



DoD Supply Chain Challenges

Why We Are Where We Are and What To Do About It.



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Preface

At the time this White Paper was written, there were 81 Cargo Ships backlogged in Southern California's two cargo ports. Roughly, 40% of the United States import market comes through these ports. One of these cargo ships can hold up to 6200 containers and take ten days to download. Although the ports have become 24 hours/7 days a week operation, the US trucking and rail industry have yet to catch up on internal distribution throughout the United States. In conjunction with a requirement for all DoD Contract Carriers to be vaccinated by 8 November, this distribution issues makes the supply chain crisis apparent.

The current situation did not develop overnight. Rather, it is a result of the confluence of Globalization, Capitalistic Markets and COVID 19. Its effect on DoD's Supply Chain's position can be understood as a threat to US National Security. This paper helps describe how the Defense Industrial Base got to this point and also makes recommendations to reform some of the practices, policy and behavior found in the Defense Industrial Base as well as the US Government.

1.0 The Confluence of Globalization, Capitalism and COVID 19 on the DoD Supply Chain

Globalization has been occurring for a long time. The Industrial and Management Ages of the 60's and 80's resulted in outsourcing and offshoring. The book The Nature of the Firm, written by Economist Ronald Coase, focuses on the creation of the Firm as an Organization. He argues that the size of a firm (as measured by how many contractual relations are "internal" to the firm and how many "external") is a result of finding an optimal balance between the competing tendencies of the costs. In general, increasing the size of the firm will initially be advantageous, but the decreasing returns will eventually prevent the firm from growing indefinitely. Simply put, once a "Firm" has been established, there is a need to determine what should remain within the boundaries of the firm and what should be contracted out/outsourced based on cost.

Oliver E. Williamson can be described as the father of Transitional Cost Economics Theory, which identifies the cost of creating boundaries. This theory primarily focuses on the economic costs associated with not doing something within the organization or the cost to bifurcate within the organization by creating boundaries that have hidden costs. These costs help create price points in competition and are often found in capitalism. Conversely, these costs can even be the heart of the problem.

Capitalism can and often does lead to a lack of transparency between competitors within industry as well as between the government and industry as a whole. It took Maersk three weeks to divulge to the US Government that they had received a cyber-attack. In some instances, this caused a delay in the download of critical fuel overseas for US Forces. Likewise, the Colonial Pipeline Ransomware incident created a significant threat for critical fuel supply to the Atlantic Fleet. At the time of the incident, US Civilian Pipeline companies only had around 8% visibility of what their peer companies were transporting through pipelines. The Defense Industrial Base characterizes this lack of visibility as competition, intellectual property, value propositions and "secret sauce." A lack of transparency nurtures a culture that values the stockholder's wants and needs above National Security priorities.

The Opposite of Capitalism is often found in offshore competition to US Industry. It is typically a State-Owned Enterprise (SOE) that runs commercial activities to generate money for the government through local labor laws, tax exemptions and resourcing. The most pressing issue concerning SOEs is that they are often a third or fourth-tier supplier/sub to a US company that is unaware of the SOE's involvement. Some companies are conscious of an SOE's participation, yet it continues to outsource certain business activities because it understands that it is cheaper (Transactional Cost Economics) and makes the company more competitive within its market.

While the true effect of container cargo backlog has yet to be determined, it is widely accepted that it negatively impacts the US Supply Chain. When orders do not arrive on time, duplicate orders are placed creating a Bullwhip Effect in the Supply Chain.

COVID 19 caused what one might name the “Perfect Storm” for the DoD Supply Chain. In 2018, there was increased focus on readiness by Secretary of Defense Mattis. He directed the Air Force and Navy to raise mission capable rates for four key tactical aircraft up over 80% by the end of September 2019. The year prior, the Air Force focused on the readiness of the Nuclear Enterprise. The Army was focusing on preparing to fight on the Korean Peninsula and preposition consumable inventories along with a desire for an increase in Supply Availability.

At the time, the Defense Logistics Agency (DLA) made record investments in consumable repair parts for all three services. This totaled a few billion dollars in Obligation/Contract Authority over a three-year period. The lead time for most of these repair parts were between 12 to 24 months because of the obsolescence of the weapons system and the incompatibility with the commercial repair parts market. Obligation Authority is only the permission to create a contract and promise to pay when it arrives on the shelf in a DoD Warehouse. There has been a move to create Indefinite Delivery / Indefinite Quantity (IDIQ) Contracts where the DoD Supplier would need to take the risk of inventory while being measured with a Time to Delivery (TTD) metric. These work well with sole source suppliers who can depend on them being the only source of supply. The “perfect storm” that was COVID 19 took off as this surge in readiness requirement of supply started to arrive onto DoD Shelves and the Working Capital Funds began to pay for their delivery. COVID hit and OPTEMPO, along with its retail sales, hit rock bottom. This increased inventory levels and depleted the Working Capital Funds. Draconian methods were taken to reduce inventory levels while increasing cash in the Working Capital Funds, including cancelling and reducing purchase orders which negatively impacted business plans of DoD suppliers.

There were some innovative acquisition actions taken regarding COVID for the purchase of PPE, Test Kits, and other medical device procurement. For example, Other Transaction Authority (OTA), a legal binding instrument was used to engage industry and academia for a broad range of research and prototyping activities. Also, the Defense Production Act (DPA) developed during the Cold War was used in response to COVID to crack down on hoarding, limit exports of medical goods and increase production of critical supplies

Another long-lasting effect of COVID is the vaccine mandate. This mandate was the subject of discussion at both the National Defense Transportation Association Annual Conference and the Professional Services Council Annual Conferences Oct 2021. The 8 November Mandate for COVID Vaccinations is reshaping the DoD Civilian Commercial workforce. In particular, the US Transportation Industry has lower than average population vaccination rates. The Class A licensed US long haul drivers was estimated to be as low as 30%.

2.0 DoD's share of the US Market

Reality of DoD influence in US Domestic Markets depends on the commodity. There are over six million total National Inventory Item Numbers (NIINs), consisting of two million active NIINs and roughly 380K extremely active NIINs. Below is a table that describes the range of participation by DoD Supply Chains in the US Domestic Markets.

DoD Supply Chain	% of US Domestic Market
Subsistence	Less than 5% <i>Note 1</i>
Medical	Between 5-10% <i>Note 2</i>
Construction & Non-Program of Record Equipment	Less than 5%
Clothing and Textile	98% <i>Note 3</i>
Fuel	~ 6% <i>Note 4</i>
Repair Parts	90% <i>Note 5</i>

Figure 1

Note 1. DoD buys more Fresh Fruits and Vegetables for the USDA School Lunch Program than for DoD Dining Facilities across the DoD.

Note 2. Some specialty DoD Medical supply chain items are specifically for DoD uniformed personnel for Combat. These would represent 100% of that demand, but most dollars spent in this space is commercial medical supplies from prime vendors with a customer direct delivery.

Note 3. The Barry Amendment restricts DoD from using funds appropriated or otherwise available to DoD for procurement of clothing, fabrics and fibers not produced in the United State. This makes the US Textile Industry dependent on DoD dollars and orders. No other Federal Department that purchases uniforms has this restriction, e.g., TSA, CBP, DHS, USFS and USDA.

Note 4. Some specialty fuel represents 100% of the market like Jet Propellant Thermally Stable Fuel (JPTS) for the U2 and Jet Propellant 5 (JP5) for Aircraft Carrier Aviation.

Note 5. The most challenging supply chain. Competes with DoD OEMs that are in active production of a Weapon System and requires long lead times, solid forecasting, and inventory on-hand.

Not all Supply Chains require the same frugality, elasticity or flexibility in their Supply and Demand. This diversity would lead one to believe that when it comes to National Defense, one commodity may be more important than others. However, a specific crisis, whether its manmade or naturally occurring, can bring any DoD Supply Chain to the forefront for National Security. Each DoD Supply Chain is vital to National Security when there is a need. Examples include a Colonial Pipeline Ransomware Attack that risked fuel supply to the Atlantic Fleet, the sudden oncome of COVID 19 that required PPE and medical supplies for the DoD and Federal Government, and a response to Hurricane Maria that required DoD to provide telephone poles, generators, fuel, and food to Puerto Rico. All were important to National Security in that time of need.

3.0 Executive Order 13806 of July 12, 2017 Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States

This Executive Order was directed by the previous administration and required coordination with the Secretaries of Commerce, Labor, Energy, and Homeland Security in consultation with the Secretaries of the Interior and Health and Human Services; the Director of the Office of Management and Budget; the Director of National Intelligence; the Assistant to the President for National Security Affairs; the Assistant to the President for Economic Policy; the Director of the Office of Trade and Manufacturing Policy; the heads of other agencies (such as the Secretary of Defense) when deemed appropriate, to provide the President with a report that identifies the military and civilian materiel, raw materials, and other goods that are essential to national security.

The report required the identification of manufacturing capabilities essential to producing the goods for emerging capabilities, intelligence, homeland, economic, natural, geopolitical, or other contingencies that may disrupt, strain, compromise, or eliminate the supply chains. The report was required to include problems that result from the elimination of, or failure to develop domestic supply chains that are sufficiently likely to arise to require reasonable preparation for their occurrence. The report also required an assessment of resiliency and capacity of the manufacturing and defense industrial base and supply chains of the United States to support national security needs. It also directed inclusion of an assessment of manufacturing capacity of the United States and the physical plant capacity of the defense industrial base, including their ability to modernize to meet future needs. Also, to be included were gaps in national-security-related domestic manufacturing capabilities, such as non-existent, extinct, threatened, and single-point-of-failure capabilities; supply chains with single points of failure or limited resiliency (especially at suppliers third tier and lower); energy consumption; and opportunities to increase resiliency through better energy management

In its full text, this Executive Order identified current or potential vulnerabilities in the Domestic US Supply Chains that warrant attention. Similar to the present Administration's Executive Order, the alarm bells were rung over four years ago. Although much progress has been made, there is still much left to be done. The hurdles faced by both the government and US Companies are a result of the nature of a free market and the competitiveness of the commercial marketplace. The report from EO 13806 is in the subsequent section of this white paper.

4.0 Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States Report directed under Executive Order 13806

In September 2018, a 146-page under Executive Order (EO) 13806 on Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States was published. The report identified that America’s manufacturing and defense industrial base (“the industrial base”) supports economic prosperity and global competitiveness and arms the military with capabilities to defend the nation.

It also reported that the industrial base faces an unprecedented set of challenges, such as: sequestration and uncertainty of government spending; the decline of critical markets and suppliers; unintended consequences of US Government acquisition behavior; aggressive industrial policies of competitor nations; and the loss of vital skills in the domestic workforce. Combined, these challenges – or macro forces – erode the capabilities of the manufacturing and defense industrial base and threaten the Department of Defense’s ability to be ready for the “fight tonight,” and to retool for great power competition. The report explained the macro forces impacting the industrial base, identified primary categories of risk, illustrated impacts within sectors, and provided recommendations for mitigation. These Five Macro Forces driving risk into the US Industrial Base included:

- Sequestration and Uncertainty of US Government Spending
- Decline of US Manufacturing Capabilities and Capacity
- Deleterious US Government business and Procurement Practices
- Industrial Policies of Competitor Nations
- Diminishing US STEM and Trade Skills

The new recommendations by the Secretaries of the Defense, Energy and Labor in this report Included:

- Create an industrial policy in support of national security efforts
- Expand direct investment in the lower tier of the industrial base
- Diversify away from complete dependency on sources of supply in politically unstable countries
- Work with allies and partners on joint industrial base challenges
- Modernize the organic industrial base to ensure its readiness
- Accelerate workforce development to grow domestic STEM & critical trade skills
- Reduce the personnel security clearance backlog
- Further enhance efforts exploring next generation technology for future threats

- Submit legislative proposals for FY2020 to establish an Industrial Base Analysis and Sustainment program to address manufacturing and industrial base risk within the energy and nuclear sectors.
- Work with the Departments of Defense, Education, and Commerce to determine critical manufacturing and defense industrial base
- Work with States to reduce occupational licensing barriers preventing qualified workers from quickly and efficiently meeting needs in other regions, thereby aiding geographic movement of individuals possessing critical skills to areas in need of human capital for production and maintenance (e.g., shipyards, depots, and production plants)

This Assessment was risk based on both Traditional and Cross-Cutting Sectors. As one can surmise, the Five Macro Forces Driving Risk into the US Industrial Base continue to exist today. The new recommendations have resulted in some traction but overcoming economic reasoning to a free-market environment where capitalism drives behavior seems to continue to be the biggest challenge.

5.0 Executive Order 14017 of February 24, 2021 America's Supply Chains

The Assistant to the President for National Security Affairs (APNSA) and the Assistant to the President for Economic Policy (APEP) in coordination with the Secretaries of Commerce, Energy, Defense, Transportation, Agriculture and HHS were required to submit a 100-day assessment. Sectoral Supply Chain assessments from Secretaries specific to their Departments is due within one year of the issuance of the Executive Order.

The assessments by Sector will include:

- The manufacturing or other needed capacities of the United States
- Gaps in domestic manufacturing capabilities, including nonexistent, extinct, threatened, or single-point-of-failure capabilities
- Supply chains with a single point of failure, single or dual suppliers, or limited resilience, especially for subcontractors, as defined by section 44.101 of title 48, Code of Federal Regulations (Federal Acquisition Regulation)
- The location of key manufacturing and production assets, with any significant risks identified in this section posed by the assets' physical location
- Exclusive or dominant supply of critical goods and materials and other essential goods and materials, by or through nations that are, or are likely to become, unfriendly or unstable

- The availability of substitutes or alternative sources for critical goods and materials and other essential goods and materials
- Current domestic education and manufacturing workforce skills for the relevant sector and identified gaps, opportunities, and potential best practices in meeting the future workforce needs for the relevant sector
- The need for research and development capacity to sustain leadership in the development of critical goods and materials and other essential goods and materials
- The role of transportation systems in supporting existing supply chains and risks associated with those transportation systems
- The risks posed by climate change to the availability, production, or transportation of critical goods and materials and other essential goods and materials

This Executive Order, unlike the one in 2017, includes a wider swath of government assessment and includes climate change risk. The 100 Day Review has been published but the real work will be in the report due by each sector a year later. It will be interesting to see how the sectors intertwine. Right now, DoD/DLA purchases more supplies for the whole of government than the Army and Marine Corps combined.

6.0 Building Resilient Supply Chains, Revitalizing American Manufacturing and Fostering Broad-Based Growth, 100-Day Review Report directed under Executive Order 14017

In June 2021 the White House Published a 250-page Report, 100-Day Review under Executive Order 14017 which included reviews by the Departments of Commerce, Energy Defense and Health and Human Services. The executive summary was signed by Jake Sullivan, Assistant to the President for National Security Affairs and Brian Deese, Assistant to the President for Economic Policy and Director of the National Economic Council.

The report assesses supply chain vulnerabilities across four key products: semiconductor manufacturing and advanced packaging; large capacity batteries, like those for electric vehicles; critical minerals and materials; and pharmaceuticals and advanced pharmaceutical ingredients (APIs). These product reports are the work of a task force that was convened across more than a dozen Departments and Agencies, consultations with hundreds of stakeholders, public comments submitted by industry and experts, and deep analytic research by experts from across the government.

Departments and Agencies have already begun to implement the reports' recommendations. These include steps to strengthen U.S. manufacturing capacity for critical goods, to recruit and train workers to make critical products here at home, to invest in research and development that will reduce supply chain vulnerabilities, and to work with America's allies and partners to strengthen collective supply chain resilience. Both the public and private sector

play critical roles in strengthening supply chains, and the Administration will continue to work with industry, labor, and others to make America's supply chains stronger.

The 100-Day Review Report makes clear that more secure and resilient supply chains are essential to our national security, our economic security, and US technological leadership. The work of strengthening America's critical supply chains will require sustained focus and investment. Building manufacturing capacity, increasing job quality and worker readiness, inventing, and commercializing new products, and strengthening relations with America's allies and partners will not be done overnight.

The 100-Day Review Report defines why resilient supply chains matter as well as describing a new approach. It asserts that the US private sector and public policy approach to domestic production prioritizes efficiency and low cost over security, sustainability and resilience and has resulted in supply chain risk as pointed out earlier in this white paper. It reveals that this approach to strengthen domestic supply chains will be attacked sector by sector since there are different vulnerabilities and risk by sector. The reports due a year from issuance of the Executive Order are hopefully reflected in next year's federal budget.

Both Executive Orders associated with Supply Chain directions reflects the challenges of the day. The 2017 EO included considerations for Sequestration and Uncertainty of US Government Spending while 2021 EO included climate change.

7.0 Supply Chain Risk Management (SCRM)

Supply chain risk management (SCRM) is the process of taking strategic steps to identify, assess and mitigate the risk in end-to-end supply chains. A comprehensive approach to SCRM involves the management of all types of risk, for all tiers of supply and for all risk objects (suppliers, locations, ports and more).

There are dozens of defense contractors that offer a Supply Chain Risk Management Tool for DoD Services and Agencies to purchase and use. The more failures seen in supply chain operations, the more SCRM tools are produced to illuminate them.

The GAO Report published in December 2020 which identified that Federal Agencies need to take urgent action to manage supply chain risk found that few of the 23 civilian Chief Financial Officers Act agencies had implemented seven selected foundational practices for managing information and communications technology (ICT) supply chain risks. They describe supply chain risk management (SCRM) as the process of identifying, assessing, and mitigating the risks associated with the global and distributed nature of ICT product and service supply chains. Many of the manufacturing inputs for these ICT products and services originate from a variety of sources throughout the world.

The US Air Force has a Program Manager and program known as the Mission Assurance Decision Support System (MADSS). They report that this program provides a common picture to all levels of command/operations through correlation of information from numerous

authoritative data sources as well as user inputs. It's a web-based application accessible via SIPRNet with primary and COOP systems hosted by DISA.

There are many risks associated with Supply Chain Operations and DoD Organizations that need to measure this risk that are sometimes not aligned. One organization can be fixated on cyber risk while another is focused on the economic fragility of a supplier that is a sole source. Others can be concerned about the physical distribution and nodes from the factory to the user. Once many of the SCRM tools are dissected, they too are focused on only a few attributes of risk, usually those that are more easily measured. Due to this hyper fixation issue, it is very difficult to find an end all SCRM tool that measures all risk. Similar to this most recent Executive Order, the Supply Chain Risk was parsed out for study by Department and sector.

The biggest supply chain risk may be the effects of capitalism itself which nurture competitiveness. DoD drives Lowest Price Technically Acceptable (LPTA) and Firm Fixed Price (FFP) acquisition strategies which do not consider the value of protecting the supply chain rather than a "Best Value" strategy which could take supply chain operations into consideration. It would be more beneficial long-term for DoD to take a Diplomatic, Information, Military and Economic (DIME) approach to supply chain operations instead of a capitalistic, low-cost approach. DoD prioritizes cost over value, resulting in supply chains being outsourced overseas in cheaper labor markets.

8.0 What we can we do to maintain a reliable DoD Supply Chain

The single most important factor to both business and the health of any DoD Supply Chain is maintaining a continuous flow in the supply chain. Starting, then stopping, then starting again effects the defense industry supply chain base both for suppliers of goods and weapon system manufacturers. For example, when industry signs on for an Indefinite Delivery Indefinite Quantity (IDIQ) contract to provide repair parts, their company designs a business plan around that contract including revenue over the life of the contract. The company takes the risk of having inventory on-hand based on projected delivery orders against that contract. When the demand forecast changes and orders stop, production lines halt production of that item. This item will be replaced with another because of the costs of keeping the workforce and facilities productive. When more repair parts are needed after halting orders for six months, it takes time to restart production of that line. Often this results in the user of the repair part ordering more than required based on the lack of trust in the supply chain to deliver.

This is considered the "Bullwhip Effect" and is defined as the demand distortion that travels upstream in the supply chain from the retailer through the wholesaler and manufacturer due to the variance of orders which may be larger than that of sales. The method which DoD uses to reduce this effect will need to be balanced against risk associated with increased DoD inventory. During constrained Operations and Maintenance (O&M) budgets and unhealthy Service and Defense Working Capital Funds, there needs to be some resolution in how supply

chains in DoD are funded and operated. Acquisition Strategies also need to be examined, especially regarding how DoD approaches sole source and obsolescence. DoD might reach a point where specific NIINs are considered a risk to the National Defense Strategy with a code. At this point, Acquisition Professionals would be directed to use different acquisition strategies instead of being forced down a road that is dictated otherwise. Many Acquisition Professionals will report that this ability already exists, but experience shows more of a “one size fits all” regarding policy when dealing with the 40K Contracting Officers in the DoD.

Key to illumination is seeing yourself, the enemy and the environment, a total end to end view. Once that is achieved, you must have the right metrics to understand vulnerability, risk and decision making. Metrics are required to illuminate the supply chain and all its components which include second, third and fourth tier suppliers and the distribution network used to deliver the supply. Some will argue that illumination takes away a company’s competitive advantage or value proposition, while others will state that “I don’t know where that comes from” – it just arrives because it’s Free on Board (FOB) destination where the supplier maintains title of the material until it arrives at destination. **DoD Industry Suppliers must be required to see themselves, end to end in their own supply chain in support of the DoD.** This requirement should be written in DoD Contracts and become inspectable by the DoD. The cost of this should be included in the price of the contract

This illumination needs to include product distribution problems to solve.

- Locations of production.
 - Where is the product being produced?
 - Is the production facility offshore with foreign influence?
 - Is the production facility located in a place that is frequently exposed to natural disasters: Floods, Hurricanes, Forest Fires, Tsunami, etc.?
 - Is the production facility located in a place subject to economic conditions that would find the workforce moving to higher paying jobs?
 - Is the production facility location prone to labor disruptions?
- Locations of distribution points of origin
 - Are the distribution points offshore with foreign influence?
 - Are the distribution points located in a place that is frequently exposed to natural disasters: Floods, Hurricanes, Forest Fires, Tsunami, etc.?
 - Are the distribution points located in places subject to economic conditions would find the workforce move to higher paying jobs?
 - Are the distribution points prone to labor disruptions?
- Location of Storage and characteristics that represent risk
 - Are the storage locations offshore with foreign influence?

- Are the storage locations located in a place that is frequently exposed to natural disasters: Floods, Hurricanes, Forest Fires, Tsunami, etc.?
- Are the storage locations located in places subject to economic conditions that would find the workforce move to higher paying jobs?
- Are the distribution points prone to labor disruptions?
- Economic health and labor conditions of those locations of the Supply Chain
 - What percent of the workforce is retirement eligible?
 - What is the average annual turn-over of the workforce?
 - What are the perishable skills in the workforce that requires time to develop?
 - What is the unemployment rate of the local economy?

The solutions below can be applied once the supply chain is illuminated to both the specific commercial enterprise executing business and DoD.

- Pursue Multiple Manufacturers and expand consumable sources
- Seek to consolidate manufacturing locations
- Pursue innovative contracting strategies that grow the DIB and invite commercial competition
- Create multiple distribution routes with multiple carriers
- Challenge boundaries that become barriers to the supply chain
- Identify the risks described above and rehearse the actions which the commercial enterprise will execute as well as DoD's actions that will be executed when required to minimize the effects on the DoD Supply Chain.

Artificial Intelligence (AI) and Additive Manufacturing (AM) in the DoD Supply Chain

Artificial Intelligence is a constellation of many different technologies working together to enable machines to sense, comprehend, act, and learn with human-like levels of intelligence. If Artificial Intelligence could be used to improve demand forecasting by just 10%, weapons system platform data, projected OPEMPO by environment and historical data by each specific weapon system, could be used to: increase forecasting accuracy; decrease DoD Inventories; and keep the Service and Defense Working Capital Funds flush with cash.

Additive Manufacturing is a transformative approach to industrial production that enables the creation of lighter, stronger parts and systems. As its name implies, additive manufacturing adds material to create an object. If Additive Manufacturing could be used at the point of need for just 10% of the DoD Supply Chain or if there was an AM capability in every Maintenance Depot, Flight Line Maintenance Back Shop, Shipyard, and the Division Rear there could be significant improvements in supply chain management. Most likely, it would result in the reduction of inventories a combat unit would need to carry forward, as well as reducing the

material going forward in the ground or air lines of communication. This would make the logistics tail shorter and more effective.

9.0 Conclusion

President Dwight D. Eisenhower ended his presidential term by warning the nation about the increasing power of the military-industrial complex. The remarks on 17 January 1961 were given during his televised farewell address to the American people. President Dwight D. Eisenhower was also behind establishing the Industrial College of the Armed Forces (ICAF) on Fort McNair in Washington DC. One wonders what his remarks would include today as it pertains to the fragility of the DoD Supply Chain and National Security. Two recent US Presidents have found it important enough to issue Executive Orders on the subject.

The Confluence of Globalization and Capitalism was and is ripe for US National Supply Chain Interruption and Crisis when unplanned natural or manmade disasters occur in global locations of the DoD Supply Chain. **The continuous flow of DoD Supply Chains is paramount to the health of the Supply Chain.**

The end-to-end Illumination of the Supply Chain is key for both industry and the DoD that depends on the health of the DoD Supply Chain. A commercial enterprise supporting DoD should not use the excuses of competition, competitive advantage, or Intellectual Property Rights as a reason for being blind in seeing themselves. DoD should demand this illumination and access to it.

Once Illumination of end-to-end DoD Supply Chain is achieved, innovative solutions in acquisition and contingency plans should be developed in partnership between DoD and Industry to address risks of DoD Supply Chain interruptions causing National Security Risk.

Innovation in everyday activities through the use of **Artificial Intelligence** and **Additive Manufacturing** in the near to midterm horizon is paramount to be able to better predict demand forecasts and to create and produce material closer to the point of need. This will shorten the logistics tail, reduce inventory and transportation need while allowing Working Capital Funds to remain healthy and effective.

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