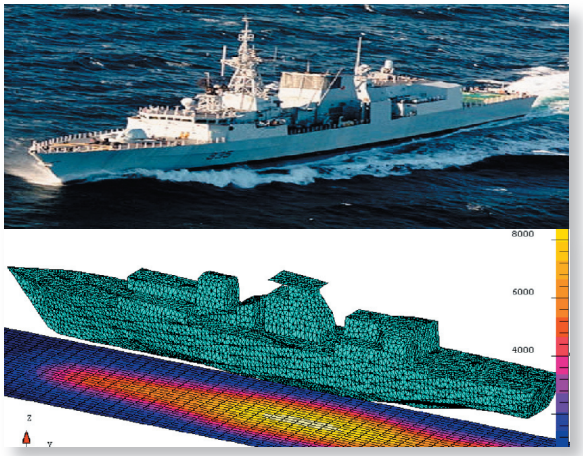
SUCCESS STORY

Defence Research for Development Canada (DRDC)



Static magnetic signature of a Canadian Patrol Frigate computed with FLUX

The Signatures Section of DRDC Atlantic addresses technologies related to the reduction of emissions and fields (signatures) by opposing forces. Military forces already employ stealth, but must continually counter the ever-increasing sophistication of opposed sensor systems. The objective is to make signatures of military assets undetectable against the background. These signatures include static and low frequency electric and magnetic fields. Passive signatures (such as static electric and magnetic fields) can be reduced by applying novel materials, design, construction or shaping and can be reduced by development of specific countermeasures, such as degaussing systems.

The Challenge

Warship magnetic signature reduction is essentially based on experience. A wide expertise is needed when manipulating magnetic ranges. To provide a broader theoretical knowledge of the phenomena that occur in ship, new tools needed to be found and used.
Moreover, DRDC Atlantic desired to study how a simulation software could help their scientists to enhance their expertise to design degaussing systems, and optimize the ship's signature.

The Solution

"Curiosity was the initial motivation" says Marius Birsan, Defence Scientist at DRDC Atlantic. Not knowing the capabilities of such software and having an extensive experience of practical aspects of warships magnetic signatures, the scientists from DRDC Atlantic needed to show that FLUX was able to provide results.

Using CAD import capabilities of FLUX, they could input the geometrical model of their vessels. The model being parameterised (materials, physical properties, ...), the correlation with measurements could be made varying those parameters.

The study predicted the degree of improvement that would be obtained if the degaussing currents of a Canadian patrol frigate were calculated using a combination of measured magnetic signatures and Finite Element modeling of ship magnetization. The idea followed in this study was to decompose the total ship's magnetization into components related to the orientation of the degaussing coils and, from the effect produced by each component, to calculate the corresponding currents. Practically, the currents were calculated by an inverse problem procedure using a regularization algorithm. The results indicated the directions to follow for improvement of the degaussing system and allowed the development of an effective coil current setting algorithm to use in conjunction with this configuration.

Various results could be then obtained from the simulations, such as the influence of the degaussing systems over the total signature of the ships. Coil effects were calculated and compared with the measured ones.

The Challenge

Get more knowledge on degaussing systems and optimisation.

The Solution

Use Flux to design the silencing systems and optimise vessels magnetic signature.

The Results

More theoretical knowledge
New competencies
Broader service range

Product used

Flux (3D Applications)

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« The FE method is used to predict the effect of degaussing current on reducing the magnetic signature of current vessels and to optimally design the degaussing coil system of future vessels. »

Dr Marius BIRSAN,
Defence Scientist,
Defence R&D
Canada
AtlanticEngineer, DCN

The Results

More theoretical knowledge:

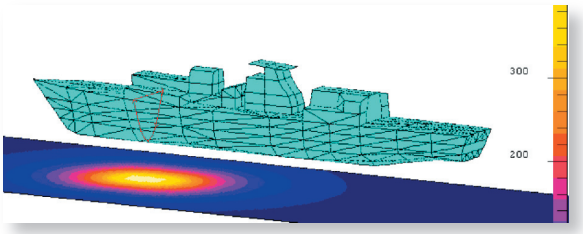
Scientists obtained significant results regarding the induced magnetisation, that is to say the influence of degaussing systems of the total magnetisation of the vessels (up to 19 coils wounded in the hull of the ship). Using the parametric capabilities of FLUX to define materials, physical properties, …, they could also fit the virtual models to get similar permanent magnetisation patterns (permanent magnetisation depends widely on the history of the ship, how materials have been manufactured…).

New competencies:

Not only can the scientists from DRDC Atlantic verify their models and see the influence of their systems, but they can also model more systems than they could do previously. ”With FLUX (3D) I simulate all kind of computations with magnetic or electric sources in the water and geometries that are very difficult to solve analytically” explains Marius Birsan.

A broader service range:

With Flux and the large capabilities it features, DRDC Atlantic gained expertise in the wide area of underwater electromagnetic fields. For example, DRDC Atlantic obtained new contracts to evaluate the magnetic influence of an offshore platform in the Golf of Mexico. The study was part of a larger project aimed to identify the environmental impact of oil platforms.time than the ship is developed, while previously we needed to wait nearly the end of the ship design ». The design starts then earlier than before, and follows the ship’s development.



Degaussing system influence on a Canadian Patrol Frigate computed with FLUX

Learn more about DRDC Atlantic at:

http://www.atlantic.drdc-rddc.

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