

How Many Rare Earth Permanent Magnets Does the U.S. Military Actually Need?

written by Jack Lifton | October 7, 2026

How much tonnage of specialized neodymium-iron-boron permanent magnets does the U.S. military require each year, and how much tonnage of samarium-cobalt magnets does it require?

This apparently simple question has no precise public answer. The Department of Defense does not publish a complete bill of materials for the permanent magnets incorporated into American weapons systems, and the Department of Commerce has redacted its more recent estimates of military demand. Nevertheless, enough information is publicly available to establish a reasonable working range.

My estimate is that the American military presently requires approximately **200–300 metric tons of specialized neodymium-iron-boron magnets annually** and the equivalent of approximately **200–400 metric tons of finished samarium-cobalt magnets annually**. For analysis, I would use 250 tonnes of NdFeB magnets and 300 tonnes of SmCo magnets, or about 550 tonnes of specialized rare earth permanent magnets annually.

These figures should not be confused with the much larger magnet

manufacturing capacities now being announced or subsidized in the United States. The Pentagon's requirements are strategically indispensable, but they are commercially small.

The last specific public estimate derived from a Pentagon supply chain assessment placed Department of Defense demand for finished NdFeB magnets at approximately 175 metric tons annually. That estimate dates from 2012. Since then, the United States has increased its use of drones, precision guided munitions, electronically controlled actuators, radar systems, military aircraft, and advanced naval systems. It is therefore reasonable to increase the old figure to a current working estimate of about 250 tons annually, with 200–300 tons as a defensible range.

The Department of Commerce's subsequent Section 232 investigation into NdFeB magnets did not publish a new number. It said it could not calculate a precise total for defense related demand and redacted the estimates it received from the Department of Defense and the Defense Logistics Agency. It did, however, confirm that military demand represents only a small percentage of total American demand for NdFeB magnets.

This is an important distinction. The American military uses high performance magnets in applications where failure is unacceptable, and substitution may be technologically difficult or impossible. These applications include missile guidance systems, fin actuators, aircraft generators, radar, sonar, communications equipment, drones, satellites, and electric machinery aboard ships and submarines. The magnets may be small in relation to the weapons systems in which they operate, but the absence of a qualified magnet can stop production of the entire system.

Criticality is not measured by tonnage. It is measured by the

consequence of absence.

Estimating samarium-cobalt magnet demand requires a different calculation. Recent industry reporting places American defense sector demand for samarium metal at approximately 50–100 metric tons annually. That is not the same thing as saying that the military consumes 50–100 tonnes of finished SmCo magnets.

SmCo₅ magnets contain approximately 34% samarium by weight. 50 to 100 tons of samarium would therefore support roughly 150–300 tons of SmCo₅ magnets. Sm₂Co₁₇ family magnets, which are widely used in demanding aerospace and military applications, generally contain approximately 23–26% samarium. On that basis, 50–100 tons of samarium would support approximately 190–435 tons of finished magnets.

I therefore believe that **200–400 metric tons annually** is the most useful working range for American military SmCo magnet requirements. I would use approximately 300 tons as a central estimate, while emphasizing that this is a material balance calculation rather than an officially published Pentagon procurement figure.

The actual number will vary from year to year. Military production is not uniform. The manufacture and replenishment of missiles, aircraft, naval systems, and precision guided weapons can change sharply with budgets, overseas conflicts, and stockpile requirements. Alloy selection also matters. SmCo₅ and Sm₂Co₁₇ are not interchangeable simply because both are called samarium-cobalt magnets. Machining losses, rejected parts, qualification inventories and replacement requirements further complicate the calculation.

Stockpile objectives must also be distinguished from annual consumption. Reported Defense Logistics Agency objectives of approximately 450 tons of NdFeB magnet block and 60 tonnes of

samarium-cobalt alloy represent inventories intended to protect the defense supply chain against disruption. They are not measures of annual Pentagon demand.

This brings us to the economic issue. Proposed American NdFeB factories are generally being discussed in capacities measured in thousands or even tens of thousands of tons annually. A factory capable of producing 10,000 tons of NdFeB magnets cannot survive on a military market consuming perhaps 250 tons. Even if my estimate were low by a factor of two, the military still could not support such a facility by itself. The Pentagon can subsidize production capacity, support qualification and pay a premium for supply chain security, but commercial customers in automobiles, industrial motors, robotics, medical equipment, consumer electronics, and power generation must provide the throughput that makes those plants economically viable.

The same principle applies, on a smaller scale, to samarium-cobalt. Defense demand matters more to the SmCo market because military, aerospace, and high temperature applications represent a larger share of total consumption. But even here, a producer must understand exactly what it is selling.

This is why government announcements about magnet "capacity" must be examined carefully. Capacity is not production, production is not sales, and sales are not qualification. Samarium metal, SmCo alloy, unfinished magnet blocks, machined magnets and fully qualified components are different businesses with different customers. A military customer does not simply purchase a tonne of magnetic material and distribute it among weapons manufacturers. It purchases components made from particular alloys, processed under controlled conditions, machined to specification, and qualified for particular applications.

My best current estimate is therefore approximately 250 tons of specialized NdFeB magnets and 300 tons of SmCo magnets required annually by the American military, with a plausible combined range of 400–700 tons. The military does not need enormous quantities. It needs assured quantities of exactly the right materials, made reproducibly, qualified for specific systems and available when required.

That is the difference between a commodity and a critical material, and it is why the rare earth permanent magnet problem has never been simply a mining problem.