Picture credit: US Department of Defense

DEFENCE LOGISTICS

Graham Grose *considers three developments that will shape the strategy of military forces, original equipment manufacturers and in-service support providers in 2020*

In a setting where even gaining the smallest advantage can be the difference between mission success and failure, standing still has never been an option for military organisations and defence in-service support providers operating in this asset-intensive environment. From an asset and equipment perspective, military organisations have found themselves at an interesting crossroads: budgets have to be balanced between keeping older, but still vital assets in service and the attraction of shiny new investment in next-generation equipment; but this is set against a backdrop of a real shortage of personnel, particularly from a maintenance engineering point of view. As a result, the spotlight is falling directly on to military logistics and supply chain technology as a strategic enabler to deal with these issues.

Here I outline my three frontrunners for 2020 and beyond. As I put my predictions together, I realised that each development linked to the next in a positive way, to help defence forces looking to straddle both the past and present to maintain force readiness – a phrase we heard a lot about in 2019, and not always in a positive sense. Here is how they can turn the tables in the battle for readiness this year.

The integration of AI will take centre stage in the development of aircraft

Artificial Intelligence (AI) is rapidly maturing to help improve the readiness of military equipment. Over the course of the last year or so, all of the US military services have launched predictive maintenance projects to help bridge the readiness gap. At the same time, some of the latest military assets in design are allowing for a whole new approach to mitigate the challenge of maintaining military assets through their service lives.

AI is expanding as a decision-making tool in the form of intelligent agents for data modelling and simulation. The arduous task of ingesting, aggregating and analysing raw data transmitted from aircraft is now being shortened as a result of this increased digitisation. As the F-35 Lightning II fighter jet continues to roll off production lines it is only natural that the industry will start to turn its attention to the sixth generation of fighter aircraft – the F-35 is just the beginning for high-tech stealth fighters. It is sustained by the Autonomic Logistics Information System (ALIS) – the most advanced sustainment solution currently in use for any military asset. ALIS provides a strong IT backbone, with the ability to turn data from multiple sources into actionable information.

At last year's IFS World Conference held in Boston USA, it was interesting to hear global security and aerospace company Lockheed Martin discuss the role of technology in the sustainment of advanced military platforms – in particular the length of time associated with the design of a 'next generation' military asset. In fact, IFS was involved in supporting the ALIS system as far back as 1999!

"If we were to do it all again, we would probably do something different, just like anything we're talking about and building today. If you were to roll the clock forward 15 years from now, it will be like: 'Why were they building those things like that?' It doesn't make any sense," explained Mark Adams, Logistics and Technology Development, Lockheed Martin, in his IFS World conference breakout session.

For the aircraft being developed into the new decade, given the long-term nature of designing, manufacturing and deploying complex new assets, it will be the integration of AI which will take centre stage in future sustainment software, from aircraft design, through to manufacturing and maintenance. Just look at the British-led Tempest and the Franco-German-Spanish Future Combat Air System or the UK Royal Navy's experimentation of an AI predictive maintenance system on its front-line Type 45 destroyers. AI is set to have a huge role in how those aircraft operate from both a maintenance and repair standpoint, but also operationally.

And it is fair to say AI is doing more than just helping sustain military equipment through secondary support and sustainment, it is already coming to the fore to actually operate military equipment too. Many predictions in recent years have focused on unmanned equipment, but the advancement a year on is in regard to the potential of grouping AI-controlled unmanned aerial vehicles (UAVs) together to provide a swarm – a development that is incredibly difficult to defend against from a military perspective.

We have seen the US military test simple Perdix drones dropped from F/A18 jets in the past, but the intention is that pilots will soon be able to leverage AI in the cockpit to control a small group of advanced drones flying nearby to perform sensing, reconnaissance and targeting functions. This takes control away from the ground, where drone operations are currently co-ordinated, and instead puts it in the hands of the warfighter themselves.

Drones in a military context have existed for a while, but a squadron of AI-controlled drones or drone wingmen is now a very real possibility. The Defense Advanced Research Projects Agency (DARPA) recently tested a swarm of autonomous drones and ground robots to assist with military missions, while the US Air Force has tested the XQ-58A Valkyrie 'Sidekick' drone, a robotic supersonic aircraft designed to be flown alongside a manned F-35. Alongside this, the US Air Force Research Laboratory's Skyborg programme is developing AI for a wider wingman-drone effort.

ONE MAJOR CHALLENGE IS PROLONGING THE LIFE OF OLDER ASSETS THAT ARE CURRENTLY IN SERVICE

The key benefits of this new age of warfare are, of course, tactical. The greatest advantage of a swarm of drones is the ability of these intelligent machines to work together – in numbers that would be simply impossible for humans – and when it comes to the battlefield, numbers matter. Most air defences are poorly prepared to deal with an aerial swarm, but simpler unmanned equipment can also be manufactured and maintained far more cost effectively. This not only reduces the logistics footprint of an aerial squadron, but also has the wider benefit of putting less servicemen at risk.

It is in the area of logistics footprint that I also expect to see further developments, maybe away from the frontline of operations, but with similar benefits of removing servicemen from harm's way. One of the most influential changes to keep a close eye out for is the introduction of electricity as a power source into the battlefield – or battlefield electrification – a development that was hot on the agenda when I attended the Defence and Security Equipment International arms fair in London at the latter end of last year.

The battlefield has been relatively immune to the wave of electrification hitting the civilian world, from cars to homes and public transport. When the concept of battlefield electrification first comes to mind it perhaps implies unrealistic visions of fully electrified ships, tanks and aircraft, built as now but without combustion engines, operating in combat environments. However, we are probably at least ten years or more away from this level of sophistication – as the same challenges of civil electrification of vehicles apply in terms of limited range, cost, weight and the fact battery technology has been slow in its

evolution and has failed to keep up with aspirations. But irrespective of future hopes, change is on the horizon and this will be about so much more than simply 'green energy initiatives' – we are talking about delivering strategic benefits by introducing new ways to power military operations. In the long-term we may see full electrification of military vehicles – witness the US army's project to produce two prototype electric tanks by 2022 for example – but in the near term it will be electrification of secondary support which will hit the battlefield first.

Fossil fuels come at a significant cost to military forces in terms of logistics support – just look at the high number of supply casualties experienced in the fuel convoys of the Afghanistan war. Consider that forward operating bases consume vast volumes of electricity, often 1000s of kWh a day. This demand is currently met almost entirely by generators fuelled with diesel, which brings forward major supply chain concerns around efficiency and safety. Reducing the number of fossil-powered generators and replacing them with renewable alternatives such as solar and wind power vastly improves the logistics footprint of a forward-operating base. This helps to keep forces lean, minimises attack vulnerability and goes a long way to reduce supply chain casualties.

ARTIFICIAL INTELLIGENCE IS COMING TO THE FORE TO ACTUALLY OPERATE MILITARY EQUIPMENT

SUPPORTING AND PROLONGING

Throughout the rest of the year and beyond we will see developments on two fronts. On the one hand the challenge will be supporting and prolonging the life of older assets currently in service – it should not be forgotten that the average service life of USAF aircraft is currently over 20 years – but on the other hand, it must be recognised that new plans need to be put in place to support the assets of the future.

Of course, getting to grips with changing requirements and finding new ways to prolong asset life requires inherent organisational flexibility, something defence organisations have historically struggled with – and this applies all the way through to the software they use to manage operations and equipment. Previously, technologies such as AI and UAVs seemed to be banded about like buzzwords so organisations could demonstrate they are progressive and up to speed with the latest technological developments. But now these initiatives are beginning to prove themselves operationally – it will be the those who prepare and take action today that will set themselves up for a strong decade ●

Graham Grose, Vice President and Industry Director, IFS, Aerospace & Defence, is responsible for supporting all IFS business development within the A&D industry, together with associated industry marketing and overall product direction.

Grouping AI-controlled UAVs together to provide a swarm is incredibly difficult to defend against

Picture credit: US Department of Defense