Effective Models for Engagement with Universities
Australian National University
Submission to the 2015 Defence White Paper

Executive Summary
The pace of technological development and its impact on defence continues to accelerate, while at the same time, the nature of Australia's geopolitical region evolves. The nature of warfare and the role of the Australian Defence Force (ADF) continue to change rapidly. The efficacy of the relatively small ADF is highly reliant on appropriate, cutting-edge technology and personnel trained in its operation and maintenance. To meet these challenges, the ADF needs to engage with an agile, broad and expert research and development ecosystem to provide solutions appropriate to our defence needs.

Role of the university sector
The ANU believes that the university sector has a critical role to play. ANU and other institutions have a significant pool of research expertise of relevance to the defence of the nation. For example, the measurement of gravity and acceleration at the extreme precision and stability that has been demonstrated at the ANU will allow the fully-autonomous and precise navigation of vehicles over extended time frames and extended distances in the absence of the (highly vulnerable) Global Positioning System. Precision sensing of electromagnetic and acoustic fields and the coupling of this technology with advances in material science, photo-voltaics, smart energy harvesting from the environment and energy efficient computing will allow deployment of sophisticated, fully-autonomous surveillance and reconnaissance vehicles and autonomous vehicles on extended missions. High-speed communication possibly exploiting quantum encryption (a demonstrated technology) will allow swarms of autonomous vehicles to be deployed with communication secured by the laws of physics. There is also increasing capability for design, manufacture and testing of precision instruments, for example through new facilities at the Advanced Instrumentation Technology Centre.

In addition to these advanced technologies, the Australian university research sector is instrumental in driving technological development in areas such as nanotechnology, chemistry, biology, biochemistry and biotechnology. Fundamental discovery in diverse areas with potential application to defence and security is essential for the ADF being at the forefront of new advances.

Whilst technology is undoubtedly important in developing our defence capability, so is an understanding of the cultural and societal environment within which our defence forces are deployed. This has been amply demonstrated in the recent conflicts in Iraq, Syria and Afghanistan. Future wars are more likely to continue to have strong components of guerrilla warfare undertaken in diverse culture. The university sector can play a significant role to contextualise and analyse local imperatives and global trends for our defence forces. ANU has world-leading expertise in strategy, defence, international relations and political studies providing comment and a broader strategic view of Australia’s role in international affairs.
Engagement between ADF, DSTO and the public and private sector research communities

The DSTO has a very challenging role in seeking to keep abreast of this fast-changing landscape. Recent developments to increase engagement are welcomed including the suite of standard DSTO-University agreements that have just been finalised. We urge the ADF and the DSTO to engage the research community in the public and private sectors even more deeply. Effective defence policy and practice must be future proofed and underpinned by a vibrant innovation ecosystem. The role of defence in stimulating innovation and economic growth in both the public and private sector and in dual use technologies is well proven in the USA.

Specifically, possible mechanisms for engagement include:

1. A major program of engagement involving a suite of different mechanisms including:
   a. Workshops involving DSTO, University and industry participants to explore particular topics and opportunities.
   b. Visits by DSTO and members of ADF to major university facilities.
   c. Sandpit events, where end users, academics and industry work collaboratively over a short period of time to develop solution ideas, and then follow on with funded research to test and bring these ideas to reality.
   d. Commissioned Technology roadmaps.
2. Development of a Research Training Hub in defence-related technologies combining research and technology development with training the next cohort of defence technologists.
3. Enhanced models for translating research outcomes into commercial products for the ADF are needed. Approaches include the development of more effective procurement models; co-development of strategic roadmaps for the sector; and the growth of a thriving innovation ecosystem underpinned by defence procurement.
4. Funding of collaborative projects that include mechanisms for university staff to gain familiarity with defence culture and defence needs and to assist DSTO staff in maintaining currency across a broad research portfolio would produce the critical mass of highly trained young scientists that are essential if Australia is to grow its capability in defence technology and if we are to grow a substantial Australian defence industry. For example, matching funds from DSTO to support Centre of Excellence, and grants for postdoctoral salaries and graduate student stipends would enable effective collaboration between universities, DSTO and the ADF on specific projects of interest to defence.
5. The effective deployment of the Small Business Innovation Research (SBIR) activities in the USA is recognised as an effective mechanism to foster innovation in the private sector, to stimulate interaction between the public sector research community and the private sector, particularly among small and medium sized businesses. The outcome of the pilot SBIR program in South Australia and Victoria should be observed with interest.

Conclusion

An uncertain world brings uncertainty in our defence needs particularly in the technology that underpins the ADF and the cultural background that defines present and future conflicts. Whether we choose to buy new technology or to grow an Australian capability, the pace of change both in terms of technology and cultural/socioeconomic change is now so great and is advancing on such a broad front that it is essential for Australian Defence to effectively engage the university research sector and harness its breadth and expertise to address issues for the defence and security of the nation. A vibrant innovation and technology ecosystem is critical to underpinning an effective national defence system.