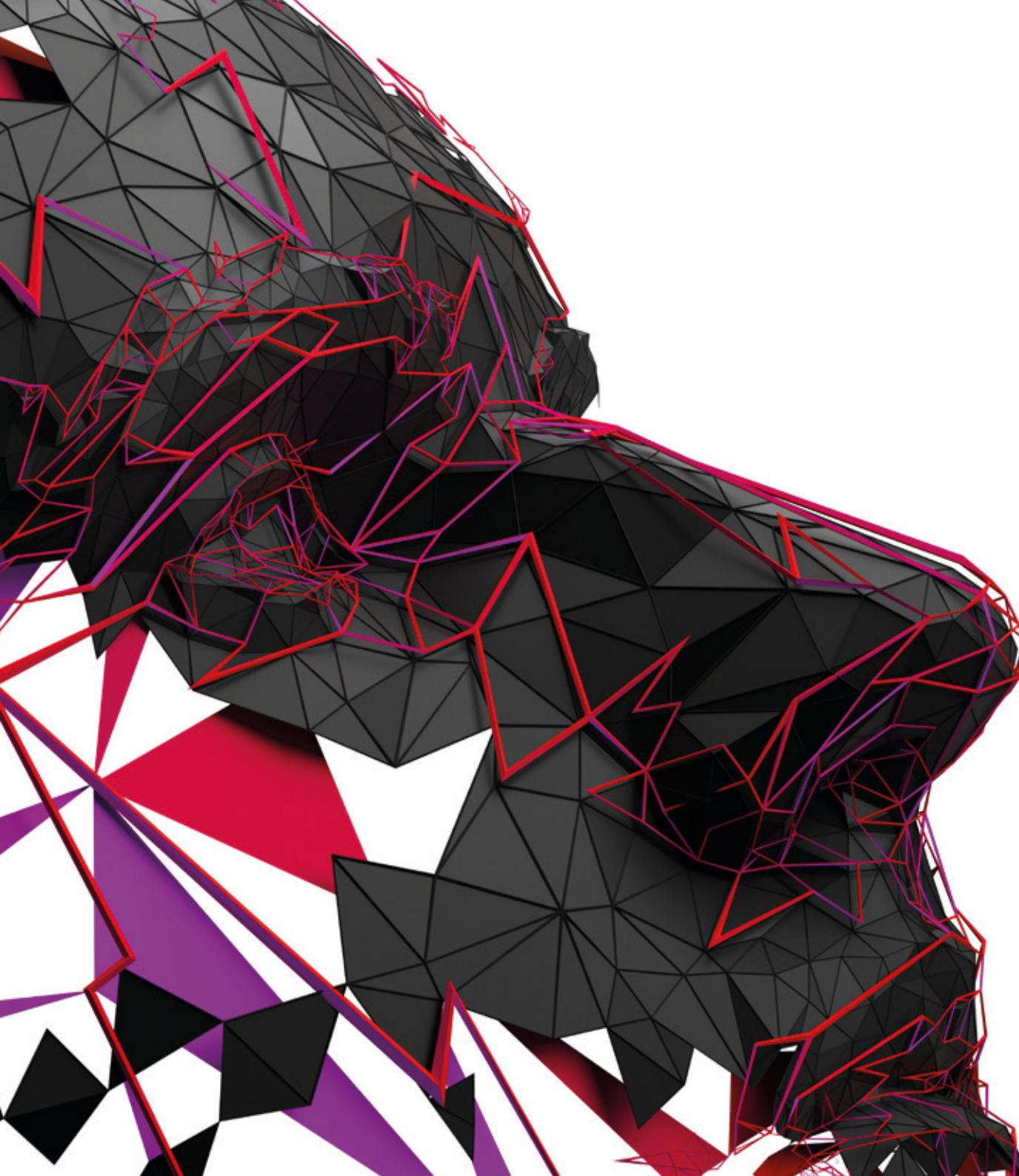


QINETIQ

Optimising Human Performance

**World-class independent human science
and systems consultancy**



A large, abstract graphic on the left side of the page features a complex, dark grey polygonal surface. Overlaid on this are several thin, glowing lines in red, magenta, and purple, which form a network of sharp, angular shapes resembling shards of broken glass or jagged ice. The overall effect is one of high-contrast, modern design.

QINETIQ

QinetiQ offers world-class independent human science and systems consultancy as well as test and evaluation, advice and research.

With expertise in evaluating and maximising human performance in complex systems and extreme environments, we help organisations increase productivity, enhance safety, improve security and reduce the risks associated with errors and failures in the aviation domain.



Personal protection

Personnel operating in extreme environments require protection from a wide range of risks. Assessing risk factors associated with altitude, noise, vibration, temperature and injury requires specialist equipment and expertise. QinetiQ undertakes research, development and evaluation to provide advice and consultancy. This allows customers to minimise the operational risks to personnel and equipment in such environments, whilst ensuring that everyday activities are not compromised.

QinetiQ has conducted manned centrifuge, hearing, altitude and thermal assessments of protection equipment, including oxygen systems, using our on-site laboratories and facilities. We also have tools to allow us to gather information from live operations and modelling capability to assess injury risk. Insight from these detailed assessments allows our customers to reduce operational risks in safety-critical aviation environments and help ensure personnel are appropriately protected at all times.



Human behaviour

Ineffective human behaviour can lead to inefficiencies, costly errors, accidents and security risks. In order to optimise performance, organisations need to understand how different behaviours can influence specific systems and the wider organisation.

QinetiQ has developed tools to support organisational assessment and change processes in a variety of fields - from cyber security

to safety. This has enabled customers to make effective personnel and system decisions which enhance productivity, ensure safety and improve effectiveness. For example, we help our customers understand how human behaviours may contribute to cyber security vulnerabilities and what changes are required to help protect these systems.

Personnel selection

The performance of individuals is not just determined by training, but also by their innate abilities and motivations. In demanding roles where mistakes could result in the loss of life or a valuable asset, effective and reliable personnel selection is of critical importance.

QinetiQ's psychologists have worked with a range of organisations where the

performance of individuals is critical to safe, secure and efficient operations. Our research and selection tools enabled airport operators to implement recruitment and selection processes that resulted in improved performance of personnel, with improved safety and security and a reduction in training costs and inefficiencies.



Analysis of team working

Successful team working is key to the success of many tasks and is of crucial importance in safety-critical industries. QinetiQ can provide advice on what makes an effective team and how to improve team performance, even when the team operates across disparate locations.

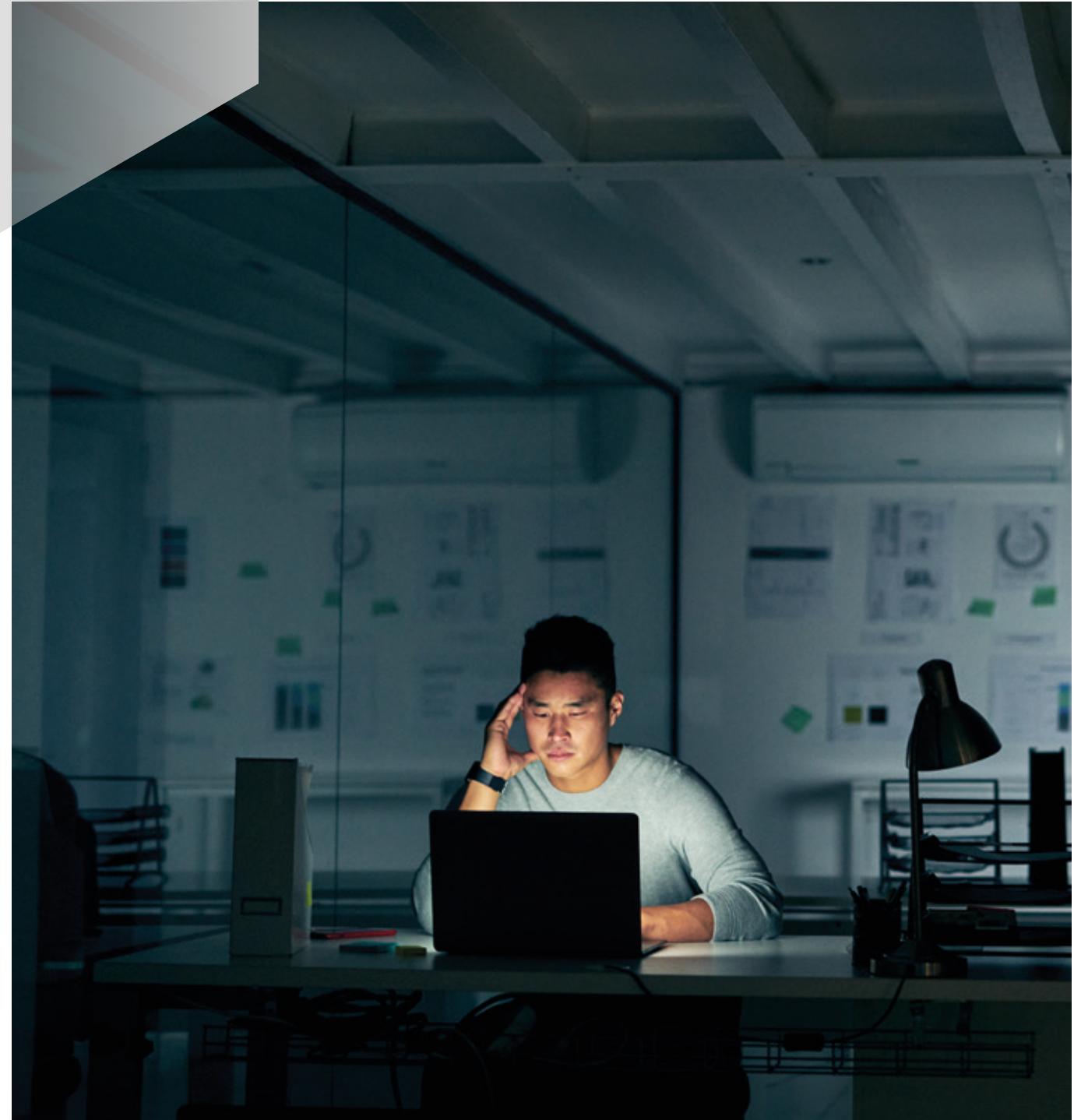
QinetiQ has developed the QinetiQ-Team Evaluation Method (Q-TEM)

to evaluate teamwork processes and assess how they contribute to team performance outcomes. This has been used to great effect for customers including aviation, crisis management and medical teams. For example, it can be used to understand how to avoid team hierarchies impacting on communication, enhance decision making and improve situational awareness.

Fatigue, workload and well-being

Fatigue and high workload in aircrew and maintenance personnel present a significant safety risk. QinetiQ has conducted assessments of workloads in high tempo and safety critical environments as well as examinations of procedures and the support that is provided to personnel to manage their psychological well-being.

Understanding how duty schedules impact on fatigue is complex and requires specialist expertise and the use of specialist systems. QinetiQ provides advice to regulators, operators and aircraft manufacturers on the management of duty schedules for pilots, cabin crew, maintenance personnel and firefighters. QinetiQ has developed software that encapsulates this knowledge into easy-to-use tools that estimate the impact of schedules on fatigue and cognitive performance. For example, the Fatigue and Risk Index (FRI) was designed for use in shift work environments, to provide an estimate of fatigue for each duty in a schedule. These tools have improved the efficiency and effectiveness of personnel while also reducing costs and the risk to flight safety.



Spatial disorientation



In flight, the performance of the human visual and vestibular systems can be compromised and instigate a sense of confusion. Spatial disorientation can pose a very real flight safety risk for aircrew and passengers. Pilots may be unaware, for example, that the attitude or position of the aircraft has altered - particularly when flying in cloud or ascending/descending - and may doubt the readings of instruments when confronted with compelling physiological cues. This can also be an issue when operating unmanned aircraft systems (UAS).

QinetiQ has developed and fielded an aircrew incident survey to understand the factors involved in spatial disorientation in flight. Analysis of these incidents has enabled customers to identify critical flight conditions that are more likely to result in disorientation, and to develop appropriate mitigation strategies through education and training. Repeating the survey over time can also quantify the effects of changes in equipment and flight conditions.



Training design

Although a wide range of specialist skills are required in the aviation industry, some of the skills are vulnerable to skill fade. Effective training will ensure personnel remain competent in all circumstances and at all times.

Training can be costly and must be designed and delivered effectively to ensure it delivers a positive performance impact. A long history

in the aerospace domain allows QinetiQ to offer aviation specific analysis of training needs, design of effective training programmes, selection of optimum training methods and development of appropriate simulation modules as required. This enables the right training to be developed and delivered in the most effective and efficient way.



Human factors integration

Failure to ensure that equipment integrates with the operator can result in increased workload, increased human error and risk to safety. Human error is the cause of the majority of task failures in complex technological systems. By designing workspaces, displays and interfaces with the human operator in mind, the potential for such errors can be reduced dramatically. QinetiQ can carry out assessment of aircraft systems to identify human factors issues, provide immediate and longer

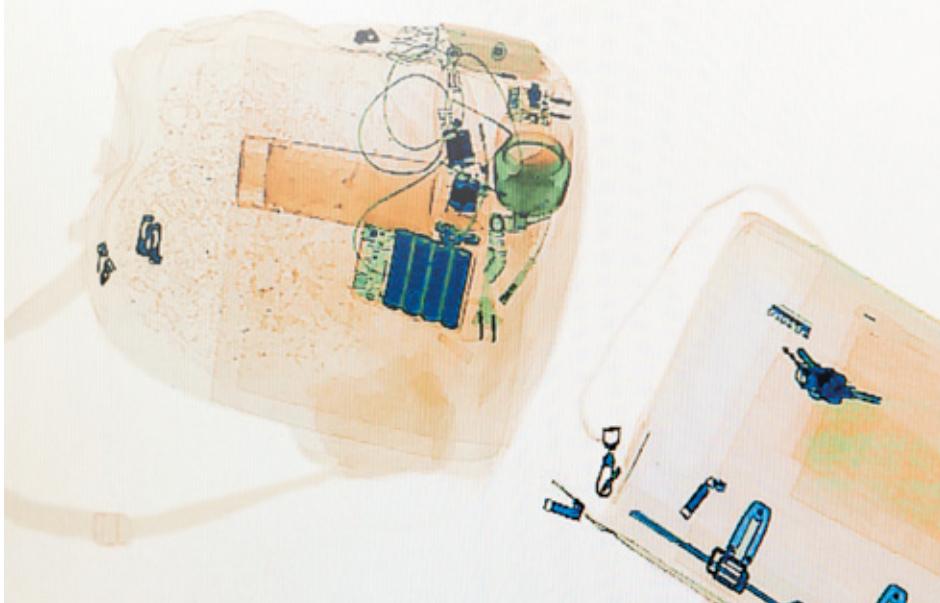
term remedial modifications and undertake further assessments to quantify the improvements made.

QinetiQ has identified numerous aviation related usability issues and provided solutions that have efficiency or effectiveness benefits. For example, QinetiQ redesigned an interface to reduce the time taken to complete a task which enabled the organisation to reduce the number of staff required to support operations. This provided a substantial saving over the lifetime of the operation.

Aviation security

QinetiQ has been providing services and advice to regulators and airport operators for over 20 years. We specialise in improving throughput and detection through modelling security systems, provision of testing services for X-ray screener competency and the design of tools for quantifying and assessing X-ray performance at the individual screener, airport and national level.

QinetiQ developed the TIP-DMIST™ system to provide secure storage, management and analysis of Threat Image Projection (TIP) performance data. The system can produce threat detection performance information in minutes to provide immense savings in time, resources and cost when compared with manual analysis and the use of spreadsheets.



Autonomous systems

Autonomous systems are being tested and deployed in a range of applications, and there is an increased reliance on automation to support single-pilot operations. The risk to users and other parties varies according to the operational approach and the level of autonomy, processes and integration.

QinetiQ has several decades of experience of leading research programmes assessing the

challenges of integrating autonomous systems into the aerospace market. We can provide evidence-based advice on the design of systems, operating processes and human/machine teaming to improve trust and confidence in autonomous systems. Wider QinetiQ capabilities have access to UAS and safe air spaces in which to assess the whole system performance, including the operators, under realistic scenarios and workloads.

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