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The Strategic Imperative of Dual-Use Agility: Bridging Peacetime Innovation and Wartime Readiness

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Introduction

In the contemporary global landscape, the traditional distinction between civilian and military industrial bases is rapidly eroding as modern conflict increasingly values speed, accuracy, and the "intelligentization" of warfare (Hadi Kuncoro et al., 2024; Strategic Survey, 1994). For many nations, particularly developing ones that are not major technological powers, resilience depends on the ability to maintain a "fast switch" capability within their technology industries. This strategic agility relies on the mastery of dual-use technology (DUT), which encompasses knowledge, goods, or research that can be applied to both civilian and military needs (Hadi Kuncoro et al., 2024; Riecke, 2023). By integrating these two traditionally separate spheres, a nation can ensure that its peacetime economic engines are designed to be rapidly reassembled into a robust defense bulwark when an unanticipated crisis arises. The challenge is no longer just about building weapons; it is about building an industrial ecosystem that is "dual-use by design" (Gürakan, 2026).

Dual-Use Technology: Definition and Strategic Necessity

Dual-use technology refers to items, including software and specialized knowledge, that can serve both commercial interests and national defense objectives (Hadi Kuncoro et al., 2024; Székely, 2024). These range from basic components like microprocessors and sensors to complex systems like global positioning satellites and high-resolution imaging (Gürakan, 2026; Strategic Survey, 1994).

The necessity for this integration is driven by a fundamental shift in the global innovation landscape. Historically, the defense sector led innovation (e.g., the internet, GPS, and jet engines), but today the civilian sector has become the primary source of cutting-edge advancements in fields such as Artificial Intelligence (AI), microelectronics, and sensor technology (National Economic Council et al., 1995; Reuven & Shamir, 2025). Commercial product cycles of three to four years now far outpace the ten-year cycles typical of traditional military development (National Economic Council et al., 1995).

For a developing nation, maintaining a separate "autarkic" defense industrial base is economically inefficient (National Economic Council et al., 1995). A single integrated national technology base optimizes limited resources, prevents double spending on R&D, and utilizes commercial sales to sustain the industrial capacity necessary for national security (Hadi Kuncoro et al., 2024; Kot, 2025). Furthermore, the modern security environment demands information dominance, where the ability to rapidly "spin-on" civilian innovations (adopting commercial tech for military use) provides a decisive edge (Kot, 2025; Reuven & Shamir, 2025).

Practical Strategies for the "Fast Switch"

Maintaining readiness during peacetime requires specific industrial configurations and policy frameworks that allow for rapid mobilization without the "ghettoization" of defense technology (National Economic Council et al., 1995). The following strategies are essential for a pragmatic fast switch. Tech industries should establish facilities capable of producing both commercial and military versions of a product on the same line.

Advanced flexible manufacturing systems already allow for a changeover time of less than two hours to switch output from civilian items (like truck circuit boards) to defense-specific components (like fighter jet circuit boards) (National Economic Council et al., 1995). This mindset enables firms to thrive in an environment of continuous, unanticipated change. By utilizing computer networks to form virtual enterprises, groups of vertically and horizontally integrated companies, a nation's industry can pivot as security needs evolve, moving beyond rigid, bureaucratic procurement (National Economic Council et al., 1995).

Success in a crisis depends on systems being designed for dual-use from the beginning. This emphasizes commonality, modularity, and the use of standardized, interchangeable civilian parts (National Economic Council et al., 1995). This approach avoids a reliance on unique military specifications ("milspecs") that are often too expensive or slow to produce in an emergency (National Economic Council et al., 1995). Readily available civilian components, such as high-performance computer chips and sensors used in consumer electronics, are often as rugged as military-spec versions but cost a fraction of the price (Cheung, 2008; National Economic Council et al., 1995). These can be rapidly assembled into effective weapon systems, such as improvised drones, when needed (Székely, 2024). Governments must remove regulatory barriers that discourage commercial firms from doing business with the military. This includes replacing how-to milspecs with performance-based specifications, telling contractors what a system must do rather than exactly how to build it (National Economic Council et al., 1995).

Real-World Examples of Agility

Pragmatic models for this agility exist in both state-owned and commercial practices globally. Indonesia utilizes its defense industry to drive economic growth while maintaining readiness. PT Pindad produces the Anoa and Komodo combat vehicles, which are used for military patrols but also deployed for civilian search and rescue (SAR) and disaster management (Hadi Kuncoro et al., 2024). Similarly, PT PAL builds Landing Platform Docks (LPDs) that serve as military transports but are essential for transporting aid and evacuating victims during earthquakes or tsunamis (Hadi Kuncoro et al., 2024).

During the 1991 Gulf War, coalition forces relied on commercial GPS receivers for over 80% of their total units because military-grade hardware could not be produced fast enough (National Economic Council et al., 1995; Strategic Survey, 1994). This demonstrated that existing civilian infrastructure could provide "fast and accurate" wartime navigation. Microwave Monolithic Integrated Circuit (MIMIC) technology, originally for military radar, was adapted for the FOREWARN system used on school buses to detect children in blind spots (National Economic Council et al., 1995). This allows the same production line to serve both fighter jet needs and civilian safety markets, ensuring the industrial base remains active and affordable during peacetime (National Economic Council et al., 1995).

Recent conflicts in Ukraine and the Middle East have seen hobbyist drones, originally designed for photography, modified by personnel using off-the-shelf microprocessors to become effective weapons (Székely, 2024). This highlights how a nation can quickly gear up a lethal force from civilian stock.

Priority Sectors for Developing Nations

For nations with limited budgets, the most effective strategy is to focus on priority sectors that offer the highest degree of civil-military synergy. These are the brains of modern systems. They are essential for both commercial communication networks and "intelligent" weaponry (Hadi Kuncoro et al., 2024; Kot, 2025). Drones are a primary area for integration, as platforms can easily transition between agricultural/logistical uses and military reconnaissance or strike missions (Hadi Kuncoro et al., 2024; Székely, 2024). This provides a horizontal layer of protection that serves both civilian data security and military network integrity. The tools for data encryption and threat detection are almost identical in both domains (Gürakan, 2026). Building modular platforms (ships or trucks) that can carry either commercial cargo or military troops/munitions ensures that transportation infrastructure is always ready for mobilization (Hadi Kuncoro et al., 2024).

While dual-use integration offers benefits, it creates a dual-use security dilemma (Kot, 2025; Székely, 2024). When a nation's civilian and military sectors are deeply fused (as in China's Military-Civil Fusion strategy), foreign observers find it difficult to distinguish between benign commercial activity and military modernization (Gokireddy & Jash, 2024; Kot, 2025). This can lead to increased securitization, where civilian technologies are treated as existential threats, resulting in export controls and trade restrictions that may hinder a developing nation's economic growth (Gürakan, 2026; Székely, 2024).

Conclusion

The "fast switch" from a peaceful economy to a wartime footing is no longer a matter of total industrial conversion, but rather one of strategic agility through Civil-Military Integration (CMI). By fostering a technology industry rooted in the dual-use concept, nations can ensure they are never caught technologically hollow during an unanticipated crisis. This approach not only enhances national security by providing rapid access to the latest civilian innovations but also drives the technological independence and innovation necessary for long-term economic resilience and global competitiveness. For a developing nation, the path forward is clear: integrate the commercial and defense sectors to create a unified, agile industrial base that serves the needs of the people in peace and protects them in war.

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