

# Singapore's next-frontier defence innovations

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Can Singapore become a leading innovator in the research, development and production of next-generation defence technologies?

For Singapore, the rationale for pursuing military innovation has never been greater. As the gap in military technology in East Asia narrows with that of the West, and the character of regional security challenges becomes more complex, Singapore must search for its niche capabilities in military technology - such as by developing superior skills and knowledge, intelligence, information and technology - to better protect itself.

Moreover, Singapore faces demographic challenges and a shrinking military force, which requires developing and integrating defence systems in new ways to become more efficient and agile.

What are some of these next-frontier areas in the military-technology field? Examples are advanced technologies such as augmented reality, 3D printing, synthetic biology and Internet-of-Things that blur the lines between physical, cyber and biological domains.

The list of potentially disruptive military technologies is extensive and encompasses various domains. These include the use of robotics, artificial intelligence and learning machines, as well as modular platforms with state-of-the-art sensors that improve target detection and tracking. Advanced materials with adaptive properties also have the potential to make military equipment lighter as well as more weather-resistant, while quantum technologies could enable the next generation of secure communications.

Much of the current debate portrays the next-frontier defence technologies as synonymous with a "discontinuous" or "disruptive" military innovation in the character and conduct of warfare.

Historically, however, most military innovations have arguably followed a distinctly less than revolutionary or transformational path, consisting of incremental, often near-continuous, improvements in existing technologies and capabilities.



Commandos putting on their field packs. An example of a potentially disruptive military technology highlighted by the writer would be advanced materials with adaptive properties that can make military equipment lighter as well as more weather-resistant. ST PHOTO: LIM YAOHUI

Singapore's defence ecosystem has traditionally projected such an adaptive approach with the adoption of a gradual, phased, building-block approach in the research and development of niche defence technologies. Singapore's defence technologies have evolved in parallel with the increasing operational requirements of the Singapore Armed Forces, while placing a premium on cost effectiveness and self-sufficiency.

The gradual approach to defence innovation has helped Singapore integrate diverse technologies.

For example, the latest Littoral Mission Vessel has integrated varying state-of-the-art navigation, command and control, surveillance, and combat systems.

But next-frontier defence innovation is driven by more than breakthroughs in technology, which in themselves do not guarantee successful innovation. To succeed in a dynamic competitive environment, Singapore's defence and technology base must be able to incorporate creative ideas from diverse sources.

It has to go beyond working on already proven technologies to betting on new concepts, moving from an incremental approach to a bolder one that supports riskier innovations.

Current efforts to forge closer collaboration with both local and global enterprises point towards that direction.

The Ministry of Defence (Mindef), for example, has been working with a number of local small and medium enterprises to boost Singapore's defence capabilities, with projects including a compact autonomous underwater vehicle capable of autonomous detection of mine-like targets in shallow waters.

In February, Defence Science and Technology Agency (DSTA) and Boeing signed a collaboration agreement to co-develop and engage in research and experimentation in data analytics for the Singapore Air Force's fleet of aircraft. The idea is to use select algorithms and models for better diagnosis of problems, and to detect system failures early, thus reducing downtime for the aircraft.

At the same time, Singapore's Defence Technology Community seeks collaboration with commercial entities worldwide to gain access to novel ideas and solutions. In this regard, DSTA is hosting the inaugural Singapore Defence Technology Summit 2018 from today to Friday - a meeting of leading defence technology policymakers, defence scientists and security professionals from academia and think-tanks.

Going forward, the key challenge for Singapore's defence planners is to successfully prioritise, generate, and incorporate these emerging technologies in the country's future weapons systems and military operations.

According to Mindef, some ongoing projects include Unmanned Watch Towers designed by defence engineers and scientists from DSO National Laboratories to enhance 24/7 coastal surveillance capabilities while optimising manpower resources.

The Republic of Singapore Navy's Smart Base Access project is looking at using a combination of facial recognition and digital identification to streamline the base security screening process for potential savings in time, costs and manpower.

Another example would be the Army Battlefield Instrumentation Analytics system that harnesses data analytics to provide commanders with focused training data from the field for more effective and efficient action reviews with their men.

These initiatives indicate that Singapore is taking multiple paths towards defence innovation - continuing with its gradualist approach of integrating existing systems, while accelerating efforts that may ultimately enable more "transformative" defence innovation.

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• The Singapore Defence Technology Summit 2018 is at Shangri-La Hotel from today to Friday.