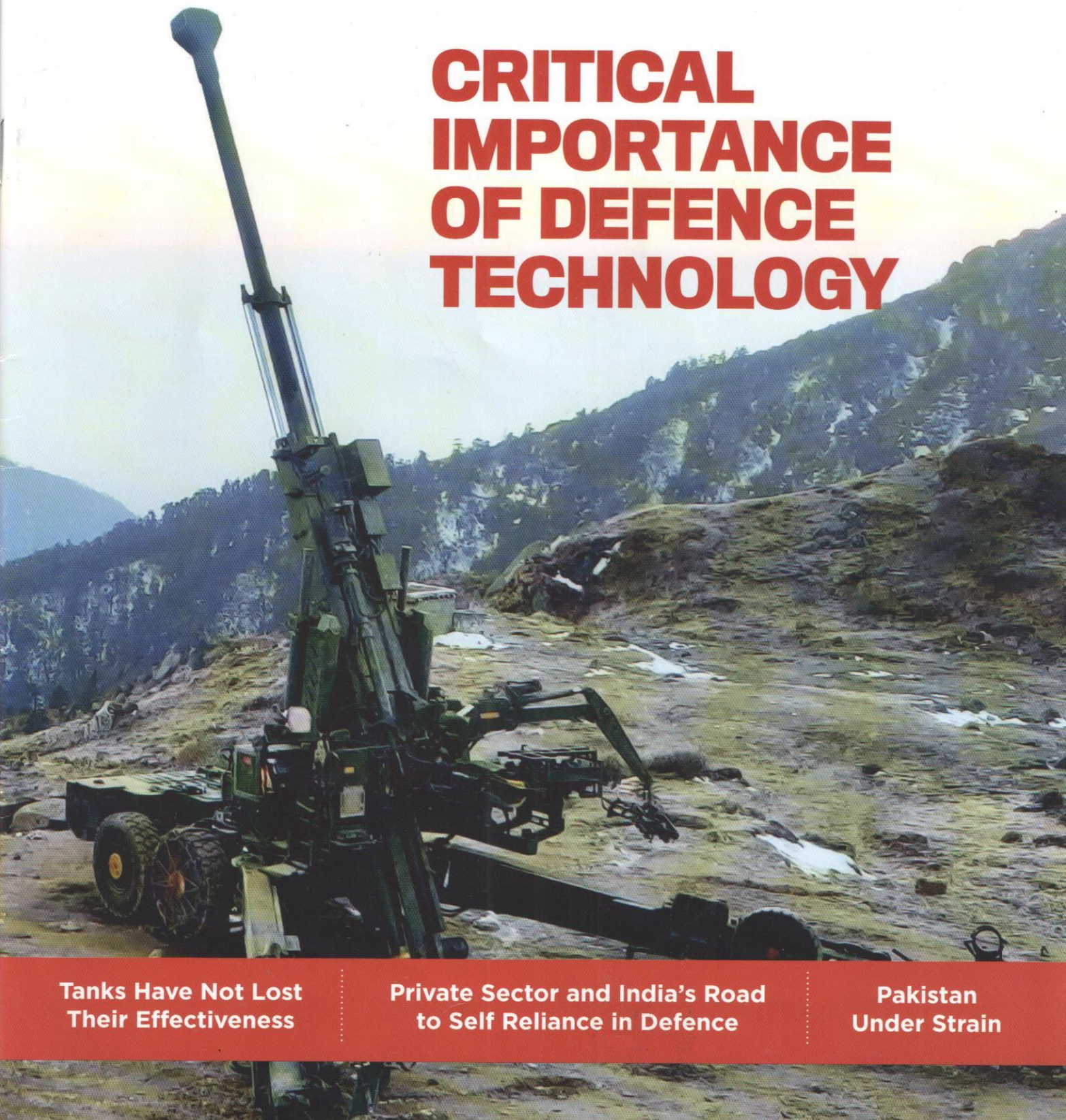
VOL. 15, ISSUE 5 & 6 WWW.SALUTE.CO.IN

SALUTE

₹200 TO THE INDIAN SOLDIER



CRITICAL IMPORTANCE OF DEFENCE TECHNOLOGY

Tanks Have Not Lost Their Effectiveness

Private Sector and India's Road to Self Reliance in Defence

Pakistan Under Strain

trial entities and develop new technologies and products in defence for the period 2021-26.

Thus, an environment that is positive, sensitive and responsive to needs of defence manufacturers has been created. Defence manufacturers also need support from government in terms of favourable policy guidelines.

- A liberal import regime to facilitate transfer of technology.
- Facilitation of technical partnerships with foreign companies to imbue modern and emerging technologies thereby reducing timelines for induction of these technologies into the armed forces.

Support from the Ministry of Defence

The accessibility, adaptability, and convenience of drones have made them major contributors to India's job market and economic growth, particularly in the country's rural and hard-to-reach regions. As of June 2022, more than 200 new drone start-ups have been founded, and this number continues to rise.One such success story is DroneAcharya Aerial Innovations Limited, a Pune-based enterprise drone solutions provider. It provides Drone & GIS services in a wide variety of fields and also offers training in a wide range of GIS and Drone-related topics. In addition to their work as an end-to-end data solution supplier, DroneAcharya has introduced a variety of aerial and geospatial products to the Indian unmanned aerial vehicle (UAV) market. According to Prateek Srivastava, Founder and Managing Director of DroneAcharya Aerial Innovations Limited, "Drones we first used in India during the Kargil war in 1999. Since ma technological advancements are currently being explored, the u age of drones in the defense sector has great promise." While t Defense Services are providing support and encouraging star ups to innovate and provide solutions to defence related pro lems, start-ups need two major policy support measures:

- Start-ups are cash strapped and need financial support. A idea that has promise must be given a chance to fructify.
- An environment free from bureaucratic rules & regulatio especially liberalized import rules that tend to deter the innov tive spirit.
- Firm orders and commitment to scale up will spur and in centivize growth.

In sum, Defence Forces need to take responsibility, espous and nurture talent, encourage innovative ideas, hand hold brigh minds through the R&D process and accept failure. Only the will a fragile and budding drone ecosystem find firm foundation and blossom into the PMs dream of being the drone hub of th world. Prime Minister Narendra Modi during a recent event sai "We have made technology a key tool to impart new strength speed and scale to the country. Technology has helped a lot i furthering the vision of saturation and in ensuring last-mile de livery". As far as the future of drones in defense goes, the Indian drone industry has a vast opportunity to work hand in hand with the defense sector. ■

Maj Gen (Dr) Mandip Singh, SM, VSM (Retd). An Artillery officer with wide experience , he is a Distinguished Fellow with USI

EMERGING TECHNOLOGIES

How to Counter the Drone Attacks in Future?

Pawan Kakkar

The current conflict in Ukraine has emerged as one of the biggest example as to how the technology can be repurposed to gain asymmetric advantage in the theatre of war, or so to say, alter the theatre itself.

After the their use in the Nagorno Karabach conflict and thereafter in the Aramco Attack and now in Ukraine-Russia War, the drones are seemingly becoming the biggest subject of intrigue. More than their legacy ISR roles their importance in the front lines has been felt in all together a different role. The use of commonly available commercial drones to deliver explosive payloads with near surgical precision in great numbers has nearly altered the perception about this threat vector.

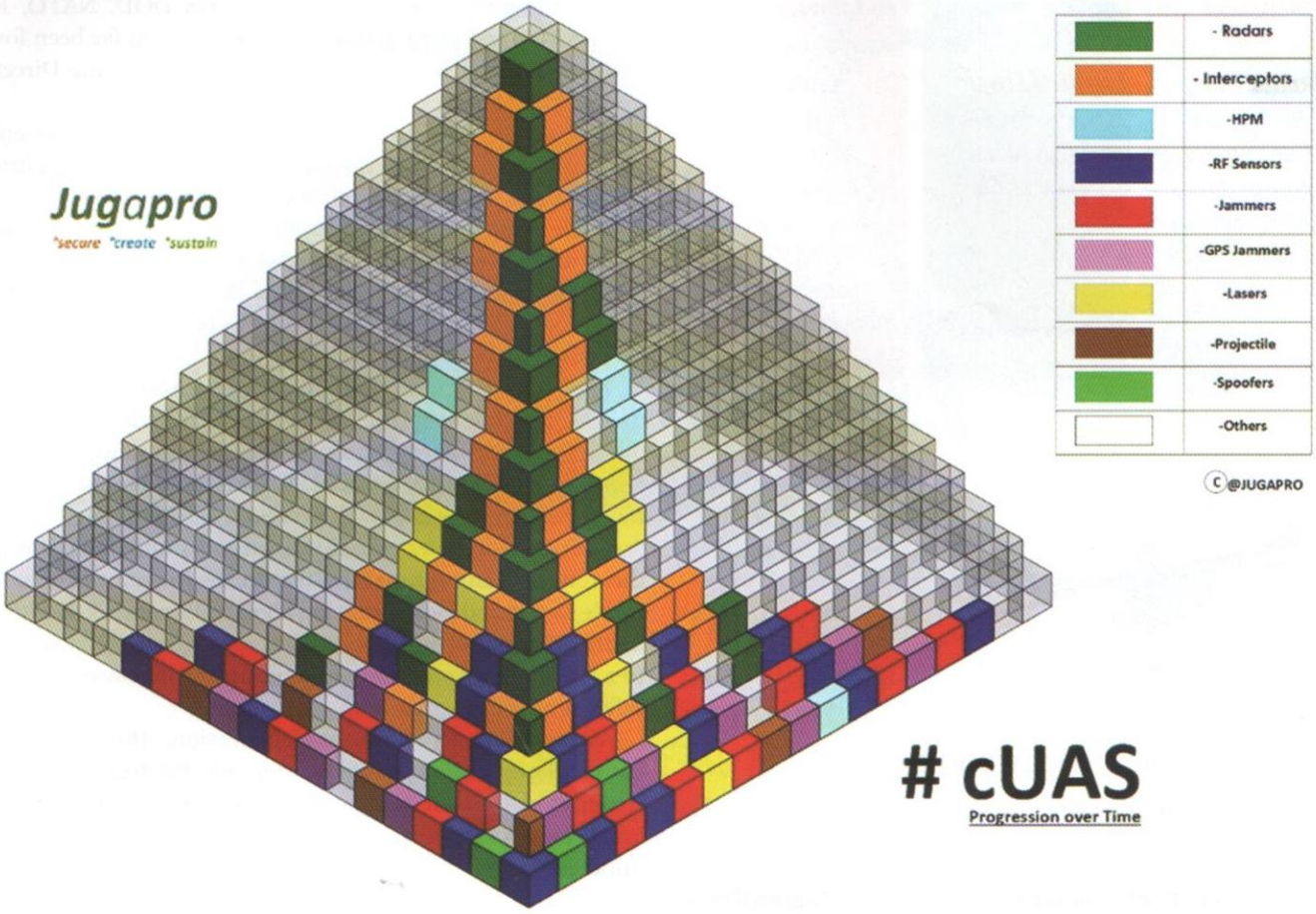
The ease of use, proliferation of the tech and the costs economics of rigging the drones for nefarious intent is both worrisome and an incentive for radical thinking in the development of the countermeasures.

Gone are the days when even the most benign drone sightings can ever be ignored, if you see a drone in your part of the sky and cannot identify to be your own, the disaster could just be behind the corner; today, the adversary has capability to deliver artillery fire with exact precision and also enjoy the first person view of the harm they can inflict with help of small low cost drones, which we would have earlier brushed as toys!

The moot question that now haunts every defence practitioner, is their inadequacy to counter this fast emerging aerial threat, which is getting away almost unchallenged; we have seen the simplest of the tech deployed in the famous low costs Shaheds is overwhelming the defences like never before. Most of us are ready to lose our sleep at the first reference of anything called swarm, however, the Robust all powerful Anti Drone solution seems to elude almost all of the governments across the globe.

The art of countering the drone threats or the #cUAS is emerging as a whole new discipline and largely a work in progress, as you shall see the graphic below.

The Counter Drone industry is quite young and most of the counter measures have so far been a derivative of the EW strategies focussing on the Jammers. Though the jammers have been so far doing a great job, the newer generation of the drones have been successful to go past the barrier and conclude their missions. We have seen that the complex Air Defence complexes



have themselves been targeted using the jammer location as the navigation tool!

Even though these trends are very alarming and the threat vector gains strength from the fact that the newer navigation controls based in 3G/4G/5G band are both difficult to detect and jam, with the use of Inertial Navigation tools like Lidars and Optical Guidance make Jamming, Spoofing and Protocol Manipulation the EW strategies are seeming to lose their teeth. It must not otherwise mean that there are no real solutions against the drone attacks, the ones other than the jammers are not that simple nor so cheap and thus less common.

Besides the Jammers shown in Red and the GPS/GNSS denial shown in pink, the advanced counter drone systems use Directed Energy weapons (DEW) like lasers shown in Yellow and HPM devices shown in Skyblue. Till the time these DEW tools like lasers and High Power Microwaves become affordable and easily available, their dominance in the counter UAS strategy is still quite a distant option.

These Hard Kill options are currently both experimental and bulky, their use in the real theatres of war is quite promising, however, these weapons cannot be deployed in the urban spaces and during the peace time.

When this deadly trouble is falling freely from the skies, and this asymmetric warfare needs to be contained somehow, the soldier on the ground can always deploy the weapons they have in hand, we have seen successful attempts to bring down the Pakistani drones by our own BSF, those sharp shooters are doing a good job. Giving them long range guns along with digital targeting aids shall be a good option.

Use of missiles is another commonly counter attack practice, being reported in several battle zones. The missiles and rockets are both expensive and a very scarce resource, though these do become a primary tool, when the adversary has launched a frontal attack using bigger military drones, in the civilian space, the ballistics are not a preferred option, you need to match the response according to the size and the enormity of the threats.

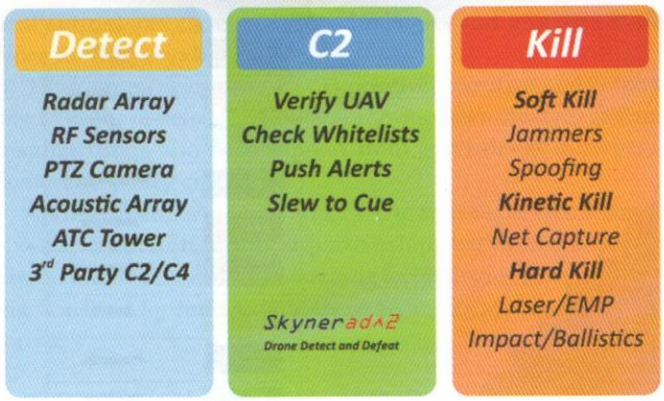
The "DroneCatchers" as these specialised drones are now being popularly called fill up the gap between the "Soft Kill" space, occupied by the Jammers and Spoofers and the "Hard Kill" options like Rockets, Missiles, Ballistics, Lasers and soon to come High Power Microwave devices.

Till recently the lasers were being seen as the most promising, our very own DRDO has successfully deployed the laser weapons in the D4 system and it seems to be just a matter of time, when the bigger, yet deadlier version Kali5000 could be the game changer.

The HPM-High Power Microwave option had so far suffered on account of their bulky format, lower power and operational ranges and very high cost. The announcements from another US based innovator Epirus puts their HPM unit-Leonidas amongst the most desired Anti-Drone tools.

In terms of an effective Anti Drone solution a mix of several detectors and effectors thus emerges as a viable solution.

Depending on the location and the severity of the threat any or



all of the options can be considered. While in the theatre of war, the options are unlimited, the peace time security of the critical assets seems to be a bigger challenge in the Indian context.

Given the fact that our agencies have already procured and or deployed the D4 system from DRDO/BEL at several locationand some other Counter Drone solutions procured from the private players have also been based on the Jamming/ Spoofing technologies, there are apparent gaps that need to be now plugged with the Hard Kill measures.

Globally, the security agencies like US DOD, NATO, EU, INTERPOL and other National agencies had so far been foxed with the lack of choices and the timelines when the Directed Energy Weapons

One of the winning strategies is the Radar based Interceptor Drone technology, where the fabled DroneHunter, from Fortem Technologies, USA tops the charts.

While there are a couple of other options where the drones throw a net to entangle the intruder drone mid-air and bring it down, this one is indeed the leader in its field because of its fully autonomous operations, it requires No Man in the Loop to be successful.

The fabled "DroneHunter" has completed over 5000 successful missions in the last 6-7 years and about two dozen of those were accomplished in the Indian skies. This fully autonomous BVLOS capable UAV is able to hound and hunt most of the small drones with over 85% efficiency rate.

Each DroneHunter carries its own radar and 2 netguns and theoretically can capture 2 hostile drones in each mission. The whole Detect and Defeat mission is generally completed within a matter of couple of minutes and the prey is generally hauled back to a predisgnated spot for neutralisation or if heavier, then it is safely dropped via parachute.

After the short & successful mission, the UAV lands automatically at its take off position and the fresh Netguns & Batteries can be hot swapped and the Drone Hunter is ready again for repeated missions at low cost within a couple of minutes.

To counter a barrage attack, the Drone Hunters are generally deployed in pairs, for larger sites like Olympics & FIFA Stadia, several units were reportedly placed. In case of remote locations, the Drone Hangars are used to safely house the machines and keep those fully charged at all times.

The DroneHunter is reported to be extremely reliable in several of the situations, where nothing else seems to work. The whole setup is controlled by AI/ML based Rules Engine that triggers the UAV to take-off within 3-5 seconds of the hostile

drone entering the protected airspace. The cue can be provided by the passive RF sensors, which some of the legacy Antidrone solutions already have, or from the Drone Detection Radars, once airborne, the DroneHunter rapidly accends to the expected height of the incoming and races forward in its collision path, depending on the size, speed and situation, it programmes the best trigger location and throws a 5mx5m net enveloping over the target and tethers the prey back to a defusing location.

The DroneHunter is perhaps the only one of its kind so far that has its own Radar and a dedicated AI/ML processing engine on-board the drone itself, with no latency to suffer, the targeting algorithms are carefully calibrated with almost surgical precision and there is no risk to the capture mission even case of losing the communication link between itself and the ground control. The TrueView R20 Radar is so small and DroneHunter so agile and capable that it is able to lock-on to the target drone and hound it in a hot chase, should the incoming pilot enjoys the advantage FPV/Racing drone. Since seeing is believing the whole sequence can be best viewed in slow motion from the NATO trials at the link: http://dronehunter.in/dronehunter/nato856794_10.mp4

The DroneHunter is perhaps the only one of its kind so far that has its own Radar and a dedicated AI/ ML processing engine on-board the drone itself, with no latency to suffer, the targeting algorithms are carefully calibrated with almost surgical precision and there is no risk to the capture mission even case of losing the communication link between itself and the ground control.

The DroneHunters have been deployed in different situation during conflicts and in peace across various location in the World. Fortem Technologies has been closely working with US Navy and US DOD for almost a decade and the solution seamlessly communicates with the other C2 systems like FAAD, however, these can be deployed independently in the field at a very short notice, with a great ease.

The ease of use, small form factor, extremely low power consumption, reliability in operations and very economical operational costs, has of late, made these DroneHunters a popular recourse when it comes to protection of the skies against the rogue drone threats.

As the Ukraine war has become a crucible to test the latest technologies, the challenges on ground have also led to rapid improvisation and advancement of technologies, the DroneHunters have been found quite useful by the NATO forces and some of the groups are now targeting bigger fixed wing drones, much larger than the DroneHunter itself! ■

Mr Pawan Kakkar is the CEO of Jugapro, a DGCA approved UAV R&D unit & GOI Recognised Startup. The DroneHunters shall soon be Made in India by Jugapro at their upcoming facility in Gurgaon.Hehas immense interest in proliferation of newer and efficient technologies that can help protect or sustain the living on this planet in a better way.