Sent: Tuesday, 30 September 2008 11:05
To: White Paper
Subject: WWW Submission: 9. Science & Technology [SEC=UNCLASSIFIED]

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Submission: This summarises my analysis of defence science and technology S&T in Australia based on my experience of 47 years as a scientist within DSTO and its forerunners, and with an external perspective from extensive interaction with the external S&T community. I am Adjunct Professor at the University of Sydney and have honorary positions at other universities with wide collaboration here and overseas in projects for defence. This is complimented by my close interaction with Defence customers (mainly RAN and DMO) who continue to seek my advice. Defence S&T is failing to meet the needs of Australia and significant changes in approach are required.

Australia is a small nation in a big country. Our defence forces must defend our large territorial regions and also serve in many hot spots around the world. Our Defence Posture therefore is to have a highly a professional defence force with the best equipment and technology. To be effective this needs to be supported by the best S&T advice and associated research and development, and crucially these need to be internationally competitive to provide the ADF with edge over any potential adversary. The ADF covers a wide range of capabilities, a range that is not commensurably small in proportion to our size, or the limited resources that Australia can provide for S&T. This breadth needs to be matched by S&T capability of similar breadth but, most crucially, with the depth required to be internationally competitive.

This is our dilemma. Australian spending on defence S&T can be expected to be proportionate to our size or to overall defence funding. It is currently about 2% of the US and less than 1% of the world, and is not likely to change appreciably. How do we provide S&T of the required breadth without sacrificing the competitive depth with such a small percentage of the world's resources? Currently we do not meet this challenge and it does not seem that this problem is effectively recognised.

How de we meet this challenge?

Choose very carefully where to deploy our S&T efforts. Import as much of S&T as possible. Adapt what others have done rather than re-inventing the wheel. Lever off collaborations with other S&T providers in Australia and overseas – opportunities extend much wider than currently exploited. Support far more work at universities where work is cheaper because of the contribution of post graduate students.

We are not adequately providing the S&T needed to support the defence of Australia. We have lost expertise in crucial areas and are losing more. The scientific quality of our work is not assessed, let alone benchmarked to internationally competitiveness. There is little assessment of the usefulness of our work to the customer, and little redress available to the customer. DSTO is overburdened by unnecessarily complicated administrative procedures to direct the work in lieu of proper assessment of outputs and outcomes.

S&T in support of defence needs to cover a wide spectrum of activities from fairly basic research (with clear defence application) at one end to very specific applied research and development at the other end. Additional activities in DSTO are systems engineering, war games and analytical studies. Potential suppliers for the full range of activities range from universities to engineering consultants as well as DSTO, but most of this is expected to be done by DSTO. Changes over the last 15 years in DSTO have resulted in increased effort in the engineering end of the spectrum with reduced effort at the research end. This has resulted from a number of pressures, including increasing demands to support systems and acquisitions without increase in resources. Over the same period the policy in DSTO has been that staff should be generalists and not specialists and they should change their area of work frequently.

The result is that the much of the necessary research to support the ADF is not being

done, but more pressing is the loss of expertise that has resulted. To be an expert in any area of S&T requires many years of work in that field (i.e. specialisation). Generalists cannot be experts and cannot provide the expert advice that the ADO needs if it is to retain a competitive edge. The S&T world is advancing rapidly and is very complex. In any particular area, a specialist will always beat a generalist.

The crucial questions, with summary answers, for defence science and technology in Australia are therefore:

What is the appropriate mix of activities from research to engineering? A greater proportion of research is required than currently in DSTO.

How do we rebuild the research end of the spectrum? By supporting work at universities. The US Office of Naval Research does this very effectively and I have shown over 25 years that it works in Australia, and is more effective in maintaining expertise than in DSTO.

How do we maintain and rebuild our expertise in crucial areas? By supporting work at universities, including collaboration with DSTO to give critical mass (see above).

How do we ensure that the work is of internationally competitive quality and is of most value for needs of the customer? Instigate true peer review of S&T work with much greater emphasis on external participation. Give the customer more control of funding. Move towards a competitive environment for DSTO scientists, particularly in allocation of funding and resources, based on real assessments of scientific outputs and usefulness to customer.

What organisations should provide the range S&T required? Wider than at present including DSTO, universities, industry.

How do we implement this?

This is broader than DSTO and probably warrants an external review with representatives of Defence customers, universities, CSRIO, and industry.

Funding for defence S&T could be split as follows:

Infrastructure funding for DSTO.

Funding to customers to buy S&T from DSTO, universities, industry.

Competitive grants scheme with clear Defence priorities open to all research providers (note the US Office of Naval Research approach).

I agree to my submission being published on the Defence website

I agree to my submission being quoted in the Community Consultation Report