CENTRE FOR JOINT WARFARE STUDIES

CENJOWS

PROCEEDINGS OF THE SEMINAR:
UAV INDIA 2018 CIVIL AND MILITARY
BY
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06-07 SEP 2018

Introduction

1. CENJOWS and Indian Military Review jointly carried out a seminar titled “UAV India 2018 civil and Military” on 06 Sep- 07 Sep 2018 at the Manekshaw centre. The first day deliberations were focused on the Military Unmanned Aerial Vehicles, while civil uses of the Unmanned Aerial Vehicles were discussed on the second day. The deliberations on both days commenced at 0930 hrs.

MILITARY UNMANNED AERIAL VEHICLES: 06 SEP 2018

INAUGURAL SESSION

Welcome Address

2. The proceedings commenced with the welcome address by Lt Gen Vinod Bhatia, PVSM, AVSM, SM (Retd), Director CENJOWS. In his address, after welcoming the participants and the delegates to the seminar, he explained the aim which essentially was to provide the stake holders, participants and delegates a platform to deliberate on this emerging area. He cautioned that while UAV offers opportunities, it poses challenges as well for the Armed forces which require free and frank deliberations. He stressed that self reliance and indigenous capabilities are important and the connected issues must be deliberated in detail. Further, use of UAV’s holds promises in cost cutting. It provides an interesting option especially when we are confronted with depleting budgets besides, other significant advantages which must be deliberated in the seminar.

Special Talk

3**.** Dr (Mrs) Tessy Thomas, DS & DG Aeronautical Systems, DRDO gave an exhaustive presentation titled, “Military UAV’s: Indian Scenario”. Herein, she stressed on the need and possible future applications of UAV which are now seen suitable to take on dull, dirty and dangerous tasks where employment of the manned platforms would be risky. The other points stressed by her are given below:-

(a) Across the world, UAV’s are experiencing a similar growth trajectory as was seen in aviation history of the manned aircraft. She believed that ultimately, UAV’s will perform a significant role in military aviation.

(b) UAV’s do not put pilots’ life at risk and provide an opportunity to carry out an uninterrupted surveillance of the area of interest. She flagged the advantages of stratospheric operations with UAV’s which provide uninterrupted ISR compared to satellite which is constrained by the revisit of the satellite.

(c) She pointed out that in we are still at a lower level of development in UAV technology. Future promises to a scenario of fully autonomous systems. These could provide 360* awareness. Using UAV with appropriate sensors and weaponization match, the shooter to sensor time lag will significantly reduce.

(d) She crystal gazed to a future scenario ,wherein after being warned by fused data emanating from the sensors, UAV’s would carry out independent operations involving autonomous target detection, identification and destruction all through autonomous decision - making.

(e) Finally, she spoke briefly on the Indian R&D effort on UAV’s by DRDO.

Industry Perspective

4. Col KV Kuber, Director, (Defence and Aerospace) Ernst and Young gave the industry perspective. He said that, there is a huge market potential for the UAV’s. It has increased from 1.5 billion dollar in 1990 to well over 5 billion dollar now. India is one of the fastest growing markets for the unmanned vehicles and one of the top importers of the UAV’s for the military purposes. India is slated to grow even faster now with the issue of the UAV policy by DGCA. Thereafter, he gave the emerging demand **of** UAV in

various categories, nano/ mico UAVs to medium and large UAVs. The demand in services and paramilitary is also likely to rise due their immense utility. The current inventory comprises of mostly Israeli made UAVs of Heron, Searchers, Harops types and among Indian, of Lakshya and Nishant. In close of his talk, he spoke on the UAV threat emanating from Pakistan and its development which is spearheaded there by Pakistan Aeronautical complex and SME's.

Key Note Address

5. Lt Gen PK Srivastava, AVSM, VSM, Director General Artillery, Army HQ gave the key note address in the seminar. The highlights of his talk are given below:-

(a) UAV's have vast arena for their employment.

(b) The costs of UAV's are based on their capabilities.

(c) The proliferation of UAV's is inevitable in future. There is thus a need for a centralized body to co-ordinate growth in civil while services should look at their own requirements holistically.

(d) There is large gap in the capacity of the industry. They need to take a leap forward.

(e) The UAV's with the services should have the capability to take multiple payloads. This is essential to cut the costs without compromising on their capacity. This is possible only if pay loads are miniaturized.

(f) We also have limitation to use more one or two UAV's from the same base. More control units would be needed to facilitate launch of more UAV's from the same base.

(g) We need UAV's that are low costs keeping in mind our meager budgets.

(h) We are good in developing the ground support equipment. To keep the costs down borrow the UAV technology and use own ground support equipment. This could be a strategy to keep the costs within limits.

(j) There is need for in-depth research to use UAV to their fullest potential which is limited only by our imagination. For example, these could be used for bunker busting by delivering a small detonator at the bunker to decapitate the occupants of the bunker.

(k) The vulnerability of the UAV's can be overcome by better route planning.

(l) we need to study how UAV's can be employed in the adverse weather or in the varied terrain such as in the mountains.

(m) If we do not have adequate provision/ facility for the maintenance, we could suffer huge costs and un-serviceability. We should consider maintenance hubs to cut costs.

(n) Swarm technology in drones is a promising field which calls for serious study for its employment both from defensive as well as from the offensive perspective.

(o) He exhorted the academia to include the subject of UAV's in M-tech study.

6**.** **Release of IMR UAV Report.** The inaugural session concluded with release of the IMR's UAV report which was compiled by Ernst and Young.

SESSION -1

EMERGING TECHNOLOGIES AND ROLES OF THE UAV'S

7. This session was chaired by Maj Gen Sandeep Apte. He was assisted by representatives from the industry as the co-panelists.

First Speaker

8. Col NC Gupta, SM (Retd), Director Drone Systems, a veteran from the core of signals and settled in Australia got interested in UAV's application in the realm of agriculture. Now, he is associated with Bharat drone Systems. The company is involved in indigenous manufacture of drones under the make in India programme and carries its own R&D and consultancy for the others. According to the Col Gupta, his company follows a comprehensive approach and has different types of drones catering for various levels of the army hierarchy say from battalion to Brigade to corps. He explained about

catapult launched drones of his company which are available off the shelf for use of the armed forces. He has categorized these drones in to strategic, solar and those catering the tactical need of the forces. He recommended that, there is need for the armed forces to establish its own incubators for R&D and develop their own systems. He also recommended that there is need to develop drone tactics which could be taken up by Army War College. This will help in optimum utilization of the drone technology.

Second Speaker

9. Mr. Robert Gilman, a retired Captain from the US Navy representing the General Atomics Aeronautical systems, briefed on the drones offered by his company. General Atomics has produced a total of 23 variants of drones in last 26 years of its existence. He covered the attributes of the most discussed MQ-9B Sky Guardian UAV which is considered the finest UAV and is being considered for purchase by India.

Third Speaker

10. Sqn Ldr VS Srinivasan of the Tata Advanced Systems in his talk titled "UAV's Commercial applications in India "gave an overview of the Tata mini-UAV systems. The focus of his talk was to highlight the indigenous capability and self reliance which according to the speaker should be the corner stone of the armed forces. The company is already selected to supply Mini-UAV's for the army. These mini-UAVs have 24 hr mission capability. The other features of Tata manufactured drones are autonomous controls and target tracking, gyro stabilized payloads, low noise, ruggedized and have low visibility. During his presentation, he discussed the attributes of Aquilon Mini-UAV which is hand launched and carries out belly landing. Its weight is just 4kg and can be easily carried by an infantry soldier. The Sky-1 on the other hand, was lesser than 10 kg in weight, a modular design and could carry multiple payloads. He stressed on advantages for the armed forces in selecting the indigenous designs which are developed in house by Tata company and offer the advantage of self reliance .

Fourth Speaker

11. Urmi Bhattacharjee of the Bentley Systems India spoke on the topic of the "Reality modeling for Better tomorrow and Digital cities". She is the geospatial expert and gave bird's eye view of the 3D modeling, an emerging technology in which the drones / RPA's could provide solutions at much lower costs than the traditional methods. In that, she gave the example in the arena of maintenance inspection say of bridge which would be difficult to assess under the piers but, can be easily accomplished by a drone.

SESSION- 2

UAV'S CAPABILITIES AND REQUIREMENTS

12. Brig Yogesh Chaudhary, Brig (LRVs, RPAs and Ops), Arty Dte, Army HQ chaired this session. The other three panelists represented the three services and gave out their specific attributes required in carrying out the designated tasks by drones in their service.

13. Brig Yogesh in his opening remarks pointed out at the recent phenomenon of growth and proliferation of the UAV's. He stressed that his panelists who represent the three services will describe in detail in the manner the UAV's will be operated keeping in mind the specific task of each service. The aim is to help the developers to understand the requirement and develop suitable platforms to do those tasks. In his talk, he briefly explained the broad contours of threat scenarios and the varied terrain of operations ranging from plains to mountainous, jungle and dessert. He covered the UAV's platforms needed by the Artillery formation which would help to find the threat, fix it and then direct fire. The artillery requires them for establishing and shortening the sensor to shooter link. The requirement for the infantry soldier was discussed later by his panelists. In explaining the army requirement, he in particular talked of the need of HALE, Male UAVs which could be used for ISR and direct support of the fire. While concluding his talk, he stressed on importance of maintenance which can be looked after by the supplier by establishing a MRO at an appropriate place.

First Speaker

14. Air Cmde Surat Singh, AVSM, VM, VSM, Principle Director Offensive Operations, Air HQ in his presentation titled "UAV's and the Indian Air Force" spoke about the history of the use of the drones in the past conflicts. In that, the conflicts of Bekka valley, Op Iraqi Freedom, Op enduring Freedom stand out. In this op, the RPA's were used for roles that were dull, dirty and dangerous. The speaker believed that in the present context, the unmanned aerial vehicles have attained their utility in some missions. He explained the possible roles in which RPA's could be used in the armed forces. In that, the emerging role of UCAV's in an uncontested environment was explained this would have better chances of success due to their small size and suffer no human limitations. The main disadvantage of the RPA is its vulnerability to the air defenses in the contested environment. The long loiter time, max range, high speed, automatic take off and landing, stealth design, secure communication and ability to carry multiple pay loads were some attributes needed in a RPA's for the air force.

Second Speaker

15. Col Prashant Pandey, YSM, Col Infantry-5, of the Infantry Directorate, Army HQ was the next speaker. He commenced his presentation by listing out the existing challenges of the infantry formation. He stressed the important of enemy Int in the vicinity of the border. While the ground based sensors suffer range limitations due to their LOS problem at the same time, their fixed locations make them susceptible to destruction by enemy action. Inherently, these suffer from the lack of the flexibility in tracking, and relocating. In comparison, the aerial sensors have the advantage but, due to the limited resources in face of the competing requirements, and time delay in receiving these from the higher formation is a great limitation. There are no dedicated aerial assets at the Inf Bn level. Provision of mini UAV can make a difference by giving information in realistic time frame. These are suit able for target detection, recognition, identification and acquisition for engagement by a suitable weapon system. Further, these assets are useful in assessing the post strike damage assessment as well as protection of own force by detecting the impending enemy action. Their spectrum of utility in operations is very wide and can be used in conventional, sub-conventional, peacekeeping HADR and during aid to the civil authority. Col Pandey then gave out specification of the mini-UAV which essentially should be man portable, with a range not less than 10 km and ceiling altitude of 1000 meter, all terrain capability and ability of day and night operations. The payloads need to provide high resolution both during day and night with video facility.

Third Speaker

16. Capt (IN) Dushyant Purohit , Director Naval Staff , Naval HQ, gave a presentation on a topic titled “Indian Navy’s experiences with the UAVs“. He explained that to cover vast coast line and sea lanes, Navy needs RPA’s which have the ability to operate for long durations at high altitude. The significance of RPA’s lies due to their improved acquisition and rapid dissemination of information compared to a satellite. These RPA’s are based at three bases in the Indian navy namely, Porbander, Kochi and Ramnad. Then he explained the control of RPA form the shore and its handing over to the ships so as to increase their control communication range. In Navy, the RPA’s will be used for the maritime surveillance, fleet control and for giving assistance to the civil agencies. In view of the expected roles, the RPA’s should have ability to carry varied payloads i.e. electro optical camera, maritime patrol radar, COMINT suite and ESM. He also explained the modalities of their op in the controlled air space in conjunction with IN and AAI formulated guidelines. The RPA’s offered by the industry for the Indian Navy should have advanced processing capability, secure data link communication, tactical collision avoidance system, automatic identification

system and ASW detection ability. Indian Navy requires High and medium altitude endurance RPA's and ship borne RPA's.

SESSION-3

RESEARCH AND DEVELOPMENT AND COUNTER –UAV TECHNOLOGIES

17. The third Session was chaired by Maj Gen GD Bakshi, SM, VSM editor IMR and Former GOC of the R Force. In his opening remark, he mentioned on the increasing emphasis on the use of the unmanned aerial vehicles in Israel and United states. In both these countries, UAV's are slated to replace the 50% the strength of the manned aircrafts.

Speaker-1

18. Mr. Siddhesh Naik, owner of the New Space research and technologies, an Indian company, spoke on the "Near Space persistent UAV's for India's military need". He explained the benefit of ISR from a HALE drone operating in the stratosphere. In comparison to the Satellite which could provide the update only on revisits after long interval, the HALE Drone for example operating at the height of 65000' could provide uninterrupted ISR up to 240 hrs. These could be beneficially employed for Border surveillance, maritime surveillance, during actual operations to monitor the TBA or the enemy area of interest. Thus, it has cost operational advantage over the satellite based ISR. These can be used to detect the aircraft, ships and even missile launches from their boost phase itself if under cover.

Speaker-2

19. Sashikanth C C, Scientist G, Principle Director (payloads) Rustom2 & head AIEL, Aeronautical Development Establishment, DRDO spoke on the "Research and Development of UAV's at ADE". In his talk, he traced the history of drone development in DRDO. In that, he spoke of ULKA which is the air launched target for the SAM's, Kapothaka which is mini RPV demonstrator, Lakshya which is pilotless target aircraft and capable of towing two targets at time, Nishant used for night reconnaissance, Panchi which is actually is Nishant on wheel, Rustom-1 with ISR capability using its 75kg electro optical payload, UAV simulator, and finally Rustom -2 which is a UCAV under development. Rustom 2 will carry out conventional take off and landing and would have a range of 250 Km with a service ceiling of 32000.'

CLOSING SESSION DAY-1

Valedictory Address.

20. The first day proceedings closed with Valedictory address by Lt Gen SS Mishra , VSM, Director General Infantry, Army HQ. He asserted that RPA's are force enabler both in conventional and un-conventional operations. America has showcased their advantage in their fight against Al Qaeda in various places in the world. In our context, we see these having significant impact in conventional operations where we plan to use these particularly in the ISR roles. Budget however, will always remain a constraint. He cautioned the participants of their indiscriminate use from the commercial market which while giving you data may also pass on these surreptitiously to a server located beyond our borders.

Closing Remarks and Vote of Thanks.

21**.** Lt Gen Vinod Bhatia, PVSM, AVSM, SM (Retd), Director CENJOWS in his closing remarks talked of the successful conduct of the first day of the seminar. He said the event has succeeded in bringing together stake holders, the services which spelled out their requirement, the industry which has to offer their products and the academia which could ruminate on issues brought out in the seminar and suggest solutions. He thanked the stake holders before closing the proceedings of the first day of the seminar.

DAY-2 (07 SEP 2018)

CIVIL USES OF THE UNMANNED AERIAL VEHICLES

INAGURAL SESSION

Welcome Address

22. Arvind K Arora, Director General, DIPM Council (India) gave the welcome address on the second of the seminar which was scheduled to discuss the civil uses of the Unmanned Aerial Vehicles. Following points were highlighted by him in the opening address:-

(a) There is immense scope of IOT and AI in drones.

(b) There is big market for Drones in India.

(c) We would face shortage of the trained drone pilots', hence; there is a need to establish training centers to meet the future need.

(d) Drone technology is disruptive, it will change the markets. We must therefore, decide whether we would like to become technology resident, or remain alien to the technology.

Special Address

23. Prof. Ajoy Kanti Ghosh of IIT Kanpur in his special address welcomed the recent issue of regulation for operation of UAV in India. He lamented that, we are woefully short of infrastructure. With its absence, the regulation will not change the situation much. He laid great emphasis on the genuine research in this regard. We need to ask whether start up claiming to be the vendors of various drones, are really developing the product or merely integrating the assemblies after importing the products from external sources. Latter, situation does not bode well for the growth the drone in India. UAV for agriculture could be useful but as in or context, when land holdings are small, it loses its relevance. There are innumerable uses of the drones in civil, which remain limited by our imagination. Air Taxi, air ambulance, emergency rescue system, remote medical delivery system, emergency medical transport system are some areas where drones can be used. Prof. Ghosh is deeply engaged in research and development of drones in IIT Kanpur. He *showed* video of drone developed by his institution which demonstrated automatic takeoff and landing ability.

24. **Counter UAV Technologies**. Maj Gen Ravi Arora (Retd), Chief Editor of the Indian Military review read out the literature on the counter drone technologies which varied from kinetic to soft kill. His talk was relevant to the

extent that besides using drones for our own use, we would also face hostile drones of the adversary which need to be neutralized. As of now, in our country only DRDO is engaged in R&D this area.

SESSION -1

INNOVATIVE EMPLOYMENT OF UAV'S

25. Lt Gen Sanjay Kulkarni, PVSM, AVSM, SC, SM, VSM (Retd), former DG Infantry chaired the first session. He apprised the audience of the new drone policy issued by DGCA which laid down the ground rules for use of drones in India. It also specifies some restrictions which must be obeyed by the drone flyers besides the requisite qualification for the drone and the drone pilots. The Chinese, Israelis and US have taken lead in the drone market. Apart from their civil use, in the market and other areas, the drone offer great possibilities for their use in the natural disasters. After the introductory talk, he invited his panel to dwell on subject at hand i.e. innovative employment of UAVs.

First Speaker

26. Col Mandeep Tiwari. He spoke on the topic of, "Drone mapping for the smart military stations." He apprised that there are 300 cantonments in India. Manually, it is not possible to map more than two to three stations in year. Use of other means like satellites, photographs etc are very expensive options. Drones on the other hand offer a very useful tool to carry out 3D mapping at a quicker pace and at a reasonable cost.

Second Speaker

27. Mr. Dheeraj kumar, IG from a CRPF HQ spoke on "CRPF experience in use of UAV's in low Intensity conflict". He admitted that while UAVs face limitation in face of thick foliage of the jungles but, still these are very useful when equipped with IR detection payload. To support his claim, he showed two videos of the Maoist affected areas where the insurgents were detected with the drones. He however, brought out the limitation of the line of the sight since the areas could be far away, precluding their control. The other limitation being the long down time in the field .Explaining the use of the UAV, He told that the drones are being used in CRPF for surveillance, terrain analysis, monitoring the operations and adversary's Int. CRPF essentially requires mini, micro and nano UAVs. Of late, the establishment has also sought Heron drone which is being used by services for ISR functions. The presentation by the CRPF clearly established their urgent need in the force for carrying out their day today tasks.

Third Speaker

28. Mr. Prithul Kumar, Director, Ministry of the Mines spoke on the Use of Drones by the Ministry of Mines. He opened his talk by explaining the methodology of mining activity which involves survey and exploitation, mine planning and development, production and monitoring and finally mine closure and rehabilitation. According to him, the drones can be used in all phases of mining operations.

Fourth Speaker

29. Mr. Madup Tiwari IPS, Joint Commissioner Police of Delhi Police spoke on Use of UAV's in maintenance of Law and Order. In that, he talked of using drones for crowd monitoring, recording of the proceedings, surveillance of the rogue elements and identification of the pressure points, aid in planning search and rescue, getting visuals of inaccessible spots, delivery of supplies to the victims, traffic monitoring etc. In his presentation, he narrated some live cases in which drones were used to detect the committal of crimes even before these occurred. UAV's are extremely good aid in recording, re-construction and review of the crime incidents.

SESSION-2

POTENTIAL CIVIL USES OF UAV'S AND THEIR RISKS

30. This session was chaired by Maj Gen AK Chanan, SM Addl DG Perspective Planning Army HQ.

31. Mr. Akhilesh Srivastava from High ways Authority of India spoke on the "Use of Drones in Highways". According to him, the drones ensure effective monitoring of national highways projects. NHAI has empanelled the agencies for doing aerial photography of their projects with the drones. The authority uses mini/ micro drones below 200' during day times, which according to the recently issued regulations by DGCA do not require clearances. The drones are now being used:-

(a) Planning, alignment fixing, estimating and subsequent bidding purposes.

(b) Project Monitoring.

(c) Operation and maintenance of highways.

(d) Bridge maintenance.

(e) Incident management.

VALEDICTORY SESSION

Valedictory Address.

32. Lt Gen BS Pawar, PVSM, AVSM (Retd), Former DG of Army Aviation apprised the audience that regulation for the drones have been issued conform more to the Federal Aviation Authority (FAA) United states than to our local realities. There are several questions which need to be addressed. For example, how would you issue clearance to drone flying requirements from the remote areas? Where is the organization to implement the regulations? United States have well established organization to acquit the FAA tasks with the help of a large staff which is missing in our case. Who will certify the flying fitness of the drones? The size and complexity of the task is not appreciated. There was a large demand for drones in India. Even during the flying ban period of the drones, the drones of more than Rs. 40 crores were imported. This demand will rise exponentially now. There are also issues of Insurance, privacy flight safety. He also spoke of unbridled start ups whose genuineness remains suspect. In addition, there is a nearly 22% world market emanating from military in India. This will give rise to the issue of air space management in India. Ministry of Civil aviation must come out with version-2 of the regulation after considering the roadblocks and suggestions.

Closing Remarks and Vote of Thanks

33. Lt Gen Vinod Bhatia, PVSM, AVSM, SM (Retd), Director CENJOWS gave the closing remarks in the seminar. The seminar proceedings came to close after vote of thanks to the stake holders and the participants.

RECOMMENDATION BY CENJOWS

34. A study of the requirements of three services indicates that presently all services require drones to meet ISR needs of their service. Even the current inventory of holding of drones is of same genre. If so, there remains a possibility of generating synergy and lowering costs in face of the scarce budgets and competing demands of three services. In view of the foregoing followings are suggested:-

(a) Keeping the op requirement of the service as possible for similar tasks, similar drone assets are procured for the services.

(b) Plan basic joint pilot training center for drones of three serves.

(c) Integrate their lgs with a common supply chain of spare support.

(d) Establish common maintenance hubs to cut costs and duplication and enhance effectiveness. The supplier could be asked to set up an MRO for this task.

(e) The employment philosophy of the drone could differ as per the requirements of the each service however, wherever, ISR data on targets of opportunity is of the interest of other service, same should be shared between the services.

(f) During peacetime the sourced data could be shared through HQ IDS. During op, channel of comn be planned to share the same expeditiously at horizontal level to the sister service.

(g) Joint sessions may be planned periodically, to share learning and op enhancing experiences for common learning.

(h) Services jointly should plan incubators to give impetus to R&D catering to their specific needs.

(j) Establish Tactics Development Centre (TDC) for development of tactics for employing UAVs in ISR and UCAV roles. This will help in optimum development of drone technology.

(k) All parameters and performances being equal, the preferences should be given to the Indian made drones against a foreign make drone which may be wittingly passing the same data to server located outside the country.