RNLN introduces new Torpedo Defence systems on its surface fleet

E. van der Spek (1), S.P. Beerens (2)

(1) Defence Material Organisation,
Underwater Warfare Technology department,
E.vd.Spek@mindef.nl
(2) TNO Defence, Security and Safety
Acoustics and Sonar department
Peter.Beerens@tno.nl

Abstract — Due to the proliferation of submarines and the improvements in torpedo technology (endurance, intelligence), naval surface vessels experience an ever increasing torpedo threat level. To counter this threat, torpedo defence systems have been developed. However, the torpedo defence technology (often only based on soft-kill countermeasures like decoys and jammers) has lacked behind the torpedo technology, which has become more and more intelligent and able to recognize and avoid soft-kill countermeasures. Moreover, wake-homing and multi-modal torpedoes are conceptually soft-kill insensitive. Only recently the development of torpedo hard-kill based on anti-torpedo-torpedo (ATT) was started. ATT based torpedo defence can potentially counter all threat torpedoes including the modern and wake-homing types. ATT technology is still under development.

In this context the RNLN has decided to introduce surface ship torpedo defence (TDS) for its surface fleet. In order to tackle both current and future torpedo threats new TDS systems will be introduced that consist of three components

- Sensor system for Detection, Classification and Localisation (phase 1)
- Soft-kill counter-measure system (phase 1)
- Hard-kill counter-measure system (phase 2)

The TDS solution should be compact in dimensions to fit all vessels, robust and effective, and is to be operated with minimal operator interaction. The sensor system will be a combined active and passive sonar to enable firing solutions for future hard-kill countermeasures. The hard-kill countermeasures will be based on an ATT.

Fig. 1. The ROK Navy Cheonan was torpedoed in 2010. After the torpedo impact it broke into two main parts and sank rapidly.

1 Introduction

Ever since the first developments in the beginning of the previous century torpedoes have been a serious threat for naval surface vessels. In Table 1 are the numbers of sunk US navy surface ships during the WWII. Most of them were sunk by torpedoes….

Due to the proliferation of submarines and the improvements in torpedo technology (endurance, intelligence), naval surface vessels currently experience an even increased torpedo threat level. This became evident with the sinking of the ROK Navy Cheonan in 2010 after being hit by a torpedo.

To counter this increasing threat, torpedo defence systems have been developed. However, the torpedo defence technology (often only based on soft-kill countermeasures like decoys and jammers) has lacked behind the torpedo technology. Over the last decades torpedoes have become more and more intelligent and able to recognize and avoid soft-kill countermeasures. Moreover, wake-homing and multi-modal torpedoes are conceptually soft-kill insensitive. Only recently the development of torpedo hard-kill based on anti-torpedo-torpedo (ATT) was started. ATT based torpedo defence can potentially counter all threat torpedoes including the modern and wake-homing types. ATT technology is still under development.

Table 1. Sinking of US navy ships during WWII (source US coast guard)

SINKING	SMALL SHIPS (IN TOTAL 92)	BIG SHIPS (IN TOTAL 23)
BY TORPEDOES ALONE	38 (41.3%)	10 (43.5%)
BY SUICIDE PLANES	16 (17.4%)	3 (13.0%)
BY BOMBS ALONE	12 (13.0%)	1 (4.3%)
BY GUNFIRE ALONE	11 (12.0%)	2 (8.7%)
BY TORPEDOES AND GUNFIRE	6 (6.5%)	4 (17.4%)
BY BOMBS AND TORPEDOES	4 (4.3%)	3 (13.0%)
BY MINES	5 (5.4%)	
BY BOMBS FINISHED OFF BY GUNFIRE	1 (1.1%)	
TORPEDOES WERE INVOLVED	48 (52%)	17 (74%)

2 RNLN TDS project

In the context of increasing threat levels the RNLN has decided to introduce surface ship torpedo defence (TDS) for its surface fleet. In order to tackle both current and future torpedo threats new TDS systems that consist of three components will be introduced in two consecutive phases

- Sensor system for torpedo DCL (phase 1)
- Soft-kill counter-measure system (phase 1)
- Hard-kill counter-measure system (phase 2)

The TDS solution should be compact in dimensions to fit all vessels, robust and effective, and is to be operated with minimal operator interaction.

The sensor system will be a combined passive and active sonar. The latter to enable firing solutions for future hard-kill countermeasures.

The soft-kill countermeasures will be based on jammers and decoys.

The hard-kill countermeasures will be based on an ATT. ATT technology is still under development. Two kinds of solutions are appearing on the market, both having their pros and cons:

- Modified light weight torpedoes
- Dedicated anti-torpedo torpedoes

The latter being a smaller (cheaper?) version of the former, but the former offering dual use possibilities.

3 TDS studies

In anticipation to the procurement of TDS (sub) systems The Netherlands is conducting studies in the field.

Based on earlier experience [2] The Netherlands is studying possibilities for torpedo detection, classification, localisation and tracking. Together with Germany trials are performed with existing and dedicated sonar systems. Moreover in this cooperation studies are performed with hard-kill countermeasures based on ATT [1].

Fig. 2. Logo of the NL-GE cooperation on SSTD studies.

Furthermore, The Netherlands has initiated a NIAG study where the combined use of soft-kill and hard-kill countermeasures is the topic.

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Author/Speaker Biographies

E. (Ernest) van der Spek started his career as an engineer at Technical University of Delft, after which he entered the armed forces, first as an engineer at the Royal Netherlands Air Force, later at the Royal Netherlands Navy and is currently part of the Defence Materiel Organisation where he is responsible for the TDS project.

Dr. S. Peter Beerens graduated in theoretical physics at the University of Amsterdam and received his PhD in 1995 at the Royal Netherlands Institute for Sea Research
In 1996 he joins the Sonar Department of TNO. Currently he is senior scientist and programme manager. He has specialised in sonar signal processing and sea trials.