Resilient Support

If you can't get to the fight, and stay in the fight, there is no fight.

In the Cold War, logistic support needs were predictable based on well-established war plans that included stock dispersal to minimise losses. The subsequent need for a peace dividend significantly reduced the size of logistic tails through reviews such as Options for Change and Front Line First. 25 years of efficiency initiatives took risk against readiness and resilience as the UK optimised logistic infrastructure, reduced inventory, rationalised stock, and outsourced much work to industry. This was only tolerable on the premise that there would be sufficient warning of the need to rearm.

The wars in Afghanistan and Iraq shifted planning from A War to The War which allowed logistic resources to be tailored to specific needs while increased funding was met by contingency reserves rather than core Defence funds. Immediate operational needs took priority over Support efficiency. Only much later was Support moved forward and in-theatre maintenance enhanced to reduce unsustainable calls to transport spares over long, precarious supply chains. On withdrawal from both Gulf Wars and Afghanistan, huge volumes of stockpiled material were left behind. The following lull in operations, Support planning again minimised contingency reserves for affordability.

Then the Russian invasion of Ukraine instigated major transfers of capabilities and spares that further depleted stocks. President Trump's attitude towards NATO funding compounded a wake-up call to highlight the progressive 'hollowing out' of warfighting capability. Europe now faces a huge and urgent challenge to increase Defence spending and rebuild industrial growth to restore supply chain resilience.

The Russian invasion prompted NATO nations to stand behind Ukraine and provide the support they needed. The NATO Defence Production Action Plan called for more attention on operational availability, supportability and resilience of systems and their supply chains. Nations must expand production capacity, develop more resilient supply chains and work coherently across multiple initiatives and institutions in EU and NATO. But what does this mean?

Is it enough just to rebuild stocks of weapons and spare parts? Is restoring Resilience a supply chain or a Support challenge? How will we know what actions are needed and effective.

Supply or Support?

Back in 2020 in his annual speech to RUSI, UK Chief of Defence Staff predicted that what had worked for the predictability of stabilisation and counter insurgency operations over 20 years of war in Iraq and Afghanistan would no longer be sufficient. Nations must be honest about the true state of their forces and restore stockpiles, improve readiness and enhance resilience. He suggested some very pertinent tests to provide the correct focus on Resilience:

- What has just-in-time logistics done to supply chains?
- Is sovereign capability assured where needed?
- Has competitive procurement which shared Support risk with suppliers worked?
- How can the availability of key platforms be improved?

It is indisputable that sustaining higher rates of effort for longer periods will require more spares and repairs. Recent wargaming has, for the first time, extended to industry to explore the capacity needed to produce both to rebuild and sustain the required stock levels. Naturally, industry welcomes additional orders for spares and repairs. But is that enough? A key thrust of IPS is to integrate all the resources when and where needed. If any of these are missing when needed, the Administrative & Logistic Delay Time (ALDT) will add Downtime. While enhanced stockpiles will contribute to Resilience, there are 2 other critical factors. First, spare parts alone are insufficient. Reserves of skilled people, tools, test equipment, deployed facilities and rapid access to information are also essential. Second, a lesson from Iraq and Afghanistan was the need to speed up the repair of critical items. Huge amounts of new equipment were shipped into theatre but far fewer were returned for repair and not in time to sustain the planned pipelines. As reverse supply chain times were excessive, forward repair capabilities were created after some years to reduce repair time delays. This was but one manifestation of revised

maintenance and Support policies to match the specific operational scenario. **Resilience demands comprehensive, coherent and complete Support**.

Resilience, Supportability and Downtime

Resilience can be defined as ***the capacity to recover quickly from difficulties - to spring back into shape***. **Supportability** is ***the responsiveness to unreliability that prevents a system's use***; in other words, *when there's a problem on a system, how quickly can its utility be restored'.* Fundamentally, it is the means of delivering **Resilience**.

Availability is not well understood, frequently incorrectly specified, complex to measure, hard to forecast and difficult to manage directly. Actual availability is often worse than demanded and at increased cost. In contrast, **Downtime** is the product of frequency of events (preventive, corrective, upgrades and non-attributable arisings), maintenance times and ALDT. It is a direct measure of unavailability that is quantifiable for each maintenance activity, can be allocated to components, activities and at system level. It can identify, quantify, direct management actions, and measure success in achieving the desired availability and cost outcomes.

Supportability Modelling & Analysis (SM&A) using dynamic simulation of various operating scenarios reflecting the frequency of all maintenance events, their duration, probability, logistic resources, delay times and cost will evaluate the cost and effectiveness of Support arrangements. While many people wrongly equate resilience with additional stockholdings, **reducing Downtime is the key method to improve Supportability and Resilience** by improving availability.

Rethinking Support Resilience

The UK Defence Support Strategy defines Support Advantage as *'The ability of UK Defence to deter and, if necessary, out-compete its near peer enemies by our key capabilities being more available, more of the time, where and when we need them, and possessing support chains which are more resilient than those who oppose us'.* It is achieved by ensuring that we have the forces and equipment, ready when and where we need them, fully fit, armed, provisioned, and able to deploy quickly and efficiently to confront the threats we face. That implies holistic analysis of what's needed, where and when not just for a specific case but for a wide range of possible employments.

Classic steady-state, cost-based spares optimisation generates knife-edged solutions based on specific reliability, cost and repair pipeline time data, estimates and assumptions. But predefined optimised Support packages using are likely to be ineffective in different scenarios that change over time. Individual and collective training, deployments, contingencies, surge and conflicts all require different resource levels and structures. Wars in Afghanistan & Iraq showed that maintenance policies designed for stable peacetime training at predetermined locations may be ineffective. Global deployments to new bases or in mobile carrier-based groups need alternative repair and maintenance policies with different resource needs and supply chains. Support must be resilient to tolerate data variances in alternative scenarios to inform risk-based decisions on what is required, when and where.

SM&A can evaluate both long-term strategic, operational and immediate tactical needs. Dynamic simulation of multiple operating scenarios will evaluate the cost and effectiveness of strategic Support solutions where affordability will always remain a balancing factor. The same models can also be used tactically for deployment or Fly Away packs for specific operational scenarios. More importantly, unpredictable enemy action will require commanders to make rapid tactical decisions on whether to surge operating rates to break interdictions or slow down to survive siege – Contested Logistics. For this, accurate projections of how long the available resources will sustain operations are essential. Operations need to hold sufficient resources for minimum operating periods at required operating rates without recourse to either resupply or information.

It follows that contingency and war reserves must be restructured, rebuilt and almost certainly expanded in a more complex, resilient way to sustain platform availability at the required usage for defined periods in multiple scenarios.

The consistent theme is that reducing Downtime will always mean more operational availability and Resilience of useable Systems.

Support Test & Evaluation and Wargames

Equipment systems are subject to end-to-end, physical test and evaluation (T&E) prior to entry into service to provide evidence that they will perform as claimed. In contrast, Support is not subject to full T&E before entry to service that will happen years or decades after contracts are awarded.

Despite inclusion within the IPS standards and being customer policy, in the past there were no practical means for comprehensive end-to-end T&E of Support. System trials tend to use early pre-production equipment in limited, non-representative tests that provide only limited evidence of Support performance. Stand-alone tests confirm specific Support activities such as maintenance procedures or tool use, but holistic end-to-end physical testing of the complete Support system is prohibitively expensive, lengthy and late. As a result, initial operating units have been left to identify Support omissions and weaknesses creating dissatisfaction, long delays and large additional cost.

End-to-end dynamic simulation of the Downtime of all maintenance events can evaluate pre-defined and procured Support solutions and available resources in the principal and many alternative operating scenarios. It will quantify and rank the effect on all maintenance and logistically significant items. Where outcomes indicate shortfalls, causes can be explored and potential engineering or Support remedies can be evaluated quickly for likely benefit before incurring considerable expenditure. Simulation is the best way to inform balanced risk-based Support solutions, including their Resilience, with confidence-based estimates of probable performance.

Model-based IPS T&E using Downtime as the driving metric is the ideal method to identify what is needed both strategically, operationally and in tactical situations. The models will connect high-level wargaming with SM&A to explore all of the Support factors, not just industrial capacity. In essence, wargaming must reach down into the detail of IPS SM&A. In this way, the use of **Downtime SM&A provides a consistent golden thread connecting operational analysis, strategic, operational and tactical planning and Support management with contracting and industrial capacity.**

Bottom-up, end-to-end modelling of appropriate events, their frequencies, resources, timings and costs is essential to reflect inputs, dependencies, resources and interactions. Model-based IPS T&E using simulation is not new. In the 1990's and early 2000's, the MOD's Logistic Analysis Research Organisation (LARO) modelled all RAF aircraft fleets each year against 7 operational scenarios ranging from peacetime MOB training, exercise, deployments to contingency & wartime operations. HQs and project teams also tasked LARO to perform interim ad-hoc SM&A tasks to inform strategic decisions such as changes in activity levels, modification programmes, fleet rebasing, fleet build-up and run-down plans, and potential or unpredicted operational deployments as exemplified by Gulf War 1 and the Balkans conflicts. The results were fundamental to risk assessment and budget allocation.

Modern computing power, modelling techniques and BI offer even more powerful capabilities that are practical, flexible, can be started early and should continue through life. The data sources, standards, tools, techniques and sufficient data computing power all now exist to develop the necessary models. However, an expert modeler must drive the analysis to rationalize the outputs. Unfortunately, there are insufficient SQEP with the will and mandate to conduct operational SM&A that can evaluate and inform Resilience correctly.

Summary

The need for greater Defence Resilience is indisputable after decades of taking peace dividends and risk on contingency reserves for affordability. The hollowing out has gone too far and must be reversed. **If you can't get to the fight, and stay in the fight, there is no fight.**

Resilience is ***the capacity to recover quickly from difficulties*** and **Supportability** is ***the responsiveness to unreliability that prevents a system's use***; in other words, *'when there's a problem on a system, how quickly can its utility be restored'.* Fundamentally, they are the same.

Achieving Support Advantage implies Resilience but is not just having more spares, repairs and industrial capability, important though they are. Resilience requires comprehensive, coherent and complete Support across all IPS disciplines by minimising Downtime. Unfortunately, classic SM&A techniques used in earlier stable circumstances are now inappropriate for the multiple, unpredictable and rapidly varying scenarios of today but are still used to define current Support solutions. True Resilience will only be delivered when all the resources are considered together in multiple scenarios to inform risk-based decisions balanced against affordability. The consistent theme is that reducing Downtime will always mean more operational availability and Resilience of useable Systems. **Downtime SM&A provides a consistent golden thread connecting operational analysis, strategic, operational and tactical planning and Support management with contracting and industrial capacity. It is the key method to improve Supportability and Resilience by improving availability.**