NATO DIANA
Defence | Innovation | Adoption

2027 Challenge: Responsive Logistics

Responsive Logistics

1. Challenge Summary: Modern civilian and defence systems alike rely on resilient logistics and agile mobility, creating a strong demand for dual-use solutions that can enhance supply-chain resilience and infrastructure robustness. The ability to move, sustain, and support people, equipment, and data across complex, distributed, and often degraded environments is essential for mission safety and operational success. Solutions that improve efficiency, resilience, and adaptability in civilian contexts can also strengthen defence readiness in crisis or conflict. Disruptions caused by extreme weather, infrastructure degradation, cyber interference, or contested access can rapidly expose the fragility of long, linear supply chains and labour-intensive processes.

Meeting these challenges depends on multi-domain redundancies and advanced in-situ repair and maintenance capabilities. Additionally, predictive maintenance, digital twin-based diagnostics, additive manufacturing, and autonomous delivery will be required across all domains, including space. The Alliance seeks smart, interoperable logistic mobility solutions that sustain endurance and freedom of action in dynamic environments, strengthening collective defence and security.

2. Illustrative Scenario: A NATO-led multinational task force deploys at short notice to a remote, infrastructure-poor region following a rapidly escalating crisis near a contested border, requiring simultaneous humanitarian and military operations. As forces are deployed, interoperable predictive logistics and communications systems enable Allies to coordinate movement, intelligence, surveillance and reconnaissance (ISR), supply distribution, personnel recovery and humanitarian action. Dynamic multi-domain logistics systems enable real-time reallocation of materiel, food, medical supplies, and mobility assets in response to evolving humanitarian needs, weather, terrain, and security conditions. A shared digital logistics picture enables prioritised real-time resupply, mobilisation of ad-hoc logistics hubs, means and routes, rapid cross-border convoy clearance and dynamic route adaptation even in the face of intensive forward operations. When equipment fails within dispersed maintenance areas, mobile repair teams employ autonomous diagnostics, digital twins and additive manufacturing to restore essential civilian and military capabilities within hours, sustaining operational tempo and combat effectiveness.

3. Exemplar Enabling Technologies: The following list provides illustrative examples of technologies that may contribute to this challenge. The list is not exhaustive, and NATO DIANA encourages integrated and novel approaches that extend beyond it:

Resilient Mobility & Responsive Logistics under Contested Conditions

- Autonomous logistics planning and optimisation platforms to strengthen end-to-end supply chain resilience, redundancy, and sustainment across contested and disrupted environments.
- Artificial intelligence (AI)-enabled stock allocation and demand forecasting to support time-critical decisions and balance military and civilian needs.
- Interoperable logistics command-and-control (C2) software enabling multinational coordination, digitised cross-border movement, materiel substitution and interoperability.
- Data fusion capabilities generating a shared logistics picture to support coordinated sustainment decisions across domains.

Rapid Sustainment, Predictive Maintenance & Lifecycle Resilience

- Operational digital twins for vehicles, systems, and sensors to enable rapid in-field repairs.
- AI-based fault diagnosis and simulation-driven assessment tools that operate under incomplete or degraded data conditions to support partial repair and functional bypass when spares, tools, or access are limited.
- Additive manufacturing and repair by addition toolchains, including in-space servicing, assembly, and manufacturing, to restore critical components without reliance on deep logistics hubs.
- Software recalibration and system reconfiguration tools to improve interoperability and ad-hoc integration of equipment and systems.

Energy Resilience

- Deployable renewable power generation and tactical energy storage to support expeditionary and contested operations, including space-dependent missions.
- AI-enabled energy and power management systems, including edge-AI control electronics, to maintain resilience against degradation, wear, or kinetic effects.
- Energy saving and energy harvesting technologies to reduce dependence on fixed supply routes and logistics tails.

Mobility Platforms & Secure Transport

- Low-signature, stealth and protected mobility vehicles adapted from civilian technologies to offset bespoke platform shortages.
- Packaging and storage systems that are resistant to shock, vibration and extreme environments.
- Modular vehicle architectures supporting ISR, C2, logistics, and casualty evacuation.
- Delivery, autonomous resupply, and rendezvous and proximity operations solutions to shorten logistics tails and reduce personnel risk across domains.