

NAVAL AIR DEFENCE: SOFTKILL, HARDKILL, AND PLATFORM SIGNATURE COORDINATION

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Abstract. Naval air defence is a complex multi-dimensional problem, requiring complex and expensive equipment. In the current military environment, both missiles (hardkill) and decoys (softkill) are used against contemporary threats. These systems all influence the same spectral bandwidth and are often required simultaneously. Only suitable coordination will allow these systems to be used to full performance against the threat. Another consideration is the signature and manoeuvre capability of the defending platform and its influence on the hardkill and softkill systems. This paper provides an overview of the problem of the threat and coordination of softkill and hardkill as an introduction to a series of papers on the subject of hardkill-softkill coordination.

INTRODUCTION

The air defence of maritime platforms is a complex multi-dimensional problem. It is less than 100 years since the first attack on a maritime platform from the air. Since then the defensive problem of maritime platforms has increased, especially so after the introduction of the modern radar-guided anti-ship missiles (ASM). Up until 1962, high-angle rapid firing guns provided air defence for the Royal Navy (RN). Such defence was proved many times during World War 2 to be woefully inadequate, especially against the increasing speeds of aircraft. In 1962, the destroyer HMS Devonshire, brought in to service the first RN guided-weapon system (GWS) called Seaslug, a medium-range beam-riding missile, followed by Seacat (GWS 20) in 1964; both of these are referred to as *hardkill* systems. Seaslug and Seacat were adequate for defence against aircraft and the ASMs of the time, however, as ASMs became more sophisticated and faster, they became less effective.

In the late 1950s and early 1960s the RN introduced chaff decoys, fired from rocket launchers. The aim of these was to reduce the effectiveness of the radar-guided ASMs by producing a cloud of metallic strips with which to confuse the ASM radar seeker. The first known operational use of chaff in a naval environment was the sea battle of Latakia during the Yom Kippur war fought on the 7 October 1973. Again, to overcome the advances of ASMs, during the early 1980s passive inflatable radar decoys (IRD) were introduced in response to the Falklands campaign. On deployment, the unit inflated producing a large radar cross section (RCS) to confuse the ASM seekers. Advances in ASM technology necessitated the requirement to introduce active decoy rounds (ADR) in the late 1990s. These are referred to as *softkill* systems.

Since the introduction of ASMs, their technology has advanced rapidly, while countermeasures in the form of hardkill and softkill have advanced at a slower rate. Hardkill and softkill have generally advanced independently, resulting in overlaps of operational use. Such overlaps result in coordination issues during engagements, including performance degradation of specific equipments. Another aspect that is often overlooked in the coordination of softkill and hardkill is the influence of the defending platform signatures during an engagement.

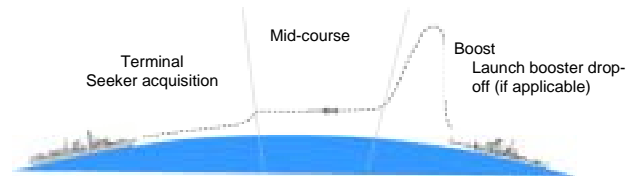


Figure 1. ASM phases of engagement.

A research programme to identify and quantify the coordination issues is currently underway. The aim of this research is to provide an understanding of the problems associated with an automated response to a threat environment using hardkill, softkill, and platform signatures, for both a single platform and multi-platform scenarios. This programme aims to be completed by 2011.

THE ANTI-SHIP MISSILE THREAT

The SS-N-2A (NATO designation STYX) was the first contemporary ASM to enter service in 1959 into the Soviet Navy. It was also the first ASM to be used operationally in the 1967 Arab Israeli six-day war. Since the introduction of this basic system, the technology behind ASM has improved significantly. Currently there are nearly 100 different ASMs around the world using radio frequency (RF), anti-radiation (AR), and electro-optic (EO) guidance packages. These guidance packages range from rudimentary technologies as employed by STYX, through to advanced ASMs using state-of-the-art technology.

The more modern systems with the advanced technology are the ASMs of concern. Generally, they incorporate manoeuvre capabilities designed to reduce the probability of hardkill interception, while also including advanced seeker design to reduce the effectiveness of softkill. ASMs can be fired from a number of platforms (air, surface, sub-surface, and land). A typical engagement sequence for an ASM is: detection, acquisition, target assignment, and launch. Typically kill assessment is not carried out by the parent platform. To reduce the probability of being negated, most ASMs are fired in salvos.

There are three phases of flight for an ASM, boost, mid-course and terminal, Figure 1 depicts the relevant phases for a surface-to-surface engagement. The phase of interest for the

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