THE FUTURE DIGITAL BATTLESPACE
yberspace is an area where we face a range of adversaries and competitors,” says General Tom Copinger-Symes, Director of Military Digitisation, UK Strategic Command, one of the four pillars of UK defence, alongside the Army, Navy and RAF.

In 2016, NATO recognised cyberspace as an operational domain alongside land, sea, air and space. Just as businesses from financial services to retail now operate in a world of ubiquitous and pervasive information, so UK defence is undergoing a transformation in order to address an era of perpetual and accelerating change.

During the post-war arms race, global players sought military advantage through innovation in the physical world. Today’s military leaders face a similar challenge, but they must also adapt and innovate in a digital world. That means competing in the cyber domain and digitising across domains through the development and deployment of leading-edge technology. This might be at a high-level – for instance multi-domain integration of the military, UK government and its international allies – or more granular applications to support deployed forces on the ground.

“The requirement is to integrate across our multiple organisational boundaries and ensure our data can be accessed when and where it is needed and to provide the transformational and force-multiplying technological edge that comes from exploiting that data for competitive advantage,” General Copinger-Symes says.

And, just as commercial enterprises are adopting and scaling to Cloud in order to leverage agile and innovative practices, so UK defence is evolving the future battlespace with the Cloud. The recent Defence Command Paper and Defence and Security Industrial Strategy made it clear that at the heart of UK Defence strategy there needs to be a £1.5 billion “Digital Backbone” to support an information network that provides the end-user – wherever they’re operating and in whatever conditions – the data, information, computation and applications that they need.

Above: digital is powering defence in all domains, including the sea
Matching quality data with agile algorithms

A strong digital ecosystem underpins all kinds of operational technology, from AI-powered analysis to interoperability and the challenge of bandwidth.
Commercial Cloud provides the platform that enables the digital backbone to scale — it’s the foundation on which the battlespace Cloud can be built.

“There’s a lot of confusion in the market over how one is an alternative to the other when, actually, each complements the other,” Poulter says. “The synchronizing machinery is the intelligent Cloud. It’s about ensuring that the system that’s trying to conduct a task has sufficient compute to act at a time that’s relevant — it’s about speed of relevance and that will really depend on context. For instance, for the intelligent edge, you want to be able to make that system smarter.”

What’s crucial for the deployment of compute capabilities is to work with clients — both in the commercial arena and in government — to understand how technology can be used in order to satisfy mission requirements. “It goes right out to the edge in some of these instances,” Luck says, “whether we’re talking about communications, the congested battlespace, or deployed capabilities on Queen Elizabeth Class aircraft carriers and how they might use compute to facilitate their operations.”

An example might be an artificial intelligence model. The operational requirement could be to recognise a particular range of vehicles that could be expected to appear in a specific area — for instance, an array of tracked vehicles or tanks.

“You need to ensure that the models for recognising those types of vehicles are deployed forward into that edge device and they have sufficient compute to be able to make a decision,” Poulter says. “So that means that you need a subset of all the different models, which can be preloaded and managed on that device.”

The low latency of 5G, which offers ultra-high-speed broadband connections and the possibility of high device density has clear applications at the edge. “But we also need to think about how we integrate with satellite partners like SCS, SpaceX and StarLink to make sure that we can operate in regions where there is poor connectivity,” Luck says. “And then it’s about using the best form of communication pathway back to a global hyperscale network to bring all those things together by using Microsoft’s own backbone network to traverse the globe.”

“The information advantage is absolutely key,” Luck continues. “And Cloud is there to bring that data together. So Cloud can be used to scale out when we’ve got all of those different sensors that are operating, and it’s there to audit that data — the provenance of data is so important: we need to understand where it’s come from, the validity of the data, how long should we be using that data for, how do we trust it. And that in turn will feed into our having confidence in how we exploit that, depending on the kind of operation that’s going on.”
Keeping users in mind will ensure Cloud lives up to its potential

Every end user has specific requirements of technology – and when it’s deployed in an integrated way that puts humans at the centre of decision making and outcome needs, the Cloud can enable real transformation.

Digital transformation projects can sometimes encounter obstacles because the implementation is dictated by a chief technology officer or chief information officer who is removed from the day-to-day needs of end users. Successful Cloud migration avoids the pitfall-ridden one-size-fits-all approach and carefully takes into account the purpose and end user. The project isn’t driven by an IT lead, but a holistic understanding of impact and outcomes.

“We’re really focused on end users to make sure that what we develop facilitates the effect they want within their mission,” Luck says. “That could be frontline health services in the NHS, or within government defence and security. It’s working alongside those individuals to make sure that the capability we deliver is going to satisfy their immediate requirements.”

High-level, multi-agency and multi-lateral co-operation is crucial here – integration needs to happen across all domains, not just the defence and security ecosystem. “This is not a thing governments can do on their own, they need an integrated industry, an integrated society supporting what is arguably the most important thing from a nation’s perspective,” says Air Marshal Philip Osborn, who served as Chief of Defence Intelligence from 2015 to 2018.

Osborn considers the challenge for UK defence to be cultural as much as technical, with success requiring each stakeholder to think beyond traditional boundaries and not operate in silos.

Luck agrees, noting that ubiquitous computing based in the Cloud enables technologies such as artificial intelligence. Crucially, however, human beings need to be central to decision-making. “We need to put people at the centre of those problems, regardless of where they reside, using our computing all the way from the edge to the Cloud,” he says.

Above: digitisation must be tailored to each end user, no matter where
Once the Digital Backbone is in place, what will be crucial to developing the UK defence technology ecosystem is the democratisation of access to the latest technology from a wide variety of providers.

“That’s where the small startup that’s got a great application can build in that environment and deploy that,” Poulter says. “Startups must be able to take advantage of the same methodology to scale. We want them to succeed – to both disrupt and refresh the industry in addition to supporting established primes.”

One entrepreneur seeking to do just that is Anisha Singh from DEFEND3D, a secure transmission service for remote 3D printing. The technology offers those in the field the ability to 3D print critical parts on-demand, without the original file ever leaving the secure source server.

“Azure marketplace allows us to really engage with industries that have complex procurement models,” Singh says.

Mobility is crucial to the functioning of the military – and DEFEND3D, which originated at Imperial College, is addressing challenges within logistics, maintenance and operations so that forces in the field can maintain operational capability.

“One US military unit in South Korea identified an issue with a part that made their mine-resistant vehicle non-mission capable,” Singh says. “The estimated delivery was around five months.” Using DEFEND3D, the part was 3D printed in the field, restoring the vehicle. “3D printing and CNC machining is a game-changer for tactical sustainment,” Singh says.

DEFEND3D enables a soldier in situ to browse a parts catalogue hosted at the MoD Defence Equipment and Support procurement centre in Abbey Wood. The files are encrypted at source, the end-user can look at the catalogue via Azure, and there is end-to-end streaming of the digital asset, meaning that the file never leaves the secure MoD server.

It’s clear that open-source information can power better decision-making. Preligens is a startup that uses AI-augmented analysis for geospatial information using open-source data.

“The problem we’re trying to address is looking for needles in a constantly growing series of haystacks,” says Philip Lear of Preligens. “Imagery intelligence has historically been a human-intensive task.”

In the past, analysts would pore over imagery – but the volume of data now available far outweighs the ability of intelligence analysts to scrutinise it. “Up to 95 per cent of the imagery data is not analysed, so nations are looking to machine learning and AI as a force multiplier, training a model to identify or classify objects of interest,” Lear says.

Preligens is a monitoring service to track strategic areas of interest such as airfields and military bases. Assigning specific objects against these reduces classification time from days to minutes, allowing human analysts to focus on interpretation and decision-making.

The French military has worked with Preligens to build a tailored, automatic activity detection tool on chosen sights of interest. The platform is fed operational images captured by spy satellites, while AI algorithms enable the detection, recognition and identification of objects. “Secure cloud computing provides the necessary capabilities to scale rapidly.
and dynamically to meet this demand in the most cost effective way,” says Lear.

Another startup, SATAVIA, uses artificial intelligence, data and software engineering in aviation. Combining this technology with atmospheric science and aerospace engineering can reduce aircraft operations and maintenance costs and decrease the impact of aviation on the climate by up to 60 per cent.

The company’s focus is to use Cloud architecture to hyperscale numerical weather prediction technology. “By hyperscale we mean at least one quadrillion computations per simulation in less than an Earth day – that’s one hundred thousand times more computations than the number of stars in the Milky Way,” says Adam Durant, the CEO of SATAVIA. The company, which is based in Cambridge, works with the civilian aerospace industry and is now making headway in the global defence ecosystem, working with Microsoft Defence and Intelligence.

“Emissions from aircraft, such as contrails, have a significant impact on climate, Durant says. “And that needs to be quantified and mitigated.”

Their platform, DECISIONX, is powered by Azure and uses data from satellites, global asset tracking and numerical models to provide high-quality, high-resolution, global scale and easily accessible atmospheric data on around 26 meteorological parameters. “DECISIONX offers a digital twin of the entire Earth’s atmosphere – we can go back and forward in time – and can inform decision-making across asset management, climate mitigation, extending into the digital battlespace ecosystem,” Durant says.

SATAVIA currently has two use-cases. The first is DECISIONX NETZERO, which aims to prevent the formation of harmful contrails – the water vapour that forms around an aircraft’s exhaust fumes, which traps heat and warms the climate – by steering planes away from atmospheric areas where contrails are likely to form.

The second SATAVIA use-case is DECISIONX FLEET, which enables smarter aircraft condition monitoring in order to lower maintenance costs.

Another new application in which Cloud can be leveraged to mitigate the impact of weather is SpaceEye, which uses AI to see through clouds in satellite imagery. Powered by machine learning, it combines data from radar and optical satellites to reconstruct imagery hidden by clouds.

The agility and scalability of hyperscale Cloud offers a powerful, globally-connected platform for a UK Defence capability that’s focused on end-users. Connecting government, industry, business and startups will be crucial, not just for operational reasons, but to drive the rapid innovation necessary to combat a growing number of adversaries. Fundamentally, collaboration will be key. “We won’t be doing this alone,” Copinger-Symes says. We will be doing it with you, industry – whether that is hyperscale cloud providers, or small sovereign business.”

Above: satellites can provide huge amounts of data suitable for Cloud
Microsoft helps defence and intelligence agencies advance their missions to promote stability and security for citizens, nations, and multinational alliances. We do this by focusing on trust, innovation, security and compliance, all powered by our extensive global partner ecosystem.