



F-35 Joint Strike Fighter

The F-35, known as the Lightning II, is a Joint Strike Fighter that performs fighter, strike and ground attack roles in a single combat airframe common to the Air Force, Marines and Navy. The F-35 was designed to be a jack-of-all-trades, created to execute multiple missions and replace multiple specialized aircraft. It brings to the battlefield such advantages as its abilities to conduct electronic warfare, do surveillance and reconnaissance, and evade enemy defenses while maintaining air superiority.

The fighter has three [variants](#), one of which (F-35A) was [certified nuclear-capable](#) in October 2023. This first edition is produced for the Air Force and most international customers. The second (F-35B) is used by the Marine Corps, United Kingdom and Italian Air Force and is distinguished by its ability to conduct short takeoffs and vertical landings. The last variant (F-35C) is operated solely by the Navy and is intended for aircraft carriers. Engineers designed the F-35 to utilize stealth technology and systems integration to give the United States and its allies advantages for decades to come.

One of the F-35 program's foundations is the international industrial participation in the program. Eight countries are cost-sharing partners. The tail-section of the airframe is [produced](#) in the United Kingdom and final assembly facilities are located in Italy and Japan. Lockheed Martin's Lot 12 sale in 2019 [included](#) investment of \$3.5 billion from the United States and \$2.5 billion from its international partners for 225 aircraft. This sharing among various national defense industries reinforces the United States' global alliance and capability to build coalitions.

Lockheed Martin, the F-35's manufacturer, has [contracts](#) for the weapon system with each service branch as well as nine NATO countries and six non-NATO partners. The United States Air Force [plans](#) to purchase more than 1,700 F-35As while the Marine Corps and Navy plan to purchase 420 and 260 F-35s respectively. The American military has already purchased 796 as of April 2022, making the F-35 fleet the second largest in the Air Force inventory, after the F-16. About 50 more F-35s have thus far been [delivered](#) to foreign partners.

Challenges

The F-35 struggled in its early operational life. Its multi-role design, although helpful for foreign sales, means it did not perform any one role optimally. While most types of military aircraft have experienced growing pains, the F-35's high cost and visibility have opened the door to criticism for perceived waste. A lack of spare parts as well as organizational maintenance challenges have [degraded](#) the F-35's effectiveness. Eight percent of F-35s [were](#) still grounded due to faulty engines in February 2022.

The F-35 has nonetheless performed exceptionally well in exercises and in limited combat use by the Israeli Air Force. The aircraft successfully [intercepted](#) two Iranian drones approaching Israeli airspace in March 2021. Pilot [reviews](#) are favorable and the F-35 remains the aircraft of choice for allies wanting top-of-the-line tech, as evidenced by recent [sales](#) to Germany and Switzerland, where the F-35 won competitions over every other top tier fighter.

The aircraft has also experienced sustainment and operational readiness problems. From 2019 to 2021, the American F-35 fleet did not [meet](#) the Department of Defense's (DoD) mission capability rates. These indexes' minimum performance targets ranged from 80% to 75% of fleets for each respective year. Each variant of the F-35 scored from 56% to 72% on mission capability during the time period.

To date the F-35's advantages are tempered by multiple shortcomings, including poorly designed ejection systems in early models, hardware and software bugs, an unwieldy logistics management system that required replacement at high cost and an inadequate first-generation helmet. While these issues have largely been resolved, they delayed operational capability and boosted costs enormously.

Costs

The Congressional Research Service (CRS) [finds](#) that, as of December 2019, the F-35 program had an average procurement unit cost of \$83.1 million for each airframe and a unit cost of \$16.7 million for each aircraft engine in fiscal year 2012 dollars. Those sums come to \$107.4 million and \$21.6 million, respectively, in 2022 fiscal year dollars. These items are separated because they are produced by different manufacturers. Accordingly, in 2019, the average procurement unit cost of one F-35 was just over \$129 million in financial year 2022 dollars. The CRS report does not distinguish the costs between each variant of the F-35.

A 2021 Government Accountability Office report [said](#) there is a widening gap between projected life cycle costs for the F-35 and what the services say they can afford. In 2018 the Air Force and Marine Corps determined it could spend \$4.1 million and \$6.8 million, respectively, per year for each branch's individual F-35s. Yet, each plane's projected 2020 lifetime costs came to \$7.8 million for the Air Force's F-35A and from \$7.9 to \$9.1 million for the Marine Corps' F-35B and F-35C. The Navy similarly underestimated its costs, meaning all three services face multi-million-dollar budget shortfalls each year that will grow with each new F-35 added to the force. If the DoD plans to acquire the nearly 2,500 F-35s that it intends to, it will [cost](#) taxpayers \$1.27 trillion to operate and sustain the fleet over their 66-year life cycle.

Sources: Lockheed Martin, Government Accountability Office, Office of the Director of Operational Test and Evaluation, House Armed Services Committee, Defense News, Defense One