Personnel Recovery and Unmanned Systems

An Opportunity Waiting To Be Seized

by Michael Winberg

Resumé

Sverige har tagit ett stort steg mot att skapa en ledningsstruktur för att undsätta isolerad personal i såväl fred, kris som krig. Samtidigt har användningen av obemannade farkoster exploderat såväl militärt som civilt. I en period där den svenska försvarsmakten ska växa och utveckla teknologi för framtiden finns en möjlighet att knyta ihop flera förmågor genom flexibla plattformar som även kan nyttjas för att understödja en undsättningsoperation. Den här artikeln kommer utifrån undsättningens fem huvuduppgifter visa hur obemannade system kan merutnyttjas för att rädda liv och samtidigt bidra till ökad handlingsfrihet på stridsfältet.

"Having a Personnel Recovery capability will not make you win a war. Not having one certainly can make you lose one ..."

Gen Lance Smith

WHENEVER A SAILOR or a soldier has lost positive and/or procedural control in a situation, this person is defined as being isolated although the individual may be with a group, i.e. her or his squad.[1] When losing control there is a need for a fail-safe that helps the isolated to return to a position in which they have control. This fail-safe is the Personnel Recovery (PR) system. PR is defined as the sum of military, diplomatic and civil efforts to effect the recovery and reintegration of isolated personnel.[2] This sum of actions is divided into five tasks; report, locate, support, recover and reintegrate. As such, it is clear that the recovery of isolated personnel is not only a joint responsibility within the armed forces of a state, but may also be a joint effort between several agencies within one state and the society as a whole. This, from a Swedish perspective, means that non-military agencies like the police or the Swedish Maritime Administration[3] may become involved in the effort to locate and recover military personnel during a confrontation with an armed adversary.

Although remotely piloted aerial systems (RPAS) could be traced back several decades, it was during the second invasion of Iraq and the conflict in Afghanistan that literally gave wind beneath the wings of unmanned systems in armed conflicts. Since then, the industry has expanded and remotely controlled systems are now available to everyone, both military and civilian. The evolution has prompted a new focus where unmanned systems have become a prioritized research area. The Committee on En Route Combat Casualty Care (CoERCCC) named unmanned platforms as one of ten research priorities for the future of casualty transportation.[4] One study concluded that approximately half of all casualty evacuations did

not need any active care during transport, and as such unmanned systems could be utilized as transport without added risk to the patient.[5] Hence, emphasizing that unmanned systems may become vital during a conflict where CASEVAC resources are scarce and manned assets are needed elsewhere. That knowledge also has value in constructing a robust and reliable PR infrastructure.

Not just Combat Search and Rescue (CSAR)

CSAR is probably the most known recovery method within the armed forces. Sweden gained the capability to educate and train in the CSAR method in early 2000 and has since trained both pilots and extraction forces in that method.[6] This may have further added to the view that recovery efforts are mainly for pilots and during deployments in foreign theatres, which has been proven several times during the French operation Barkhane in the Sahel region.[7] Nonetheless, CSAR is just one recovery method of many and should as such not be used synonymously with PR.

The PR umbrella contains; Search and Rescue (SAR), which normally is conducted during peacetime; Combat Recovery (CR), a recovery method that all military units should be able to conduct; CSAR, containing more advanced techniques and tactics to recover personnel in a hostile environment; and Non-conventional Assisted Recovery, in which local forces (mainly in foreign theatres) are used as extraction force supervised by special operation forces. To keep this article short, the methods will not be described in detail, the main point being that the system contains several methods which could be applied across the conflict spectrum.

Although there exists a need for a PR structure, the concept is still met with some scepticism within the Swedish Armed Forces. The main reason is, as previously stated, that the methods of the extraction of isolated personnel are heavily related to deployments abroad. Especially due to the perception of a non-linear battlefield, which in turn has led to the faulty conclusion that there is no need, or time, to recover soldiers or sailors on home soil. Seemingly indicating a digital view of the world, either there is peace which requires no military recovery capabilities, or there is war in which there is no time to recover soldiers or sailors. Hence, according to some, it is not worth the effort to create and maintain a PR structure within the national context. A perspective that may be perceived as rational at first.

Nonetheless, history has shown that there is a need to address PR in daily operations in Sweden, even in peacetime. The downing of a Swedish DC-3, and the succeeding attack of the search and rescue aircraft Catalina participating in the search efforts, is perhaps the clearest example of how a PR incident may unfold during peace where several states have a perception of elevated threat towards their nation. That particular incident also taught us that an adversary may have interests in recovering Swedish personnel for their own purposes.[8] Meanwhile, with the downsizing of the Swedish military came also the removal of airborne search and rescue (SAR) capability. Instead, Swedish pilots and sailors have had to rely on civilian assets to recover them when in distress, even though the Swedish Armed Forces now claims to have some SAR capabilities.[9] With the Swedish Maritime Administration being the responsible agency for SAR within the Swedish SAR region, there may come a time where military and civilian needs collide, creating an unnecessary struggle for resources and also creating a vulnerability for the military

systems if the civilian helicopters should be incapacitated for some reason.

The creation of a Joint Personnel Recovery Centre (JPRC) in the Swedish Armed Forces Joint Staff indicates that Sweden now has recognized that we cannot depend solely on external assets (i.e. our partners or other agencies) and that it is time to rebuild our capacity to rescue our personnel. This is of importance in a region where military activity has increased and so has the risk for collisions between aircraft or naval vessels.[10] Partnering up with other states who may rely on Sweden to recover their personnel when isolated, either in peacetime during an exercise, or during a conflict, adds further weight to the argument that the capability needs to be put in place sooner rather than later.

With an increasing number of military operations comes a greater demand of accessibility and redundancy in being able not just to locate and recover, but also support the isolated personnel, support the ongoing rescue operation and bring home any sailor, soldier or civilian who has lost control. This article aims to highlight how unmanned systems can become an integrated part during the majority of these tasks, and that the Swedish Armed Forces, as well as other governmental agencies, have already started the process. These agencies are seemingly unaware of that development that has been categorized as logistics, or purely SAR of distressed civilians, and is a part of the PR system. Furthermore, this article will highlight that PR and unmanned systems are critical also within the national context when in competition with a peer-adversary.

Previous discussions about the use of unmanned systems, especially autonomous, has in part focused on the ethical dilemma.[11] An area that of course is of great interest when discussing the autonomy of unmanned recovery vehicles. But, that discussion should not overshadow the ethical discussion about the responsibilities that we have towards the soldier and the sailor, ensuring their safe return when isolated in a hostile environment.

Unmanned Systems as a reporting and locating sensor

The report and locate tasks aim to verify, validate, find, fix and track the isolated personnel within the designated area of operations. This may require that sensors are active over a considerable timeframe which in turn may require several platforms to keep track without downtime. As such it is no wonder why RPAS became the go-to asset when tracking objects.

Nonetheless, since the introduction of RPAS on the battlefield, all unmanned airborne systems have had limitations in quickly locating and correctly identify targets on the ground. Using an electro-optical, or sometimes an infrared, sensor has its limitations and can be compared to trying to find a football on a pitch but you are only allowed to look through a straw.[12] As such the operator would need a well-defined area and distinct ground signals in order to find an object fast. This is of course old knowledge that has been identified historically when signalling to airborne platforms using ground-to-air signals (GTAS). However, it seems that some of this knowledge has not been connected to unmanned systems, although this has started to change.

Normally unmanned systems, at least within the military context, are used to locate, gather information and deliver a kinetic payload to a target. Throughout the years airborne unmanned systems have become more technologically sophisticated with added capabilities to locate personnel and equipment, not just visually but also through ground moving target indica-

tion (GMTI) or by locating emitting devices. Data is collected and disseminated throughout command-and-control networks at high speed. Within the PR community, this has become a standard of a sort in locating isolated personnel within a defined area. The use of GMTI and COMINT as additional tools for locating objects has added to the capabilities of unmanned platforms as valuable PR assets.

The use of COMINT platforms not only increases the possibility of quickly locating a survivor, but it also adds the capability to collect and identify distress signals within the area of operations, potentially shortening the reaction time between the activation of the beacon and the identification of the source. This of course could be exploited by a peer-adversary who might have an interest in reaching isolated personnel or recovering specific components from the wreckage.

Competing with a peer adversary increases the risk for the personnel involved in the rescue operation. During the operation, there is a need for an On-Scene Commander (OSC) and later a Rescue Mission Commander (RMC). The downside with manned options is, besides the risk for the pilot and crew, the limitations in regards to the amount of fuel that a manned airframe can carry. Unmanned systems add unmatched longevity, not just for fuel consumption but also the ability to rotate the ground control crew. Thus, with an unmanned option, the risk is mitigated and combat pilots are focused on tasks where they are needed the most without leaving the isolated personnel to fend for themselves.

Unmanned systems in a support role

The support task aims to support the isolated personnel with, although not limited to, protection, communication, situational awareness and resupply.

Protection of isolated personnel may include support by fire to keep the soldier safe until extraction. This may of course be built into the system of establishing restriction zones (ROZ) or no-fire areas (NFA) as means of avoiding friendly fire. However, operating in mountainous terrain where rescue by conventional air assets is unsafe has pushed the evolution towards unmanned systems being able to drop medical supplies to troops in need of replenishment.[13] Both the United States and Sweden have conducted trials with various systems carrying blood, as means to enhance the survivability of wounded soldiers.[14] This of course falls naturally within support tasks in the PR system. It also highlights that if a system can carry two-kilogram blood, it may also be able to carry the same amount of weight of other materials that can be fit into a similar container.[15] Thus opportunities are added to support individuals with material that boosts the survivability of the individual, i.e. survival blankets or life jackets. Nonetheless, this requires systems that have a range that enables operations not just outside of the units' ordinary operational bubble, but also the ability to carry out the mission at higher altitudes.

With the development of loitering munitions, one cannot discuss unmanned systems and support without mentioning the value of systems that can conduct both overwatch of an area and conduct a strike when an enemy has been detected. Systems like the Harop, Switchblade and Warmate will likely play an important role in future battlefields in suppressing air defences and enemy forces approaching the isolated personnel.[16] The support task is however not limited to only kinetic actions or dropping resupplies, it could also be used as a tool to increase the

soldiers' ability to make correct decisions and make use of his or her SERE[17] skills, such as guiding towards favourable terrain to shelter from the environment, or through voice communications be able to avoid dangerous areas. Or they can be utilized as a sensor in collecting data about underwater mines when conducting maritime rescue operations.[18]

One could also argue that unmanned systems could be utilized as decoys or physical obstacles when protecting the soldier from a peer adversary trying to locate and extract the isolated personnel. Using various methods unmanned systems could deploy countermeasures that inhibit the adversary from using various systems, such as jamming, without affecting the abilities of their forces. One possible strategy in the future may be using RPAS to deploy unmanned ground vehicles (UGV) as semi-autonomous countermeasures on the ground.

Furthermore, smaller airframes can be used during the extraction phase to mark the spot and act as a beacon in guiding the extraction force to the correct location[19] while at the same time providing the same protection of counter-measures as given to the isolated soldier. Hence, an unmanned system could play several key roles at once while supporting an ongoing PR operation. The limitations lie within our decision process of which system to purchase.

Unmanned systems as a method of extraction

Modern unmanned air systems range from small systems in the size of a human hand to systems with the wingspan of a commercial jet. Furthermore, the commercial interest of systems that can carry a person has acted as a catalyst creating the potential for future systems to be able to carry a soldier to safety. Nonetheless, although the airborne systems cannot yet complete the extraction, ground-based systems can. Some systems are designed to have the ability to carry a stretcher with a wounded soldier, other systems aim to recover wounded or deceased personnel from high threat areas without risking the lives of others.[20] Unmanned maritime systems could be utilized as means to recover, or at least assist in the recovery operation of, personnel or sensitive items at sea. Such a capability may show itself to be of high value in the Baltic Sea if a collision would occur (again) between assets carrying sensitive equipment or personnel that could be of interest to a peer adversary.

Unmanned systems as a complement to the reintegration

While an unmanned system itself cannot conduct the debrief with the soldier that has been isolated, recorded data may help the process of tending to the psychological welfare of the recovered personnel. It may also add valuable information to the information derived from the debriefing of the individual, strengthening the validity and reliability of the data. Presenting this for the individual further enhances the narrative that the individual was never alone and that the nation-state (and the Armed Forces) cares about the survival and return of the individual. As such increasing the chance of the individual returning to duty without limitations.

Furthermore, it sends a clear message to the troops that the Swedish Armed Forces holds the ability to recover personal throughout all domains, utilizing the full might of technology in doing so. A powerful message to convey not just to Swedish soldiers

and sailors, and partner forces, but also to the adversary. "We will recover our personnel wherever they may be, and you cannot stop us."

The increasing utility of unmanned systems in the society

During the last five years, the usage of RPAS within the civilian sector has increased and today it is estimated that about 400 000 Swedes own some kind of remotely piloted system.[21] Not only do citizens use these systems for fun, but they have also become increasingly used as tools to locate lost individuals in the wilderness. These systems complement the standard search party on the ground in covering terrain that may be too dangerous for individuals to search, or is inaccessible by foot. As the systems have become cheaper, they have spread exponentially throughout society which in turn has affected civilian air space regulations and who is allowed to fly within certain areas. Although the state cannot rely on civilian initiatives it has also benefited the military community which gains advantage from not just a relaxed attitude towards RPAS but also regulations that ensure that systems can be operated safely throughout all dimensions.

With the creation of an RPAS division within the Swedish police agency,[22] it could be said that the police have further enhanced their ability to search for not only suspected criminals but also missing individuals, spreading the knowledge of how even smaller systems could be used for a wide range of tasks. Also, the unmanned systems are a suitable complement to manned aircraft when overviewing forest fires, minimizing the risk to aircrews and aircraft while adding durability and valuable sensors for detecting hot spots as well as delivering medical equipment to patients.[23] This shows that the non-military side of the society already has acknowledged the value of RPAS for various activities, enabling the state to further care for its citizens during peacetime and a nationwide crisis. Thus, highlighting the importance of the military to catch up with its civilian counterparts and shoulder the responsibility in coordinating between the agencies throughout all dimensions of conflict.

Challenges to overcome

Despite all the possibilities, there also exist challenges to overcome to fully utilize unmanned systems within the domain of PR. Since the battlefield in the future will continue to rely on the usage of, and protection from, electronic warfare; the level of autonomy and the ability to safely navigate in a distorted environment has to be addressed. Not only to avoid collision between vehicles but also to avoid further risk to the person being recovered. Another challenge will be how we can incorporate a wider use of unmanned systems into our planning processes. In what way will the increased use of unmanned systems affect our operations on land, sea or in the air? How can we utilize a rescue package containing manned and unmanned systems without added risk?

Although advanced technology has become cheaper to develop and buy, it is still not free. Systems then need to be maintained and personnel trained so that the capability could be maintained over time. This means that each branch may have specific needs that require solutions that cannot be applied by all which in turn likely means higher costs. On the other hand, with strained resources comes a need for adaptation and innovation. Working closely with the industry will help

us to find solutions that fit the specific needs of every branch.

The way forward

Admitting the challenges, the main takeaway should be that the limitations of today exist in our minds. The history of PR is riddled with examples of creative thinking in recovering personnel abroad, either by the Fulton surface-to-air recovery system (STARS) or by Fast Rope Insertion/Extraction System (FRIES). As more people start to understand the system of personnel recovery and how it fuses naturally with all other functions, we will start to find effective solutions and strengthen our capabilities to recover personnel, military and civilian, without adding risk for loss of human life or straining resources that may be needed elsewhere.

As with all systems, there is a need for continuous training and evaluation. While the US conducts larger exercises with a near-peer scenario, Sweden's approach seems a bit more modest. Although some air force exercises contain PR elements,[24] it is far from a natural state throughout the branches. Despite that Swedish officers are trained yearly both in national and international courses, we still have a road to travel in creating a robust PR system that is accepted by all levels within the Swedish Armed Forces. Since more and more nations, including Sweden, have started to look at space, there is of course a discussion to be had about PR in space and how unmanned systems will play a role in recovering personnel in a completely different environment.[25] However, that discussion will be saved for the future.

The author serves as a sergeant first class in the Swedish Armed Forces.

Notes

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