

## **Erosion of the Defense Industrial Base**

There are many events and factors that led to the fragility of the defense industrial base. When the Cold War ended, the U.S. no longer felt it needed to have massive inventories of weapons, as there was no ‘peer’ competitor that had the matching inventory or technology to prevail in a conflict against us. Therefore, there was no longer a need to have a defense industrial base that was as large either. This led then Secretary of Defense Les Aspin to convene a meeting of the major defense contractors in 1993, in what would eventually become known as ‘the Last Supper,’ to explain that they needed to consolidate because demand would be decreasing and there wouldn’t be enough business to sustain them all. The Defense Industrial Base (DIB) went from 51 to 5 prime contractors as a result, and many thousands of sub-tier suppliers were also eliminated from the DIB.

Fast forward to 2020, and suddenly COVID raised awareness of the fragility of supply chains for both commercial and Department of Defense (DoD) systems. Some countries were completely shut down and shipping was severely delayed even when there was supply. Americans couldn’t get cars due to the microelectronics shortage, and this also delayed deliveries of some DoD systems. In 2022, the Ukraine conflict emphasized this fragility, as Russian (titanium) and Ukrainian (titanium, gallium, and 90% of the U.S. chip industry’s neon) sources of supply for key items for DoD systems were no longer available.

But this fragility didn’t happen overnight. Numerous decisions by U.S. industry and government played a very large role. For instance, decades-long private sector and public policy approaches to domestic production prioritized low, short-term costs over security, sustainability, and resilience – the industrial base has become optimized for efficiency, not resiliency. Just in time deliveries vs. inventories of long lead time components cut warehousing costs and increased efficiency, but limits industry’s flexibility and responsiveness. The DIB has many single and sole source suppliers – often foreign adversarial (e.g. China) sources – that are cheaper, but that can introduce risk.

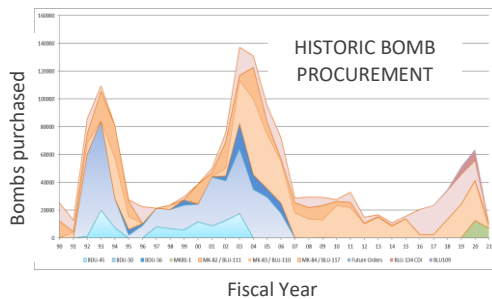
The U.S. is a free-market society and industry is profit driven. They will seek out the least costly sources of materials and components, even when it may create a risk to national security. DoD takes a hands-off approach – contracting with the top-level prime integrator for most systems, and letting industry choose who their sub-tier suppliers are. And in fact, DoD acquisition often incentivizes adversarial sourcing behavior, as given two technically equal proposals, DoD will most often choose the one with the lower cost. Therefore, industry won’t risk losing out on a contract award by using a non-adversarial, less risky source of supply.

As a result, critical capabilities have been driven off-shore, and global supply chains, although when strategically developed with partners and allies may be beneficial, have introduced risks. Examples include: rare earths elements, where the U.S. was the world-leader until the 1980s, and now China controls 85% of global refining capacity; critical chemicals, where China is the sole source for most of the chemicals needed to produce DoD weapons systems; and semiconductors, where US production has fallen from almost 40 percent to just over 10 percent over the last forty years.

Exacerbating this issue is foreign ownership and control of U.S. businesses. The Committee on Foreign Investment in the United States (CFIUS) process reviews transactions where a foreign company or government attempts to purchase a U.S. company. Nine U.S. government agencies review each transaction to determine if it is beneficial or detrimental to the U.S. However, each agency conducts their review through a different lens. DoD looks at whether the transaction will affect national security, but the Department of Commerce may look at how many U.S. jobs the transaction may create for instance. Ultimately, the DoD's argument of national security issues may lose out to other agencies' interests, resulting in, worst case – the loss of a supplier and capability, because in many of these cases China is only interested in the intellectual property, so they take it and then shut the company down, and best case – a China-owned company that has now become a much more risky supplier from a national security perspective.

### The Role of Acquisition in Industrial Base Health and Resilience

Acquisition or procurement decisions play a key role in the health and resilience of the DIB; however, the effect on the DIB is rarely considered when these decisions are made. For instance, DoD does not send industry a steady procurement demand signal. It purchases in a cyclical, or feast and famine, manner that can provide cost benefits for large lot buys, but that is counter-productive to a healthy and resilient industrial base (see figure below). At the prime contractor level, a large drop in the procurement level for one system is not a major issue, as most companies have multiple large systems they are producing simultaneously, so decreases in one system can be offset by other systems. But at lower levels in the supply chain, this can have detrimental effects, as there are many companies who only produce parts for one or two systems. When procurement levels drop for those systems, those companies may not be able to survive. Even a one- or two-year procurement drop may lead to the loss of a supplier.



A similar situation exists for large increases in procurement. DoD typically has knowledge of production capacity only at the prime integrator level and bases its procurement decisions on that knowledge. However, just because the prime integrator has capacity, doesn't mean all their sub-tier suppliers do. Unfortunately, when these decisions to increase or decrease procurement levels are made, there is no analysis performed to consider what the effect on the industrial base may be or whether the DIB can support the decisions being made. Procurement levels should be smoothed out as much as possible, even if it means the cost benefits of large lot buys are not obtained. Additionally, industrial base health should be one of the criteria used to make acquisition decisions, along with cost, schedule, and performance. An analogous issue occurs during wargaming because there is no component of these exercises that considers whether the

DIB can support the scenarios being considered. Just as with the acquisition decisions, it's assumed the DIB will just be there when DoD needs it to produce whatever it requires.

In addition, munitions accounts are fungible and often used as 'bill payers' by both DoD and Congress, with the 'plan' to make up buys in the out-years, which almost never happens. These are conscious decisions – jointly made by the Department and the Congress, in the face of competing priorities, but with little to no analysis performed to understand the effects on the DIB, which are usually detrimental. The use of multi-year procurements solves many of these issues. It provides industry with the steady demand signal it needs to have the confidence to invest in increased capacity (to include some surge), modernization, and innovation – at the prime and sub-tier supplier levels. At a minimum though, munitions accounts should not be used as bill payers – especially when inventories are at required levels.

Even when new acquisition programs are undergoing milestone reviews as the program progresses from development to production, there are documents (Acquisition Strategy, Lifecycle Sustainment Plan) that contain what is supposed to be analysis to show the industrial base can support the program. DoD typically relies on the prime contractor to conduct this analysis, as DoD divested of industrial base/supply chain analysts in their program offices long ago. The prime contractors usually perform the analysis of just the first few tiers of the supply chain because they lack visibility below that level. However, most of the supply chain constraints and vulnerabilities lie at those lower tiers, so the analysis is far from complete, and major new systems are fielded without a true understanding if the DIB can support production.

### **The Ability to Surge Production in Response to a Crisis**

Russia's invasion of Ukraine has brought into sharp focus the importance of being able to surge production rapidly, as well as the challenges in doing so. DoD lacks flexibility and surge capability in the industrial base for many systems it procures, which affects readiness and mobilization. Over time, DoD and the industrial base have prioritized efficiency over resiliency; production lines have gone cold, parts have become obsolete, and sub-tier suppliers have consolidated or gone out of business entirely – industry right-sizes itself to DoD demand. DoD has the DIB it pays for. Industry is reluctant to build additional capacity at risk until they have a clear, consistent demand signal or business case from DoD. Industry needs to see some degree of confidence that if they invest, there's a good chance they will get something for their investment – and that is sustained production.

Also, DoD does not pay industry to maintain surge capacity. Without that, industry will not run and maintain production lines or keep trained workforce. When the next conflict or stress to the industrial base occurs, DoD pays to re-constitute lost capability. In times of crisis (e.g., Ukraine conflict), DoD attempts to surge quickly to meet requirements, but faces many constraints:

- Insufficient capacity (DoD does not pay industry to maintain surge capacity)
- Insufficient workforce (workforce shortages across the DIB)
- Obsolescence (DoD systems fielded for long periods without technology refreshes)
- Long lead time items (just in time deliveries; no stockpiles)
- Shared sub-tier suppliers (consolidated DIB means systems compete for same suppliers)

Realizing increased capacity can take months or even years, and the deliveries at the increased capacity can come years afterwards due to production lead times. There needs to be a recognition that complex production lines can't be turned on or off based on the requirements of the day.

Increased production rates of some of the weapons (but not deliveries of most yet) donated to Ukraine and Israel to help replenish U.S. inventories are just now being realized, nearly three years after the conflict began, and some haven't even begun. And this is at a time when the Foreign Military Sales backlog for Taiwan is also large. If the 2027 timeline for a potential China-Taiwan conflict is to be believed, we are already too late to start ramping production for systems needed to support that fight. And many of those weapons are different from the ones that DoD has been supplying to Ukraine, which has been engaged in mostly a ground-based conflict using artillery and ground launched missiles. An IndoPacific conflict will not be ground-based and will require more air- and ship-launched munitions, most of which the U.S. is not currently ramping production for. Inventories of many of those munitions are already below requirements – some having been used in the Israel-Hamas conflict, so even without a China-Taiwan conflict, it would be wise to maximize procurement of those systems at a minimum and increase production capacity if there is no excess currently.

Industry should also be using advanced manufacturing techniques that are more efficient and cost effective, enabling faster production within the same or less capacity and with the same or fewer people. This would help surge production as well. DoD does fund some of these efforts through programs such as ManTech, Industrial Base Analysis and Sustainment, and Defense Production Act Title III, but industry needs to self-fund these efforts as well, and there seems to be a reluctance on their part to do this even with large reported profits at the prime contractor level. Suppliers at lower levels in the supply chain find it more difficult to do so because they operate at lower profit margins due to cost pressure from the primes. This is unfortunate because it is at these levels where the most benefit would be realized from modernized manufacturing and innovation. It is not understood by this author why the primes wouldn't want their sub-tier suppliers to be more efficient and cost-effective, thereby making the primes more profitable, but it seems that if this requires the primes to allow the sub-tier suppliers to make more profit, it is not something they support.

DoD should also be maximizing the use of Modular Open Systems Architecture (MOSA) and Digital Engineering (DE), as it provides a multitude of benefits, one of which is with surging production. When surging weapons production for Ukraine, obsolescence became one of the biggest constraints. It is why DoD couldn't make any new Stinger missiles and why they couldn't ramp production of the Patriot missile for instance. Many obsolescence issues are with microelectronic components, which undergo technology advancements every 2-5 years, while DoD systems stay fielded for 15-30 years. This is completely out of phase. And without MOSA/DE, those systems are not easily upgradeable. To replace an obsolete part requires a redesign of the component the part goes into, and then testing and requalification of the system, which is costly and time consuming. MOSA/DE allows systems to be easily upgraded – enabling obsolete parts to be replaced and even new technology to be inserted that provides better capability.

However, until all existing systems that aren't designed with MOSA/DE are out of circulation, DoD needs a better way to address obsolescence issues. DoD treats this issue reactively - waiting until there is an end-of-life notice issued and then scrambling to figure out if they want to do a lifetime buy or a technology refresh, neither of which have been budgeted for - and that's if there's time. Instead, they should be proactive and plan and budget for periodic technology refreshes that would allow them to replace outdated parts and even put in newer technology. Program managers say they can't afford it, but they are already paying for it, they are just paying more by having to address it reactively instead of proactively.

### **Lack of Supply Chain Visibility**

A large part of why it is difficult for DoD and industry to surge production is their lack of visibility into their supply chains. This has been a chronic issue for the DoD, as it has shifted responsibility for supply chain and production management to industry. However, as DoD has found out the hard way, industry also does not have visibility into its supply chains past a couple of tiers. Unfortunately, most of the issues in the supply chain, and certainly the constraints when attempting to surge, occur at lower tiers, where there is little visibility.

This has spawned an entire industry of supply chain "illumination" companies that promise to "map" a program's entire supply chain and provide risk analysis of those suppliers. However, these companies mostly rely on publicly available data – news articles, LinkedIn posts, government contracting and financial data, etc. – and then use AI / ML to digest these inputs to find or establish relationships between suppliers and programs. For example: if a news article states that Company X won a contract for Program Y, the software links Company X as a supplier to Program Y.

But none of the information derived from this method comes directly from the suppliers themselves, and none is directly verified or validated. Primes on any contract depend on their sub-tier suppliers (subs) for information about the supply chains the subs use. But for the subs, that information is sometimes fiercely guarded and considered proprietary; it's the 'secret sauce' that makes them competitive, and they don't want to share that information for fear that either it won't be protected or may be misused. This had made illumination big business, with supply chain companies competing to portray themselves as the panacea that can solve DoD's supply chain risk management problems.

The Department pays – inefficiently as each successive program pays over again to start the analysis from scratch. Consider that the Navy paid Govini \$400 million "to deliver data, analysis and insights into DoD spending, supply chain and acquisition using a database it continues to compile." The results, e.g., U.S. defense systems are highly reliant on Chinese sub-tier suppliers, were deeply concerning, although not surprising to anyone who has any knowledge of DoD supply chains and yet, still DoD lacks a comprehensive picture. There is no one to cross-reference all the data, and no one tracking cases where companies supply multiple programs. This becomes critically important when there is an obsolescence issue or when DoD wants to surge production.

The biggest issue with all these methods, government or commercial, is they seek to reverse engineer the problem – trying to put together the supply chains after they’re already built instead of as they’re being built. It would be much easier to capture supply chain data while systems are being developed and fielded. The Service program offices, the prime contractors, and OSD should build complete supply chain maps during this phase, with accurate information that doesn’t have to be pieced together after the fact with assumptions and unverified, unvalidated information. And this data should be available so all programs can access it and so there is no duplication of effort and cost. Deputy Secretary Hicks was attempting to start a data repository for the information that does exist by storing it in the Advana tool, but that program has recently been paused and is being recompleted.

In place of a repository – in which proprietary data can either be shared inappropriately, or worse, infiltrated by adversarial cyber threats – DoD should adopt a system that uses blockchain technology where only data owners possess and can grant access to that data. With owners deciding who has access and for how long, DoD can conduct the supply chain analysis it needs (for instance, on programs that share suppliers), while dramatically reducing the risk of enemies using it to find vulnerabilities.

## **Industrial Policy**

The U.S. is not typically in favor of utilizing industrial policy, although many of our adversaries are. Not having an industrial policy may be acceptable as long as there is a level playing field. But as we know, this is not, and has not been the case. Many countries – especially our adversaries, and specifically China – do not play by the same rules. They provide subsidies to their industries, and many are state-owned. They encourage over-production, which leads to dumping/flooding the market, which drive prices down, which then drives out the competition, who cannot be cost-competitive. This captures market share and allows them to monopolize markets. They weaponize this advantage – as China has recently with export controls on critical minerals – gallium, germanium, graphite, and antimony that are used ubiquitously in national defense, critical infrastructure, and commercial applications.

China has also used this to great effect to capture and dominate markets such as rare earths and lithium for EV batteries and is now attempting to do so for semiconductors. The CHIPS Act and the export controls the Department of Commerce has put in place for manufacturing equipment for advanced semiconductors are examples of where industrial policy is necessary and has slowed China down, but we will not be able to stop them. They are currently concentrating on legacy or trailing edge chips which dominate critical industries such as automotive, aircraft, appliances, cell phones, medical equipment, critical infrastructure, and DoD weapons systems, until such time as they can catch up on leading edge.

The Defense Production Act is also a good example of where the U.S. uses industrial policy effectively – making investments in critical sectors when industry can’t make the investment themselves due to market economics.

However, the investment programs only solve the supply side of the problem. To be successful in truly reducing reliance on China, the U.S. must also solve the demand issue. There

is a reason the demand went off-shore in the first place – usually cost – so in order to sustain the capability once the investment is made, the U.S. has to figure out how to bring the demand back. One way would be to make U.S. sources cost competitive. This is usually difficult, as U.S. labor rates are higher, China subsidizes its industry, and in the case of critical minerals there may be high environmental costs to build capability. In addition to grants, the government can offer low-cost loans, tax incentives, workforce training credits, and other aid. It can also encourage private investment through public-private partnerships. But all of these may not be enough since China has been known to produce at a loss just to capture and maintain market share.

This is where legislation banning adversarial sourcing and/or requiring U.S. sourcing can be helpful. However, Congress should be careful that the legislation is actually producing the intended outcome. For instance, often legislation on non-Chinese or U.S. sourcing is only levied on DoD. For instance, by January 1, 2027, DoD is prohibited from acquiring certain magnets made from critical minerals mined in China, North Korea, Iran, and Russia. However, DoD only uses ~1% of the total critical minerals consumed by the U.S., so this prohibition will have very little effect on increasing the demand for U.S. critical minerals and magnets. The prohibition, at a minimum, should be in effect for all government agencies, and even expanded to include any industry that receives federal funding. This would have a significant effect on increasing the demand for U.S. suppliers, helping to sustain the capability invested in.

Another classic example of legislation that does not achieve its intended purpose is the Buy American Act. The question that needs to be asked is “what is this legislation really trying to achieve?” Is the goal to increase the U.S. domestic economy and economic growth, and therefore economic security? Is the goal to increase national security by reducing reliance on foreign sourcing – even if it’s allied/partner suppliers? Right now, you can get away with having 65% of your system supplied from America but having all of your most sensitive components come from China. Is that what we’re really trying to achieve? It needs to be restructured to focus on what’s important. For DoD, it is important for the U.S. to have the capability to produce its own weapons and platforms. However, the U.S. has never had and will never have a completely domestic industrial base. It can’t and it shouldn’t. The U.S. believes that for certain key critical capabilities, it is necessary for there to be domestic supply, but that is not the case for everything, and in fact there are many situations where this is not the case.

First, there are many instances where the U.S. DoD’s demand, while large compared to some other countries, is still not enough to sustain even a single supplier for some capabilities. A perfect example is chemicals production for munitions. Not for things like TNT, where DoD is using millions of pounds per year, but things like curing agents for solid rocket motors for missiles, where the total demand may be tens or hundreds of pounds per year. Most chemical manufacturers in the U.S. cannot make a business case to produce such small quantities, so it’s helpful if DoD can find a supplier in an allied or partner nation that is producing for multiple customers, so the total quantities make that business sustainable. In other instances, there may be better technologies in partner and allied nations that would provide the U.S. with better capabilities for its warfighters, so shouldn’t DoD take advantage of that? It may also be advantageous from a logistics perspective to have suppliers and production capability near/in theater. Additionally, when scaling up production, it is helpful when DoD finds constraints in

the supply chain to turn to partners and allies to see if they have excess capacity to help mitigate those constraints.

So, instead of blanket percentages, Buy American should focus on key strategic sectors that are more important for the U.S. to have those capabilities and less on those things that are not as strategic and can be purchased from allies and partners. Executive Order 14017 identified key sectors where the U.S. should focus reshoring efforts – Kinetic capabilities (missiles, etc), Microelectronics, Critical Materials, Energy Storage and Batteries, and Castings and Forgings. This can help guide legislation. In some instances, Congress does attempt to do this – for instance for Printed Circuit Boards (PCBs) – Congress has attempted to pass legislation in various NDAs that sets a certain percentage of PCBs in DoD systems that must be made in the U.S. However, the capacity to produce PCBs in the U.S. is not sufficient to meet those requirements, and Congress does not appropriate funding to develop additional capacity, so this is not helpful.

Equally frustrating and unhelpful, Congress many times only levies these requirements on DoD, when DoD is often a very small percentage of the market – for instance in microelectronics and rare earth elements/critical minerals. If they are serious about Buy American, Congress should insist that other agencies are held to the same requirements as the DoD, so the combined strength of all government can work to achieve the goal. Again – this goes back to the question – “what is this trying to accomplish?” In addition, it’s too easy to get a waiver by claiming there is no capability in the U.S. to produce the item(s). If that is the case (and it frequently is), there should be two courses of action, 1) they should have to use a non-adversarial source (similar to legislation passed in Section 244 of the FY2024 NDAA for certain critical chemicals), and/or 2) it should spur investment to develop and qualify a U.S. source and Congress should help appropriate funding to do that. Otherwise, there is no incentive to stop using the adversarial source, and therefore no way to help increase the demand for U.S. sourcing.

## **Industrial Base Investments**

The Office of the Secretary of Defense has two investment programs that address industrial base issues by providing grants to develop, maintain, and expand capacity, modernize capability, and scale emerging technologies – the Industrial Base Analysis and Sustainment (IBAS) and Defense Production Act (DPA) Title III programs. DPA Title III, in particular, has been used to great effect over the past couple of years to address the effects of COVID-19, to implement parts of the Inflation Reduction Act, and to execute Ukraine Supplemental Funding to increase production capacity, as well as funding efforts to on-shore capability to produce rare earths, critical minerals, and chemicals for munitions to reduce our reliance on Chinese sourcing. IBAS has also made investments in rare earths and critical minerals, as well as castings and forgings – another sector China has taken market share and capability away from the U.S., and has made significant investments in workforce development – a shortfall in nearly every industrial base sector and a major constraint when surging production needed to support Taiwan. Both programs are investing in technologies needed to support the production of hypersonic missiles, a capability that will definitely be necessary in an IndoPacific conflict, and where the U.S. is woefully behind in production compared to China and Russia.



These programs are truly the only ones that can address these cross-cutting industrial base issues. And so additional funding for these programs would increase the health and resilience of the DIB, allowing it to be a deterrent to China and other adversaries. Currently China knows the U.S. is struggling to supply both Ukraine and Israel with munitions and keep its own inventories healthy. These events are helping to inform their strategy, so the U.S. must do everything it can to repair the health and resiliency of our DIB.

### **National Defense Industrial Strategy**

This year, the DoD published the National Defense Industrial Strategy (NDIS) and the follow-on implementation plan. It calls for the DoD to do numerous things to improve the health and resiliency of the DIB. However, DoD cannot do this alone – it must be a multi-agency effort. For instance, the Commerce Department can help with supply chain surveys, export controls, and other trade remedies (along with the U.S. Trade Representative). The State Department can help negotiate data sharing agreements with partners and allies that help mitigate some of our supply chain shortfalls. The Treasury Department can help by leading the CFIUS process that limits foreign investment controls and ensuring that national security is the factor that is highest in importance when reviewing transactions. The Education and Labor Departments can help with workforce development and labor regulations. All of these things must come together with the common goal of improving the DIB. It remains to be seen if these sometimes-competing forces can rally around this call to action and take the steps necessary to rescue our industrial base in time.

[Note: Recommendations have been underlined in the text]