Sea Sentor – Hydrodynamic Modelling

Ultra Electronics is the prime contractor for delivery of the Surface Ship Torpedo Defence system to the UK Royal Navy, known as S2170 Sea Sentor. The system is recognised as the worlds most advanced torpedo defence system available to any surface vessel; compatible with corvettes, warships, auxiliary vessels and aircraft carriers.

Key Capabilities:

- **Detects, classifies and localises all threat torpedoes**
- **Un-manned system**
- **Designed for rotation between vessels**
- **Declared in-service by UKRN in 2004**

Background

With the continuing proliferation of modern submarines and increasing emphasis on littoral waters there is a growing need to equip high value assets with effective protection against torpedoes.

The Challenge

There are three main issues for a towed-array undergoing dynamic manoeuvring, they are increasing levels of array self-noise, rapid changes in array shape (array element location AEL), and signal spreading in the phone-space sample-matrix.

Array shape estimation through turns can be determined using a hydrodynamic model with data from the non-acoustic heading and depth sensors. Additionally, the detection range of a towed array is highly dependant upon its position in relation to the thermal layers; hydrodynamic modelling is able to determine this position taking into account tow cable DW ratios, transom height, vessel speed, array scope, amongst others.

Solution

Ultra has modelled the dynamics of both very long ASW towed arrays, e.g. S2031, and the shorter S2170 “Surface Ship Torpedo Defence” towed array, with heavy tow cables, under both steady state tow conditions and during significant own ship manoeuvres. Towed array depth and tensions at key points along the tow are key parameters for assessment in steady state tow conditions. The same parameters are calculated, as a function of time, during manoeuvres, along with array turn rates and array shape prediction. The latter two parameters allow us to make sensible decisions regarding the approach to beamforming signals from the array.

In addition, Ultra models the stability of underwater towed objects. Understanding the dynamics of a submarine towed-communications buoy has been of key importance to successful programme outcomes.

Such models not only allow us to design and build Towed Array sonar solutions with predetermined performance, but also allow us to feed the resulting hydrodynamic motion into subsequent modelling programs that in turn allow us to predict post-beamformer contact detection performance based upon thermal layers, array bend and vernier selection.

Contact us
seasentor@ultra-scs.com
+44 (0)20 8813 4644
www.ultra-scs.com