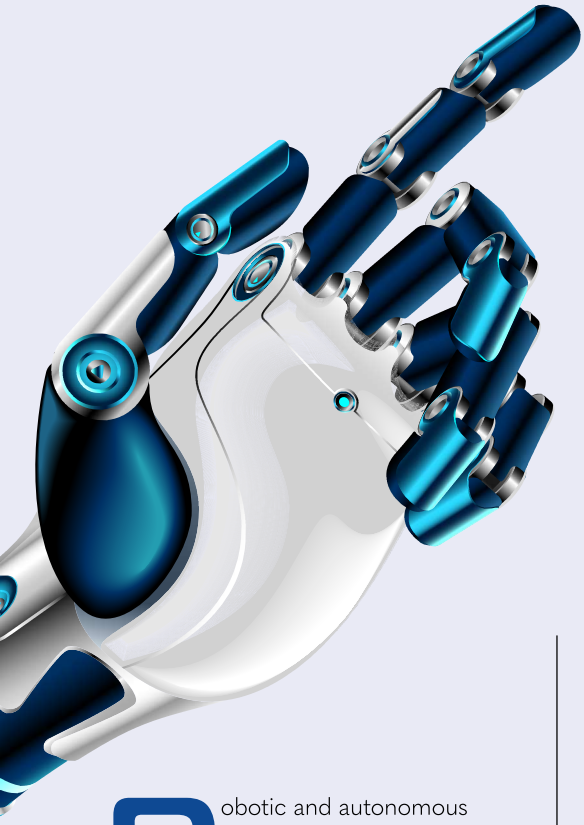
Ready for a robotic future



To help navigate the increasing role of robotic and autonomous systems in defence, an Exploration Guide has been developed which examines both the challenges and the opportunities of the new technology

Robotic and autonomous systems (RAS) will play an increasingly important role in defence capability and are likely to have a fundamental impact on the way in which future military activities are conducted.

This will have consequences on, for example: how people interact with these systems; the skills required to acquire, operate and maintain them; and the number, organisation and location of these personnel. Understanding how to optimise both the human and technological components of such systems is critical.

While significant systematic research has been conducted into RAS technologies, relatively little human science research has been conducted outside of generic work on human-computer interaction or on topics such as the safety of remotely piloted vehicles (RPVs). There's still a lot to learn about how humans might interact with complex RAS and how these technologies might be, optimally, integrated with the human component, both at the individual and at the collective level (such as might be reflected in Human-Machine Teaming, HMT). Development of RAS is progressing at pace and timely guidance covering the human factors considerations associated with these systems is essential to support defence to design, field and operate RAS and build appropriate trust in these systems.

In 2021/2022, a study was conducted to produce an Exploration Guide to raise awareness of the human factors opportunities and challenges associated with the use of RAS by defence, and to provide advice and guidance on how to respond to these.

Key considerations included: situational awareness and workload; system trust and reliability; decision transparency and explainability (i.e. what is the logic, process, factors or reasoning upon which an artificial intelligence (AI) enabled system's actions or recommendations are based); physical design considerations; and HMT and communication.

It draws on the outputs of a comprehensive review of more than 300 publications including empirical research, published best practice and standards and guidelines examining the design and operation of systems (within both military and non-military domains).

Initially, a set of 60 search terms was developed and 1,014 papers identified for review (via Google Scholar). The team conducted a relevance scoring activity to filter the papers down to a core set of 272 papers and this set was supplemented with additional information sources (including the Defence Standard (Def Stan) 00-251 'Human Factors Integration for Defence Systems' Technical Guides). The final set of papers was subject to a more detailed review and key themes were identified for inclusion in the final guide.

Robotic and Autonomous Systems present a unique set of human factors considerations over those that apply to other systems. The interaction between a human operator and an RAS is different from typical human-computer interaction as they may employ AI, involve complex dynamic control systems, exhibit high levels of autonomy and operate in changing real-world environments. This Exploration Guide provides high-level guidance to address many of these challenges and opportunities.

Who is the intended audience?

This guide has been designed for use, primarily, by human factors practitioners involved in developing, evaluating, acquiring and/or commissioning RAS. However, outside of this primary audience, it also provides useful contextual and awareness material for systems and software designers and engineers less familiar with basic human factors approaches.

Work is in progress to exploit this output by uploading it on to the Knowledge in Defence Human Factors Integration Management System (HuFIMS) to sit alongside other Human Factors Technical Guides. ■

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