

Workplace health and safety in Defence and the challenge of automated and autonomous technologies

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Automated and autonomous devices and systems are being widely used to increase workplace efficiency. The Australian Defence Force (ADF) is also undergoing this technological shift and, in time, automated and autonomous technology can be expected to become central to all aspects of defence work.

The ADF must figure out how to manage the adoption of these technologies for use in peacetime consistently with Australian workplace health and safety (WHS) laws. WHS laws require the ADF to protect — as far as is reasonably practicable — the safety of its members during their work. Technological change will make keeping workers safe more complicated, and some of the regulatory interventions more challenging to carry out.

New technologies are changing the work of the ADF

The convergence of several forms of technology — autonomous robots, the internet of things, and additive manufacturing — are transforming how work happens, including in the ADF. By working in combination to enhance and augment one another, this technology is displacing some roles, such as in administration and manufacturing, and creating new kinds of jobs, such as in computer engineering. The boundary between home and work is becoming more blurred as remote working becomes more viable and peer-to-peer platforms making 'freelancing' possible on a global scale.

Many of the aspects of the future of work are relevant to the ADF. The most prominent example is the 'remote work' enabled by drone technology: the pilots of uncrewed aerial vehicles can be based far away from where the device is flying. Given the need for the specialised design and manufacture of military equipment, the ADF is also likely to benefit from advanced manufacturing. The efficiencies of other tasks essential to military work — maintenance, logistics and keeping track of equipment and personnel — will be improved if well-designed computer programs are used to assist with gathering and filtering information.

These changes will have significant safety implications for the ADF

Three risks of the use of automated and autonomous technology are particularly relevant to the ADF: psychosocial risks, physical risks and the challenge of testing new technologies to understand the safety implications of their use.

Psychosocial risks

Many of the potential safety issues relate to how people will cope psychologically with the changes to their work. People are likely to find these changes stressful, particularly the pace of working with robots that they do not fully understand and might even mistrust or fear. One directly relevant risk for the ADF is the potential for human machine-interfaces to increase mental or emotional strain on workers. The capacity of technology to present copious amounts of information and combine tasks carries the risk of compounding small operator errors and leading to serious consequences. Designers must find a way to balance the need to provide clear and relevant information about how the system is arriving at recommendations, decisions or actions with the risk of overloading the human operator.

Physical risks

ADF members will also face physical risks from working alongside automated machinery and robots. In the past, such risks were much easier to control as robots were confined to certain spaces, or only moved according to predictable, tested, and validated sequences. Where this technology is performing a wider range of tasks alongside human works the risks are substantially less predictable.

Challenge of testing for safety risks

Testing is a crucial opportunity to assess the safety of the systems and identify hazards. This is true of assessments by militaries of automated and autonomous systems. Testing defence systems is already time-consuming, complicated and very expensive; and the increasing number of systems that provide for, or depend on, human-machine teams, and the algorithmic complexity of the software supporting these systems, mean these difficulties are certain to increase.

New technologies can also be used to help keep ADF members safe

The rapid development and deployment of digital technologies does not only present risks; it presents opportunities to improve safety for ADF members. Most obviously, the use of robots can reduce the need for humans to do dangerous or repetitive work. Beyond this, it will also permit responsive and real-time safety monitoring. Advanced sensors can be used to track safety, including by being worn on the body, surgically placed in the body, or embedded in safety clothing or a workplace object. The use of these devices has clear benefits when working

with dangerous substances: they allow for ongoing, instead of episodic, sampling, which enables earlier interventions.

New technologies also have the potential to transform training. AI-enabled virtual reality could be used to create immersive environments that improve the capacity of workers to recognise safety risks. The ADF is already using forms of this technology. For example, the North Queensland Simulation Park (NQ Spark) facility will allow for the ADF to conduct immersive live and simulation training using cutting-edge technology.

Regulatory responses to new technologies

While Australian WHS laws are flexible and sufficiently broad to cope with these technological changes without legislative change, the proliferation of automated and autonomous technology will have an impact on the operation of the regulatory scheme. First, the increase of 'reasonably practicable' safety measures available to the ADF; and second, the difficulties regulators will face carrying out inspections and investigating safety incidents related to new digital technologies.

The range of 'reasonably practicable' safety measures will increase

As noted, the WHS Act requires the ADF to take 'reasonably practicable' steps to keep its workers safe. New technology will increase the range of interventions that might be 'reasonably practicable': it may be reasonable in some settings to use advanced technology to undertake personalised occupational risk assessment for individual workers. Determining when adopting a new safety measure is reasonably practicable is fact-dependent: Australian Courts consider the safety measure in the context of the worksite and the constraints that are on the employer. This means that even where a safety measure may help in some circumstances it may not be reasonably practicable. ADF managers will have to maintain awareness of what sorts of new safety monitoring is available and continue to consider how computer systems might aid in keeping their workers safe.

Investigating some safety incidents will become more complicated

The complexity of new digital technologies makes carrying out workplace inspections and investigations of any safety incidents more difficult. Where a system operates on the basis of code, a visual inspection will not reveal some of the most important aspects of its operation. If a workplace accident happens, it might not be possible to conclusively assign responsibility if multiple complex systems interacted in unexpected ways.

These changes mean that investigating and prosecuting breaches of WHS law will require specialised knowledge of how the systems operate, and technical evidence demonstrating how any breach happened. If a safety incident ends up in some sort of judicial investigation — whether in a contested hearing or some other form of inquiry — evidence about the operation of the system will have to be presented to the decision-makers in a way that they can understand. The proceedings can take longer and cost more, and may ultimately lead to an inconclusive outcome.

The ADF should reassess its WHS policies in light of emerging technologies

While the ADF is no stranger to dealing with new and potentially dangerous technologies, it is in the interests of all ADF members if the organisation continues to update its WHS policies to respond to the risks of automated and autonomous technology. WHS law provides a key framework for how this technology will be designed and deployed by the ADF, requiring the responsible commanders and managers to maintain awareness of risks, and plan for new ones. ●



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