



QINETIQ



Accelerating
quantum technologies
into quantum capabilities

What are Quantum Technologies?

Quantum technologies use the properties of quantum mechanics and the physics of sub-atomic particles, to create new devices with exceptional performance and the ability to overcome the fundamental limitations faced by classical technologies.

Quantum covers a very broad range of technologies that can be divided into two categories:

- **Quantum computing** - Although speculative, if a suitably large, reliable, fully error-corrected quantum computer could be built, it would allow us to do things we simply cannot do with classical computers, including better simulation of chemistry and materials, and perhaps even optimisation of complex problems in logistics.
- **Quantum enhanced technologies** - Sensing, timing and communications are all things we can do right now with classical technologies, but quantum enhancement could potentially provide greater sensitivity, accuracy and range for these systems.

Quantum technology buyers need help to navigate a burgeoning market, to understand whether a particular piece of quantum technology will work in practice and deliver the operational advantages a customer is seeking. Examples of this are when used as a component in hybrid, complex moving environments such as a ship, train or aircraft.

QinetiQ's Quantum Capabilities

At QinetiQ, our focus is to turn quantum technologies into quantum capabilities, to meet the defence, security and national infrastructure challenges that our customers face.

We are taking a pragmatic and long-term view of quantum technology, to generate and attract the right scientific expertise and support the needs of our customers. Our strengths lie in bringing together quantum physicists and mathematicians, systems designers and engineers to develop and deliver practical hybrid solutions.



1 Test and Evaluation (T&E)

Through our supplier-independent T&E services QinetiQ is able to utilise quantum technology to quantify product performance, such as sensitivity, drift and susceptibility to environmental factors, using consistent, repeatable experimental processes.

Already a leading global provider of T&E services for the defence and security sector, we validate and verify systems performance, delivering testing and trialling at scale across the maritime,

land, air, space and cyber domains. We do this through our wide range of T&E facilities, laboratories and controlled environments, such as our hydrodynamics test environments and our vehicle proving ground. We also run trials using QinetiQ assets such as the Airborne Technology Demonstrator (ATD), and for Position Navigation and Timing (PNT), trials are enabled by our high-end synthetic environments and a new market-leading quantum test harness for alternative PNT.

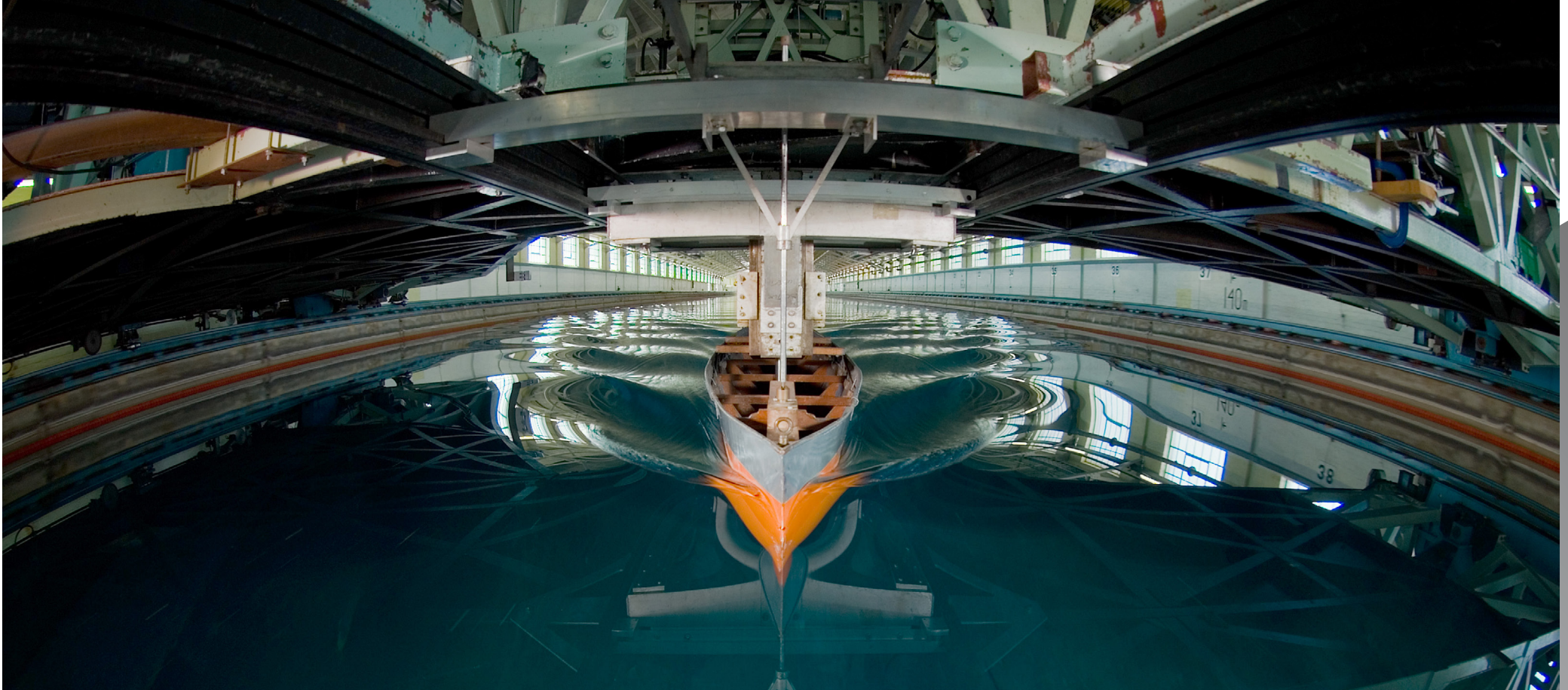
2 Systems Integration and Engineering

The integration of quantum technologies into larger hybrid systems poses unique challenges due to their very sensitive nature. QinetiQ has invested in developing market-leading techniques so we can integrate the outputs from quantum sensors such as accelerometers, gyroscopes, gradiometers and magnetometers with classical PNT sensors. QinetiQ is also pioneering an emerging new discipline Quantum Systems Engineering, generating capacity and skills to ensure that quantum enablement and enhancement become a reality.



3 Applied Research and Development and Data Fusion

We take fundamental research published by academia and use our deep knowledge of defence, security and critical national infrastructure, to design and run our own experiments. These allow us to give impartial, technology-independent and evidence-based advice on the suitability of quantum technologies to deliver operational advantage. For example, QinetiQ has Beta tested Noisy intermediate-scale quantum (NISQ) computers for manufacturers, evaluated quantum algorithms for specific defence and security use cases and facilitated field trials on quantum secured communications. In addition, our Advanced Materials Team researches the synthesis of 0D, 1D and 2D materials - including quantum dots and graphenes – and we are also developing novel data fusion methods to integrate quantum and classical navigation subsystems.



4 Technology Watch and Market Integration Services

Through our technology watch and consultancy services, QinetiQ provides quantum technology buyers with vendor-independent advice. From horizon scanning to informing specific product choices, we give our clients insight and evidence to inform their plans.

We also have long experience in creating and managing extensive partner

ecosystems across industry and academia, to generate new solutions for our customers' mission critical problems. Our repeatable model includes commercial and security enablement that allow agile procurement and delivery of client tasks, drawing from multiple organisations and award-winning collaborative working arrangements beyond ISO 44001 standard.

Quantum technologies
have the potential to
reshape our world.

Contact Quantum@QinetiQ.com to find out more.