UDT 2019 – Big vs medium sized AUVs from a defence perspective

Abstract — An AUV can be used for MCM, ASW and Intelligence operations among many other things. This means that an AUV will be needed to operate and search in wide areas with good endurance.

To achieve good enough resolution AUVs normally operates in slow speed (~ 3 knots). Sea lines that are to be searched and/or cleared usually have a width of 400 meters. This means that it is time consuming to have an AUV in the operational area and will put the AUV and the operation at risk for an enemy to engage.

To operate covert, the possibilities of detection reduces. This places great demands on implementation of the engagement. The vulnerable parts of an AUV operation are launch, retreat or malfunction / accident. On these occasions, detection probability is greatest. By operating in darkness, the possibilities of a hidden behavior increase.
Other example to operate covert is the usage of containers on commercial vessels or from a pier in tents in a harbours cargo area.
Large platforms as carrier for the vessels, in themselves, mean a greater detection probability compared to small platforms or a land-based unit. A larger platform such as a mining ship is a valuable target for the opponent.
A small, easy moving platform is more difficult to detect for the opponent. The protection of this type of device is covert behaviour, speed and good mobility.
In order for a covert behavior to be effective, methods are required to quickly launch and retrieve a craft. It is not uncommon for naval forces to be limited by their crane capacity on board or time-consuming retreatment procedures.

When using a bigger AUV you will have the opportunity to launch your AUV from a great distance far away from the actual operating area. This way the opponent will have small chances of detecting the launch of the AUV and even more difficulties to find out where you actually operate your system.

With the possibility to recover your AUV at a different position from where it was launched, the opponent again would have a hard or impossible chance of knowing where you have operated your system.

Therefore, the rationale behind this abstract is that if you want to be covert you should go for a bigger AUV rather than go for a small AUV that needs to be launched closer to the operational area.

There are various ways to bring home an AUV deployed covert. The basic philosophy should be to make it simple and quiet. Examples of methods are:

- Recovery by submarine by locking the AUV into the torpedo tube or lock.
- With diver
- With recovery vehicle (ROV)
- Recovery by submarine attaching the AUV on the submarine's hull
- Recovery by fast boat or helicopter
- Recovery by allowing the AUV to transport itself to a safe area
- Recovery at fixed installations on land

Each method should be customized according to the most appropriate technique suited for each task/operation.

1 Purpose

The AUV market is overwhelmed with different AUV´s but very few discussions is about how to use different sized AUV's in the best tactical way. This presentation is about how a user can optimize its AUV's in different tactical cases.

2 Introduction

For most Navies the amount of naval vessels are always too few. The MCM community have the demanding responsibility to keep sea line of communication (SLOC) for commercial shipping open as well as protection of naval assets. This job is both time consuming and a tough priority for higher command to decide on where to put their resources. To be able to make high value assets as MCM vessels available for priority tasks, other systems as AUV's, can act as gap fillers and area surveillance tools.

This presentation will discuss different tasks that AUV's can support MCM operations.

3 Discussion

As for all Defence Forces, the knowledge of their terrain is essential to be able to act and use its assets in the best way. As for the Navy sea mines will always be one of the

biggest threats and therefore essential do handle. A well-prepared Navy will have their SLOC monitored by sonars which data will be stored in a database. This way the Navy will have a better and faster way of clear their SLOC in the event of wartime. Using change detection from the normal picture in the database and the present picture will allow the Navy to act in the right area with the right assets. The time-consuming data analysis would be done by other personnel than the crew on-board the MCM vessels and most likely be supported by Computer Aided Detection/Computer Aided Classification (CAD/CAC) functions in the AUV's. This will both save time and resources to secure SLOC and safe passage.

The AUV's are the perfect tool to continuously conduct surveillance with a minimal demand of personnel and other resources. By using AUV's to do surveillance over time the MCM vessels will be able to conduct other tasks and be available for other duties. When using a bigger AUV you will have better endurance and possibility to have more sophisticated sensors on-board due to the size. With better sensors, you will also have the possibility to increase the speed and thereby save time in surveillance of big areas.

When you are protecting your international waters, more options occur, such as fixed installations along the coastline that could be fitted for launch and recover AUV's. Depending on ambition, these fixed installations could be covert and equipped with direct communication to the database that collect, store and analyse the seabed information. Additionally each fixed installation could be fitted with maintenance and personnel to handle the system over time. This personnel wouldn't need to be sonar experts or MCM sailors of any kind but rather basic trained technical personnel. This way highly skilled and trained sailors and sonar experts would be operating at more difficult positions somewhere else.

With a set-up of AUV's around national waters, the Navy would have good knowledge on their SLOC's status. To speed up the MCM operation the ship's hull mounted sonar then could either be used for relocation of mine like objects (MILO's) found and located by the AUV's CAD/CAC function or as a change detection towards collected data from the AUV's. In the case were the AUV's collect data thru CAD/CAC any disposal unit (MCM divers, EOD-team, MVMV's) could respond to the task giving the Navy flexibility of the usage of its assets.

If a Navy will be limited of, the amount of AUV's, mobile AUV units could operate the systems like in the fixed installations case but from trucks. In this mobile set up pre planned launch and recovery locations could be prepared in advance and give these mobile units great flexibility.

Since launch and recovery is the most vulnerable phase of AUV operation, this is something that should be done as seldom as possible. When using smaller AUV's the "play-time" is less than when using a bigger AUV. Obviously this will result in more often launch and recovery handling. A launch of a smaller AUV would need to be closer to the area of interest meaning that the personnel would also be put in to a greater risk as well as the AUV.

This discussion promote the bigger AUV before the smaller one but there is off course situations where smaller AUV's have their perfect fit. For example could launch and recovery be hard to do at some areas where bigger AUV's would not be possible to get in to the water. Other issues such as operating units and their possibility to bring a big AUV to the area where they should operate would be to the smaller AUV's advantage.
When it comes to manoeuvrability, buoyancy and handling in the water both AUV's would be able to act equally.

4 Conclusion

The fact that the AUV's are available and operational today means that Navies around the world must come to learn better how to use them. If AUV's still will be operated from traditionally MCM vessels not much is won. The MCM community needs to use the AUV's from other platforms or land based units to set valuable assets free to conduct other tasks than surveillance and data analysis.

If MCM or surveillance operations would be covert a bigger AUV would be a better choice rather than a smaller AUV. Also data quality, speed and endurance would be much better when using a big AUV. There is always cases where a small AUV will have its fit but that will most likely be connected to limitations at the launching site or the units that operates the AUV.

References

This presentation is based on Saab Dynamics MCM strategy, reports and internal work within the Saab group.

Author/Speaker Biographies

Thomas Ljungqvist is 46 years old and has his experience from Navy EOD (Explosive Ordnance Disposal). Thomas has served as a mine clearance diver, Dive master, navigational officer and XO on-board different naval vessels in the Swedish Navy. The last years of service Thomas was operating both at sea but also supporting land operations in Afghanistan and in Sudan were he conducted and commanded IED (Improvised Explosive Disposal) operations.

Thomas retired as Commander and has 15 years of experience as a commanding officer at all levels up to Squadron commander. Thomas finished his master thesis in war science 2012 that focused on naval deterrence against irregular groups in Lebanon and Somalia.

Today he is working as a Director Business Development & Strategy at Saab Dynamics Underwater Systems and

partly as a Reserve Officer at the Swedish Armed Forces HQ.