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Air Force Next-Generation Air Dominance Program

According to the Air Force, the Next-Generation Air Dominance (NGAD) program is intended to develop “a portfolio of technologies enabling air superiority” (Figure 1). The Air Force intends for NGAD to replace the F-22 fighter jet beginning in 2030, possibly including a combination of crewed and uncrewed aircraft, with other systems and sensors. NGAD began as a Defense Advanced Research Projects Agency project. Since 2015, Congress has appropriated approximately \$4.2 billion for NGAD.

Figure 1. Artist Rendition of NGAD



Source: <https://www.airforcemag.com/article/piecing-together-the-ngad-puzzle/>

NGAD is a classified aircraft development program, but the Air Force has released a few details. On September 15, 2020, then-U.S. Air Force acquisition executive Dr. Will Roper announced that the Air Force had flown a full-scale flight demonstrator as part of the NGAD program. Secretary of the Air Force Frank Kendall announced on June 1, 2022 that NGAD program technologies have matured enough to allow the program to move to the engineering, manufacture, and design phase of development.

Is the Goal of NGAD a New Fighter?

While a stated aim of the NGAD program is to replace the F-22 fighter jet, the aircraft that come out of the NGAD program may or may not look like a traditional fighter. The Air Force is developing technologies involved in NGAD to provide air dominance. Part of the program’s goal is to determine how to achieve that end, independent of traditional U.S. military approaches to air dominance. NGAD could take the form of a single aircraft and/or a number of complementary systems—manned, unmanned, optionally manned, cyber, electronic—forms that would not resemble the traditional “fighter.”

For example, a larger aircraft the size of a B-21 may not maneuver like a fighter. But that large an aircraft carrying a directed energy weapon, with multiple engines making substantial electrical power for that weapon, could ensure that no enemy flies in a large amount of airspace. That would achieve air dominance. There appears to be little reason to assume that NGAD is going to yield a plane the size that one person sits in, and that goes out and dogfights

kinetically, trying to outturn another plane—or that sensors and weapons have to be on the same aircraft.

NGAD Development Efforts

The Air Force has said that NGAD exists to develop four publicly acknowledged technologies.

- **Propulsion.** Over the past few years, the Air Force has invested substantially in variable cycle engines through the Advanced Engine Technology program. One objective for this program is to improve the amount of electrical power generation while improving cooling.
- **Uncrewed systems.** Secretary Kendall has stated the Air Force is developing uncrewed aircraft complementing NGAD. While the Service has not stated how it intends to use these uncrewed aircraft, some analysts suggest these aircraft could collect intelligence, provide electronic warfare capabilities, or carry additional munitions.
- **Materials.** The NGAD program seeks to examine new composite materials and structures. FY2023 Air Force budget materials state it seeks to “continue new low cost design and manufacturing structural concepts for attritable vehicles,” implying that these new materials could be used for uncrewed aircraft.
- **Sensors.** This development effort likely seeks to develop an advanced radar, infrared sensors, and improved electro-optical cameras.

What Companies Are Involved?

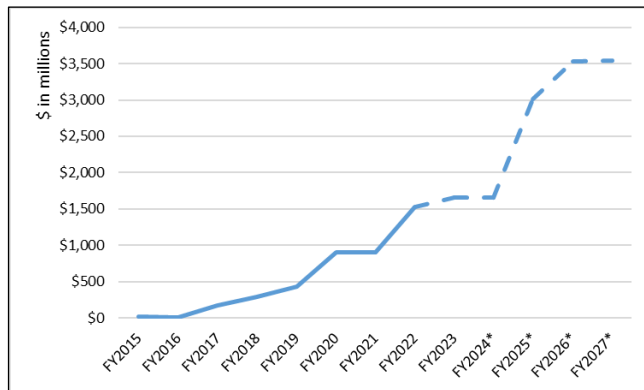
The Air Force has not mentioned specific NGAD contractors. The defense press and large defense prime contractors have hinted at their respective roles with the NGAD program. Lockheed Martin’s Chief Executive Officer (CEO), Jim Taiclet, and Northrop Grumman’s CEO, Kathy Warden, have both highlighted their current efforts during earnings calls. Lockheed Martin, in particular, has highlighted its role in developing manned and unmanned teaming as a significant effort within NGAD. Textron also has demonstrated a capability to quickly design and produce an aircraft with its Scorpion trainer/light attack jet, and General Atomics has shown a series of increasingly sophisticated designs with capacity for low-rate serial production.

Budget and Unit Cost

The Air Force requested \$1.66 billion on NGAD for FY2023, and projects spending an additional \$11.7 billion between FY2024 and FY2027. This would represent a three times increase in funding compared to what was appropriated from FY2015 through FY2022 (see Figure 2). Secretary Kendall stated at the House Armed Services

Committee’s FY2022 Air Force Posture hearing that NGAD would cost “multiple hundreds of millions” of dollars per aircraft.

Figure 2. NGAD Research, Development, Test, and Evaluation Funding FY2015-FY2027



Source: Derived from Air Force FY2015-FY2023 RDT&E Budget Justifications

Note: The dashed line represents the Air Force’s planned funding for FY2024-FY2027

What Else Is Important About NGAD?

The NGAD program also is part of the Air Force’s attempt to redesign its acquisition process. Dr. Roper stated that one goal is to split design, production, and sustainment contracts. Thus the company that wins the design contract might be different from the company receiving the production contract, and a third company could win the sustainment contract to support the aircraft in the field.

That vision could result in firms specializing in design passing their designs to high-tech manufacturing centers capable of producing anything sent to them in digital form, rather than maintaining dedicated airplane factories. Furthermore, companies like Boeing, with global logistics chains, could take on the sustainment mission. This reallocation of roles could open Air Force programs to firms that are not traditional military aviation prime contractors.

Such a concept complements another Air Force goal, to move from long, single aircraft producing programs to short runs of different aircraft, theoretically made possible and economical by flexible production lines. This might lower sustainment costs because aircraft would be replaced by newer designs rather than being kept in service for long periods. This effort is often called the “digital Century series,” referring to simultaneous Air Force development programs of the 1950s and 60s.

Does NGAD Compete with F-35?

For the next few years, the Air Force aims for NGAD to be a research effort, with plans to acquire production aircraft or other systems beginning around 2030. Congress authorizes and appropriates research and development funds and production funds in separate budget lines. F-35 is funded largely through procurement, while NGAD is funded through research and development.

Even if the flight demonstrator were a fully production-ready aircraft, it could still take industry several years to create production facilities. Producing aircraft requires complex manufacturing tooling and techniques. In addition, manufacturers need to certify secondary suppliers. The Air Force has sought to reduce the amount of time required to produce new aircraft; it is unclear if these aircraft manufacturers would be able to quickly shift production between multiple types of aircraft.

The F-35 is a program of record, with funding projected for the next five years at least. The Air Force has not changed its ultimate goal of 1,763 F-35s. No acquisition goal or fleet size has been posited for NGAD. Also, the air dominance role NGAD is intended for is more in line with the current mission of the F-22 or F-15EX than F-35.

That said, these programs would all have to fit within an Air Force topline budget, which could lead to pressures to favor one program over another in funding decisions. For example, Secretary Kendall stated that the Air Force chose to defer some F-35 procurement in FY2023 to expedite NGAD development.

Potential Issues for Congress

As DOD continues to develop NGAD, there are several potential issues that may concern Congress: costs associated with NGAD, NGADs impact on the fighter inventory, and the amount of information that the Air Force has released publicly.

- Secretary Kendall has stated that NGAD will cost “several hundreds of millions” per aircraft. By comparison the F-22 Raptor had an average per unit cost of \$191.6 million which resulted in a procurement of 183 aircraft. Some Members have expressed concern about the cost of NGAD, particularly in light of competing Air Force priorities including nuclear modernization, F-35 procurement, and aerial refueling tanker recapitalization.
- Some Members have expressed concern that this program may result in an Air Force fighter gap as a result of the aforementioned cost of NGAD. Historically, programs that have had significant developmental cost growth, like the F-22 Raptor and the B-2 Spirit, have seen the number of aircraft reduced.
- The NGAD program is being developed as a classified program. Some Members have expressed concern that developing a major classified program, like NGAD, risks increased costs and development issues due to limited oversight by organizations like the DOD Inspector General and the Government Accountability Office.

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