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Keynote Address by Mr Peter Ho, Permanent Secretary (Defence), at the Naval Platform Technology Seminar 2003, held at Singapore Exposition Conference Hall

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Introduction

On the evening of 21st October 1967, two Egyptian missile boats off Port Said fired four Russian-made Styx anti-ship missiles and sank the Israeli Navy destroyer, Eilat. While this was a sideshow in the Six Day War, the sinking of the Eilat was a seismic event in naval warfare. For the first time, a naval battle was decided not by guns or torpedoes or bombs, but by a new weapon - the anti-ship missile.

The Israeli Navy learnt its lesson from the sinking of the Eilat. Six years later, in the 1973 Yom Kippur War, its ships were armed with the new Gabriel surface-to-surface missile system. More than that, the Israeli Navy ships were equipped with electronic warfare systems to defeat the Styx missile. In the first surface-to-surface missile battle in the history of naval warfare, the Israeli Navy ships, protected by their EW systems, successfully penetrated a curtain of Styx missiles fired by the Syrian Navy. They then launched their Gabriel missiles and sank five Syrian ships.

These naval battles have helped to shape modern naval warfare. The anti-ship missile has not only transformed naval tactics, but also profoundly influenced the design of ships and their fighting systems.

After 1967, the anti-ship missile became part of the essential inventory of the modern warship, supplanting the gun as the main offensive weapon.

In turn, the anti-ship missile threat compelled navies to develop a host of missile warning systems and electronic countermeasures to protect their ships. Indeed, the lack of up-to-date

counter-measures can be fatal. On 4th May 1982, two low-flying Argentinean Super Etendards caught the Royal Navy destroyer, HMS Sheffield, unawares. One of the two AM39 Exocet missiles fired by these aircraft locked onto the Sheffield and hit it square amidships. The damage was too great and a few days later, the Sheffield sank. Twenty men lost their lives.

As the designs of anti-ship missiles improve, soft-kill anti-missile electronic countermeasures may not be enough. After the Yom Kippur War, the Israeli Navy began preparing for the next war by developing the Barak anti-missile missile system.

It is never-ending. The combat effectiveness of a new design or fresh upgrade of an anti-ship missile is short-lived, as ever more sophisticated electronic countermeasures and anti-missile systems emerge. This imbalance is then redressed in the development of the next generation of anti-ship missiles.

So today, the latest anti-ship missiles have electronic counter-countermeasures incorporated into their seekers in order to defeat the target ship's electronic countermeasures and to defeat hard-kill anti-missile systems, the flight route can be timed so that two or more missiles arrive simultaneously at one target, saturating and defeating the ship's defences.

If an anti-ship missile can reach supersonic speeds, reaction times would be sharply reduced, and current anti-missile systems would be rendered impotent and this would allow the supersonic missile to penetrate the ship's defences. This is not a theoretical construct. The technology is available. France and Germany teamed up to develop the ram-jet ANF supersonic anti-ship missile. While this project fell through, there are already a couple of such missiles under development. The most prominent one is the Brahmos, which is a joint project between India and Russia. The Brahmos will be deployed on Indian Navy ships. Russia is also adapting its Kh-31P anti-radar missile to produce an air-launched supersonic anti-ship missile code-named Krypton. Maybe MBDA will be prompted to revive the ANF supersonic missile programme.

Advances in technology mean that there is constant churn in modern naval warfare. If we fail to stay ahead of the curve, then we will be condemned to repeating the mistakes of the last war, relearning the painful lessons of the Eilat and the Sheffield. Because the stakes are high, armed forces have no choice but to invest time and resources in developing innovative new concepts and adopting new technologies in order to be ready for the next war.

I will explain this point by giving examples from the experience of the Singapore Armed Forces.

Our Approach

The development of the SAF has been, and will always be, constrained by limited resources of budget and manpower. While larger armed forces can develop their capabilities by

growing and spending more, the only feasible approach for the SAF to maintain its strategic edge lies in doing things smarter and in stretching the value of every defence dollar.

Among other things, this means keeping abreast, and sometimes running a bit ahead, of evolving trends in modern warfare and technology. This also means acquiring capabilities in critical technologies, so that we can either be a smart buyer of state-of-the-art weapons systems, or develop specialised systems to meet our unique operational needs.

In certain strategic areas, like naval fighting platforms, we buy advanced systems in order to obtain an early advantage and this advantage is not just obtained by the hardware acquired, but also by the experience gained in operating these systems, as this enables us to rapidly move up the learning curve.

The RSN's acquisition of the Lurssen-Werft 45-metre Missile Gun Boats in the 70s is a good illustration of this approach. Armed with the Gabriel anti-ship missiles that the Israeli Navy used to good effect in the Yom Kippur War of 1973, the MGBs were very advanced for their time. However, with rapid advances in naval technology, obsolescence soon crept in. But by then, we had gained a lot of experience operating this first generation of missile ships and that experience gave us the confidence to define a second generation of missile-armed ships that became our Missile Corvettes of today.

Whenever necessary, we improve and upgrade the equipment to enhance their performance to meet new operational requirements. So rather than dispose of the MGBs when they approached obsolescence, we upgraded them. We installed a suite of electronic warfare systems to provide "soft-kill" protection against anti-ship missile attacks, and we added longer-range Harpoon missiles to the existing battery of Gabriel missiles and the combination of the Harpoon and Gabriel missiles improved the MGBs' attack and penetration capability.

Meanwhile, more capable electronic countermeasures and the Barak anti-missile missile system were acquired for the Missile Corvettes, giving the RSN's main strike force a stronger defensive shield against anti-ship missiles.

From 2007 onwards, the Navy's stealth frigates will enter service. These third generation platforms will be equipped with a robust hard-kill anti-missile capability in the form of the new Aster missile system that has been designed to deal with future generation of anti-ship missile threats.

Our frigates will initially be equipped with the Harpoon anti-ship missile system. But going forward, like the first generation Gabriel-armed MGBs, these third-generation platforms must eventually be upgraded and armed with a new generation of anti-ship missiles that can defeat the most advanced defences. Like other navies, the RSN will have to look ahead to future anti-ship missile systems and one promising option is the supersonic anti-ship missile that I mentioned earlier. But it will need an additional capability to discriminate legitimate targets against the cluttered background of one of the busiest shipping lanes in the world.

Critical Technologies

In Singapore, while we buy whatever and whenever we can, off-the-shelf, there will always be an "irreducible" minimum of investment in strategically critical technologies that Singapore needs to commit to in order to stay ahead. That "irreducible" minimum sometimes requires MINDEF to invest in R&D technologies and systems that we know could become irrelevant, redundant, or even obsolete in the future, either because they become available on the open market, or because new operating concepts make them unnecessary. But it is a price that we have to pay in order to develop and sustain our defence technology capability.

There are some critical technologies that will feature in the development of the third generation Navy. These include stealth, electronic warfare, guided weapons, and unmanned systems. Because of their importance, an "irreducible" minimum of R&D must be invested in these critical technologies.

Stealth protects by reducing the signature of platforms and thus the likelihood of detection. It confers the ability to surprise in operations because the stealthy platform is detected much later than an unstealthy one. The ships of the third generation Navy must be stealthy. So we consider stealth a critical technology that we must develop capabilities in and our collaboration with France in development of our new stealth frigates is a vital step in this direction.

The ability to dominate the electromagnetic spectrum through electronic warfare provides a critical operational advantage that is both highly prized and jealously guarded. While EW systems can easily be bought from the open market, they are mostly just black boxes. The advantage goes to the armed forces that can tailor specialised techniques and develop customised systems more advanced than those available off-the-shelf and this is why electronic warfare has been one of the most important and long-standing R&D programmes of our DSO-National Laboratories, and perhaps its most secretive.

The dominance of the anti-ship missile in modern naval warfare reflects a wider military trend of the increasing importance of stand-off precision weapons. This trend clearly emerged in Operation Desert Storm, gathered momentum in Kosovo and during Operation Enduring Freedom. But the use of precision guided weapons reached a peak in Operation Iraqi Freedom in which almost 70% of all ordnance were precision weapons, compared to just 8% in the first Gulf War.

For an armed forces like the SAF, with limited resources and manpower, the force multiplication effects of guided weapons constitute an important strategic advantage. This was something we recognised early on with the acquisition of the Gabriel missile system for our MGBs. But to better understand guided weapons, it was not enough just to buy such systems off-the-shelf, as we did with the Gabriel missile system. So in the early 80s, DSO-National Laboratories embarked on the development of a TV-guided bomb as a learning

project for its young engineers and scientists just out of university. It was not rocket science. But while the outcome was only an engineering field prototype, it gave our engineers and scientists in DSO an excellent learning opportunity in design, testing and evaluation and This was the foundation upon which they built up expertise in technologies such as aerodynamics, flight control, navigation and guidance and such technologies overlap into another strategic area for the SAF, namely, unmanned systems.

As a result, the SAF today has access to expert advice for the evaluation not just of guided weapons, but also of unmanned vehicles which share with precision weapons the need for good guidance, navigation and control systems.

Going forward, the demand for guided weapons and for unmanned systems can only increase. Indeed, the use of unmanned air vehicles for surveillance and strike has already begun to change the rules of warfare, especially since Kosovo. Just a year ago, a Predator UAV in Yemen launched a missile accurate enough to hit terrorists in a car.

By enabling an armed forces to act on intelligence rapidly, in minutes instead of hours or even days, UAVs are likely to prove to be a significant force multiplier in the long run and it is an area where the SAF must gain an early advantage. In addition, UAVs have the potential of overcoming the problem, perhaps unique in Singapore, of the limited number of pilots we can generate due to our small population base and we have already gained substantial experience through years of operating the short range Pioneer RPV, and the medium range Searcher UAV. To understand the technologies of unmanned systems more deeply, we even made an "irreducible minimum" investment in the development of a target drone, not unlike the ubiquitous Chukar. Again, the outcome was a field prototype. But the real gain was in expertise build-up. That expertise was leveraged in a recently concluded long-term study for a High Altitude Long Endurance UAV with an integrated airborne surveillance and communications system and such a HALE UAV would provide continuous temporal coverage over a very large area, and could potentially replace our E2Cs in the long term.

Conclusion

In describing our experiences with guided weapons and UAVs, I am making a couple of points. Let me summarise.

My first point is that there has to be a willingness to commit investments in building up capabilities in critical and strategic technologies. While these investments may not result in any weapon or system that can be deployed, this "irreducible minimum" is necessary to stay ahead not just of the technology curve, but also of the strategic curve.

My second point is that there is no end to change and transformation. This means that we must always be thinking about how to fight the next war, not the last, and preparing and equipping ourselves accordingly.

My third and last point is that the exploitation of technology for strategic advantage is best achieved in an environment where experience is tapped, and knowledge is shared vertically and horizontally throughout the organisation. To do the long-term study of the HALE UAV in Singapore depended on mining the accumulation of operational experience and technical expertise throughout the defence establishments in Singapore.

In conclusion, a long-term view is necessary to meet the multi-faceted challenges facing today's modern navies. Investments in time and resources have to be made now to seek innovative responses, in order to be ready to respond effectively to future challenges and changes that may come our way.

And on that note, I wish you all a fruitful and enjoyable seminar.

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