Vehicle integration – playing 3-d chess in the real world
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Our troops deserve the best. DEC Ground Manoeuvre's slogan "what have you done for them today?" reflects that noble aspiration and over 80 urgent operational requirements responded to by BAE Systems alone in the last 18 months demonstrate the MoD's short-term drive to meet it and industry's ability to respond.

But individual responses to individual problems can often lead to a sub-optimal overall solution and limit future options. For instance, some equipment for Operation Telic proved so power-hungry that other apparatus could go down at the most inconvenient time. Early-generation generators and power management systems just can't cope with the ever-growing demands of modern electronic warfare, situational awareness, communications and vehicle prognostic and diagnostic systems.

And of course, the current increasing need for protection against rapidly changing and evolving threats from a resourceful and innovative enemy inevitably leads to compromises in vehicle manoeuvrability and reliability - and ultimately potentially limits capability.

That's why a broad view of vehicle integration is so essential. Wiring black boxes together – vehicle installation – is only a one small part of the role. A vehicle integrator must understand that, to paraphrase the UK Defence Industrial Strategy, integration is not just for Christmas – it's for life. It must span front line to factory, cradle to grave and pan-fleet dimensions.

FRES will replace part of the armoured battlegroup to give it the medium-weight networked protection and mobility it needs – but its successful introduction to service and integration with the wider fleet will require this multi-dimensional approach to ensure the right trade-offs are made. Only that way will industry and the MoD deliver to the front line optimum military capability in a well-engineered and integrated package.

BAE Systems' experience in systems integration and knowledge of through-life capability management issues provides us with an intimate understanding of those integration needs. We understand the risks shared by the MoD and industry as we jointly commit to contracts incentivised for availability, such as those already in place on AS90, Bulldog, and shortly on Terrier.

This partnered approach, set out in the Defence Industrial Strategy is already achieving real benefits in the air sector. Tornado has achieved reduction in aircraft downtime while support costs have been more than halved (£601-£258m between 2001-2 and 2006-7) thanks to a partnered approach with industry, according to the National Audit Office. Harrier shows a similar downward trend in running costs.

Both programmes are now moving towards contracting for capability, using a managed cycle of regular technology insertion during maintenance. Commercial innovation can be part of the contribution to capability improvement too.

As design authority for over 95 per cent of the current AFV fleet and a key provider of support to operations with engineers on the ground in Iraq, we are well-placed to understand

UK forces' operational imperatives, the capability improvements needed and hence to manage risk. We have over 600 engineers working on AFV design, manufacture and support (including training) in the UK and more on systems integration for the benefit of the front line.

Operational sovereignty depends upon this sort of resource, not least to respond to urgent operational needs, as current events demonstrate. But it's important that these urgent pressures don't completely over-ride a planned approach to the sustainment – and enhancement - of military capability across all the Defence Lines of Development (DLODs).

For instance, "traditional" insertion of extra capability usually brings with it an extra control box or display which has to be housed in an already-cramped crewspace. This inevitably causes ergonomic, workload, information management, training and crew tasking problems.

New developments are already addressing these issues. For example the Terrier combat engineer vehicle, in addition to being 'drive-by-wire', also features open architecture and aircraft-style multi-functional displays. (Terrier is the first vehicle compliant with UK's VSI standards and guidelines.)

As a result upgrades can be incorporated much more effectively, enhancing the crew's operating environment rather than degrading it, and simplifying training and logistics provision.

Integration isn't just about software – it also includes physical integration and here too pan-fleet commonality can pay big dividends. Many of the UORs we have responded to, such as external fire suppression systems and electronics counter measures, have been fitted across vehicle types. We can also make key new technologies available to FRES. Examples include the 120mm smoothbore gun, and the 40mm case-telescoped ammunition weapon system and turret being developed for Challenger 2 and Warrior respectively.

We have transferred technology from our US business to create the Systems Integration Facility at Leicester which allows us to carry out faster, cheaper and better integration at lower risk – during all stages of the life cycle. There, among many other activities, a vehicle crew member can work in cyberspace with our engineers and supply chain specialists to ensure he gets exactly what he needs and firm up designs before expensive metal-cutting begins.

So, in summary, systems integration requires a broad view, one which takes into account of operational experience and which is based on thinking through-life and pan-fleet. It works most smoothly when it is linked to other activities, such as support and upgrade, in 'output-based', partnered and incentivised contracting models.

Experience shows that this approach, set out in the Defence Industrial Strategy and pioneered in the air sector, is the best way of bringing key technologies, skills and resources to bear in a coherent way across the fleet and DLODs so that UK forces' military capability and worldwide reputation are successfully enhanced.