Submission to 2014 Defence White Paper

During his 2014 May 23 /24th trip to Shanghai President Xi of China said. “In today’s world, scientific and technological innovation [STI] has become an important pillar for improving comprehensive nation strength, facilitating the change of production mode and bettering the way of people’s lives. It is indeed those countries that have STI advantages, like grasping the key of things, or taking a decisive step on a chessboard, that can seize opportunities and win the strength of development”.

President Xi continued. “We must be clearly aware of the trend in the progress of science and technology, focus on the world advanced technologies and science frontiers, endeavour to gain great innovation in basic research and make key breakthroughs in core technologies”.

He concluded. “In line with the major trend of the industrial revolution, we must deploy relevant tasks for innovation, the aim being to promote and upgrade the industrial chain, and boost STI for industrial development. Efforts should be made to gather talents for innovative activities, improve the environment for innovation in research institutes and universities, and enhance the mechanism for IPR management and protection, so that various talents could play a greater role in their innovative activities”.

Reference: China Science and Technology Newsletter No 16 August 2014.

Designing and building the next generation of submarines in Australia would provide an ideal opportunity for Australia to develop a new and innovative product. Australian designers and construction teams must commence with a clean slate their taking on board the most recent developments in materials, production methods, power sources and weapons.

In relation to the latter: It was reported in July / August issue of Warship Technology that BAE are committed to developing rail-gun technology that will revolutionise naval warfare. Chris Hughes, vice president and general manager of Weapon Systems at BAE Systems said.

“The rail-gun’s ability to defend against enemy threats, from distances greater than ever before, improves the capabilities of our armed forces”.

Building rail-guns into our new submarines would greatly enhance the vessels effectiveness.

On the material side the use of composite [Carbon Fibre / Kevlar Epoxy] construction methods for hull and pressure vessel construction should be considered. The use of such lightweight high strength materials would provide far greater design flexibility. The aircraft industry has already provided a lead in this area. Incorporation of such technologies would lead to a lighter faster more effective submarine. Australian firms such as the Bankstown based Quickstep already have the ability to produce large complex composite modules without the use of autoclaves. [See Quickstep web site.]

In relation to power sources Australia should consider installing nuclear power plants as the prime power source for Australian submarines. Modern nuclear submarines are virtually silent. The older US Navy U.S.S Seawolf class travels in excess of 25 knots, and can dive to at least 800 ft. Australia already has staff with pratical experience in the nuclear industry.
It should also be noted that Lockheed - Martin have just announced that at their skunkworks they have made a major fusion energy breakthrough in that within 5 years they expect to be in a position to produce a fusion power unit the size of a truck.[See Lockheed – Martin website for October 2014 press release.]

As an alternate to nuclear power and combined diesel and gas turbine [CODAG] power consideration should be given to developing a gas turbine power unit where the exhaust gases are routed through a liquid metal heat exchanger the liquid metals [eg mercury / sodium] absorbing what would normally be waste heat. The heated metal [eg mercury, a liquid at up to 900 degrees] being circulated into a sealed water boiler producing steam which may power a steam turbine powered electric generator. [Low temperature exhaust steam would be condensed and recirculated.]

When submerged, the gas turbine being shut down, the stored heat in the liquid metal would provide time limited power to the steam turbine.

In normal operations it could be expected that such a unit would be up to 30% more fuel efficient then a standard CODAG unit.

It is strongly recommended that Defence consider developing a unique Australian designed submarine. One built along the lines suggested.

The flow on benefits to industry and the nation would more than repay any additional costs.

Submitted by

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Exportwise