May 16, 2025

The Honorable Howard Lutnick
U.S. Secretary of Commerce
U.S. Department of Commerce
1401 Constitution Ave NW
Washington, DC 20230

Subject: Aerospace Industries Association Comments on Section 232 National Security Investigation of Imports of Processed Critical Minerals and Derivative Products

Reference: BIS-2025-0025, XRIN 0694-XC124

Dear Secretary Lutnick,

The Aerospace Industries Association (AIA) and its nearly 300 member companies welcome the opportunity to provide comments on the initiation of the Section 232 investigation to determine the effects on national security of imports of processed critical minerals and derivative products. Given the role of critical minerals in the aerospace and defense (A&D) supply chain, our industry is eager to work with the U.S. government to develop solutions that ensure reliable access to these resources and reduce dependencies on adversaries.

AIA represents companies in the A&D industry, ranging from small suppliers to large original equipment manufacturers (OEMs), that span the entire supply chain and have a vital role in global trade. Our industry directly supports U.S. national security and economic growth through our export leadership and technological superiority in fuselage design, semiconductor manufacturing, satellites, and other critical applications. American-made A&D products are consistently preferred over foreign competitors' due to our industry's cutting-edge commercial and defense technologies. To maintain this technological advantage, our supply chain relies on processed critical minerals to produce parts and components essential to the production and sustainment of commercial and defense systems.

Our industry relies on critical minerals to support the U.S. national defense objectives and meet global demand for American-made products. Regulatory restrictions on sourcing critical minerals must reflect the realities of today's global market and mitigate supply chain vulnerabilities that could impact the export competitiveness of U.S. A&D products.

AIA and our members are dedicated to supporting the U.S. government and providing technical expertise from all tiers of the supply chain—from producers to end-users—in the crafting of policies. Any actions taken should be deliberate, strategic, and aim to increase critical mineral supply and support national defense objectives.

Understanding the aerospace and defense supply chain is imperative to national security

As the U.S. responds to adversarial threats, commercial travel increases, artificial intelligence and data center development accelerates, demand for American-made A&D products will increase while supply of processed critical minerals needed for these products remains limited. It is vital to U.S. national and economic security to understand the complexity of the A&D supply chain.

The A&D industry is unique compared to other manufacturing sectors (e.g., automotive applications or consumer electronics, etc.) due to our need for high-purity, aerospace-grade materials from qualified processing and refining operations. These complex applications meet stringent strength and durability requirements for performance and safety but are purchased at smaller quantities from fewer suppliers, leaving our industry with less buying power.

To ensure long-term access to critical minerals, our members rely on qualified domestic and international suppliers and employ several risk mitigation strategies. These strategies include entering into longer-term supplier agreements, securing material in advance of need, building material buffers and stockpiles, and incorporating high-quality, non-contaminated scrap into products and materials.

Countering supply chain disruptions amid geopolitical uncertainty and access limitations

Recent economic and geopolitical disruptions have highlighted vulnerabilities in critical mineral supply chains. In recent months, the U.S. has become increasingly vulnerable to volatile markets, particularly through export restrictions imposed by the People's Republic of China on critical minerals, of which the U.S. is net-import reliant and through China's efforts to control the global supply chain of critical mineral mining, processing, and refining. Our members have developed a preliminary list of critical minerals significant to the A&D industry, their relative import reliance, and threats to the global supply chain (Annex 1).

Mature, reliable global supply chains are vital for safe and secure procurement of processed critical minerals. The U.S. relies on imports where domestic sources are unavailable or the U.S. lacks sufficient capacity. Expanding refining and processing capacity of materials required by the A&D supply chain is complex, costly, and time intensive. Our members report it may take up to 10 years to identify, build, transition, and certify a new mining or refining source. Existing processing sources may take up to 12 months to qualify aerospace-grade inputs due to testing and certification required to ensure material meets safety, airworthiness, and durability standards. This timeline may increase further as customer testing is required to approve alternative suppliers.

In the case where domestic supply is not available, due to geographic dispersion of critical minerals or delayed integration of domestic suppliers, the U.S. aerospace industry sources from reliable and trusted international suppliers. This global sourcing is critical to the health and resiliency of the U.S. A&D supply chain.

Our members are encouraged by President Trump's Executive Order "Immediate Measures to Increase American Mineral Production" and support innovative efforts to invest in domestic sources and reduce barriers to entry. Stable supply requires an approach that is rooted in understanding the complexity of critical minerals market, strategic and targeted investment into U.S. supply chains, and increasing reciprocal agreements with partners where U.S. capacity is unavailable. Closing markets without readily available alternative sources will have a detrimental impact on U.S. national and economic security.

As companies transition their critical mineral supply chains to domestic sources, access to international markets must also be preserved to ensure stability and avoid disruptions in the production of A&D applications. Tariff and non-tariff actions on critical mineral imports where there is not a readily available domestic supply could significantly impact the U.S. A&D industry and its manufacturing capabilities.

Recommendations:

1. Leverage existing funding tools to drive domestic production

The U.S. government should pursue short and medium-term solutions that support American companies and build domestic capacity. Our members are supportive of President Trump's call to provide financing, loans, and investment support for new mineral production projects.[1] Loans, loan guarantees, purchase commitments, grants, and equity investments are vital to supporting the upfront capital needed to develop critical mineral mining, refining, and processing capabilities.

Our members support the U.S. government using all existing funding tools (e.g., Department of Defense Office of Strategic Capital and Defense Production Act Title III, and Industrial Base Analysis and Sustainment programs, Department of Energy Loans Program Office, etc.) to support domestic critical minerals projects. Given our industry's direct contributions to national security, the U.S. government should prioritize high-purity, aerospace-grade applications.

The Administration and Congress should work collaboratively to maintain investment in and incentives for American companies investing in critical mineral projects in the U.S. For example, the Department of Treasury's guidance for Section 45x(c)(6) (i.e., Advanced Manufacturing Production Credit) provided relief for domestic critical mineral producers. Our members were pleased to see several efforts prioritized in recently unveiled legislation from the Senate and House Armed Services Committees for defense priorities.[2] AIA and our members would like to see the Administration and Congress continue these efforts for domestic critical mineral production through the annual defense appropriations process.

2. Strengthen recycling and infrastructure capacity

High-quality, aerospace-grade scrap material from processing operations (e.g., forging, casting, machining) as well as end-of-life airframes and engines are critical to the A&D supply chain. For example, domestically melted and produced titanium alloy and nickel superalloy are often made with over 50 percent recycled materials, minimizing the need to purchase virgin-mined and refined materials. In some cases, aerospace alloys may contain up to 100 percent recycled materials.

U.S. capacity for sorting, processing, and recycling critical minerals is limited due to outdated technology and the complexity of managing scrap and ensuring unserviceable material does not re-enter the supply chain. Industry has developed closed-loop recycling programs—from OEMs to refining plants—to improve management of scrapped materials (e.g., the Aircraft Fleet Recycling Association) and counter this challenge.

The U.S. government should support these efforts further by investing in recycling capacity (e.g., grants for recycling research and development and consideration of tax benefits for companies to help strengthen recycling infrastructure) and the issuance of guidance to ensure the safe and secure handling of material and alleviation of challenges faced by recyclers. There are several opportunities to increase recovery of aerospace components—largely nickel superalloys containing rhenium, tantalum, tungsten, niobium, etc.—from government propulsion maintenance and decommission operations that could be leveraged with industry support.

---

[1] Immediate Measures to Increase American Mineral Production, Presidential Executive Orders, 20 March 2025.
[2] SASC and HASC Chairmen Release Statement on Reconciliation Legislation to Modernize our Military and Strengthen National Defense, House Armed Services Committee, 27 April 2025.

Additionally, the U.S. government should support existing initiatives such as the Department of Defense's Defense Logistics Agency (DLA) Strategic Material Recovery and Reuse Program (SMRRP) (50 U.S.C. 98) to allow for the recovery and access of any strategic and critical materials from obsolete military systems that are targeted for disposal. SMRRP has proven to be successful in mitigating disruptions to the germanium supply chain, contributing to the National Defense Stockpile (NDS), and increasing domestic supplies of critical minerals to support defense and commercial industries.

3. Pursue permitting reform

The average U.S. mine development time is 29 years – the second longest average time in the world.[3] Permitting is the largest barrier to establishing new mines in the U.S. due to ineffective government coordination and uncertainty in entering production. Compared to U.S. business investment in foreign mines, U.S. mines are at higher risk of litigation even after permits are received. Companies also face challenges accessing the amount of energy infrastructure needed to open a new mine.

Our industry is supportive of President Trump's call for increased permitting for mining. At the same time, the U.S. government must undertake significant reform to upscale mining and processing to counter these challenges. The Administration should work with Congress to reform legislation and streamline the approval timelines for domestic critical minerals projects. Policymakers should address specific concerns that slow permitting, including environmental risks, royalties, agreements with Native American tribes, foreign investment standards, end-use delegations, and patent restrictions.

As mining capacity remains limited, the U.S. government should consider elevating and increasing the capacity of existing domestic projects. For example, MP Materials, Nyrstar, USA Rare Earths, and Energy Fuels Inc. all have existing critical mineral mines in the U.S. that with increased resourcing can further support domestic demand. The U.S. should also continue to support tailing projects, such as the Uranium Mill Tailings Remedial Action (UMTRA) Project, to relocate mill tailings. These projects may be crucial in reclaiming land, accessing additional revenue streams for mines, and accelerating recovery from non-traditional sources.

4. Revitalize the National Defense Stockpile

Stockpiling processed materials has long been considered a reliable solution to mitigating risks in the national defense supply chain and encouraging the development of domestic sources of critical materials. As the U.S. maintains net-import reliance on adversaries—the U.S. Geological Survey reports the U.S. is 100 percent net import reliant for 12 of 28 identified critical minerals[4]—and faces export restrictions from China, stockpiling has become crucial.

President Trump's Executive Order "Unleashing American Energy" directed the Secretary of Defense to ensure the NDS provides a robust supply of critical minerals in the event of a future shortfall.[5] Under the *Strategic and Critical Materials Stockpiling Act of 1939* (50 U.S.C. § 98), Defense Logistics Agency (DLA) Strategic Materials is the agency responsible for managing the

[3] Mine development times: The US in perspective, S&P Global, June 2024
[4] Mineral Commodity Summaries 2025, U.S. Geological Survey, U.S. Department of Interior, March 2025.
[5] Unleashing American Energy, Presidential Executive Orders, 20 January 2025.

NDS. However, the DLA Strategic Minerals office requires more funding and personnel in identifying material requirements and managing the stockpile.

The Administration should work with Congress to revitalize the National Defense Stockpile Transaction Fund to ensure it is adequately resourced to acquire material, finance off-take agreements, support critical mineral research and development, fund qualification of domestic sources, and invest in recycling initiatives. AIA and our members support the $2.5 billion in proposed funding for the NDS that was recently unveiled by the Senate and House Armed Services Committees included in reconciliation.[6] Congress should also support NDS' utilization of tools and enhanced statutory authorities to increase its operations, support development and qualification of domestic sources, and invest in critical mineral research and development.

5. Enable global partnerships for critical minerals production

The use of bilateral and sector-specific plurilateral agreements provide incentives for fair and reliable global market access and are critical to building U.S. supply chain resiliency and promoting U.S. competitiveness through balanced and reciprocal trade. As the U.S. continues to face domestic sourcing and processing limitations, cooperation with trusted foreign markets is essential to maintaining and strengthening critical mineral access.

The U.S. has several trade agreements with partners that are primary suppliers of processed critical minerals for which the U.S. is greater than 50 percent net import reliant. For example, the U.S.-Mexico-Canada Agreement (USMCA) has provided access to the Canadian critical mineral sources. Agreements are critical for U.S. companies as Canada supplies 21 of these net import reliant mineral commodities and other partners, such as Japan, have increased capacity to process and refine critical minerals and downstream products.[7]

These agreements are crucial as they ensure U.S. manufacturers have access to a secure supply of materials to produce aerospace applications. Ending these agreements or imposing tariffs on trusted international partners risks harming U.S. producers' ability to supply the aerospace industry and compete globally. Our members are pleased with President Trump's recently announced U.S.-U.K. Economic Prosperity Deal which provides access to key imports with "modified reciprocal tariff treatment" based on balanced trade relationships and shared national security priorities.[8]

The U.S. government should continue to pursue and expand bilateral and sectoral trade agreements—and maintain existing agreements like USMCA—with key trading partners and allies with strong rules of origin, quality standards, and reciprocal trading practices. Additionally, the Administration should support Congress in adopting legislation that enhances U.S. manufacturers' competitiveness by temporarily removing standard import duties on critical mineral supply when domestic production is unavailable, such as the *Securing America's Titanium Manufacturing Act of 2024*.[9]

---

[6] SASC and HASC Chairmen Release Statement on Reconciliation Legislation to Modernize our Military and Strengthen National Defense, House Armed Services Committee, 27 April 2025.
[7] Mineral Commodity Summaries 2025, U.S. Geological Survey, U.S. Department of Interior, March 2025.
[8] General Terms for the United States of America and the United Kingdom of Great Britain and Northern Ireland Economic Prosperity Deal, White House, 8 May 2025
[9] S. 4015-Securing America's Titanium Manufacturing Act of 2024, 118th Congress (2023-2024)

Our members support empowering the Export-Import Bank (EXIM) Supply Chain Resiliency Initiative and U.S. International Development Finance Corporation to finance international mining, refining, and processing projects around the world. To ensure the success of this initiative, the U.S. government should further incentivize companies to prioritize offtake agreements by providing clarity on tax credits and employing risk mitigation tools including risk insurance and price floors.

6. Continue industry and public consultation

The A&D industry has maintained the largest trade surplus across all American manufacturing industries for over 70 years. Partners continue to prefer U.S. A&D products over foreign competitors due to the technological innovation of our products and their long lifecycles of use. Our industry is committed to supporting the U.S. government by providing practical knowledge and expertise to assist in policy development that will support domestic industry and mitigate risks to export competitiveness.

Critical mineral supply chains are highly complex and globally integrated. As the Department of Commerce continues its investigation, our members encourage the Bureau of Industry and Security Office of Strategic Industries and Economic Security extend the comment period by 90 days and continue to work with industry to assess the short and long-term impact of tariff and non-tariff actions. Our members are supportive of the Administration's non-stacking tariff measures and would encourage similar actions to be considered if any tariffs are imposed on critical minerals.

Additionally, our industry recommends an existing agency be assigned to work with industry directly on products and derivatives that may be covered by Section 232 tariffs to ensure they accurately reflect national security concerns and do not put the supply chain at further risk. Collaboration with agencies such as the U.S. Geological Survey Minerals Information Center or DLA Strategic Materials is crucial given their deep understanding of processed critical minerals, domestic supply, and national security objectives.

Conclusion

AIA and our members are committed to working with the Department of Commerce to develop transparent polices, incentives, and implementation timelines that secure U.S. industry's access to critical minerals. We appreciate the opportunity to provide public comments and look forward to close collaboration on this matter. If you have any questions or require additional information, please contact my staff lead for this matter, Lizzie Patterson (lizzie.patterson@aia-aerospace.org).

Respectfully,

Derek "Dak" Hardwick
Vice President, International Affairs
Aerospace Industries Association

Annex 1 – Strategically Significant A&D Critical Minerals

Critical Mineral	A&D Application	Import Reliance[10]	Market Distortions	Domestic/Alternative Source(s)
Aluminum and ultra-pure aluminum (greater than 99.8% purity)	Aluminum is widely used in structural airframe material for aircraft, military, and combat vehicles. Ultra-pure aluminum is used in thin films and critical semiconductor manufacturing.	The U.S. is <50% net-import reliant, with 56% of imports from Canada. The U.S. is 100% net-import reliant on ultra-pure aluminum Germany and China.	Section 232 tariffs on aluminum has constrained A&D access to ultra-pure aluminum.	In June 2023, Arconic received Defense Production Act Title III funding for high purity aluminum production. No domestic manufacturers have the ability to refine ultra-pure aluminum.
Antimony	Used in commercial and military engines for dry film lubricants, cold airfoils, steel shafts. Present in high-temperature electrical and mechanical solders in existing products.	The U.S. is 85% import reliant, metal and oxide. The U.S. relies primarily on Italy (44%) and China (23%) for ore and concentrates. Unwrought metal and powder is imported primarily from India (25%) and China (24%).	In December 2024, China banned all exports of antimony to the U.S.	In February 2025, Idaho mining company Perpetua received conditional funding from Defense Production Act Title III for mining. The mine is not expected to open until 2028 but is expected to supply 35% of U.S. demand.
Arsenic Metal	Used in semiconductors for solar cells, space research, and telecommunications platforms.	The U.S. is 100% net import reliant on all forms, with 96% of imports from China.		The U.S. has not had domestic arsenic production facilities since 1985.

[10] Mineral Commodity Summaries 2025, U.S. Geological Survey, U.S. Department of Interior, March 2025.

Chromium	Used in superalloys in jet engines, turbine discs, and exhaust systems.	The U.S. is 77% net import reliant on all forms. The U.S. imports 100% of chromite ore, 96% from South Africa. Largest import sources of metal are South Africa (25%), Kazakhstan (14%), and Finland (7%). Canada and Mexico are responsible for nearly all scrap.	China controls large parts of ferrochrome production, which influences chromium pricing.	The U.S. has been primarily import dependent since the 1960s. Existing resources are often low-grade and remote.
Cobalt	Used in superalloys, mainly jet engine castings and forgings.	The U.S. is 76% net import reliant on metals, oxides, and salts. 70%+ of cobalt is mined in the Democratic Republic of Congo (DRC). Largest import sources of metal, oxide, and salts are Norway (27%), Finland (17%), Japan (14%), and Canada (13%).	In February 2025, DRC banned exports of cobalt for 4 months with a potential extension at the end of May.	The Department of Defense has supported feasibility studies regarding cobalt extraction. DOD has also awarded a cobalt refinery in Canada to produce cobalt sulfate.
Copper	Used in electrical systems, cooling systems, and engine components.	U.S. is <50% net import-reliant on refined copper. The U.S. relies heavily on imports from Canada, Chile, and Mexico. U.S. has trade agreements with all these countries.	China has increased investments in copper mining in African and Latin America through state-owned enterprises.	Several mines in the U.S. have closed recently and mining production has decreased due to lower ore grades.

Fluorspar	Used in etching processes, cleaning surfaces, and removing impurities in U.S.-based semiconductor manufacturing.	The U.S. is 100% net-import reliant, mostly from Mexico and China.		The U.S. does not have domestic access.
Gallium	Used in platinum and blazing alloys. Present in electronic devices, transistors, and integrated circuits.	U.S. is 100% net-import reliant on metal. Largest import sources are Japan (24%), China (19%), Germany (19%), and Canada (17%).	In December 2024, China banned all exports of gallium to the U.S.	The U.S. has not had domestic, unrefined gallium recovery since 1987.
Germanium	Used in brazing alloys, most transistors, integrated circuits, and certain diodes, and fiber optics.	The U.S. is 100% net-import reliant, with primary sourcing from China (51%), Belgium (27%), and Germany (15%).	In December 2024, China banned all exports of germanium to the U.S.	DOD has initiated programs to recycle optical-grade germanium from decommissioned military equipment.
Graphite	Used in thermal protection systems, including missile nose tips, aircraft fuselages, wings, satellite structures, steelmaking, and casting processes.	U.S. is 100% net-import reliant on graphite, with primary sourcing from China (43%), Canada (13%), Mexico (13%), and Mozambique (13%).	China controls 78% of the total world production of graphite.	DOD has awarded grant money to Canada to develop natural flake graphite mines, as well as recycling facilities in Kentucky and Louisiana and a production facility in Alabama.
Hafnium	Used in commercial and military superalloys applications and coatings for high-temperature application	Primary sourcing from producers in France, China, U.S., and Russia.	China (20% of global production capacity) has imposed dual end-use export control restrictions on hafnium and export approvals have been delayed.	Only 1 U.S. processor is supplying the A&D industry.

Lithium	Used in aluminum-lithium alloys for fuselages, spacecraft panels, and rocket components.	U.S. is >50% net-import reliance. U.S. primary imports are from Chile (50%) and Argentina (47%).		In 2024, Department of Energy announced $3 billion in funding for lithium production, primarily focused on battery manufacturing.
Manganese	Used in aluminum alloys for aircraft frames and wings and tail sections.	U.S. is 100% net-import reliant. Total imports from Gabon (24%), South Africa (21%), Australia (10%), and Malaysia (9%).	At least two manganese mining and processing plants in Ukraine have remained idle since November 2023 and another two have resumed minimum production since the second quarter of 2024.	U.S. has not produced manganese ore since 1970. Department of Energy has funded development of mines in Australia. In May 2024, South 32 was awarded Defense Production Title III funding to produce battery-grade manganese in Arizona.

Magnesium Metal	Used in aluminum alloys for aircraft frames and wings and tail sections as well as the metallization of numerous refractory oxides (e.g., niobium, hafnium).	U.S. is 100% net-import reliant on magnesium metal, primarily from Israel (40%) and Turkey (34%). Combined total imports from Israel (17%), Canada (15%), Turkey (12%), Czechia (9%).		In 2022, the only primary domestic magnesium metal producer (Utah) shut down production due to water sourcing and permitting issues. In February 2025, Magrathea Metals was awarded Defense Production Title III funding to establish domestic primary production of magnesium at a demonstration plant.
Molybdenum	Used in rocket nozzles, turbine blades, and jet engine components.	An estimated 90% of aerospace-grade material is produced in China.	In February 2025, China imposed export controls on molybdenum.	Non-Chinese sources of molybdenum are mainly generated from scrap which may be as high as 30% of apparent supply.
Nickel	Critical element for high-temperature castings and forging alloys	U.S. is 47% net-import reliant. Primary nickel imports from Canada (46%), Norway (11%), Australia (8%), and Brazil (6%). Producers in Canada and Norway make material for aerospace grade applications.	Chinese firms have significant financial investment in Indonesian mining and refining.	Mining production has decreased since 2021 while demand has increased. Concentrate production in Michigan is exported to smelters in Canada. Significant nickel recovery is from scrap (>50% of consumption).

Niobium	Used in steel, titanium alloys, and superalloys (and master alloys used in production) for jet engines, spacecraft, and missile systems.	U.S. is 100% net-import reliant. Total imports from Brazil (66%) and Canada (27%). Brazil is world's leading niobium producer, accounting for 92% of global production.		In September 2024, Global Advanced Metals USA was awarded Defense Production Act Title II funding to support establishing high-purity niobium oxide production capabilities.
Rare Earth Elements/Permanent Magnets (Samarium, Dysprosium, Terbium, Samarium, Neodymium, Praseodymium, Lanthanum, Gadolinium, Erbium**)**	Used in magnets, batteries, phosphors, metallurgical additives, ceramics, catalysts, coatings, and other various applications.	U.S. is 80% net-import reliant on compounds and metals. China controls an estimated 70% of rare earths that are found in permanent magnets.	On April 4, China imposed export restrictions on rare earth metals, including samarium, used in permanent magnets.	In the past five years, the Department of Defense has awarded more than $439 million to establish rare earth element supply chains, including separating and refining capabilities as well as downstream processes to convert into metals and magnets.
Scandium	Used in aluminum-scandium alloys and electronics, lasers, and radioactive isotopes.	U.S. is 100% net-import reliant. Imported material mostly from Japan, China, and Philippines.		Neither mined nor recovered from process streams or mine tailings. Limited capacity to product ingot and distilled scandium in facilities in the U.S.

Tantalum	Used in superalloys for jet engines, rocket nozzles, and thermal protections systems.	U.S. is 100% net-import reliant. Metal and powder imports primarily from China (43%), Germany (27%), Kazakhstan (15%), and Thailand (5%).	An estimated 50% of tantalum smelters are in China.	No significant U.S. mine production since 1959. Several domestic producers of tantalum metal and alloy from imported ores, concentrates, and tantalum containing materials.
Tin	Used in solder alloys for connected electronic components in flight control systems, communication devices, and satellite electronics.	U.S. is 73% net-import reliant on refined tin, primarily from Peru (30%), Bolivia (23%), Indonesia (20%), and Brazil (11%).		Tin has not been mined or smelted in the U.S. since 1993 or 1989, respectively.
Titanium Sponge	Used in titanium aerospace alloys utilized in airframes, jet engine components, and landing gear.	U.S. is 100% net-import reliant, primarily importing from Japan (82%), Kazakhstan (9%), and Saudi Arabia (7%).	U.S. applies Column I MFN a 15% tariff on titanium sponge despite no U.S. supply. Prior Section 232 investigation acknowledged harm to domestic titanium industries from imposing import tariffs or quotas.[11]	U.S. has had no domestic A&D-grade sponge production since 2020 and has relied on close partnership with Japan for access.

[11] The Effect of Imports of Titanium Sponge on the National Security, Commerce Department, November 2019.

Tungsten	Used in superalloys for commercial and military engines. Present in spark gaps, ignitor plugs, electronic switches, circuit breakers, etc.	U.S. is >50% net-import reliant, primarily from China. Concentrate production outside of China is estimated to be <20% of world production.	In February 2025, China imposed export controls on tungsten. World tungsten supply is largely dominated by China production and exports.	Tungsten has not been mined in the U.S. since 2015. Several companies can convert concentrates, oxide, etc. to tungsten metal powder.
Vanadium	Used in master alloys that enhance properties of titanium alloys for airframes, jet engine components, and landing gear.	U.S. is 40% net-import reliant, with ferrovanadium primary sourcing from Canada (48%) and Austria (37%). Imports of high-purity vanadium pentoxide is provided by mature sources from Brazil (49%) and South African (35%).	Prior Section 232 investigation acknowledged harm to domestic steel and titanium industries from imposing import tariffs or quotas.[12]	Vanadium mining in Utah closed in 2020 and has not reopened. One U.S. producer of high-purity vanadium pentoxide.
Yttrium	Used in commercial and military jet engines, including turbine blades, thermal barrier coatings, and bondcoat materials.	U.S. is 100% net-import reliant, with 94% of metals and compounds sourced from China.	In April 2025, China imposed export restrictions on yttrium product forms (yttria).	High risk critical mineral as there is no yttrium-free alternative and no mine or refinement sources.
Zinc	Used as a protective coating for fasteners, brackets, connectors, and landing gear parts.	U.S. is 73% net-import reliant on refined zinc. Refined metal imports primarily from Canada (59%), Mexico (16%), South Korea (7%), and Peru (7%).		

[12] The Effect of Imports of Vanadium on the National Security, Commerce Department, February 2021.

Zirconium	Used in superalloys for engine fans and high-pressure compressor structures. Key element in thermal barrier coatings.	Hafnium and zirconium ore imports have increased in recent years, with primary imports from South Africa (46%) and Australia (35%)	A&D industry competes with nuclear industry. Prices will increase as demand increases	