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Supply Chain Agility and Production Acceleration in the Defense Industrial Base: A Qualitative Study of Practitioner Perspectives

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Supply Chain Agility and Production Acceleration in the Defense Industrial Base: A Qualitative Study of Practitioner Perspectives

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Abstract

Rapidly evolving global threats demand a fundamental reassessment of the defense supply chain and industrial base readiness. Traditional acquisition frameworks, historically optimized for cost efficiency and process compliance, are misaligned with the speed and scale requirements of modern defense needs. This study examines the supply chain factors most critical to enabling production acceleration and source-to-scale responsiveness within the defense industrial base (DIB).

Drawing on qualitative data collected from fourteen practitioners across supply chain, engineering, and program management, this study identifies six recurring themes that collectively inhibit production surge capacity: sole-source dependency, qualification cost and time, workforce erosion, communication and data gaps, regulatory and compliance, and industrial base contraction. Co-occurrence analysis reveals that sole-source dependency and industrial base contraction are the most prevalent issues, while qualification requirements and regulatory constraints constitute a second barrier to supplier diversification and capacity growth.

The findings indicate that the DIB challenges reflect deeper enterprise-wide friction, including organizational misalignment, communication barriers, and compliance constraints, rather than solely insufficient capacity. Viewed through a supply chain agility lens, the core problem is that the enterprise and its supplier network are not structured to adapt, coordinate, and scale effectively in response to changing demand conditions.

Introduction

During World War II, the American military industrial base became a defining example of national mobilization through industrial conversion, production expansion, and coordinated public-private action. Civilian manufacturers were redirected toward wartime output, and prewar industrial centers with automobile, truck, steel, and aircraft capacity were rapidly converted to military production, demonstrating how existing physical and human capital could be reorganized in support of national defense. Firms that had once produced consumer goods, including companies such as Singer, were at times incorporated into wartime military production, illustrating how existing industrial capacity could be reorganized in support of national defense (Canfield, 2016). Economic history research treats this period as a large-scale case of government-directed industrial mobilization in which wartime contracts, facilities, and production systems were aligned around military need rather than normal market demand. As a result, the World War II period remains an important historical benchmark for understanding how the United States once generated defense production at scale and adapted its industrial base to meet the demands of major war (Jaworski, 2017; Rhode et al., 2018). In contrast to this

historical model of rapid industrial adaptation, the modern defense industrial base operates within structures that are less responsive to sudden shifts in demand, raising questions about its ability to scale efficiently under surge conditions (Army Science Board, 2023; DoD, 2022b).

Today, the defense industrial base (DIB) produces complex systems with long life cycles that span from development through sustainment and often extend over several decades (Del Campo et al., 2022). These systems, which include aircraft, ships, ground-based platforms, and advanced electronics, require highly specialized supplier networks that must reliably provide materials and components throughout the life of the system. As operational requirements expand and procurement quantities increase, the supply base's ability to ramp up production becomes a critical factor in maintaining program schedules and meeting critical defense needs.

In recent years, due in part to increased global conflict, demand for defense systems has surged, straining the DIB. This dynamic, fast-paced environment exposes vulnerabilities that steady-state production may conceal, such as sourcing shortages. Shortages can occur when materials, components, and major assemblies cannot be sourced in sufficient quantities to meet production requirements. These shortages may occur when suppliers lack the ability to scale output, when material constraints arise, or when disruptions occur across the supply base. This challenge has revealed limitations in supplier capacity and throughput. When supply chains are unable to meet increased demand, production lines slow or halt, resulting in delays to critical program schedules and requirements.

Supply shortages become particularly complex when multiple programs rely on common materials, components, and manufacturing sources. In avionics and other integrated subsystems, components are frequently shared across multiple aircraft types and platforms. When supplier capacity is constrained, limited availability can propagate across several programs simultaneously, creating cascading effects that increase costs and delay deliveries. This interconnected structure requires careful assessment of supplier capabilities, production scalability, and demand forecasting to ensure the industrial base can respond effectively to increased operational requirements.

Failure to address these supply chain capacity limitations can have significant consequences for both industry and national defense stakeholders. When materials, components, or assemblies cannot be produced at the required rate, the availability of critical systems and equipment may be delayed, potentially affecting operational readiness (DoD, 2022a). Additionally, organizations may incur higher costs associated with expedited procurement, alternative sourcing, or inefficient production adjustments. Despite increased attention to supply chain resilience within the defense sector, there remains a limited understanding of how supplier capacity constraints and production scalability affect the DIB's ability to respond to sustained increases in demand. Therefore, the central problem is that the DIB currently faces supply chain capacity constraints that limit suppliers' ability to rapidly scale production in response to increased demand for aerospace and defense (A&D) systems. Without improved insight into the factors that limit production scalability across the supplier network, defense stakeholders may continue to experience production delays and an inability to meet operational requirements for source-to-scale initiatives.

Problem Statement

Accelerating production to meet urgent defense requirements has become a strategic imperative for the DIB. Many segments of the DIB have limited capacity to expand, creating challenges when demand surges rapidly. This results in constraints to achieve rapid production and delivery to support the warfighter, including fragmented supply chains, industrial base capacity limitations, and misaligned demand signals to the supply base. These challenges delay the availability of critical products needed to meet operational timelines. As a result, the

warfighter may face delays in receiving essential weapons systems. These constraints reflect not only capacity limitations but also broader challenges in coordinating, aligning, and adapting across the enterprise and its supplier network.

Statement of Purpose

The purpose of this research is to determine how supply chain collaboration can enhance production capacity and enable more agile and responsive scaling across the A&D landscape. The study plans to draw on practitioners' insights to understand collaborative methods that support rapid scaling of manufacturing output. The study explores how collaborative frameworks can strengthen industrial responsiveness, improve supply chain throughput, and sustain long-term readiness within an increasingly complex and dynamic demand environment.

Significance

The significance of this paper lies in its focus on the urgent challenge of increasing supply chain capacity and production output to support customer demands. As the DIB tackles constraints and misalignment between capacity and demand, this research highlights the critical role of supply chain collaboration in enabling speed, source-to-scale, and resilience. In this context, collaboration functions as a key enabler of supply chain agility, supporting the ability of the enterprise to adapt, coordinate, and scale in response to changing demand conditions. The insights presented are valuable to researchers and practitioners in defense acquisition, procurement, engineering, and supply chain management, as they provide a framework for understanding how collaborative approaches can overcome barriers to expanding industrial capacity and improving throughput. Further, the findings inform acquisition and industrial base leaders as they make strategic decisions to enhance responsiveness, risk reduction, and ensure readiness in support of customer requirements.

Review of Literature

A literature review examined the historical foundations, current challenges, and strategic imperatives associated with rapidly scaling defense production capacity to meet critical national security needs. The review examines past strategies used to accelerate the DIB to increase capacity during national emergencies. Key areas of importance include World War II public-private industrial actions, the Defense Production Act (DPA), and post-COVID-19 strategic efforts. Recurring themes in the literature include proactive versus reactive approaches to production scaling (source to scale), cross-industry coordination within the A&D supply base, misconceptions regarding supply chain constraints, the significant cost and lead-time implications of surge manufacturing, technology readiness and production maturity, and the influence of product design and contractual requirements on acceleration feasibility. Across these areas, a recurring implication is that production acceleration depends not only on capacity expansion, but on the ability of the industrial base to operate with agility through coordinated and adaptive supply chain structures.

American DIB

The DIB generally refers to the network of firms, facilities, workers, technologies, and institutions that support the design, production, and sustainment of the weapons, equipment, and materials required for national defense (DoD, 2022a; GAO, 1993). Although the term is more common in modern defense policy, its practical roots reach back through earlier U.S. mobilization efforts and became especially visible as wartime production agencies and economic coordination systems expanded in the years surrounding World War II (National Archives and Records Administration [NARA], n.d.). In that sense, the World War II period was

not the beginning of American defense production, but it was the clearest early demonstration of how a national industrial base could be organized, expanded, and accelerated in support of war.

American Military Industry During World War II

The American military industry during World War II is often described in the literature as a case of accelerated capacity growth rather than simply a story of high wartime output. Scholars generally emphasize that mobilization depended on the rapid conversion of existing industrial assets, large-scale federal investment, and administrative systems capable of redirecting production toward military demand. Jaworski (2017) treats the period as a government-led "big push," arguing that wartime investment expanded productive capacity and reshaped regional industrial development. Rhode et al. (2018) argue that wartime contract allocation was strongly associated with existing economic capacity, reinforcing the view that preexisting industrial depth mattered because it made rapid expansion possible once military demand intensified. In this sense, the wartime industrial base was not built from nothing, but it grew through the accelerated use, enlargement, and redirection of existing plants, labor pools, and logistics networks. This aligns closely with the claim that World War II became a benchmark for American industrial mobilization because it demonstrated how quickly the United States could convert civilian manufacturing strength into defense production at scale.

The literature also suggests that this growth in capacity was inseparable from the systems that made acceleration manageable. Waddell (1994) argues that wartime mobilization transformed the U.S. state by expanding federal authority and creating new forms of coordination between government and industry. Rockoff (1996) adds that the wartime surge should be understood as a process shaped by time-to-build constraints, material-allocation problems, and the gradual development of planning mechanisms rather than as a seamless production miracle. Recent work by Garin and Rothbaum (2025) added that publicly financed wartime plant construction contributed to a major episode of government-backed industrial expansion with long-run local effects. Even narrower examples, such as Singer's temporary incorporation into wartime pistol production, help illustrate the broader principle that firms outside the traditional defense sector could be drawn into military manufacturing when national mobilization required it (Canfield, 2016). Taken together, this body of scholarship presents World War II as a historically important case of industrial acceleration in which capacity growth depended on both physical expansion and institutional coordination. That synthesis provides the scholarly basis for using the wartime military-industrial base as a point of comparison for evaluating current questions of defense production, responsiveness, and surge capability.

Defense Production Act

The Defense Production Act (DPA) grants the President broad authority to prioritize production and supply of products, materials, and services in support of military and civilian agencies (Else, 2009). The DPA was enacted during the Korean War in 1950, with four of the original titles expiring by 1953, leaving Titles I, III, and VII in effect today (GAO, 2025).

Title I, Priorities and Allocations, provides priority to critical defense programs and national security needs over competing commercial demands (Else, 2009). Examples of its use include assigning "DX" priority to the M1 Abrams Tank Program in the 1970s and prioritizing Precision Lightweight Receivers in support of British soldiers operating in Iraq in 2003 (Else, 2009).

Title III, Expansion of Productive Capacity Through Financial Incentives, enables the President to expand capacity through financing tools, including loans, loan guarantees, and purchases of industrial equipment and technologies within the supply base of the United States and, under certain conditions, in Australia, Canada, and the United Kingdom (GAO, 2025). The

ultimate goal of Title III is to enable the maintenance, restoration, and expansion of the domestic industrial base (GAO, 2025). Over the years, Title III appropriations by Congress have consistently exceeded Department of Defense (DoD) requests and require the Secretary of Commerce to annually report on defense export offsets (Else, 2009). From 2018 through 2024, the DoD, the Department of Health and Human Services (HHS), and the Department of Energy (DOE) made a total of 222 Title III investments to approximately 182 companies at $3.2 billion (GAO, 2025). The majority of this activity involved DoD investments primarily in the United States, with a small number in Canada during COVID-19 (GAO, 2025).

Title VII, General Provisions, provides protections and authorities to support industrial preparedness and national security, while shielding companies from liability when complying with the DPA authorization rules (Else, 2009). Additionally, Title III protects voluntary preparedness agreements from antitrust litigation (GAO, 2025). One example, the Voluntary Intermodal Sealift Agreement (VISA) program, provides commercial maritime assets to government use when required through Title VII invocation (Else, 2009).

While the DPA was originally designed as a wartime economic policy tool, it has become more narrowly scoped, while national security, military organization, and the US industrial base have transformed. Over time, some critics of the DPA argue that it has become obsolete, as the U.S. domestic industrial base it was intended to protect has been swallowed up by a globalized economy (Else, 2009). Over the past seven years, the DPA has proven to be an important tool for national defense preparedness (GAO, 2025). While it has demonstrated value in recent years, the GAO has found that there are lessons to be learned from past experiences to inform and improve future use of these authorities (GAO, 2025).

Current State of the DIB

The COVID-19 pandemic exposed significant vulnerabilities in the DIB, particularly for companies diversified across both defense and commercial sectors, as they faced greater short-term financial strain due to the collapse of commercial aerospace demand. In an interview with Brian Hiro, Cal State San Marco, professor Robert Aboolian argues that while major disruptions such as pandemics are inevitable, companies can mitigate their impact through proper preparation and supply chain resilience, with the critical question being not whether a disruption will occur, but how severe the impact will be and how quickly recovery can be achieved (Hiro, 2021). While large companies may implement lasting changes, such as increased flexibility and simplified product offerings, smaller firms will largely return to business as usual due to limited investment capacity (Hiro, 2021). Aboolian cautions that even large companies may revert to cost-focused practices if significant disruptions do not recur over an extended period, noting that organizations may tend toward short-term thinking (Hiro, 2021). To prevent this, Aboolian emphasizes that federal government regulation requiring companies to maintain supply chain preparedness and resilience plans is essential to ensuring sustained readiness for future large-scale disruptions (Hiro, 2021).

Though defense firms experienced comparatively less immediate risk during COVID-19, they remain vulnerable to longer-term pressures as rising government debt from pandemic mitigation efforts could lead to future defense spending cuts, continued resolutions, and program cancellations (Hensel, 2021). The pandemic also disrupted global supply chains, accelerating a strategic emphasis on reshoring critical materials and manufacturing to reduce dependence on foreign suppliers (Hensel, 2021). Cross-sector collaboration, the development of interchangeable commercial and military applications, and product diversification emerged as key strategies for mitigating future risk (Hensel, 2021).

Ultimately, while the full long-term impact of COVID-19 on defense industrial capacity remains uncertain, the experiences of 2020 have provided critical lessons for strengthening

supply chain resilience, sustaining workforce capabilities, and maintaining the financial viability of the DIB in the face of future disruptions.

While these disruptions revealed immediate vulnerabilities, they also exposed deeper structural limitations within the DIB. In addition, the conflicts in Ukraine and the COVID-19 pandemic have stressed the industrial base and exposed fragility within both the Army's Organic Industrial Base and the commercial Defense Munitions Industrial Base (Army Science Board, 2023). More than 50 mergers and acquisitions within the commercial base have concentrated market control among just five prime contractors, while inconsistent government funding signals, a decades-long emphasis on cost efficiency over surge capacity, and more than 100 single points of failure throughout the supply chain have left the industrial base ill-equipped to rapidly scale production in response to a sustained high-intensity conflict.

These conditions collectively point to a broader pattern of structural and coordination challenges within the industrial base. The Army Science Board explored the current state of Army munitions gaps and issues and recommended strategies to improve in a 2023 report. Key findings of this report identify that formal munitions processes exist, but fragmented authority, limited senior-leader visibility into risks and tradeoffs, misaligned funding and contracting incentives, industrial and inflation pressures, and outdated assumptions about surge capacity collectively undermine timely investment and wartime responsiveness needed for munitions acceleration (Army Science Board, 2023). In order to accelerate munitions production, the authors recommend: centralization of authority, clarification of command roles, improvement in long-range demand analysis, leveraging of large multiple year procurement strategy to support sustained production, expansion of attritable munitions, and investment in flexible pilot plants to advance manufacturing capabilities, modernization of energetics, and reduction in foreign dependence (Army Science Board, 2023).

These structural challenges are reinforced by broader research on the modern defense industrial environment. That benchmark is especially important when considering the condition of the present-day U.S. DIB. Recent literature suggests that today's environment is shaped less by mass industrial conversion and more by supply-chain fragility, limited surge capacity, weak sub-tier visibility, and increasing dependence on specialized technologies. Hellberg et al. (2025) argue that efficiency-oriented peacetime models are poorly suited for wartime production demands, while Antai and Hellberg (2025) identify coordination breakdowns, capacity inflexibility, and information asymmetries as key barriers to surge response. Similarly, the Brookings Institution (2024) and the U.S. Defense Business Board (2025) point to fragmented ownership, workforce and capital constraints, and limited transparency across defense networks as persistent obstacles to resilience. At the same time, the Defense Logistics Agency (2025) suggests that artificial intelligence may improve supply-chain awareness and risk detection, but only when integrated effectively into leadership and governance processes. Taken together, these studies indicate that comparing the World War II military industrial base to the DIB of today provides a useful framework for examining how American industrial readiness, responsiveness, and strategic coordination have changed over time.

In response to these persistent structural challenges, recent policy and strategic initiatives have increasingly emphasized the need to accelerate defense production. Following strikes on Iranian nuclear facilities in 2025, the Reindustrialize 2025 Summit, and a July 2025 memo from the Deputy Secretary of Defense, focus and concern over defense capacity has received more attention. Through Executive Order 14265, the U.S. government has launched a coordinated effort to accelerate production and reinvigorate the DIB (Stewart, 2025). This Executive Order established a policy to direct the acquisition workforce to prioritize speed over cost optimization, accept greater risk, and adopt a wartime mindset (Stewart, 2025). Congress has reinforced the urgency through the FY2026 National Defense Authorization Act (NDAA) and

bills supporting investment into munitions, missile defense, and shipbuilding capacity (Stewart, 2025). Combined, these efforts signal a commitment to rebuilding the U.S. DIB to address output chokepoints and ensure defense forces can meet operational needs.

A 2025 RAND report conducted by Laufer et al. confirmed that strengthening the DIB requires coordinated actions across funding, procurement, and international partnerships. The report identifies that the U.S. government should prioritize sufficient funding for DIB reform and expansion, sustain multiyear procurement contracts for critical weapons assets, and protect the skilled defense workforce by avoiding stop-work orders during government shutdowns while continuing to fund mission-critical contracts during continuing resolutions (Laufer et al., 2025). Further, the DoD should monitor the effects of capital investments, prioritize ease of production in weapons design, designate production-critical expendables for dedicated funding, and track Europe's DIB investments to inform transatlantic coordination (Laufer et al., 2025). Recommendations for the Department of the Air Force include stacking munitions requirements by conflict phase, determining projected expenditure needs for large-scale conflicts through 2030, and engaging with Ukraine to identify joint innovation and production opportunities (Laufer et al., 2025). In aggregate, these recommendations emphasize the need for strategic investment and deeper allied cooperation to ensure the U.S. and its partners can meet the production demands of future conflicts (Laufer et al., 2025). These findings reinforce the importance of coordinated, system-wide approaches to improving industrial responsiveness and scalability.

Similarly, a 2025 report from the Boston Consulting Group and the Munich Security Conference found that the defense industry continues to struggle with an innovation readiness gap between ambition and the ability to field new capabilities (Giesener et al., 2026). Framing this study around munitions production, the report highlighted that 65% of defense industry respondents identified innovation as a key priority, but only 26% believed their organization was innovating at a sufficient pace (Giesener et. al., 2026). Study respondents identified fragmented and opaque supply chains, stop-and-start demand signals, and misaligned incentives as barriers to munitions production and scaling defense innovation (Giesener et al., 2026). The report findings further solidify the need for a sustainable model for government and industry to execute at the speed and scale needed. Together, these insights further highlight that improving production output requires not only increased capacity, but also better alignment, coordination, and adaptability across the defense supply chain.

Current State of Supply Chain Within the DIB

Competition within the DIB is essential because it improves cost, schedule, and performance outcomes while incentivizing innovation and best-value solutions during procurement and contract execution (DoD, 2022b). A competitive environment also signals sufficient industrial capability and capacity to meet defense needs, while insufficient competition can lead to higher costs, reduced innovation, barriers to new entrants, and increased supply risk (English, 2022). Since the 1990s, the defense sector has undergone significant consolidation, shrinking from 51 prime contractors to five and leaving the DoD increasingly dependent on a small number of firms for critical capabilities (DoD, 2022b). This trend is evident across major defense systems, where the supplier base has narrowed substantially, increasing reliance on a limited number of firms for critical capabilities (DoD, 2022b). Consequently, promoting fair, open, and robust competition remains a top priority for enabling and sustaining the DIB.

As previously noted, when consolidation increases at the sub-tier supplier level and reduces the number of available producers, proactive and continuous collaboration becomes critical to support defense production acceleration. As more consolidation and cannibalization of efforts occur within merged organizations, the once competitive supply base is reduced to a

single-sole source, which makes managing capacity needs and shortages more difficult. English (2022) emphasizes that sustained engagement is necessary to maintain visibility into supply-chain risks as they propagate upward. In this way, sustained collaboration becomes a critical mechanism for improving supply chain agility by enhancing visibility, coordination, and responsiveness across the network.

Del Campo et al. (2022) analyze supply chain vulnerabilities and resilience in the A&D industry, with implications that can extend to concerns about production acceleration. Their work identifies factors that constrain rapid production scaling, which include global supply chain disruptions, regulatory barriers, and technology transitions that affect manufacturing readiness and throughput. Key findings from their research highlight the value of digital tools and data analytics in improving demand forecasting, enhancing supplier visibility, and mitigating risks to support faster production ramp-up (Del Campo et al., 2022). The authors emphasize the importance of integrating life cycle forecasting with multi-tier and sub-tier supplier networks and strengthening collaboration across the supply base to enable responsive and sustained munitions production. However, the applicability of their findings is limited by the small number of case studies, the focus on legacy systems, and ongoing constraints on collaboration and data sharing caused by organizational privacy rules and fragmented information systems (Del Campo et al., 2022).

Without transparent, open dialogue across the supply base, the DoD and the DIB cannot anticipate critical constraints or implement timely risk mitigation strategies, resulting in increased risk to production output and to alignment with critical milestones and delivery schedules (English, 2022). Further, a study conducted by Ullrich (2021) provided quantitative evidence that single-source supply chains, sub-tier supplier fragility, and demand uncertainty are problems within the DIB.

Academic Models of Collaborative Supply Chains

Modern defense supply chains are characterized by interdependent relationships, multi-tier procurement networks, and competing stakeholder priorities. Collaborative frameworks can bridge organizational and institutional boundaries to drive meaningful improvements in production output. Addressing critical part shortages and broader supply chain capacity constraints requires moving beyond macro-level strategy toward more collaborative, integrated, and practitioner-informed operational models.

Emerging conceptual models grounded in the direct experiences of defense and aerospace procurement practitioners offer promising approaches to operationalizing cross-functional coordination and supply chain optimization. Two such models, the Integrated Obsolescence Management (IOM) and Defense Supply Chain Collaboration (DSCC) models, were developed through empirical research with defense supply chain professionals. These models provide particularly relevant frameworks for understanding how integrated collaboration and stakeholder engagement can be structured to address the systemic bottlenecks and capacity limitations that continue to constrain munitions production and broader defense industrial output.

The IOM model is a conceptual model developed from the analysis of the lived experiences of 40 procurement and supply chain practitioners interviewed in a study on A&D (Griffiths, 2025). The IOM model approach integrates seven components of obsolescence: cross-functional collaboration, centralized data and systems, intellectual property, training, education and awareness, dedicated obsolescence funding, supply chain visibility, and industry visibility (Griffiths, 2025). This type of integrated model can be applied to the problem of critical parts shortages to enable a more collaborative environment and focused effort across the supply chain to support improved output.

Another study examined the complexity of defense supply chains (DSCs) and highlighted the need for collaboration among the many stakeholders involved to improve performance outcomes (Loska et al., 2024). The authors identify that the nature of the DSC is interdependence, which relies on public-private alliances and shared resources to support demands (Loska et al., 2024). The key variables that influence the DSCC model include: strategic leadership, resources, capabilities, financial coordination, and institutional constraints. The goal is to achieve DSCC across governments (the United States, the United Kingdom, and Australia), industry, and international partners, enabling strategic flexibility while addressing vulnerabilities. The DSCC model offers a collaborative relationship that can also be applied to support the DIB goal of critical parts acceleration by fostering better alignment across the supply chain to provide a more focused effort on improved throughput.

These models offer promising frameworks for structuring cross-functional collaboration and coordination to address the systemic bottlenecks constraining defense production and capacity.

Summary of Literature

To summarize, the review analyzed past strategies used to accelerate DIB during national emergencies, with key areas of focus including World War II, the Defense Production Act (DPA), and the post-COVID-19 period. Taken together, the findings of this review underscore the enduring importance of coordinated government-industry partnerships, flexible legislative frameworks, and sustained investment in maintaining and expanding defense production capacity in an increasingly complex and contested security environment.

Despite the breadth of historical and policy-oriented scholarship regarding the DIB, a significant gap remains regarding the practical and operational dimensions of scaling the supply chain in response to urgent national security demands. Existing research has largely focused on macro-level policy frameworks, legislative mechanisms, and historical case studies, while limited attention has been given to the integrated, operational, and practitioner-informed dimensions of supply chain scaling in real-time production environments. This includes discussion of real-time issues, stakeholder engagement, and specific bottlenecks and inefficiencies that have contributed to the current production shortfalls.

Furthermore, while elements of these challenges have been explored, the literature has not fully integrated tactical and longer-term approaches into a cohesive framework for resolving these urgent production challenges in a scalable way. In addition, there is a notable lack of research that captures the lived experiences of defense industry practitioners engaged in day-to-day production, procurement, and supply chain management. These insights are essential to developing actionable and implementable solutions.

The gap between theoretical and policy-level analysis and practitioner-level understanding represents a critical blind spot that limits industry leaders' ability to make fully informed decisions on how to effectively and rapidly expand defense production capacity in an increasingly volatile global security environment.

This research will differ from previous studies in that the objective will be to bridge the gap between theoretical and policy-level perspectives and how practitioners in the DIB experience and address these challenges in practice.

Research Question

After identification of a gap in the literature on supply chain acceleration and improving output, the following research question is identified for this study: What supply chain factors

most effectively enable production acceleration and source-to-scale responsiveness within the DIB?

Research Method: Qualitative Study

The researchers identified gaps and uncertainties regarding how DIB practitioners perceive the challenge of improving production output. To address the lack of data, the researchers determined that guided questions and discussions with a sample of experienced practitioners could uncover important nuances and enhance the validity and relevance of this research. A qualitative approach is appropriate for this study because it enables the exploration of lived experiences and complex operational dynamics that are not easily captured through quantitative measures.

Sample

The researchers recruited 14 practitioners through purposeful selection from their own network and snowballing to interview for the qualitative study. Approximately 20 practitioners were contacted to secure the 14 study participants. The individuals identified had direct experience in the DIB, with varied experience within procurement, supply chain, and engineering. Participants' years of experience ranged from 2 to 41, with a median of 25. Appendix A Qualitative Sample Characteristics provides details on the interviewees' roles, years of experience, education, certification(s), and day-to-day tasks.

Data Collection and Analysis

Participants were asked five questions, which are noted in Appendix B to support the research question, "What supply chain factors most effectively enable production acceleration and source-to-scale responsiveness within the DIB?" The researchers conducted the interviews via Zoom and documented the interviewees' responses to each question.

The study employed ATLAS.ti as the primary computer-assisted qualitative data analysis tool for examining the collected data (ATLAS.ti, 2023). Prior to analysis, each interview transcript was reviewed to verify accuracy, then imported into ATLAS.ti to begin the open coding phase. Through this methodology, key concepts, themes, and patterns were identified. Codes were iteratively reviewed and grouped into higher-level thematic categories to identify recurring patterns and relationships across participant responses.

The researchers coded responses to each question into 226 codes, capturing the breadth of practitioner perspectives on the challenges and opportunities associated with increasing production output in the DIB.

Results

The initial 226 codes were sorted into six recurring themes: Regulatory and Compliance, Communication and Data Gaps, Workforce Erosion, Qualification Cost and Time, Industrial Base Contraction, and Sole Source Dependency. Figure 1 summarizes the themes and their aggregated response counts from the interview sessions.

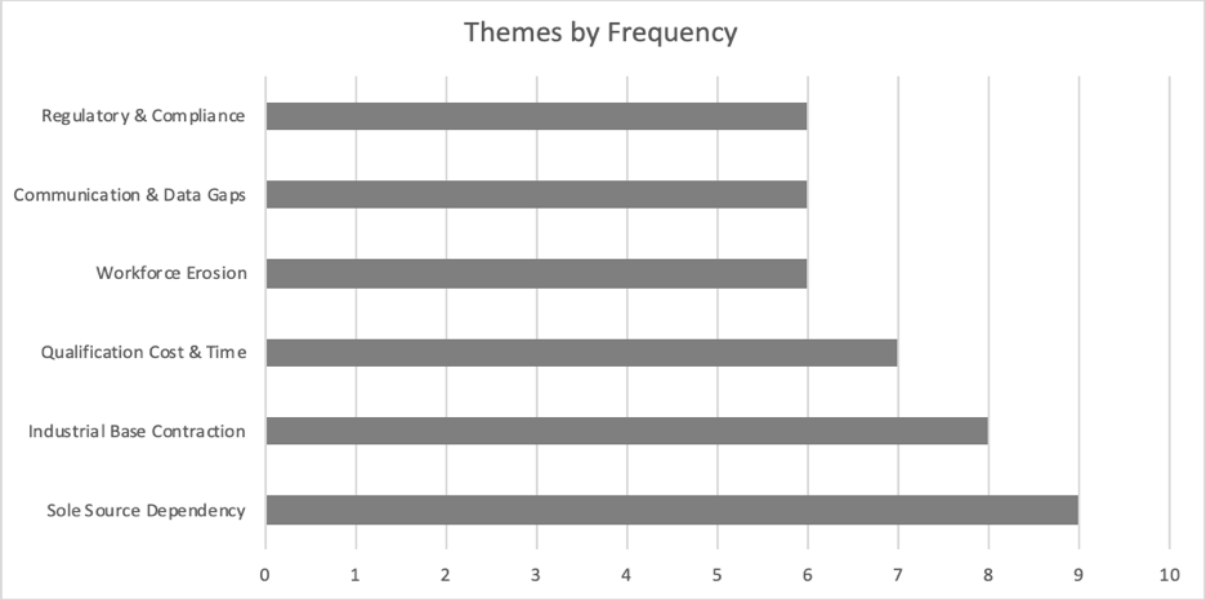

Figure 1. Recurring Themes

The themes of sole-source dependency and industrial base contraction emerged as predominant challenges for the practitioners interviewed in the context of managing production surge initiatives. Notably, these two themes co-occurred across seven interviews, representing the highest co-occurrence frequency observed in this study. Multiple participants attributed the current state of sole-source dependency to the consolidation of defense-related enterprises over several decades, resulting in a reduced supplier base capable of supporting complex defense system requirements. Consistent with this finding, nearly all participants characterized single-supplier exposure as a compounding risk to both cost management and operational readiness.

Qualification costs and time were similarly identified as structural bottlenecks to production acceleration across the practitioner sample. Concurrently, regulatory and compliance requirements emerged as a distinct yet related inhibitor to production surge efforts. Participants specifically cited MIL-standards, safety requirements, and regulatory controls as the primary drivers of extended qualification timelines. The co-occurrence of qualification and regulatory themes across five interviews underscores the interdependence of these two constructs in the defense industrial context.

Communication and data gaps were another key theme that emerged from participant interviews. Practitioners engaged in internal and external stakeholder coordination for production acceleration efforts reported challenges, including inaccurate or absent demand forecasts, organizational silos, and ambiguity surrounding critical decision points. The co-occurrence of communication and data gaps with sole source dependency across five interviews further illustrates how forecast opacity constrains the ability to develop and sustain relationships with prospective suppliers.

Finally, workforce erosion was identified as a cross-cutting concern, characterized by the attrition of manufacturing engineering expertise as experienced practitioners retire and newer entrants enter the field without the foundational knowledge required to support the scale of production surge demanded by the current defense environment.

Of analytical note, workforce erosion and communication and data gaps co-occurred in only three interviews. This limited overlap suggests that practitioners may perceive these as

functionally independent challenges and warrants further investigation to determine whether distinct intervention strategies are required to address each domain.

Figure 2 summarizes the top co-occurring themes of this study and occurrence or number of interviewees that identified both themes.

#	Theme 1	Theme 2	Occurrence
1	Sole Source Dependency	Industrial Base Contraction	7
2	Qualification Cost & Time	Regulatory & Compliance	5
3	Sole Source Dependency	Communication & Data Gaps	5
4	Workforce Erosion	Communication & Data Gaps	3

Figure 2. Theme Co-Occurrences

Summary of the Results and Themes

The themes identified in the responses suggest that the DIB problem is not merely one of insufficient capacity, but of deeper friction across the enterprise and its supplier network. The barriers that surfaced suggest that organizational misalignment and weak communication across the business, industrial base constraints, and compliance and safety requirements point to a system that struggles to translate demand into coordinated production outcomes. This interpretation aligns with DIB research emphasizing structural fragility, constrained supplier depth, and risks to responsiveness under stress (DoD, 2022b). It also aligns with case-based work showing that surge conditions introduce substantial complexity into defense supply chains (Antai & Hellberg, 2025) and with research showing how disruption can expose industrial-base vulnerability across defense production networks (Hensel, 2021).

Viewed through an agility lens, these themes describe more than a throughput problem. Barratt and Eagle (2017) argue that supply chain agility is the ability to respond to demand and its variations through deliberately designed and appropriately sized buffers such as time, capacity, and inventory. From that perspective, the DIB challenge is not simply that more output is needed, but that the enterprise and supplier network are often not structured to adapt, coordinate, and scale effectively in response to changing demand conditions. That point is reinforced by research showing that defense supply chain responsiveness depends heavily on collaboration and coordination across the network (Loska et al., 2024). It is also supported by case-based evidence showing that performance constraints in defense industry supply chains emerge from structural and operational limitations across the wider system, not just from insufficient production volume at the top level (Hellberg et al., 2025).

A useful historical illustration is the period of World War II industrial mobilization. WWII should not be treated as a model to be copied directly, but it does provide an example of a period in which national demand, production priorities, and industrial conversion were aligned at an unusual speed and scale (Waddell, 1994). Research on wartime production and political allocation further shows that the United States built an industrial system capable of rapidly expanding output to support war needs (Rhode et al., 2018). At the same time, materials-planning mechanisms such as the Controlled Materials Plan demonstrate how scarce inputs were directed and coordinated to support mobilization across sectors (Rockoff, 1996). More recent scholarship also suggests that wartime industrial investment had lasting developmental effects, indicating that mobilization was not only large in scale but also structurally consequential (Garin & Rothbaum, 2025; Jaworski, 2017).

This is why “source to scale” should not collapse into a simple call to increase capacity. When firms and suppliers lack agility, scaling becomes a brute-force expansion exercise that does not address the underlying problems of alignment, signal clarity, supplier readiness, and constrained production pathways. A more serious solution is to improve industrial base agility through clearer stakeholder alignment across the enterprise and stronger collaboration across the defense supply network (Loska et al., 2024), stronger and more centralized demand signals tied to surge planning and industrial readiness (Army Science Board, 2023), investment in lower-tier supplier capability and resilience to support production under stress (Army Science Board, 2023), and modernization of proven legacy production pathways so they can support current output requirements without abandoning safety and reliability (Del Campo et al., 2022). In that framing, capacity still matters, but capacity becomes effective only when it is embedded in a more agile industrial system (Barratt & Eagle, 2017).

Original Contribution to Knowledge and Advancement

This qualitative study of accelerating production in the defense industry offers an original contribution by examining the operational and practitioner-level dimensions of defense production acceleration. The small study group provided practitioner-level insight into these gaps, particularly regarding the need for greater investment, visibility, and capability development in lower-tier suppliers. By identifying key themes and challenges faced by defense industry practitioners, this research offers a more nuanced and operationally grounded understanding of the implications of production acceleration, extending beyond what industry participants typically address.

Original Contribution to Practitioner and Scholarly Literature

This research holds value for both academics examining defense supply chains and defense industry practitioners involved in planning, sourcing, production, and industrial base strategy. For practitioners, the findings reinforce that production shortfalls should not be interpreted solely as capacity problems, since misalignment across the enterprise, weak demand signaling, supplier fragility, and constrained modernization pathways can all undermine the ability to move effectively from source to scale. For scholars, the study opens the way to extend DIB research beyond descriptive accounts of shortages or bottlenecks toward a more integrated framework of industrial base agility. In that sense, agility research offers a useful bridge between practical industrial concerns and academic analysis, providing a way to examine how coordination, responsiveness, and lower-tier resilience shape defense production outcomes under real-world constraints (Antai & Hellberg, 2025; Barratt & Eagle, 2017; Loska et al., 2024; Ullrich, 2021).

Limitation of Study

This study offers valuable insights into increasing capacity and output in the defense industry. The initial study group contained 14 participants, which may limit the generalizability of the findings, and the study participants were primarily from larger, established corporations. Practitioners from medium and small organizations may offer different perspectives on the issue, from a bottom-up approach rather than the presented top-down viewpoint. The data collected in this study is qualitative, meaning it is more subjective and could be influenced by individual biases or recall inaccuracies. These limitations highlight the need for further research with a larger, more diverse sample and additional data-collection methods to strengthen the results.

Future Research Potential

Future research could build on this study by incorporating quantitative data to complement the qualitative insights to provide a more comprehensive understanding of the implications of defense production acceleration. Additional studies could also examine perspectives from government, small and medium-sized businesses, and international organizations to develop a more holistic view of the challenges faced when scaling manufacturing and increasing output in support of the defense industry. Further, integrating Artificial Intelligence and data-driven predictive analytics could be investigated to enhance production planning, capacity analysis, and supply chain optimization. Finally, these findings could be tested across different industries and geographies to evaluate broader applications of production acceleration efforts.

Conclusion

This study provided valuable insights into the challenge of defense production acceleration. The findings highlight that the issue is not simply one of increasing production capacity, but one of addressing deeper friction across the DIB, including organizational misalignment, industrial base constraints, and compliance and safety requirements. By connecting these practitioner-informed themes with research on agility, this study helps bridge the gap between existing literature on defense production acceleration and the lived experiences of those working within the system. In doing so, it offers a more complete understanding of why “source to scale” cannot be reduced to a narrow capacity discussion alone. These findings will inform the next phase of the research, which will further investigate these challenges with a larger sample of practitioners. Ultimately, this research aims to provide practical recommendations for improving industrial base agility through better alignment, stronger demand signaling, lower-tier supplier investment, and modernization of proven production pathways to support critical warfighter needs.

APPENDIX A

Qualitative Sample Characteristic

Number of Interviewees	14
Representing Companies	4
Range of Experience	2 - 41 years
Median Experience	25 years

Level of Practitioner Experience	
Level of Role	# of interviewees
Directors	8
Fellows	2
Managers	3
Analysts	1

Education / Cert	
Type	# of Interviewees
OTJ Training / Certs	6
Six Sigma / Lean	6
PM Cert	3
SC Cert	4
Leadership Cert	1
Business / Finance Degree	2
STEM Degree	6

Day-to-Day Activities / Work Focus	
Type of Activities	# of Interviewees
Reviewing Demand and Lead Time Data and Signals	4
Reviewing Industry and Technology Data	2
Developing New Suppliers	6
Assessing Existing Supplier Capabilities and Constraints	7
Assessing Current Program Cost, Schedule, Risks, and Other Constraints	2
Developing Strategy to Support Surge Effort	2
Developing Internal Requirements Process	1
Working with Cross-Functional Teammates	5
Managing Day-to-Day Quality and SCM	1
Engineering Development and Design	1

APPENDIX B

Interview Protocol

Part A Questions:

1. What is your current role and function?
2. How many years have you worked within the Aerospace and Defense (A&D) industry?
3. Do you have any education or certification related to your role? If so, which ones?
4. What day-to-day tactical activities are you working on in support of supply chain optimization and capacity growth initiatives?

Part B Questions:

1. How long have you been aware of the need to increase capacity and throughput within the A&D industrial base and the problems in this focused effort?
2. Describe the current state of the need for supply chain optimization and capacity growth initiatives as it relates to the A&D environment (why is this important?), key issues, and areas of focus.
3. What are the key functions/stakeholders (internal and external to your organization) that are involved when working to resolve a critical supply chain shortage?
4. What are the issues and bottlenecks that you identify that result in supply chain shortages and the need for escalations?
5. From your perspective, what solutions or approaches should be considered tactically and longer-term on how to address and resolve this urgent need?

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