBIR) contract to flight qualify the RAFTI port.

Orbit Fab's plan is to deploy propellant tankers to serve as gas stations in space. Its first tanker was launched last year to low Earth orbit. Its first geostationary tanker is projected to launch later this year or next year on a SpaceX commercial lunar lander mission.

The company is working with commercial and government customers to equip their satellites with RAFTI ports so they can be refueled and continue operating. The military is interested in this technology primarily to get more mileage out of its satellites in geostationary orbit.

Orbit Fab won what is known as a STRATFI contract, short for strategic financing. STRATFI is a funding initiative created by the Air Force to allow companies that win SBIR contracts to compete for bigger awards that are matched by private investment

Schiel said there are no plans yet to conduct an on-orbit demonstration with a military satellite "but we're in talks."

Founded in 2018, Orbit Fab is based in San Francisco but announced plans to move to Colorado. It has attracted financial support from defense contractors Northrop Grumman and Lockheed Martin.

With Soyuz Off the Table, OneWeb Back In The Mix

Jason Rainbow | 03 March 2022

Source: *Space News* | <https://spacenews.com/with-soyuz-off-the-table-oneweb-back-in-the-mix/>



Russia issued an ultimatum on a March 4 launch for OneWeb after the Soyuz was rolled out to the launchpad.

Credit: Roscosmos

TAMPA, Fla. — OneWeb is considering American, European, Indian and Japanese rockets for launching its remaining 220 satellites after the company announced March 3 that it would stop using Russia's Soyuz rocket.

OneWeb, which is partly owned by the British government, has launched 428 of a planned 648 broadband satellites aboard Soyuz rockets under a 19-launch contract with Arianespace of Evry, France.

All 13 of OneWeb's launches to date have been on Soyuz and OneWeb planned to launch five more missions by the end of August to enable its low Earth orbit constellation to provide global services. A sixth Soyuz mission had been planned to provide in-orbit backup capacity.

Those plans were upended after Russia's Feb. 24 invasion of neighboring Ukraine sparked the most dangerous geopolitical crisis since the Cold War.

Preparations for OneWeb's scheduled March 4 launch from Russia's Baikonur Cosmodrome

in Kazakhstan were suspended after Roscosmos Director General Dmitry Rogozin said Russia would only allow the launch to proceed if OneWeb guaranteed its satellites would not be used for military purposes, and the British government divested its stake in the company.

On March 2, Rogozin posted a video on social media of Baikonur workers removing OneWeb's livery from a Soyuz rocket that had rolled out to the pad the same day carrying 36 OneWeb satellites. That same day, London-based OneWeb ordered its staff to leave Baikonur.

OneWeb announced March 3 that its board of directors "has voted to suspend all launches from Baikonur."

U.K. Business Secretary Kwasi Kwarteng said that the British government supported OneWeb's decision, adding: "In light of Russia's illegal and unprovoked invasion of Ukraine, we are reviewing our participation in all further projects involving Russian collaboration."

With Soyuz off the table, OneWeb told SpaceNews the company is seeking alternatives.

"We're looking at U.S., Japanese and Indian options," Chris McLaughlin, OneWeb's chief of government, regulatory affairs and engagement, said March 3.

"But in the first instance, we're pointing to Ariane and saying you still owe us a number of launches."

Arianespace spokeswoman Cyrielle Bouju did not respond to requests for comment.

Soyuz Out of The Picture

Roscosmos said March 4 that the Soyuz rocket, with the Fregat upper stage and OneWeb spacecraft, had been removed from the pad.

"In the coming days, specialists from Roscosmos enterprises will disassemble it into its component parts," the space agency said in a tweet translated via Twitter.

Arianespace also announced in a March 4 news release that it is suspending all Soyuz launches operated by Arianespace and Starsem, a Russo-French joint venture that commercializes Soyuz launches.

"Arianespace will work with its partners to ensure the well-being of the goods and means currently in Baikonur," Arianespace said.

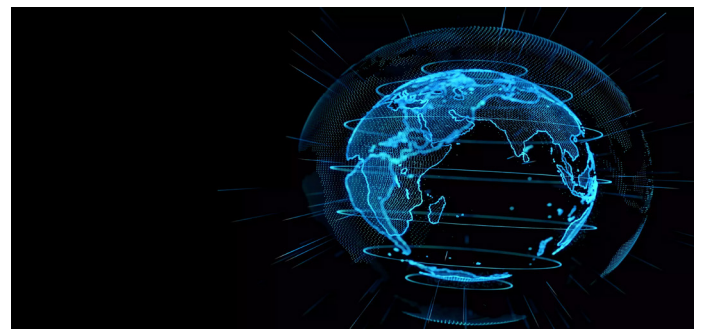
"Arianespace is in close contact with its customers and French and European authorities to best assess all the consequences of this situation and develop alternative solutions."

Indian Aerospace Industry

Sanctions Against Russia May Offer Opportunities for India's Space Sector

13 March 2022

Source: [Setcom.com](https://setcom.com) | <https://telecom.economictimes.indiatimes.com/news/sanctions-against-russia-may-offer-opportunities-for-indias-space-sector/90181229>



Russia issued an ultimatum on a March 4 launch for OneWeb after the Soyuz was rolled out to the launchpad.

Credit: Roscosmos

Chennai: The US and Europe's economic sanctions against Russia for its military action against Ukraine may throw up economic opportunities for the Indian space sector, instead of burdening it with economic cost, say industry experts.

They also feel that to cash on the opportunities, India should accelerate its satellite launch capabilities, and announce productivity-linked incentive (PLI) schemes for the aerospace sector.

"All those countries feeling the pinch due to the absence of Russian rockets for satellite launches may look at alternatives. While the bulk of the satellite launch contracts will be taken by the US and Europe, there will be others who may look at other options. India's neutrality has created a new market segment," Chaitanya Giri, Founder, DAWON Advisory & Intelligence,

told IANS.

He added that the Indian Space Research Organisation (ISRO) should ramp up its satellite launch capacity as two launches per year is not on anymore.

With private rocket companies also in the process of developing their small rockets, ISRO should actively handhold them so that they also realise their launch vehicles faster.

In the \$360 billion global space sector market, India's share is very negligible.

Industry experts are unanimous that the sanctions against Russia will not have any major impact on India.

Space is a critical sector and there are chances of the US asking India to take aside -- for or against Russia.

So, what if the US and the West add India to their sanctions list owing to its relationship with Russia?

In the case of satellites, nearly 60 per cent of the components by value are now imported from Europe.

"India imports memory chips, sensors, onboard processors, relays and other items. We get components from Japan, Singapore. Sourcing of components from Russia is low due to language barrier," Tapan Misra, Co-founder and Chief Technology Officer (CTO), Sisir Radar Private Ltd, told IANS.

Misra was earlier a Director at the ISRO's Space Applications Centre, and Sisir radar plans to make X-band synthetic aperture radar with 0.5 metre resolution.

Another retired senior official of ISRO told

IANS preferring anonymity: "As a policy, ISRO will have an inventory of components for 15 satellites. The reorder level for components will come when the component inventory level is down to 10 satellites.

During the past two years, ISRO did not make many satellites and hence the inventory levels will be comfortable for some more years, given its launch record and plans, the official added.

However, there are short life items like adhesives and soldering paste, which are imported. One has to plan for that by proper supply chain links.

"India has to make a tight-rope walk as it imports some rare earth materials and space grade metals. The Russia-Ukraine war will cool down, but the secondary effects of the sanctions may take time to go," Giri said.

In the case of rockets, India has localised the majority of the items that go in the making of its rockets -- Polar Satellite Launch Vehicle (PSLV) and Geosynchronous Satellite Launch Vehicle (GSLV) and the upcoming Small Satellite Launch Vehicle (SSLV).

"Most of the Russian and European parts and materials for making of ISRO rockets are indigenised. The impact of sanctions on India will be minimal. For Sky root, the impact is zero as the supply chain is mostly within India, thanks to ISROs indigenisation efforts over the decades," Pawan Kumar Chandana, Co-founder and CEO, Skyroot Aerospace, told IANS.

Skyroot Aerospace is into making small rockets -- Vikram 1, 2 and 3 -- with varying payload capacity.

But the point is, the engine designs of Indian

rockets are three-decade vintage and there are no plans for making bigger and multiple engines, as voiced by an expert.

According to a retired senior official of the Indian space agency, ISRO had collaborated with Ukraine for semi-cryogenic engine technology but has not made much headway.

"One has to see what impact the war-hit Ukraine will have on India's semi-cryogenic engine project," the official said.

Responding to that, a former Chairman of ISRO told IANS: "Whatever needs to be obtained from Ukraine for semi-cryogenic engine development has been obtained. The testing of the engine has to be done."

While India's human space mission is tied up with Russia tightly in terms of astronaut training, supply of space suits and others, experts said that missions may not be affected owing to India's changed stature in the international arena.

"This is new India, which is standing on a higher position in the pedestal than it used to be earlier. It cannot be arm twisted. We have to take care of the supply chain and become an octopus in sourcing materials for the strategic sectors," Giri said.

The US may not antagonise India, and the Indo-US collaborative NASA-ISRO Synthetic Aperture Radar (NISAR) Mission may go on as planned, Giri added.

"Western ban on exports of space components will provide a big incentive for India to innovate. There are lobby bodies that promote imports and stall local development. If there is a ban, then local development will have to be made which the lobbies may not want," an official said.

As regards the opportunity for the Indian space sector, he said Russia may like to source some components from India and hence the latter can be a trading partner.

Industry officials said ISRO should accelerate its SSLV programme. The small satellite launch market is increasing with 90 per cent of the satellite launches in recent times being small ones.

Similarly, the private rocket makers should also gear up and realise their vehicles faster.

"The Indian government has to come out with a PLI scheme for the space sector like it has done for semiconductors, electronics and other sectors. The PLI scheme should be focused on defence, aerospace and electronics," Giri said.

The government could ask the Indian companies signing up satellite sourcing deals with foreign companies to localise the manufacturing.

"The Indo-UK joint venture OneWeb has not leveraged Indian opportunity. ISRO can offer to launch OneWeb's satellites with its GSLV rocket," Giri remarked.

Recently, the board of OneWeb -- jointly owned by India's Bharti Global and the UK government -- voted to suspend satellite launches from the Baikonur rocket port in Russia.

Further, the Indian government could ask the domestic companies signing up satellite service ventures with foreign companies to localise their manufacturing, Giri suggested.

The Indian government is focusing on the startup ecosystem for the space sector. Once the system is in place, perhaps then the government can ask the major players to localise their needs, he added.

HAL Debuts 19-Seater Civilian Aircraft Hindustan 228

25 March 2022

Source: Newsable | <https://newsable.asianetnews.com/india-defence/hal-debuts-19-seater-civilian-aircraft-hindustan-228-adt-r9ad80>



Hindustan Aeronautics Limited (HAL), an Indian state-owned aerospace and defence company, has launched a 19-seater aircraft in its first major attempt to develop civil transport aircraft. As per ANI, Hindustan 228 can fly from semi-prepared and unpaved airstrips.

Apurba Roy, General Manager, HAL, quoted by ANI, stated that the design had been transferred to us from Dornier GmbH. This aircraft is undergoing type certification and will be known as the Hindustan 228. All of the parameters for testing have been completed.

Roy further stated that there's a huge potential for small civil transport aircraft in the market as few in India and across the globe are designed for short-haul travel and can operate on the semi-prepared runway. The multi-purpose aircraft can be used as an ambulance, cargo, parajam or paradrop, among other things, she added. They are making six more such aircraft.

The aircraft has no toilet; however, the seating capacity can be reduced to 17 in case of the toilet is added. The engine is not made in India.

Roy stated that there's a lot of interest shown

from the state and private parties in making it deployable in the Udaan scheme.

HAL stated that a groundbreaking ceremony for a new facility of Helicopter Engines MRO Pvt Limited (HE-MRO), a joint venture of Hindustan Aeronautics Limited and Safran, was held earlier this month in Goa. The facility, located in Sattari, 40 kilometres from Panaji, will be operational by the end of 2023.

Uganda Contracts India's HAL to Maintain Su-30 Fleet

Guy Martin | 25 March 2022

Source: Defence Web | <https://www.defenceweek.co.za/aerospace/aerospace-aerospace/uganda-contracts-indias-hal-to-maintain-su-30-fleet/>



Uganda has awarded Hindustan Aeronautics Limited (HAL) a contract to maintain and support its Su-30 combat aircraft fleet in a historic deal.

The MoU was signed by Lieutenant General Charles Lutaaya, Commander of the Uganda People's Defence Air Force, at the Indian High Commission in Kampala.

In announcing the Memorandum of Understanding (MoU) at the beginning of March, the Indian Embassy in Uganda said the agreement with HAL is the first major defence agreement with Uganda following Prime Minister Narendra Modi's unveiling of '10 Principles of India-Africa

Engagement' in mid-2018.

HAL has a manufacturing license from Russia to build the Sukhoi Su-30 – the Indian Air Force also operates the type.

The Uganda People's Defence Air Force acquired six Su-30MK2 Flankers between 2011 and 2012. They are operated by the Su-30 Squadron at Entebbe International Airport.

Lieutenant Colonel Ronald Kakurungu, the spokesperson of the UPDF, told The Independent that Uganda used the Su-30 jets when it bombed camps of the Allied Democratic Forces (ADF) in November 2021 at the start of the hunt for ADF militants in the Democratic Republic of Congo as part of Operation Shujaa.

Adani, L&T Among Firms Keen to Build Satellite Launchers: Govt

25 March 2022

Source: Setcom.com | <https://telecom.economictimes.indiatimes.com/news/adani-lt-among-firms-keen-to-build-satellite-launchers-govt/90431041>

The government Thursday said Adani Enterprises Limited and L&T are part of two consortia let by State-run enterprises that have evinced interest in building the Polar Satellite Launch Vehicle (PSLV), the ISRP's warhorse rocket to put satellites in orbit. In a bid to encourage private sector participation in the space sector, New Space India Limited (NSIL), a company under the Development of Space, had invited proposals from the India industry to build five PSLVs.

Minister of State in the PMO Jitendra Singh said two consortia, one comprising Hindustan Aeronautics Limited and Larsen & Toubro, and

another involving Bharat Electronics Limited (BEL), Adani Enterprises Limited (AEL) and Bharat Earth Movers Limited (BEML), have submitted techno-commercial proposals for building PSLV.

State-run Bharat Heavy Electrical Limited too has submitted a techno-commercial proposal for "end-to-end realisation" of PSLV, he told the Rajya Sabha in response to a question by NCP member Vandana Chavan.

The Indian Space Research Organisation (ISRO) had been working closely with the industry in building launch vehicles, satellites and other components, but it was for the first time in 2020 that the government opened up the sector for private participation for the entire spectrum of space operations, including planetary exploration missions.

The Indian National Space Promotion and Authorization Centre (IN-SPACe) acts as the agency to promote, hand hold and authorise private sector activities in the sector, besides enabling sharing of technical facilities and expertise from ISRO.

NSIL has the mandate to scale up private participation in the space programme and also own and operate capital-intensive assets such as satellites and launch vehicles.

Singh told Rajya Sabha that since 2020, there have been 48 applications from private players received to IN-SPACe for undertaking space activities and their applications are being processed for further action.

"Out of these, the applications with respect to authorizing the space activities to non-government private entities are 16, sharing of technology and facilities of Department of Space to NGPEs are

23 and Consultancy and Promotion are 9," he said in a written response.

ISRO Moves Closer to Establishing 2nd Launchpad as Tamil Nadu Govt Clears Land Acquisition

Aakansha Tandon | 25 March 2022

[Source: Republic World | https://www.republicworld.com/india-news/general-news/isro-moves-closer-to-establishing-2nd-launchpad-as-tamil-nadu-govt-clears-land-acquisition-articleshow.html](https://www.republicworld.com/india-news/general-news/isro-moves-closer-to-establishing-2nd-launchpad-as-tamil-nadu-govt-clears-land-acquisition-articleshow.html)



ANI/ PTI

Former ISRO Chairman Dr K Sivan on Friday expressed happiness on Centre and Tamil Nadu government's approval for the construction of the second launch pad for the space research organization in the state. He further informed that the state government had cleared the acquisition of land in Kulasekharapatnam. Dr Sivan expressed confidence in the organization and asserted that ISRO will establish the second launch pad soon.

The land acquisition process was initiated back in December 2019. Around 2,300 acres of land has been reserved across three villages -Mathavankurichi, Padukapathu and Pallakurichi for setting up the country's second spaceport.

The development holds significance as it is a big push for India's advancement in space. The Kulasekharapatnam was chosen after significant deliberation. The second spaceport will reportedly

provide a scientific edge over Sriharikota's Satish Dhawan Space Centre launch pad in Andhra Pradesh.

The second spaceport will reduce ISRO's fuel requirement for launching, as a small satellite launch vehicle (SSLV) can directly be launched in the south pole without having to swerve around Sri Lanka.

India Successfully Launches PSLV-C52 Carrying EOS-04

Earlier last month, India had successfully launched the PSLV-C52, the Polar Satellite Launch Vehicle carrying Earth Observation Satellite (EOS-04) along with two other co-passenger satellites on Feb 14. The launch had marked the space agency's first mission launch in 2022 followed by the 54th flight of PSLV and the 23rd flight of PSLV in XL configuration.

The PSLV-C52 has been designed to orbit an earth observation satellite (EOS-04) which weighs around 1710 kg into a sun-synchronous orbit of 529 km. The mission will also carry two other satellites as its co-passengers which will include one student satellite (INSPIRESat-1) from the Indian Institute of Space Science and Technology and a technology demonstrator satellite (INS-2TD) from ISRO.

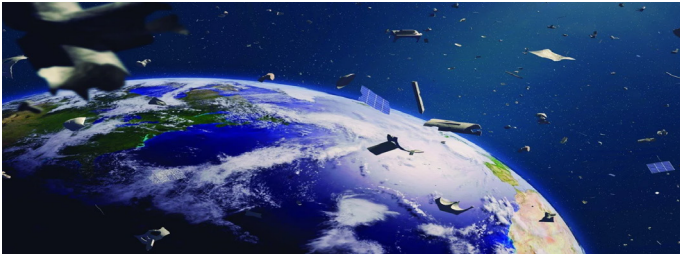
Notably, the earth observation satellite or EOS-04 is a radar imaging satellite designed to provide high-quality images under all weather conditions to be applicable on various fields including Agriculture, Forestry & Plantations, Soil Moisture & Hydrology, and Flood mapping. Meanwhile, the two other scientific payloads installed in the satellite will help in improving the understanding of ionosphere dynamics and the sun's coronal heating processes.

Technology Development

Chinese Scientists Hail Space Radar Breakthrough

Stephen Chen | 16 March 2022

Source: South China Morning Post | <https://www.scmp.com/news/china/science/article/3170571/chinese-scientists-hail-space-radar-breakthrough>



The lasers could detect debris that poses a threat to satellites. Photo: Shutterstock

A team of Chinese military scientists say they have achieved a breakthrough in laser imaging technology that will allow ground stations to identify and track a target in space with unprecedented accuracy.

The results suggest that the radar, developed by Professor Han Fei at the National University of Defence Technology in Anhui province, can take images of a thumb sized object in near-Earth orbit with a resolution of up to 3 millimetres (0.1 inches).

This accuracy is two orders of magnitude higher than the best results achieved by similar devices in the United States and other Western countries, according to the researchers.

The technology could also help guide ground-based laser beams to remove small pieces of space debris that threaten satellites and spacecraft, Han and his colleagues wrote in a paper published in domestic journal *Acta Physica Sinica* last Saturday.

“Centimetre or even millimetre-level resolution for space object imaging in the 100km [62-mile] range can be achieved in the foreseeable future with a performance far superior to those achieved by traditional optical or radar imaging technologies,” said the researchers.

Space engineers’ biggest headaches come from debris between 1cm (0.4 inches) and 10cm because satellites can be given protection from smaller items while larger objects can be detected using existing technology with enough notice to take evasive action.

In 2016, one of the largest space-based radar systems owned by China lost 4 per cent of its power supply after a tiny piece of space junk, just over 1cm in length, hit the satellite’s solar panel, according to a report released last month.

High-power lasers can make these small pieces of debris change course and eventually fall back into the Earth’s atmosphere.

But the laser shots must land precisely and there is only a tiny margin of error – a matter of millimetres, according to Han’s team.

In a low-gravity environment, most debris rotates randomly, making identification and tracking more difficult so to overcome these challenges the team used an imaging technology that, according to a counter-intuitive theory in optical physics, does not result in a decrease in resolution when the distance increases.

The technology, known as laser reflection tomography, was inspired by the CAT scans used in hospitals and uses several laser beams to illuminate the target’s surface and then reconstructs the image from light particles bouncing in various directions.

The resolution on the images obtained using

this method is determined by small differences in the angle of the laser beams when they hit the target, rather than the distance from the observer.

By improving the quality of the laser source and sensitivity of the receiving device, scientists could obtain ultra-sharp images of a tiny object from a long distance away.

The radar built by Han's team fires short laser pulses with a peak power of over 100 kilowatts.

The machine's actual performance in space surveillance remains classified, but the researchers revealed part of its potential in a ground experiment.

The device, mounted on the bank of a reservoir in a suburban area of Hefei city produced sharp images of a 5cm wide, rotating target a kilometre (0.6 miles) away.

The results provided a solid proof to the device's potential to be used in space according to a researcher with the Chinese Academy of Sciences' Xian Institute of Optics and Precision Mechanics who was not involved in the project but familiar with the technology.

"A major challenge to the quality of laser imaging technology is turbulence in the atmosphere," said the researcher who requested not to be named due to the sensitivity of the technology.

The disturbance caused by turbulence within a horizontal, one kilometre range in Hefei was almost equivalent to that within an altitude of 100 kilometres, as the air becomes thinner higher up.

Beyond that there was little atmospheric effect because the laser would be travelling in space, according to the researcher.

The technology could be also used to study

satellites to obtain valuable information about their design, technology, status and purpose, he added.

The technology used was first proposed by American scientists in the late 1980s and researchers around the world have been working to find ways to improve it.

Though a late comer in this field, China has quickly caught up with some significant progress being achieved in recent years.

Han's team said that their achievement was based on a cutting-edge laser source that significantly reduced the noise that affects signal quality.

They also developed a new algorithm using artificial intelligence to estimate the random movement of a small target and help the radar generate high quality images with incomplete, rapidly changing information.

In December, a research team at the Space Engineering University in Beijing said they had used a different type of laser imaging technology to achieve a resolution of 5mm from a distance of 1.2km.

The Chinese government announced a plan last year to build a defensive system with a number of cutting-edge facilities, including the world's largest radar network and high-powered laser systems.

Commentary

1. India Could Become 4th Country With Stealth Jet How Will Indigenous AMCA Gain Air Edge On China's J-20? - <https://defenceaviationpost.com/india-could-become-4th-country-with-stealth-jet-how-will-indigenous-amca-gain-air-edge-chinas-j-20/>
2. Russia Unveils New R-37M Hypersonic Air to Air Missile Deployed From Su-35 Fighter: What is it Capable Of? - <https://militarywatchmagazine.com/article/russia-unveils-new-r-37m-hypersonic-air-to-air-missile-deployed-from-elite-su-35-fighter>
3. What to know about hypersonic missiles Russia is using in Ukraine - <https://www.axios.com/kinzhal-hypersonic-missiles-russia-ukraine-5f50f8b5-719d-450e-9744-5523202cf227.html>
4. Telesat mulls downsizing delayed LEO plan as costs mount - <https://spacenews.com/telesat-mulls-downsizing-delayed-leo-plan-as-costs-mount/>
5. The Air Force just soared past an electric aircraft milestone - <https://www.popsci.com/technology/air-force-pilots-fly-beta-electric-aircraft/>
6. Proof of Russia Using Suicide Drones In Ukraine Emerges - <https://www.thedrive.com/the-war-zone/44725/proof-of-russia-using-suicide-drones-in-ukraine-emerges>
7. Successor To Dassault Rafale & Eurofighter Typhoon – Why The Next-Gen FCAS Fighter Jet Program Is Hitting Turbulence - <https://eurasianimes.com/rafale-typhoon-why-the-next-gen-fcas-fighter-jet-program/?amp>
8. U.S. Air Force sees no impact from Russia's decision to cut off supply of rocket engines - <https://spacenews.com/u-s-air-force-sees-no-impact-from-russias-decision-to-cut-off-supply-of-rocket-engines/>
9. Privateer unveils technology for improved tracking of space objects - <https://spacenews.com/privateer-unveils-technology-for-improved-tracking-of-space-objects/>
10. China launches test satellites for broadband constellation - <https://spacenews.com/china-launches-test-satellites-for-broadband-constellation/>

Further Reading

1. India eyes more military satellites, aims for secure communication & 24-hr border surveillance - <https://theprint.in/defence/india-eyes-more-military-satellites-aims-for-secure-communication-24-hr-border-surveillance/884796/>
2. CChina plans to open its Tiangong space station for tourism within a decade - <https://www.space.com/china-tiangong-space-station-tourism-plans>
3. GEO operators say they can compete against LEO systems on cost - <https://spacenews.com/geo-operators-say-they-can-compete-against-leo-systems->

11. SpaceX shifts resources to cybersecurity to address Starlink jamming - <https://spacenews.com/spacex-shifts-resources-to-cybersecurity-to-address-starlink-jamming/>
12. Warplanes: UAV Superiority Over Ukraine - <https://www.strategypage.com/htmwtairfo/articles/20220325.aspx>
13. U.S. confirms Ukraine struck Russian ship; Russian cruise missiles failing at rate of 20-60% in Ukraine - <https://www.cbsnews.com/news/ukraine-russia-struck-resupply-ship/>



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