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Back to the Future?

Second Sourcing in Defense Acquisitions

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EXECUTIVE SUMMARY

U.S. efforts to support the war in Ukraine have magnified the importance of supply chain resilience in the defense sector, revitalizing discussions about second sourcing as a tool to strengthen the U.S. defense industrial base. In a government acquisition context, the term "second sourcing" describes the practice of using at least two different suppliers to provide goods and services that are comparable or identical in form and/or function. It is often undertaken when sourcing from a single supplier is no longer a sustainable procurement strategy due to rising demand, rising costs, poor supplier performance, or other external market conditions.

This white paper focuses on the past and future impacts of second sourcing as a practice in U.S. defense acquisition. It examines the feasibility of renewing this method in a procurement environment in which the government remains excessively dependent on single- and sole-source suppliers for major sub-systems and components.

The white paper presents a cohesive definition and potential rationale for second sourcing, placing it in the context of current supply chain issues and threats to the U.S. defense industrial base. After providing a brief summary of other sourcing methodologies used in the defense commercial sectors, the paper then provides a basic overview of the history of second sourcing, followed by a summary of different types of second sourcing—dual-award arrangements, leader-follower arrangements, competitive subcontracting, and company-funded second sourcing. Finally, the white paper analyzes current roadblocks and makes recommendations for modern-day second sourcing strategies.

Second sourcing can strengthen supply chains, cut costs, and improve the quality of items procured, but today it is often turned to in a reactive rather than proactive fashion. In this research, we identify several appreciable barriers to the successful implementation of second sourcing acquisition methods in a modern-day context:

- The costs of establishing new sources of supply tend to deter defense professionals and policymakers from second sourcing, despite potential long-term cost savings.
- Extensive qualification, testing, and requalification costs also deter defense professionals from second sourcing.
- Size and stability of procurements have a major effect on the success of second sourcing. Uncertain demand and small quantity orders lead to situations in which the time and money required to establish and qualify new sources of supply do not outweigh long-term benefits, leading to potential waste.
- Difficulties associated with the transfer of defense technologies and manufacturing know-how have stymied past second sourcing efforts and still pose obstacles today.
- It is difficult to craft a targeted second sourcing strategy where many supply chain weaknesses exist and only so many qualified suppliers are available.

Despite these challenges, second sourcing can still be an effective approach to building resilience in the U.S. defense industrial base. We have identified the following best practices for the implementation of second sourcing today:

- Prioritize agility and resilience over immediate cost savings.
- Create better financial incentive structures for second sourcing.
- Devise better methods for prioritizing where to second source.
- Expand the use of open system architectures in defense programs.
- Secure necessary data rights and establish second sourcing precedents as early as possible.
- Move away from the leader-follower method of second sourcing.
- Consider international defense supply chains, including the capacities of both allies and competitors.

Second sourcing is undoubtedly not a one-size-fits all solution. Rather, as this paper's recommendations reflect, it ought to be accompanied by a willingness to endorse real structural changes in legacy DoD thinking and procurement styles in order to reap great benefits for the gov-

ernment as well as for industry. Defense contractors, increasingly paying for their own necessary second sourcing efforts, cannot be expected to take the lead on kick-starting the major institutional shifts in thinking necessary to do acquisitions better and do second sourcing right.

Garnering financial support for second sourcing in a resource-constrained environment is difficult and entails substantial commitment. However, to avoid further lack of readiness as tragically illustrated by the war in Ukraine and the COVID-19 pandemic, policymakers and defense professionals should take it seriously for various reasons. Cost savings could ultimately provide a valuable added benefit of second sourcing in more defense programs, but as emphasis on supply chain resiliency has grown, so should the fundamental drive behind second sourcing reflect this need to have diverse suppliers who can produce and provide during moments of great need.

INTRODUCTION

The term "second sourcing" typically describes the practice of using two different sources of supply for goods and services that are comparable or identical in form and/or function. Second sourcing has been used for acquisitions of two distinct categories of products supporting the U.S. warfighter, both of which will be discussed in this white paper:

- Major sub-systems: i.e., engines, missiles, etc.
- Components: i.e., rocket motors, propellants, long-lead parts

Decisions to second source are made for one or a combination of reasons, including: to cut costs by introducing competition, to patch supply chain shortcomings, to motivate an original sole-source manufacturer to improve its performance, to increase production capacity, or to produce a higher quality or updated version of a good or service.

RATIONALE FOR SECOND SOURCING

Recent events prompting global supply chain disruptions have magnified the importance of supply chain resilience in the defense sector, revitalizing discussions about second sourcing as a tool to strengthen the U.S. defense industrial base.

In particular, the war in Ukraine has exposed weaknesses in the U.S. defense industrial base linked to critical points of failure.

- Manufacturing shortages, parts obsolescence, and delays have made it more difficult for the United States to help Ukraine replenish lost supplies and weapons as it fends off Russian aggression.
- Ammunition shortages paint a particularly concerning picture. For example, the United States has sent GPS-guided Excalibur artillery shells at a rate of 1,000 per month to Ukraine, but the Ukrainian monthly expenditure rate is the shell's current annual production rate.[1]
- Highly dependent on U.S. aid, Ukraine is running low on important supplies, especially munitions, but the United States faces difficulties meeting many of its own defense needs. With 98 percent of second- and third-tier suppliers in its munitions industrial base being single- or sole-source, it is challenging for the United States to accelerate ammunition production.[2]

Before the war in Ukraine emphasized readiness and sourcing issues as they pertain to weapons systems, the COVID-19 pandemic had already exposed and exacerbated preexisting supply vulnerabilities for various industries worldwide. Supply chain disruptions manifested in global shortages, delays, company failures, and loss of life.

According to 2021 analyses by the World Bank and International Monetary Fund, the pandemic disrupted 51 percent of organizations' supply chains for 3–6 months, and another 17 percent of organizations required 6–12 months for their supply chains to recover. At least 60 percent of these organizations chose to adapt their business models in response to the pandemic.[3] To foster greater business resilience, many companies established plans to invest in diversifying their supplier bases.[4]

In its response to the pandemic, the U.S. government also moved to mitigate disruptions in the delivery of critical products. Facing a crisis of depleting stockpiles and limited suppliers which heightened the national security threat of the pandemic, the government established COVID-19 task forces. A prime objective of these task forces was to onshore production of critical prod-

1. Mark F. Cancian, "Rebuilding U.S. Inventories: Six Critical Systems." Center for Strategic and International Studies, January 9, 2023, https://www.csis.org/analysis/rebuilding-us-inventories-six-critical-systems.

2. OSD A&S Industrial Policy, *Fiscal Year 2020 Industrial Capabilities Report to Congress*. U.S. Department of Defense, January 2021, https://media.defense.gov/2021/jan/14/2002565311/-1/-1/0/fy20-industrial-capabilities-report.pdf.

3. Alexandre West, "Resilience during Prolonged Acute Crisis: Control the Supply Chain." *Bdaily Business News*, February 23, 2021, https://bdaily.co.uk/articles/2021/02/22/resilience-during-prolonged-acute-crisis-control-the-supply-chain.

4. A. B. Brown, "Gartner: 77% of Companies Invest in Deeper Supplier Relationships for Resilience," *Supply Chain Dive*, February 18, 2021, https://www.supplychaindive.com/news/supplier-relationship-resilience-agility-mapping-gartner/595187/.

ucts to ensure sources of supply within national borders.[5] When the pandemic brought risk management to the forefront of supply chain strategy, both the commercial and government sectors turned to multi-sourcing to build resilience and continue production at suitable rates.

As individual firms cannot always be counted on to meet production demands during a national security crisis, sole-source dependencies could become an Achilles' heel to the U.S. warfighter in future conflict. The United States would be impeded in any major military engagement, particularly in the Indo-Pacific, by substantial supply chain vulnerabilities.

Many vital needs for U.S. defense programs hinge on single-suppliers of key components and subcomponents—for instance, only Aerojet Rocketdyne can provide the rocket motor for the Javelin; and several industrial sites in the United States provide the metals, semiconductors, high-temperature materials, and a range of microelectronics needed for weapons and munitions with few or no substitutes.[6]

Multiple DoD Inspector General reports over the last two decades have highlighted the problems related to sole-source contracts, from instances of companies overcharging the government to loss of supply chain security. Reports derived from Executive Orders 13806 and 14017, respectively released in 2018 and 2021 under The Trump and Biden Administrations, have also identified supply chains with single-point-of-failure capabilities as major sources of risk for the United States in both defense-specific and macroeconomic contexts.[7] In fact, the importance of diversifying defense supply chains has been recognized on a bipartisan basis in both the legislative and executive branches.

In a movement toward greater capacity, resilience, and wartime efficiency, defense professionals, legislators, and academics have advocated for the Pentagon to take advantage of alternative procurement strategies to redress slow or inadequate production, such as multi-year procurements, long-lead contracts, and second sourcing.

Second sourcing in particular offers one strategy to counter the DoD's unsightly dependence on single and sole sources of supply. Second sourcing does not provide a panacea to all the supply chain issues faced by DoD, but an increase in the use of second sourcing methods could be used to pivot the U.S. defense industrial base away from the current status quo of peacetime efficiency and towards a new baseline of readiness to ensure overmatch against competitors like Russia and China.

MULTI-SOURCING, SOLE-SOURCING AND SINGLE-SOURCING IN THE COMMERCIAL SECTOR

In supply chain literature, there are three main types of sourcing strategies: multi-sourcing, single-sourcing, and sole-sourcing.

- Second sourcing as used by the government is a controlled form of "multi-sourcing," which typically describes situations in commercial business practice in which multiple potential suppliers for an offering exist, and the buyer can choose to contract with more than one, or purchase from the supplier that offers the best value or price for a good or service.
- In single-source situations, multiple vendors may be available for a specific offering, but the buyer chooses only one firm to fulfill its purchasing needs, possibly due to a close or collaborative buyer-seller relationship.
- In sole sourcing, only one supplier is available to fulfill the commercial buyer's requirements, precluding any competitive bidding processes. The supplier may be the sole provider of an offering because it produces state-of-the-art technology, holds exclusive IP rights, or specializes in niche or even outdated products that other suppliers are not capable of or willing to produce.

In general, Western business practice tends to espouse competitive environments with multiple suppliers as the optimal purchasing environment for promoting lower prices, higher quality goods, and increased innovation.

Although multi-sourcing is preferred in the commercial sector, many commercial buyers end up in single- and sole-source scenarios due to their own choice or because of certain purchasing constraints. Single- and sole-source

5. Interviews, March 21, 2023–May 1, 2023.

6. Seth Jones, "Empty Bins in a Wartime Environment: The Challenge to the U.S. Defense Industrial Base." Center for Strategic and International Studies, January 2023, https://csis-website-prod.s3.amazonaws.com/s3fs-public/2023-01/230119_Jones_Empty_Bins.pdf?VersionId=mW3OOngwul8V2nR2EHKBYxkpiOzMiS88.

7. Department of Defense, *Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States*. Report to President Donald J. Trump by the Interagency Task Force in Fulfillment of Executive Order 13806, September 2018, https://media.defense.gov/2018/oct/05/2002048904/-1/-1/1/assessing-and-strengthening-the-manufacturing-and%20defense-industrial-base-and-supply-chain-resiliency.pdf; Department of Defense, *Securing Defense-Critical Supply Chains, Action Plan Developed in Response to President Biden's Executive Order 14017*, February 2022, https://media.defense.gov/2022/feb/24/2002944158/-1/-1/1/dod-eo-14017-report-securing-defense-critical-supply-chains.pdf.

contracts may indicate a high level of trust and cooperation between buyer and seller, a need for customization that requires intense buyer-seller collaboration, or intentional efforts on the part of the buyer to streamline and simplify acquisitions.

However, single- and sole-source situations can pose many of the same issues for commercial buyers faced by government buyers. For example, sole sourcing may lead to scenarios of "vendor lock-in," whereby firms use monopolistic methods to completely block competitive choice even when superior offerings are available.

In the process of negotiating contracts in the absence of supplier competition, commercial buyers can also lose some of their bargaining power, which is a key component of obtaining favorable prices for goods and services. Single-sourcing and sole-sourcing can also make firms more susceptible to risks, such as supplier default, in uncertain environments such as the global COVID-19 pandemic. Despite the commercial emphasis on multi-sourcing and competition, some recent research has suggested that only 31 percent of companies have developed alternate sources of supply for 70 percent or more of their Tier 1 suppliers.[8]

HISTORY OF DOD SECOND SOURCING

DoD turned to second sourcing acquisition strategies for a number of reasons. During the peak of the antitrust movements in the United States from the 1940s to the late 1970s, there was an emphasis on encouraging competition in the government contracting space.[9] For instance, in trying to both strengthen domestic supply chains and preclude the formation of monopolies, the U.S. military required its suppliers to develop domestic second sources for electronically and functionally identical semiconductor products, and mandated that companies exchanged technical details and manufacturing knowledge to promote consistency.[10] The policy is considered to have helped promote a "golden age" of domestic semiconductor manufacturing in the 1960s and 1970s by facilitating ease of entry into the semiconductor market, promoting more effective solutions for semiconductor manufacture, and speeding up technology diffusion.[11]

By the time of the U.S. defense buildup of the 1980s, second sourcing initiatives emphasized cost-cutting through the introduction of competition for weapons components. Per the 1984 Competition in Contracting Act, the rubric of full and open competition was touted as the ideal approach to protect public funds and ensure the best value for government buyers.

Moreover, the appointment of the Packard Commission, which investigated and prescribed changes to DoD management and procurement, resulted in the release of an influential 1986 report that recommended the expanded use of second sourcing to keep procurement costs low.[12]

Second sourcing was also driven by the efforts of influential and outspoken advocates for defense sector competition, especially by former Secretaries of the Air Force and Navy, Verne Orr and John Lehman. Throughout the 1980s, the Air Force and Navy worked together to qualify second sources for annual split buys of various missiles and recorded great success from such programs in terms of both cost-cutting and performance reliability.

After the Reagan Administration's military buildup ended, second sourcing practices remained fairly common—for a time. For example, the Joint Direct Attack Munition (JDAM) program conducted continuous dual-sourcing competitions through the late 1990s into the 2000s to control unit costs.[13] This environment began to change, however. There were two main reasons for this: tighter defense budgets and quality issues associated with second sourced items.[14] Money was flow-

8. Steve Banker, "If Multi-Sourcing Is A Best Practice, Why Are So Few Companies Doing It?" *Forbes*, May 1, 2020. https://www.forbes.com/sites/stevebanker/2020/05/01/if-multi-sourcing-is-a-best-practice-why-are-so-few-companies-doing-it/?sh=1be517966121.

9. Maurice E. Stucke and Ariel Ezrachi, "The Rise, Fall and Rebirth of the U.S. Antitrust Movement," *Harvard Business Review*, December 15, 2017, https://hbr.org/2017/12/the-rise-fall-and-rebirth-of-the-u-s-antitrust-movement.

10. David C. Mowery," Federal Policy and the Development of Semiconductors, Computer Hardware, and Computer Software: A Policy Model for Climate Change R&D?" in *Accelerating Energy Innovation: Insights from Multiple Sectors*, ed. Rebecca M. Henderson and Richard G. Newell (Chicago: University of Chicago Press, 2009), 159–188, https://www.nber.org/system/files/chapters/c11753/c11753.pdf.

11. Alex Williams and Hassan Khan, "A Brief History of Semiconductors: How the US Cut Costs and Lost the Leading Edge," *Employ America*, March 20, 2021, https://employamerica.medium.com/a-brief-history-of-semiconductors-how-the-us-cut-costs-and-lost-the-leading-edge-c21b96707cd2.

12. Michael H. Riordan and David E.M. Sappington, "Second Sourcing," *The RAND Journal of Economics*, 20 no. 1 (1989): 41–58, https://doi.org/10.2307/2555650.

13. D. Meyers, "Acquisition Reform-Inside the Silver Bullet: A Comparative Analysis—JDAM Versus F-22," *Acquisition Review Quarterly* 9 no. 4, 313-322; quoted in Wydler, Ginny, Su Chang, and Erin Schultz. "Continuous Competition as an Approach to Maximize Performance., *Defense Acquisition Research Journal 20*, no. 1: 027-058 (April 2013). https://www.dau.edu/library/arj/ARJ/ARJ65/ARJ_65-Wydler.pdf.

14. Interviews, March 21, 2023–May 1, 2023.

ing less freely toward defense projects—national defense spending had declined from 6 percent of GDP, its figure before the end of the Cold War, to around 3 percent by the end of the 1990s.[15]

During this era of military drawdowns, the initial costs of establishing new sources of supply became major deterrents to second sourcing. Paying to establish new suppliers appeared risky when considering examples of poorly executed second sourcing efforts in the 1980s that had resulted in sunk costs or products which did not work.

The use of second sourcing continued to fade with the subsequent emphasis on cost savings and efficiencies. During the H. W. Bush Administration, Defense Secretary Dick Cheney and Deputy Secretary of Defense Donald J. Atwood espoused using second sourcing only on a case-by-case basis and only when justified, reversing the previous presumption that dual-sourcing was the optimal first option.[16]

Following such reversals in policy, second sourcing in government contracting became a relatively rare practice. In the twenty-first century, the DoD even departed from second sourcing engine development and production, which has historically lent itself to competitive contracts due to the high volume of engine contracts and the ongoing advancements in propulsion technologies in both commercial and military markets.[17] Sole sourcing remained the preferred option in defense acquisitions as DoD's laser focus on cost savings and efficiency has been further expanded on and codified through a number of federal initiatives, such as DoD's implementation of three rounds of Better Buying Power (BBP) initiatives from 2010 to 2016. The initiatives aimed to "increase the productivity, efficiency, and effectiveness of DoD's acquisition, technology and logistics efforts" but focused primarily on lowering program costs.[18]

The cost-squeezing effects of BBP were additionally emphasized by the cost-cutting goals of the Budget Control Act of 2011, which reinstated budget caps on defense discretionary spending. Like BBP, the well-intentioned Budget Control Act had a major impact on defense acquisitions by prompting a decline in DoD's modernization accounts and more competition over procurement funds.[19]

TYPES OF DEFENSE-RELATED SECOND SOURCING

The decision to use a second source strategy, and the form in which it takes, often depends upon the goals that are sought. For example, the military services may seek to create a viable second source for national security and supply chain resiliency purposes. In certain commodity product contexts, a primary goal may be to reduce costs and pricing across multiple production runs. Another goal may be to work around a deficient sole source who is failing in terms of quality or schedule. Our research suggests that a growing concern is the need to mitigate a declining industrial base to address the growing lack of production capability to "surge" manufacturing in the context of global and emerging great power competition.[20]

Although some second sourcing strategies may comprise elements of multiple procurement strategies, this white paper has narrowed down second sourcing into four primary models of implementation: dual award arrangements, leader-follower arrangements, competitive subcontracting, and company-funded second sourcing.

DUAL AWARD ARRANGEMENTS

One approach to second sourcing is for the government to manage and fund (either totally or partially) multiple awards for large defense contractors. Such dual award arrangements are usually implemented for larger subsystems rather than component parts, and they can help to inject competitive pressures into the procurement at the outset of a program. This often results in competing designs that still must be compatible with defense systems in form, fit, and function.

In this arrangement, potential contractors may invest more of their private research and development funds into the

15. Michael E. O'Hanlon, "Defense Budgets and American Power," Brookings Institution, December 3, 2010, https://www.brookings.edu/research/defense-budgets-and-american-power/.

16. Ralph Vartabedian, "At the Pentagon, Competition Is No Panacea," *Los Angeles Times,* May 13, 1990, https://www.latimes.com/archives/la-xpm-1990-05-13-fi-415-story.html.

17. Ginny Wydler, Su Chang, and Erin M. Schultz, "Continuous Competition as an Approach to Maximize Performance," Defense Acquisition Journal, Defense Acquisition University, April 2013, vol. 20, no. 1: 27–58, https://www.dau.edu/library/arj/ARJ/ARJ65/ARJ_65-Wydler.pdf.

18. Frank Kendall, "Implementation Directive for Better Buying Power 3.0—Achieving Dominant Capabilities through Technical Excellence and Innovation," Washington, DC: Office of the Under Secretary of Defense for Acquisition & Sustainment, April 9, 2015, https://www.acq.osd.mil/fo/docs/betterbuyingpower3.0(9apr15).pdf.

19. Marcus Weisgerber, "Slow and Steady Is Losing the Defense Acquisition Race," *Government Executive*, November 2014, https://www.govexec.com/feature/slow-and-steady-losing-defense-acquisition-race/.

20. Interviews, March 21, 2023–May 1, 2023.

project in the hopes of winning a large enough share of the ensuing production requirements, and suppliers' future shares of business may be contingent upon product quality and performance.

An example of this dual award second sourcing strategy can be illustrated by the original "Engine Wars." In the late 1970s, when durability and performance-related issues plagued the initial F100 engine for the F-15 fighter jet, the Air Force could not come to an agreement with the engine's supplier, Pratt & Whitney, over who should pay to fix its flaws. The F-16 fighter jet, currently in development at the time, was also set to use the same engine as the F-15 fleet as it continued to experience engine problems, prompting the Air Force to resolve its supplier issues by injecting competition into the fighter engine market.

The result of the ensuing competition was that the Air Force added General Electric, which had invested its own resources into developing an alternative engine, as a second source along with Pratt & Whitney for the F-15 and F-16 fighter engines. The Air Force initially awarded 75 percent of production to General Electric and 25 percent to Pratt & Whitney, but also enabled continuous re-competition to split production quantity each year depending on the firms' prices and performance. The result was recorded as a success, with the second sourcing arrangement reportedly saving $2–$3 billion over the 20-year life cycle and doubling reliability-per-1000-engineflight-hours.[21]

Former Navy Secretary John Lehman, who oversaw a massive Navy buildup to support muscular maritime deterrence, followed suit to adopt the dual award second sourcing strategy and claimed to reap comparable benefits with Navy missile programs. Some studies found that the lifecycle costs of 14 tactical missile programs second sourced between 1975 and 1995 were reduced by 20 percent thanks to second sourcing, all at minimum DoD investment. For the Navy's Tomahawk missile program, annual split awards reportedly increased performance reliability from 80 to 97 percent.[22] By the first production year, FY 1985, it was estimated that the dual-source competition up through FY 1994 would save $630 million.

The program saw significant reduction in unit prices over time, and second sourcing was considered a success due to several reasons which made it possible: the low cost of second source entry (less than two percent of projected production cost), significant learning curve improvements, the large size of production, and strong management and leadership.[23]

The approach taken by the Engine Wars and various missile programs — i.e., creating a "split buy" by establishing separate production contracts—resulted in co-production benefits, including the willingness of the competing prime contractors to invest their own resources into competing for larger shares of long-term production opportunities. The goal of this approach is to improve upon the base design, as each competing prime seeks to "one up" the other with improved features to set it apart for ensuing production allocation. However, this approach only works when there are sufficient production opportunities and order quantity in the first place such that there are financial "guarantees" to justify the significant research and development costs borne by the bidding competitors.

Dual award arrangements can also incur additional costs and management complexity for the government to manage. These additional costs include the cost of evaluating and managing two separate contractors, the costs of dual qualification procedures, the burdens associated with duplicate and overlapping supply chains (which may end up cannibalizing each other for scarce parts and materials) and potential politicization of the competitors distorting the market.

LEADER-FOLLOWER ARRANGEMENTS

A variation of the second sourcing model is the leader-follower strategy, an approach which is outlined in the Federal Acquisition Regulation (FAR) subpart 17.4. In this approach, a "leader" firm and a "follower" firm contract together, usually through a development and eventually production subcontract, or via a technology licensing approach. The lead firm is positioned to complete the primary research, development, and production of new technologies, products, and services, at government expense as well as through investing its own funds. The lead firm is then expected to guide the follower firm on recreating or co-producing the item. During the second sourcing boom of the 1980s, leader-follower strategies were often used to accelerate the transfer of technical date packages from one contractor to another.

One successful example of a leader-follower program is the production of next-generation ejection seats for the Air Force. This leader-follower arrangement was dubbed the "ACES II" pro-

21. J. Gansler, W. Lucyshyn, and M. Arendt, *Competition in Defense Acquisitions,* College Park, MD: Center for Public Policy and Private Enterprise, School of Public Policy, University of Maryland, 2009; quoted in Wydler, Chang, and Schultz, "Continuous Competition as an Approach to Maximize Performance."

22. Ibid.

23. Ibid.

gram. The primary purpose of the ACES II program was to standardize the new lifesaving fighter and ground support aircraft escape systems. These large quantity purchases in turn required a substantial production run to satisfy the combined A-10, F-15 and F-16 aircraft production quantities and rates.[24]

Since large quantity purchases were necessary and a lengthy production run was anticipated, the Air Force considered it highly desirable to introduce a continuing competitive pressure on the firm(s) selected to produce the ACES II ejection seat. To accomplish this continual competitive pressure and maintain standardization, the qualification of a second firm to produce ejection seats identical to the original selected design was deemed necessary. The decision to employ the leader-follower technique on the ACES II program was based upon a subjective determination that substantial economic benefits would be realized through competition. The savings realized from competition were said to have more than compensated for the initial costs including the qualification of the follower company, government test costs, and the higher initial follower company costs for tooling and learning.[25]

Leader-follower arrangements, however, ultimately were often counter-productive because they inherently contradict the interests of defense contractors as they ignored basic economic incentives. A prime contractor is unlikely to be suitably motivated to shoulder the expensive task of developing new technologies or innovating upon existing offerings, only to be required to share those designs to a market competitor (and in some cases, still earn less profit).

During the peak of second sourcing, some firms realized they could actually fare better if they avoided becoming the leading firm, which would inevitably have to grapple with absorbing the lion's share of risk and costs of developing a product. In other situations, where the winner would win contract awards for only 60 percent or less of a government order, for example, some firms also figured out they could reap higher profits on the remaining 40 percent of the order by bidding high.[26]

COMPETITIVE SUBCONTRACTING

In competitive subcontracting, the government engages with the prime contractor to have them qualify multiple viable second sources for a specific part or subsystem. Often, the government funds these efforts in the prime contract, and such arrangements usually incorporate some form of technology licensing arrangement. The technical data from the prime is used to qualify the subcontractor as a viable second source. The adequacy and completeness of the technical data is therefore essential to the success of this approach.

Competitive subcontracting works best when the government seeks to improve the quantity or establish the surge capacity of otherwise identical or otherwise interchangeable end items, such as ammunition. An example of this arrangement is the A-10 ammunition procurement. In 1973, during the development of an armor piercing round for the A-10 Thunderbolt attack aircraft's GAU-8/A autocannon, GE was required to take on two competitive subcontractors for ammunition development, and each of these subcontractors acquired two sources of supply for the case, propellant, and penetrator.[27]

The Air Force worked with the contractors in a cohesive development effort to reduce risks and costs associated with the production of these parts. Although the estimated cost of ammunition development for the A-10 increased from $9.2M to $15M, the GAU-8/A round cost was reportedly reduced from the original cost estimate by 80 percent. The dual sourcing subcontracting arrangement continued through FY77, and by FY78, the Air Force began buying ammunition directly using competitive contracts with both Aerojet and Honeywell.[28]

Through this aggressive second sourcing strategy facilitated by government support, the Air Force and its contractors were able to resolve issues associated with the GAU-8/A's armor piercing round, a key developmental challenge, as well as improve upon its components.

COMPANY-FUNDED SECOND SOURCING

Today, it is now defense contractors who are more willing than their government customers to pay the costs associated with second sourcing efforts. When the underperformance of key subcontractors jeopardizes a contractor's ability to deliver

24. Larry L. Soderquist, "Leader/Follower: An Analysis of a Proposed Technique for Increasing Competition in Air Force Weapon System Procurement," *Air Force Institute of Technology*, September 1979.

25. Ibid.

26. Vartabedian, "At the Pentagon, Competition Is No Panacea," May 13, 1990.

27. David R. Jacques and Dennis D. Strouble, "A-10 Thunderbolt II (Warthog) Systems Engineering Case Study," *Air Force Institute of Technology*, 2010, https://apps.dtic.mil/sti/pdfs/ADA530838.pdf.

28. David R. Jacques and Dennis D. Strouble, "A-10 Thunderbolt II (Warthog) Systems Engineering Case Study," A*ir Force Institute of Technology*, 2010, https://apps.dtic.mil/sti/pdfs/ADA530838.pdf.

quality final products to customers in a timely manner, second sourcing represents one possible solution. If the defense contractor has already used some of its own resources to help a struggling subcontractor perform at required standards to fulfill its production obligations and it is still failing, then onboarding a new supplier may be the rational next step.[29]

There are several different ways in which a company might implement and fund a second sourcing effort, many of which are unique to specific departments within a defense firm. For example, in some instances, the company might make internal funding determinations utilizing review board processes designed especially for managing supply chain performance and risks. These specialized processes can help the defense firms critically examine the performance of existing suppliers and determine whether to accept, mitigate, or transfer any risk posed in a supply chain.[30]

In other cases, firms can draw from a limited amount of overhead funding to establish new sources of supply. However, the ability to draw from these funds is constrained by other funding needs, including the need to mitigate the costs of second sourcing efforts to avoid passing them on to customers.[31]

There are multiple ways in which companies might try to offset the costs of standing up new sources. For instance, they might undertake rigorous quantitative and qualitative analyses to determine the best sources to award new contracts with and avoid potential risk factors, or they will convince the new suppliers to invest in their new production effort from a tooling perspective.[32]

Sometimes, it is also the subcontractor rather than the prime contractor who is experiencing difficulties with sub-tier suppliers and has concluded that supporting them is insufficient, rendering it necessary to establish a new source of supply. In these cases, the subcontractor may be able to provide the prime contractor with an effective business case to obtain their support in helping to fund the new source of supply. If amenable, the customer, expecting to be recouped in value or costs, supports the second sourcing effort.

This is a more common scenario for programs where DoD wants a certain item, such as a critical missile component, to be delivered faster or iteratively improved upon through evolutionary development models, facilitating a type of structured second sourcing.[33] Prime contractors, like the government, are intuitively more likely to fund second sourcing efforts where rapidity and reliance are critical in the supply chain.

ENABLING SECOND SOURCING TODAY

Overcoming Challenges

Although DoD and defense contractors increasingly find themselves in situations in which more than one sources of supply are needed, there are critical factors which dissuade the government and defense contractors from incorporating second sourcing strategies. For second sourcing to take hold as a viable solution to sourcing weaknesses, there are several challenges which will need to be addressed.

High Upfront Costs

The costs of establishing second sources of supply tend to deter defense professionals and policymakers more than potential cost savings associated with second sourcing appeal to them. For example, the alternate engine program for the F-35 first went under attack in 2007 with the Office of Management and Budget asserting that "analysis indicated that savings from competition would not be offset by high upfront costs."[34] By FY2011, after several proposed terminations, Congress deleted funding for the program, with DoD following suit by terminating it completely.[35]

In 2023 discussions about reestablishing an F-35 second engine source, one of the main arguments against a second sourcing option was that it would cost roughly $6 billion to develop the new engine plus an additional $40 million for maintenance, in contrast to a $2.5 billion investment required to upgrade the existing engine.[36] USAF Secretary Kendall made it clear that cost was the principal reason the Air Force did not proceed with its Adaptive Engine Transition Program in the FY24.[37]

29. Interviews, March 21, 2023–May 1, 2023.

30. Interviews.

31. Ibid.

32. Ibid.

33. Ibid., March 21, 2023–May 1, 2023.

34. Office of Management and Budget, Terminations, Reductions, and Savings, Budget of the U.S. Government, Fiscal Year 2010, Washington, May 2009, p. 38; quoted in Jeremiah Gertler. "F-35 Alternate Engine Program: Background and Issues for Congress." Congressional Research Service, January 12, 2012, https://crsreports.congress.gov/product/pdf/R/R41131/15.

35. Gertler, "F-35 Alternate Engine Program: Background and Issues for Congress," January 12, 2012.

36. Brody Mullins and Tedd Mann, "Military Contractors Square Off Over F-35 Jet Engine Program," *The Wall Street Journal*, March 8, 2023, https://www.wsj.com/articles/military-contractors-square-off-over-f-35-jet-engine-program-2e37e048.

37. Stephan Losey, "US Air Force Secretary wants 'another shot' at adaptive F-35 engine," *Defense News,* March 16, 2023, https://www.defensenews.com/air/2023/03/16/us-air-force-secretary-wants-another-shot-at-adaptive-f-35-engine/ (accessed May 24, 2023).

While there are compelling examples of the substantial long-term payoffs derived from footing the initial costs to establish second sources of supply, it is difficult to conclusively measure the ultimate cost savings derived from second sourcing. For example, one 1981 RAND study showed how an analysis of prices paid for the Shillelagh missile could produce estimates ranging from procurement cost savings of 79 percent to a loss of 14 percent depending on the procedures used by researchers.[38]

Moreover, even when the rationale behind second sourcing shifts from being a matter of cost savings to supply chain resiliency, the estimated savings from shoring up critical points of failure remain hypothetical. Proponents of the revitalized second sourcing option for the F-35 engine have argued that a new generation of engines will be more cost-effective in the long-run to address quality concerns and keep pace with a rising China, but it is difficult to quantify such benefits.

Qualification Costs

Extensive qualification and testing requirements are often levied on new suppliers, and these requirements can cost millions of dollars. Requalification costs for existing systems can be even more expensive[39] Qualification and requalification not only increase the immediate monetary costs associated with standing up suppliers, but the long processes associated with these efforts also add significant time-related costs, eating up labor hours and potentially resulting in missed opportunities along the way as technologies rapidly improve. Both the government and contractors are likely to be especially keen to avoid second sourcing in those instances where the initial prototype has a limited life cycle, or where it has a rapid obsolescence and the time- and money-related costs of requalification will come into play sooner.

Size and Stability of Procurements

The effectiveness of second sourcing is strongly correlated with the size and stability of DoD procurements. When the needs of the U.S. warfighter can change rapidly depending on shifting national security priorities and demands, investing in a new source of supply can be a difficult task.

The flaws associated with second sourcing under uncertain conditions can be illustrated by the Navy's choice in 1994 to second source the F/A-18 attack jet's F-404 engine, designed by General Electric, to Pratt & Whitney. After providing Pratt & Whitney with the key technical data from its rival, the Navy paid it $300 million for 215 engines. Several years later it abruptly terminated the competition after most of the $300 million it had paid had been spent on building the facilities at Pratt & Whitney required to produce the F-404. Not only had unpredictable military demand for the engine resulted in major sunk costs, but it was also frowned upon that General Electric had been required to hand over blueprints for its manufacturing processes to a company that was its competitor in both the federal and commercial marketplaces.[40]

Difficulties with Technology Transfer

Transferring critical defense and other technologies is one major aspect of establishing second sources, but when poorly executed, a technology transfer can lend itself to problematic dynamics between the provider and receiver of the technology blueprint, or major quality issues with the offering. In the former situation, supplier firms may struggle to cooperate with the complex allocation of data rights, resulting in bidding and production issues as discussed in this paper's description of leader-follower second sourcing.

One example of the latter situation is the Army's selection of Olin Industries in 1985 to compete against Honeywell in production of 30-milimeter ammunition for the Army. Although Olin received a technical data package from Honeywell describing the round, Olin chose to build most of the components itself excepting the 30-mm fuse, which was only produced by Honeywell. Rather than rely on its competition, Olin opted to subcontract the unique sub-component to a firm that lacked the expertise. The manufacturing know-how could not be adequately transferred even with all of Honeywell's data, and the subcontractor produced fuses which did not work. As the subcontractor was liquidating itself under bankruptcy laws, the Army lost $20 million on fuses it never received.[41]

Choosing Where and With Whom to Second Source

It is difficult to choose which items to second source when supply chains for many defense programs can contain thousands of vulnerabilities. Our research indicates that second sourcing is often used retroactively when an existing

38. J. L. Birkler, E. Dews, and J.P. Large, "Issues Associated with Second-Source Procurement Decisions," RAND Corporation, December 1990, https://www.rand.org/content/dam/rand/pubs/reports/2007/R3996.pdf.

39. Defense Standardization Program Office, "Diminishing Manufacturing Sources and Material Shortages: A Guidebook of Best Practices for Implementing a Robust DMSMS Management Program," May 2022, https://www.dau.edu/tools/Lists/DAUTools/Attachments/139/Diminishing-Manufacturing-Sources-and-Material-Shortages-(DMSMS)-Guidebook-(SD-22).pdf.

40. Vartabedian, "At the Pentagon, Competition Is No Panacea," May 13, 1990.

41. Ibid.

source of supply has begun to stumble or exit the market. As a result, it can be implemented in a fragmented or poorly integrated fashion out of a state of emergency or concern for a potential loss of supply.

Furthermore, without sufficient government investment, the existing supply base for certain offerings is often extremely limited. Many companies simply do not have the resources or the infrastructure to fulfill government contracting requirements, even if they would otherwise be potential contenders for production.

FINDINGS AND RECOMMENDATIONS

Second sourcing is making a modest comeback. As its use has led to substantial successes for major defense programs, second sourcing represents a viable solution in the acquisition toolkit to address the modern national security demands of the U.S. warfighter. However, if it is to be resuscitated in practice as an endorsable procurement strategy for DoD, it must be executed with consideration paid to its inherent challenges as previously discussed, lessons learned from history, and a rethinking of "business as usual" operations in defense acquisitions.

This white paper proposes the following recommendations for an effectual implementation of second sourcing practices.

Prioritize Agility and Resilience Over Immediate Cost Savings

With high initial costs and a government contracting base geared toward a sole sourcing preference, it can be extremely difficult to convince appropriators and DoD officials to implement second sourcing, even where defense supply chain weaknesses pose threats to U.S. national security.

This is why second sourcing efforts cannot be implemented in isolation. Rather, new second sourcing initiatives should be accompanied by various complementary measures as part of a conscious mindset shift within the defense community to emphasize that cost efficiency must sometimes take the back seat where defense priorities are concerned. The Undersecretary of Defense for A&S, Bill LaPlante, captured this need for a shift in thinking in a recent speech directed to the U.S. defense acquisitions workforce.[42]

This point of view should be formalized in an Under Secretary memo from Dr. LaPlante to the acquisition workforce emphasizing that cost savings are not the number one priority in pursuit of a strong and well-equipped military. Prioritizing agility, resilience, and even quality over cost could be a step in helping to upend the effects of decades of tunnel vision focus on cost-cutting in defense acquisitions. Constantly limiting defense procurement approaches to align with strict cost constraints impedes defense programs from progressing as needed to secure overmatch with U.S. rivals, protect U.S. national security interests, and promote defense supply chains which can bounce back from crises.

Create Better Financial Incentive Structures for Second Sourcing

The costs of establishing and maintaining new sources of supply comprise the number one barrier to the implementation of second sourcing. With better financial incentive structures, the government and defense contractors will be more motivated to sponsor a second source.

One way to do this would be through the establishment of a tax on specific defense programs, like that used for the Small Business Innovation Research (SBIR) program, which would go into a specific government-held budget to help fund second sources where the need arises. A specific bucket of money to fund and establish new sources of supply would give both the government and defense contractors the opportunity to get some second sourcing efforts off the ground. Congress could direct DoD to pilot this approach in a select number of program executive offices (PEOs) in the FY2024 NDAA.

Another important aspect of this recommendation has to do with committing to economic order quantities. Since it is more rational to fund second sourcing for large or stable orders, production guarantees could prove to be invaluable where second sourcing is necessary to strengthen defense supply chains.

Through promoting the use of procurement vehicles such as multi-year procurement (MYP) authorities and block buy contracting, the government could "de-risk" significant costs that defense manufacturers will otherwise incur in establishing and qualifying secondary production lines and facilities. Contractors have always made the bulk of their profits in production, and the lure of profits from multiyear streams of business could mitigate concerns about high qualification costs. [43]

With support from Congress, DoD is already implementing new MYP efforts to lock in investments and stabi-

42. David Vergun, "Official Says Just-In-Time Deliveries Fail in High-End Competition," *DOD News*, March 16, 2023, https://www.defense.gov/News/News-Stories/Article/Article/3331657/official-says-just-in-time-deliveries-fail-in-high-end-competition/.

43. Interviews, March 21, 2023–May 1, 2023.

lize demand signals to industry. Per the FY2023 NDAA, DoD has been granted the authority to exercise MYP for critical components such as munitions, and the FY24 President's Budget Request includes nine recommended investments in munitions: four "large lot" procurements and five traditional multiyear procurements.[44]

Devise Better Methods for Prioritizing Where to Second Source

Pentagon and congressional leaders will be more confident pursuing a second sourcing strategy if defense officials can craft a more targeted strategy to identify where second sourcing is most needed, and which companies are most likely to bring the best return on investment. We know that not all be parts will be second sourced, so how do we decide which are the highest priority components?

Some defense contractors have already developed their own rigorous internal methods for screening where to prioritize second sourcing. For example, one defense firm uses its sales inventory operations planning procedures to assess supplier performance, identify rising costs, examine gaps between demand versus supply plan as well as risk versus returns, and ultimately gauge whether or not to pursue the establishment of a second source.[45]

Many companies in the commercial sector also use their own forms of analysis to manage their supply chains and categorize vendors based on their strategic importance. These include the Kraljic Matrix, for instance, which uses a 2x2 matrix to segment suppliers and items on the basis of supply risk and profit impact.[46] Tools like the Kraljic Matrix can help firms grasp how much they gain or lose from supply chain vulnerabilities.

At the government level, an established best practice or model for prioritizing defense programs' most critical sources could facilitate second sourcing decisions that make the most fiscally and strategically sound sense. To address this, the Office of the Assistant Secretary of Defense for Industrial Base Policy should establish a government-industry task force charged with developing a set of best practices for identifying components that require second sourcing.

A baseline model for this task force could potentially be found in the Defense Priorities and Allocations System (DPAS). Through DPAS, the Secretary of Defense is authorized to assign programs of national priority a DX rating, which enables contracts for such programs to be accepted on a priority basis over other contracts. DoD can devise a different set of ratings to assign to programs or parts for which second sourcing should be prioritized in support of near-term and long-term national security imperatives.

Expand the Use of Open System Architectures in Defense Programs

A way to facilitate agility, cost savings, and even innovation in second sourcing is to incorporate more open systems architectures for sub-systems and component parts in defense programs. The model for this would be the Modular Open Systems Approach (MOSA), a design philosophy that creates new products in a modular fashion, streamlining technology data packages into discrete systems and subsystems with common interface standards allowing full interoperability. Defense contractors design the systems to enable open sourcing for subsystems and components, and to facilitate faster transitions to new sources of supply.

If DoD can replace interchangeable parts within a subsystem or plug and place contractors from among a pool of qualified suppliers, second sourcing could become a more agile process.[47] Initial qualification costs can also be reduced as the actual production is atomized into discrete production-ready modules or subassemblies.

Key to the successful use of MOSA-like architecture would be for dual and alternative sources to be provided with access to application programming interfaces—this strategy should be implemented in a way that encourages new entrants to supplier bases for programs that would benefit from increased collaboration and competition.

Secure Necessary Data Rights and Establish Second Sourcing Precedents as Early as Possible

While second sourcing decisions have often been made *after* the development cycle of a weapons system, our research suggests that it is best to commit to a second sourcing effort as early as possible in the acquisition timeline. Where a second sourcing protocol is not established and data rights are not allotted in a clear manner as early as possible, it can lead to vendor lock-in or proprietary lock-in situations which can rapidly increase costs. Confusing technology transfers and unplanned shifts in production share

44. Matthew Beinart, "Lawmakers Roll Out Final $858 Billion FY '23 NDAA, Allows for Multi-Year Deals to Buy Munitions," *Defense Daily*, December 7, 2022, https://www.defensedaily.com/lawmakers-roll-out-final-858-billion-fy-23-ndaa-allows-for-multi-year-deals-to-buy-munitions/congress/.

45. Interviews, March 21, 2023–May 1, 2023.

46. Peter Kraljic, "Purchasing Must Become Supply Management," *Harvard Business Review*, September 1983, https://hbr.org/1983/09/purchasing-must-become-supply-management.

47. Interviews, March 21, 2023–May 1, 2023.

are a significant risk, which in turn can contribute to development lags and other issues which raise the costs of second sourcing and reduce the quality of items produced.[48]

As part of a proactive rather than reactive approach to second sourcing in defense procurements, it should be considered best practice to establish essential technical data rights at the forefront of contract negotiations. This is essential to allow the rapid sharing of key manufacturing data to multiple sources of supply, and could help to ameliorate issues related to technology transfers, incentivizing developer firms, and even qualification costs and upfront costs associated with establishing a second source. It will also help DoD or contractor to weigh the costs, benefits, and challenges of second sourcing earlier rather than later, ensuring a smoother transition from development to production.

Keep the Leader-Follower Method Where it Belongs—the Past

Leader-follower programs suffer from a key incentive issue. Lead firms are often reluctant to train up and qualify a second source competitor who could deprive it of future market share and production opportunities. Follower firms may lack incentive to invest in improving upon a technology or to develop more cost-effective methods of production, especially when they are guaranteed a profitable share of production or do not have to share in costly development efforts. Examples of failures related to the leader-follower method of second sourcing abound.[49]

In some cases, a botched leader-follower arrangement can devolve into protracted federal litigation between the leader and follower companies, such as what occurred after the Navy decided to second source its SLQ-32 electronic countermeasure suite in 1995. Raytheon, the original sole-source provider, and Hughes, the established second source, each claimed the other had sabotaged the technology transfer, and the Navy's second sourcing effort eventually collapsed amidst the legal battle.

Due to the inherent disincentivizing and flawed nature of the leader-follower premise, we recommend eliminating existing language describing leader-follower contracting as it is outlined in FAR subpart 17.4.

Consider International Defense Supply Chains, Including the Capacities of Both Allies and Competitors

Ultimately, it will not suit the federal government to implement a second sourcing strategy with a tunnel vision limited to U.S. defense suppliers. For large defense companies managing their own supply chains, geopolitical considerations already play a major factor in current deliberations over whether or not to spend company funds on replacing a vulnerable foreign source of supply or adding another supplier.[50] If a foreign competitor nation, or a foreign source threatened by U.S. adversaries, represents the only source of supply for a critical component, investing in an ideal environment to promote domestic second sourcing should be considered a priority.

Conversely, when it comes to long-standing U.S. allies and coalition partners, international sourcing and co-production/co-development efforts can prove to be highly fruitful. The United States has no shortage of international friends and allies who could help bolster the resilience of the U.S. defense supply chains by providing second sources, if only all partners can agree on key sources of supply to develop healthy redundancy on.[51]

There are many examples of ongoing international procurement, sustainment and co-development efforts that already exist and could provide a could blueprint of lessons learned for future efforts, from the F-35 to second source development of the rocket motor for the ARAAM missile by the Norwegian company Nammo in the 2010s.[52]

If done right, harnessing international partners can help to promote further cooperation on advancing critical defense technologies and ameliorate the impact of supply shortages in the wake of international security crises such as the war in Ukraine.[53]

CONCLUSIONS

The developing situation in Ukraine has provided a rude awakening for defense officials regarding the need for supply chain resilience in the context of emerging and unforeseen surge requirements. DoD leadership recognizes that sole-

48. Riordan and Sappington, "Second Sourcing."

49. Interviews, March 21, 2023 – May 1, 2023.

50. Interviews, March 21, 2023 – May 1, 2023.

51. Ibid.

52. See Jerry McGinn and Michael Roche, *A "Build Allied Approach to Increase Industrial Base Capacity*, Baroni Center Report No. 9, June 22, 2023, https://mymasonportal.gmu.edu/bbcswebdav/orgs/AU_SOB_SOBW/Centers and Initiatives/Center for Government Contracting/COVID-19 Reports/mason-business-baroni-center-a-build-allied-approach-to-increase-industrial-base-capacity.pdf.

53. Aleksandar Jovovic, "Taking Defense Sourcing Abroad: How to Successfully Harness International Partners," *Breaking Defense,* March 31, 2023, https://breakingdefense.com/2023/03/taking-defense-sourcing-abroad-how-to-successfully-harness-international-partners/.

source dependency can seriously inhibit technological progress and production capabilities. The establishment of new MYP authorities and the revival of second sourcing debates for an alternative engine program suggest that the Pentagon and Congress are taking seriously the need to change business as usual in the U.S. defense sector. An increasing need to establish supply chain resilience makes it imperative to consider revitalizing a practice like second sourcing.

When it comes to crafting targeted and effective second sourcing strategies, it will also be important for defense professionals to consider that second sourcing methods will not be effective if they are implemented in isolation from other best practices for effective defense acquisitions and supply chain resilience—a targeted approach in tandem with complementary efforts is key. Second sourcing is an important tool in the toolkit, so DoD can learn from the mistakes of the past and make better use of this procurement strategy to meet today's national security challenges.

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Beutel has bicameral Congressional experience, previously serving as lead oversight and acquisition policy counsel for Senator Susan Collins, the formerly ranking member of the Senate Homeland Security and Government Affairs Committee. While serving with Senator Collins, Beutel authored major acquisition reform legislation that revamped government's use of large IDIQ and GWAC IT contracts.

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