National Intelligence and Security Discovery Research Grants Program Round 2 (for funding commencing 2022): National Security Challenges

Pre-amble:

Science and technology plays a crucial and at times, dichotomous role in both strengthening and threatening a prosperous, secure and cohesive Australia. Australia's national security agencies, including those within the Defence and Home Affairs portfolios, operate within increasingly complex and rapidly shifting environments driven by multiple threat and opportunity vectors, including science and technology. Outcomes from our collective strategic outlook and scenario forecasting for the future out to 2040, including the Defence Strategic Update (DSU), signal that we are entering an era of significant change, unprecedented in scale and pace – both geo-strategically and technologically. In order to enable rapid responses to these challenges, we need to ensure that our national security capabilities are supported by science and technology that enhances strategic advantage.

The National Security Science and Technology Centre coordinates whole-of-Government science and technology for national security in order to support Australia's economic prosperity, national security and social cohesion.

Below are research topics focused on science and technology challenges for national security. The target time horizon is 2040. Proposals are invited that will significantly advance the sciences pertaining to these challenge topics. We are seeking research with game-changing potential.

Serial	NSST Priority	Topic	Description	Security Layers[1]
1	P3IR	Resilient Supply Chains	As a result of globalisation, Australia is strongly connected into the international network of physical flows (in the forms of physical trade and the movement of people) and information flows (in the form of financial and social exchanges). This has generated much prosperity in Australia over the last few decades, but has also introduced new vulnerabilities, which the current COVID-19 pandemic, and rising international tensions, have highlighted (e.g. PPE and fuel stocks). Research is sought that explores Australia's resilience to global and regional shocks, by ensuring our critical supply chains, infrastructure and systems are identified, protected and managed.	Prepare Prevent Protect Contain Recover
2	BS&IM IS&FS	Human Identification and Vulnerability Assessments	Our everyday routine transactions (e.g. travel, access to services) use identification capabilities to ensure the security and privacy of our citizens. These capabilities include: fingerprints, face, iris, DNA, handwriting/signatures and voice. However, criminals and other adversaries may seek to exploit these capabilities also. This Challenge Topic seeks: • innovations in human identification; and • to understand the weaknesses and vulnerabilities of these technologies We invite research proposals that address one of the following specific areas: • New and innovative human identity technologies • Real time audio and text translation of foreign languages • The use of linguistics across languages as a means of identification • Predictive biological science (DNA and genealogy) • Human identification utilising multiple identity factors (multi nodal identification as a means of verifying identity) • efficient and scalable Vulnerability assessments ('White-Hat' ethical hacking) • scalable vulnerability technologies for existing human identification solutions.	Prepare Prevent Investigate

[1] Nunes-Vaz, R; Lord, S, "Designing physical security for complex infrastructures," *International Journal of Critical Infrastructure Protection*, 7(2014), pp178–192.

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3	IS&FS	AI/ML for Investigative Support and Forensics Science	Digital device use and electronic information storage significantly increases the analytical challenge for investigative and forensic activities; yet advances in AI/ML offer potential opportunities to: • automate some processing tasks; and • complement human cognition for 'sense-making' Realising these opportunities will reduce processing times and increase capacity, productivity and situational awareness capabilities. This Challenge Topic invites proposals in enhanced data analytics and engineering which seek to: • automate processing tasks (e.g. fingerprint pattern recognition) • data-fuse disparate information sources • rapidly interrogate: extract facts and determine associations from Big Data • analyse and evaluate sources – 'sense-making'	Investigate Prevent
4	P3IR	Robust Consequence management improving Australia's responses to, and recovery from, disasters and emergencies	Whether anthropogenic or natural, events that can cause mass harm or mass damage have immediate and long-term effects on the economic prosperity, security and social cohesion of the Australian people. Recent events such as the Salisbury poisoning in the UK, the COVID-19 pandemic world-wide, and the bushfires in Australia, have highlighted the need for robust systems for the immediate containment of events and effective recovery once the immediate crisis is over. This topic seeks to generate research insights that ultimately improve the capabilities of Australian government, industry and society to respond to, and recover from, these types of events.	Prepare Protect Contain Recover Investigate
5	P3IR BS&IM IS&FS	Stand-Off/Remote Detection for 2040	Emerging threats to national security have increased the need for stand-off and remote detection. These capabilities will reduce exposure risk and compromise of operators. Remote information acquisition keeps operators safe; and increases capacity for expanded coverage.	

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			This Challenge Topic invites proposals which develop stand-off/remote capabilities for: • situational awareness • evidence collection • decision-making Specific applications include: • detection of contraband within imports; • threats in air cargo and freight; • chemical, biological, radiological and nuclear hazards or threats; • forensic evidence (DNA, finger prints, chemical, voice, handwriting), electronics; and • positive identification of person(s) crossing a border. Performance sensitivity and portability are two important factors in addressing this challenge.	