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Three A's of Military Logistics: Modernising the Armed Forces' Tail

By Zoe Stanley-Lockman

Synopsis

Autonomous systems, artificial intelligence and additive manufacturing have come to be discussed as the drivers of a futuristic brand of warfare replete with 'killer robots' and weapons on-demand. These technologies will almost inevitably change warfare, but their greatest impact will be behind the scenes – transforming the logistical 'tail' rather than the 'teeth' of combat.

Commentary

AT THE United Nations in Geneva, as in capitals around the globe, governments are hotly debating the legal, ethical and philosophical implications of lethal autonomous weapons systems – the so-called 'killer robots' – and proliferation risks associated with sensitive dual-use technologies.

But below the threshold of kinetic activity, armed forces have already begun incorporating these exact kinds of technologies behind the scenes to the benefit of the logistical 'tail'. An evolution in military logistics is brewing, driven largely by the three A's of 21st-century innovation: automation and autonomous systems, artificial intelligence and additive manufacturing.

Adapting to Technological Changes

Logistics is ripe for adapting to these technological changes for two key reasons. Firstly, effective logistics is the common denominator across the full spectrum of security challenges. Be it for peace contingency operations, humanitarian aid and disaster relief, island defence or high-intensity urban operations, no military mission could succeed without timely delivery of supplies or pre-deployment information. This

will remain steadfast in future operational environments for which the Singapore Armed Forces (SAF) and other modernising forces are preparing.

Secondly, a decent share of military logistics overlaps with civilian logistics, and leading logistics companies have a history of working with militaries through privatisation and varied public-private partnership arrangements. This marries well with the fact that the three A's of 21st-century innovation are largely driven by the commercial-tech sector, rather than the traditional defence industrial base.

As military procurement agencies around the globe reorient toward increased commercial technology utilisation, logisticians should have a reflex – or at least a natural proclivity – toward working with companies outside the traditional defence industrial base.

As the SAF adjust toward the future operating environment and contribute to Singapore's aspiring status as a 'Smart Nation', logistics innovation will only become an increasingly urgent component of having a professional, connected and effective force.

Automation and Autonomy: Robotic Logisticians

Unmanned systems are already found in depots and warehouses to make supply chain management more efficient. In inventory control, one issue is the discrepancies between records and the stocks themselves. The use of unmanned systems to read radio frequency identification (RFID) tags at a distance can correct this mismatch.

Borrowing tactics from global shipping companies, unmanned aerial vehicles (UAVs) have reduced the average aircraft inspection time from two hours to 15 minutes in some cases. This greater accuracy saves money by minimising excess stock – and in forward operating bases (FOBs) and more remote operating theatres, the efficiency also translates to enhanced mobility.

Unmanned systems are attractive for transportation and distribution because they can offer tailored approaches rather than one-size-fits-all solutions. These types of supply chain efficiencies reduce the required manpower for convoys, potentially compensating for lower recruitment or conscript rates.

Incorporating more unmanned systems into deployed units does not fully replace human touch, but rather acts as a force multiplier for smaller militaries. Delegating tasks to machines gives troops more time to refocus on core combat tasks or ensuring more rest and sleep to make them more effective. Unarmed UAVs can be used for pre-deployment reconnaissance so that logisticians can determine, for example, how to navigate roads or where to locate supply routes.

Artificial Intelligence: Complete Big Data Links

In line with military modernisation trends around the globe, the SAF is actively moving toward a force where 'nodes' are linked together as part of a larger network. In large part, fostering this connectivity starts with logistics. The SAF already leverages information technology (IT) to transform facilities management (FM), including through

the Automated Storage Retrieval System (ASRS), Mobile Racking and Shelving System and through an FM app and portal.

In theory, AI could eventually replace any logistical task at hand. To take the SAF FM systems as an example, artificially intelligent systems could activate other 'nodes' in the system to perform necessary maintenance, repair or overhaul (MRO) tasks based on aggregated data from RFID chips.

Another example would be AI analysing terrain to determine the fastest supply routes in a jungle versus city, or the most effective way to retrieve lost items. AI can analyse the patterns seen in data, identify outliers which signify issues such as sabotage – and then edge processing could filter out which information needs to be sent to higher echelons. In theatre, AI information sharing could further inter-unit cooperation or even jointness far faster than that of which humans are capable.

Additive Manufacturing: Spare Parts Revisited

The production and delivery of spares is also essential to keeping equipment operational, be it in the midst of an expeditionary operation or in response to an unanticipated national emergency. Additive manufacturing (e.g. 3D and 4D scanning and printing) offers new pathways to flatten supply chains and speed up delivery time through the prospect of on-site production, and offer an unprecedented degree of specialisation, meaning the printed parts would ultimately be compatible with various platforms.

There are obstacles to large-scale utilisation of additive manufacturing in the armed forces today: raw materials can still be expensive and deployed personnel are not necessarily trained to operate the equipment. A switch to additive manufacturing would likely depend on market forces driving prices down and further training.

In the area of logistics, automated and autonomous systems, AI and additive manufacturing are all relevant to the spectrum of security challenges facing the SAF and other small militaries seeking to economise on manpower. Investing in these technologies is usually either through acquisitions or partnerships with companies already active in these areas.

While this should always be weighed against budgetary constraints, it is worth regularly revisiting the costs as technologies predominantly found in the civilian sphere become cheaper and go through technology lifecycles more quickly.

Furthermore, these types of technologies will only become more widely available to state and non-state adversaries alike. In peacetime or otherwise, investments in a technologically enhanced logistical tail will ultimately serve as a force multiplier for higher operational readiness.

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