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Dr K. Dermody
Secretary
Standing Committee on Foreign Affairs, Defence and Trade
The Senate
PO Box 6100
Parliament House
Canberra, ACT 2600

March 29, 2011

Dear Dr Dermody:

Inquiry into Defence Procurement

I have been an academic at The University of New South Wales since 1971, where I have specialized in the area of hydrodynamics of ships. This subject refers to the study of the flow of the water over the hull of the ship and is therefore the most fundamental feature of a ship. Understanding this subject allows the naval architect to design a ship so that it has a low resistance to forward motion through the water, thus reducing the capacity of the engine and minimizing the fuel consumption. This leads to a more efficient and more environmentally-friendly vessel. Hydrodynamics also covers the matter of seakeeping (the motions of the ship in waves) and maneuverability.

My one comment to the Committee is that I have observed that Australia does not have a single organization with high-level naval architects (doctoral-level qualifications and active in ship hydrodynamics) who can advise on such matters. There has been a small number of such highly qualified hydrodynamicists in Australian universities but their expertise has not been utilized.

I shall mention two Australian naval projects where hydrodynamics were clearly ignored or, at best, misunderstood:

- **Bay Class Minehunter**: This was a catamaran (twin hull) vessel equipped with surveillance gear to detect mines. Two craft were built, namely the *Rushcutter* and the *Shoalwater*. There were some novel features of the design. It was constructed of "composites"

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(fibreglass), which avoided the use of metal (steel) that would have interfered with the electronics. The (steel) engines were placed high, also with the intention of reducing electronic interference. Unfortunately, the spacing between the two demihulls (hulls) of the vessel was too small, resulting in poor lateral stability.

I have been reliably informed that this Australian designed vessel did not undergo any model testing. Model testing consists of constructing a scale version of the vessel and testing it in an experimental facility called a towing tank or a wave basin, There are special techniques for extrapolating or predicting the behavior of the prototype vessel from tests on the model. It is well established practice to test ship models *before finalizing the design of the vessel.* This was a major omission which could have been avoided at a small expense. Computational techniques (although in their infancy at the time) could also have been used and much knowledge could have been gained from the exercise.

- **Collins Class submarines**: I attended a technical lecture given by a representative of the shipbuilder, Kockums AB, to the Sydney Branch of the Royal Institution of Naval Architects, shortly after the contract for the design of these vessels was announced. At the presentation, I noticed the very bluff (blunt) bow of the submarine and mentioned it during the question period. The speaker's response was that there are many problems related to submarines — other than hydrodynamics, and that this matter was unimportant.

  One did not have to be an expert or an engineer to understand that the sharp edges of the bow were a poor design feature that would lead to high drag. Certainly, all previous submarines that I had seen the drawings for possessed a properly streamlined bow. In retrospect, my question was prophetic, because the Collins bow was a source of many problems. The turbulent flow shed by its bow interacted with the sharp-edged deck casing and the resulting poor flow entered the propeller. This was the primary cause of the hydroacoustic noise that was suffered by the *Collins.*

My recommendation is that we in Australia establish an equivalent of the Naval Surface Warfare Center (NSWC), in Carderock, Maryland, USA. While our centre would be on a much smaller scale, it should employ (as intimated above) highly qualified Australians with doctoral-level expertise in ship hydrodynamics. Such a hydrodynamic institute exists in all other first-world countries.

I trust that my comments are useful to the Committee and I offer to assist in any way possible with its work.

Yours sincerely,

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