# Hostile Drones – The perspective of the emerging threat

**Special editor Dr Pranay in conversation with Mr Pawan Kakkar and Maj Gen MPS Baweja (Retired), to discuss the mitigation aspect of this emerging threat, here are a few excerpts.**


**Q Now that we see several incidents across the world, what are the security measures to counter the attacks using drones?**

**A** There are not many options to the common people when it comes to counter the threats from an intruding drone, your first instinct might be to hurl stones on it, we did see videos of frying pans being hurled over by disenchanted women, if there is a security agency around a several instances of neutralisation have been reported using the barrage of gunfire, sometimes foreign agencies have resorted using projectiles and even missiles, if the urge to shoo these mechanical birds is quite urgent.
We have also heard some agencies training Birds of prey to attack the drones and sometimes, it works.

**Q On a serious note, it is becoming imperative that the counter drone solutions are necessary, please explain what are the options for the security**

**agencies?**

**A** On the serious note, the Jammer have, so far been doing a good job, if you can snap the communication link between the pilot and the drone or deny the GPS or GNSS for the navigation, the battle is nearly half won.

**Q Why do you say, the battle is half Won?**

**A** Since the time the breed of Self Navigating drones has entered the scene, the whole paradigm of the Anti Drone solutions has shifted, we need additional measures to counter the threats when the adversary can fly the drones using optical guidance, or with the those which can navigate hugging the terrain with help Lidar the job of the CUAS operator becomes yet tougher, the jammers might not work, but the GPS Jamming will still be effective.

**Q So if jamming works, why bother with anything else?**

**A** In theory, when you can use a jammer and or resort to GNSS denial attacks, the drone traffic can be prevented from entering the protected zone, right? But no, the usage of Jammers to block the ISM band frequencies and or the GNSS bands is not a preferred strategy in the civilian Airspaces.
The jammers cannot be used as often, unless there is a real crisis. There are several radars, RF Equipment in use by civilians and aviation authorities that can get affected by indiscriminate jamming. The collateral damage risks of peripheral equipment going haywire does exist. The use of jammers in the theatre of war is a different ball game, but imagine the impact on the communication links when several RF hotspots start radiating humongous amount of RF energy into the airspace with a single sighting of a drone. The commercially available drones operate on the same frequency bands on which you have WiFi and other devices.

**Q You said that GPS Jamming is illegal, why so?**

**A** There are thousands of devices in the civilian and military use that GNSS constellations like GPS (US), GLONASS (Russia), Galileo (EU), BeiDou (China). Additionally, there are two regional systems, like QZSS (Japan) and IRNSS or NavIC.
Any EW attack blocking these constellations can successfully mitigate the drone threats to a great extent, as most of the COTS are programmed to RTK/hover or land when the navigation is lost, that well serves the purpose of the security agencies, who are facing a life and death situation in an active theatre of war, however GPS jamming or GNSS denial in the civilian spaces can be catastrophic in some cases and the legal and moral responsibilities cannot be ignored.
For your information Jamming and interference with GNSS is a criminal act in almost all parts of the world including India. The civilians, including our homeland security agencies shall need a specific permission to obtain and use Jamming devices of any kind and that permission is hard to get and rightly so.
If you are any private or even a semi government agencies planning to deploy any kind of counter drone solution, it is imperative that you obtain expert opinion and requisite permissions before going ahead with any procurement plans.

**Q Is it only the legality of their use or is there any other issue with Jammer?**

**A** The investment in jammers as an effective tool for Counter Drone Operations requires a very careful study and where the deployments are being allowed, the deployment of these devices has to be carefully calibrated. In an urban environment, where

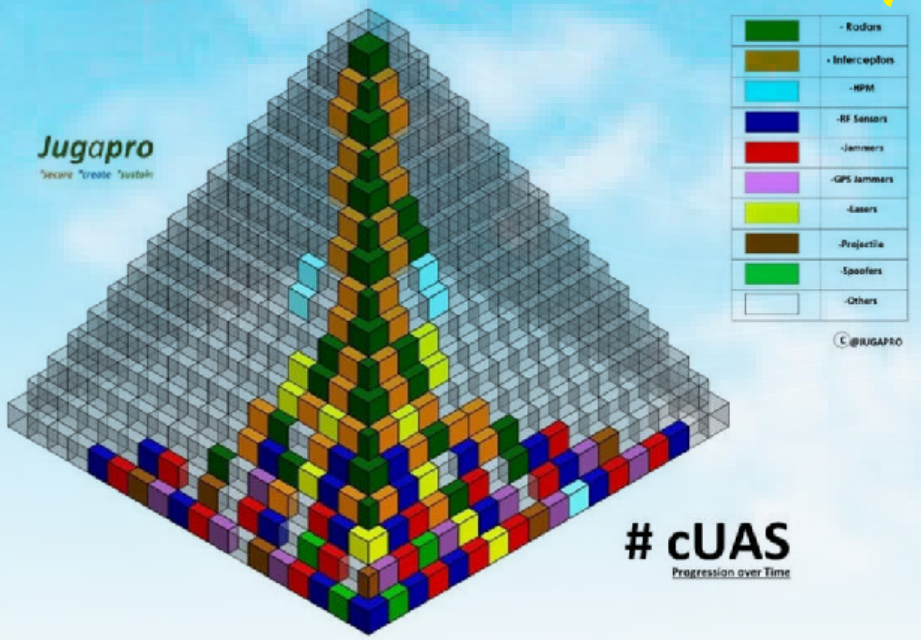
we might have civilian airports adjoining other sensitive sites, some of which might be quite sensitive, the indiscriminate deployment of jammers by one could render the detection equipment by another absolutely useless.
The considerations on the flight safety of small aircrafts is also a big concern, some of the legacy aviation equipment including S Band radars can get affected by Jamming.

**Q Can you elaborate more on this aspect?**

**A** Sorry, no more, one this subject is too sensitive to be discussed in greater detail on a public forum and two, each installation has to be designed after a careful study of the threat, terrain and situation, any generic comment can be misleading.

**Q Agreed, if Jamming is not the comprehensive solution, then what are the other options?**

**A** 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.




**Q Quite intriguing, much of this pyramid is still blank, can you explain?**

**A** You might have noticed that the use of the drones in hostile attacks is almost new, the world had been blissfully protected from such threats until recently.
Prior to their use in the recent conflicts in Syria, Libra, Nagorno-Karrabah, Persian Gulf and now in the Ukraine, the incidents involving drones to inflict serious harm were not too many.
The Counter Drone industry is quite young and most of us carry very little experience in this specialised domain. 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.

**Q If Jamming is not an option, Hard Kill measures still experimental, do you see anything else?**

**A** 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 enrmity of the threats.

**Q cUAS is a challenge indeed, what other strategies do you suggest?**

**A** 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 midair and bring it down, this one is indeed the leader in its field because of its fully autonomous operations. 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.

**Q Interesting, can you elaborate more on the "DroneCatchers"?**

**A** To some extent, yes. There are two types of Net Catcher attacks, one which are launched from an airborne platform and the other from the ground. The ground systems have been there for quite while and seem like a small cannon, which fires a shot containing a light weight net targeting the incoming drone, largely inexpensive, these solutions work very well against the aerial threats at a short distance.
Given the sensitive nature of the protected sites, it is always advisable that the protected zones must have an impregnable dome over their skies, thus the need for kinetic devices, which can approach the incoming threat, while it is still quite far away, thus the concept of drones catching the drones emerged.

**Q Drone capturing another drone, interesting, but, is it practical?**

**A** Seeing is believing, the DroneHunter is dispatched towards the incoming drone as soon as the outer perimeter is breached, detection is done by both passive "RF sensors", which continuously scan the lower airspace for all kinds of moving RF energy sources in 3D as well as active AESA panel "Radars". At the slightest detect a custom built AI/ML engine analyses the threat and based on the "Rules Engine" the threat is classified as a Friend or a Foe, if latter the nearest DroneHunter is dispatched autonomously from its secure charging pod to make a capture all on its own! Once on the prowl, the DroneHunter, depending on the size and speed of the incoming meets the incoming threat somewhere midway, throws a net, entangles it and hauls it back to a predesignated location for safe disposal and lands, simple!

**Q Simple! It sounds quite a complex operation, how can one remain prepared to do all that much within a short span?**

**A** While it seems quite a complex operation, the devil is in the detail. The whole Detect and Defeat process is Fully Autonomous, repeat fully automatic, there is No Man in the loop.
The DroneHunter, its controlling software suite- SkyDome and its purpose built radars- TrueView is a complete system that operates on AI/ML, a differentiator from Fortem, that has been perfected over the last 6 years!
The DroneHunter has over 5000 successful capture missions to its credit, nearly two dozen of which have been recorded in the Indian skies. The whole suite commands over 85% success rate over small fixed wing and multicopters, some of which could be much larger and much faster than itself! The biggest advantage of this system is its capability to mitigate the hostile drone threats with great precision, that is possible because this UAV is capable of fully autonomous BVLOS missions all on its own, to take off, it just needs the cue from the C2 software and the general direction of the incoming, thereafter, its own onboard Radar and the AI/ML processor takes charge.

**Q Radar onboard a Drone, is it for real?**

**A** Yes indeed, the DroneHunter is the only available Drone Catcher in the world that has its own "Radar" to lock on to the target and thereafter hound till the intruder gets hunted, plus its own "Brain" to analyse the tracks to position itself for getting the best shot at the incoming drone. The DroneHunter can thus also differentiate between a bird and a drone and thus has never brought a live prey as a trophy!
Since seeing is believing, you may try evaluating this option on your own. Recording of extensive trials done by NATO, interesting slow motion view from captured drone and commentary from the Military commanders.

*dronehunter.in/dronehunter/nato856794_10.mp4*
*Capture of bigger drones and parachute assisted release*
*http://dronehunter.in/dronehunter/Jugapro_Dronehunter_Droguechute.mp4*