



June 2024

# F-22 AIRCRAFT

## Air Force Needs to Better Document Options Before Making Critical Decisions

## Why GAO Did This Study

The Air Force faces challenging decisions in modernizing its current aircraft while developing advanced capabilities to meet future threats. One such decision is whether to upgrade or divest 32 F-22 aircraft known as Block 20. The Air Force has not upgraded these to the same level as its 150 Block 30/35 aircraft—the modernized portion of the F-22 fleet. The Air Force's fiscal year 2023 budget proposal included Block 20 divestment, with the intent to use the savings to develop new types of aircraft.

Federal law includes a provision to prohibit the Air Force from divesting the aircraft until fiscal year 2028. It also includes a provision for GAO to assess issues related to upgrading the aircraft. This report addresses the extent to which the Air Force (1) had sufficient information to propose repealing the prohibition of divesting Block 20 aircraft, (2) had sufficient information to support upgrading Block 20 aircraft, and (3) has guidance to inform its divestment decisions.

To conduct this work, GAO reviewed an Air Force legislative proposal, cost and schedule estimates, and other relevant documentation. GAO also interviewed Air Force officials and a representative for the F-22 contractor.

## What GAO Recommends

Congress should consider requiring the Air Force to provide it with data and analyses before making certain aircraft divestment determinations. GAO is making two recommendations for the Air Force to fully document the options for divesting and upgrading Block 20 aircraft. The Air Force did not concur with GAO's recommendations. GAO believes its recommendations are valid, as discussed in the report.

View [GAO-24-106639](#). For more information, contact Jon Ludwigson at (202) 512-4841 or [ludwigsonj@gao.gov](mailto:ludwigsonj@gao.gov).

## F-22 AIRCRAFT

### Air Force Needs to Better Document Options Before Making Critical Decisions

#### What GAO Found

The Air Force decided to divest a portion of its aging F-22 aircraft used primarily for training—referred to as Block 20. The Air Force proposed Block 20 divestment to Congress without documenting key factors, such as training, mission capability, and testing, to inform that decision.

- The Air Force did not document how it will conduct F-22 training or testing—the current Block 20 functions—without Block 20 aircraft. It also did not document the challenges that combat units may face if mission-ready Block 30/35 aircraft are used for training or testing instead of Block 20s.
- The Air Force stated that divestment would result in cost savings from not flying Block 20s. These savings, however, did not account for other costs, such as maintenance for increased operations to make up for less aircraft.

The Air Force also obtained limited information about potentially upgrading as opposed to divesting Block 20 aircraft. The Air Force collected notional estimates from the F-22 prime contractor for upgrading Block 20s to the fleet's more modernized Block 30/35 level. The contractor estimated upgrades would cost at least \$3.3 billion and take approximately 15 years to complete but did not provide supporting data. The Air Force determined this information was sufficient for its purposes. Without better evidence about the potential effects of either divesting or upgrading F-22 Block 20 aircraft, Congress may be impeded from making a well-informed decision on the merits of the Air Force's proposal.

#### F-22 Aircraft



Source: U.S. Air Force/2nd Lt. Ariana Wilkinson. | GAO-24-106639

Finally, the Air Force does not have guidance to document and provide Congress with information on its aircraft divestment determinations. A previous Air Force effort to divest aircraft provided insufficient details to Congress about the factors shaping that decision. GAO recommended in 2016 that the Department of Defense create divestment guidance to help ensure senior leadership, including Congress, has quality information. The Air Force did not agree and stated that it already had budget guidance. However, GAO's review of the Air Force's budget guidance found that it did not address providing Congress with sufficient data to make informed divestment decisions.

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## Abbreviations

DOD Department of Defense

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June 18, 2024

### Congressional Committees

The F-22 Raptor, a fifth-generation aircraft possessing low observability characteristics among other things, is critical to the Air Force mission of establishing air superiority.<sup>1</sup> However, some of these aircraft are approaching 30 years old and can be costly to maintain. The F-22 currently has two configurations: (1) Block 20, which, as of September 2023, totals 32 aircraft, and (2) Block 30/35, which accounts for 150 aircraft.<sup>2</sup> The Air Force has continued to modernize the Block 30/35 aircraft over time, but it has not done so for the Block 20 aircraft.<sup>3</sup> The Air Force uses Block 20 aircraft for training, testing, and development purposes. In its fiscal year 2023 budget request, the Air Force proposed divesting the Block 20 aircraft.<sup>4</sup>

In Senate and House Armed Services Committee reports accompanying the James M. Inhofe National Defense Authorization Act for Fiscal Year 2023, the committees expressed concerns about reducing the F-22 fleet by divesting the Block 20 aircraft.<sup>5</sup> These concerns included the (1) potential effect on Air Force combat capability through the removal of the

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<sup>1</sup>The term “fifth-generation” generally indicates aircraft that have stealth characteristics.

<sup>2</sup>In this report, we refer to both 32 and 33 Block 20 aircraft. The Air Force proposed divesting 32 Block 20 aircraft; however, the primary contractor developed an estimate for upgrading the Block 20 which included 33 aircraft. There is one Block 20 aircraft that the Air Force uses for testing that the primary contractor included in its upgrade estimate, but which the Air Force did not include in its divestment proposal. There are also three additional F-22 test aircraft. Defense Acquisition University defines configuration as representing the requirements, architecture, design, and implementation that describe a particular version of a system or system component.

<sup>3</sup>The Air Force jointly categorizes Block 30 and Block 35 aircraft as “Block 30/35” because it modernized these aircraft to a common configuration. The F-22 prime contractor stated that there are no capability differences between these aircraft, but there are technical differences that may affect future upgrades.

<sup>4</sup>For the Department of Defense (DOD), the term “divestment” includes the strategic discontinuance of legacy acquisition programs to fund purchases in support of the department’s highest priorities. GAO, *Defense Reform: DOD Has Made Progress, but Needs to Further Refine and Further Formalize Its Reform Efforts*, [GAO-21-74](#) (Washington, D.C.: Nov. 5, 2020). For fiscal year 2024, DOD is incorporating divestment as part of its Enabling Future Capabilities Transition priority initiative.

<sup>5</sup>S. Rep. No. 117-130, at 9-10 (July 18, 2022) and H.R. Rep. No. 117-397, at 23-24 (July 1, 2022).

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aircraft themselves, and (2) need for the Air Force to divert other frontline F-22 Block 30/35 aircraft to fill the training mission currently performed by Block 20 aircraft. The act prohibited the Air Force from divesting F-22 aircraft until fiscal year 2028.<sup>6</sup>

The act also includes a provision for GAO to assess issues related to upgrading the F-22 Block 20 aircraft.<sup>7</sup> Our report addresses the extent to which the Air Force (1) gathered, used, and communicated sufficient information when proposing to repeal the prohibition on the divestment of F-22 Block 20 aircraft; (2) gathered, used, and communicated sufficient information on the costs, schedule, and risks associated with upgrading F-22 Block 20 aircraft; and (3) has guidance to inform divestment decisions.

To determine the extent to which the Air Force considered relevant factors before seeking to repeal the prohibition on divestment of the F-22 Block 20 aircraft, we reviewed an Air Force legislative proposal that accompanied the fiscal year 2024 budget request. We also reviewed material submitted to the Deputy's Management Action Group in support of the fiscal year 2023 budget request, which was when the Air Force initially proposed to divest the F-22 Block 20 aircraft. We interviewed Air Force officials from Headquarters Air Force, Air Combat Command, and the F-22 program office to further understand the factors involved with divesting the Block 20 aircraft. We discussed with these officials the preliminary actions the Air Force would take if it no longer had the Block 20 aircraft. We compared the information we received to our key practices for evidence-based policymaking to determine the extent to which the Air Force gathered, used, and communicated sufficient evidence to make determinations regarding Block 20 divestment.<sup>8</sup>

To determine the extent to which the Air Force evaluated the costs, schedule, and risks associated with upgrading the F-22 Block 20 aircraft, we asked for all available data associated with estimating this effort. The Air Force provided the most recent estimate of the costs and schedule associated with the upgrade, which was prepared by the F-22 prime contractor. We interviewed a representative from the prime contractor to

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<sup>6</sup>James M. Inhofe National Defense Authorization Act for Fiscal Year 2023, Pub. L. No. 117-263, § 143(a) (2022)(amending Section 9062 of Title 10, United States Code).

<sup>7</sup>Pub. L. No. 117-263, § 143(c) (2022).

<sup>8</sup>GAO, *Evidence-Based Policymaking: Practices to Help Manage and Assess the Results of Federal Efforts*, [GAO-23-105460](#) (Washington, D.C.: July 12, 2023).

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further understand the estimate and how it was developed, as well as considerations and potential challenges for upgrading Block 20 aircraft. We also reviewed other documentation, including prior reports prepared by the Air Force related to upgrading the Block 20 aircraft. In addition, we interviewed officials from Headquarters Air Force, the Department of Defense's (DOD) Cost Assessment and Program Evaluation office, Air Combat Command, and the F-22 program office to gain their perspectives on the current issues and challenges associated with upgrading the Block 20 aircraft. We also compared this information to our leading practices for evidence-based policymaking.<sup>9</sup>

To determine the extent to which the Air Force has guidance to inform divestment decisions, we interviewed Air Force officials to determine their applicable guidance for the process of divesting aircraft platforms such as the F-22. We also reviewed DOD and Air Force documentation, including program objective memorandum guidance for DOD's budget process and Air Force budget instructions, to determine if the documents discussed aircraft divestment. We compared this information to federal standards for internal control related to making decisions with quality information.<sup>10</sup>

We conducted this performance audit from February 2023 to June 2024 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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## Background

The Air Force began development of the F-22 in the 1980s as its fifth-generation air superiority fighter aircraft. The F-22 is optimized for air-to-air combat and incorporates low observability and high maneuverability. The aircraft can carry up to eight air-to-air missiles and it is equipped with a 20-millimeter cannon. The Air Force began the F-22 acquisition program with an intended development period of 12 years and a planned quantity of 648 aircraft. However, due to schedule delays, cost increases, and changes to threats, missions, and requirements, DOD reduced the

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<sup>9</sup>[GAO-23-105460](#).

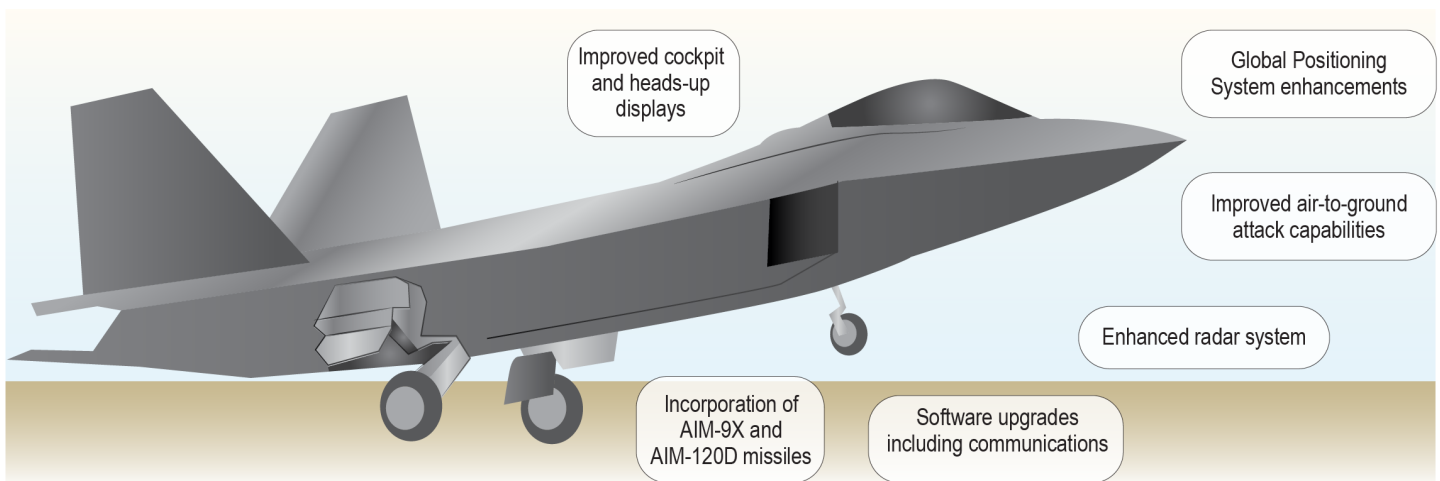
<sup>10</sup>GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: Sept. 10, 2014).

number of F-22s it eventually purchased to 187. As of September 2023, the Air Force had 185 F-22 aircraft in its fleet.

Within this fleet, the Air Force currently has two configurations of the F-22 with different levels of capability: Block 20 and Block 30/35. In 2011, the Air Force implemented an F-22 modernization program for most of the fleet, with these aircraft ultimately becoming Block 30/35. These upgrades included sensors, weapons, software, and communications systems. At that time, the Air Force also determined that a subset of the fleet, later known as Block 20, would be used for training and not included in the modernization efforts. As of September 2023, the Air Force had 32 Block 20 and 150 Block 30/35 aircraft. The Air Force has two operational units on each coast of the United States with between 26 and 28 Block 30/35 aircraft. The Air Force has completed the process of stationing the Block 20 aircraft that it uses for training at Langley Air Force Base. Air Combat Command officials stated that the Air Force also has F-22s of various configurations at other bases used for testing purposes.

The Air Force has continued to further upgrade the capabilities of the Block 30/35 aircraft, including radar, weapons, and communications, and currently plans to continue these modernization efforts through at least 2030. It has not, however, upgraded the capabilities of the Block 20 aircraft. Select capability differences between the Block 20 and Block 30/35 aircraft are shown in figure 1.

**Figure 1: Select Capability Differences Between Air Force F-22 Block 20 and Block 30/35 Aircraft**



Source: GAO analysis of Department of Defense (DOD) information. | GAO-24-106639



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We previously reported that the F-22 aircraft has experienced maintenance and sustainment challenges.<sup>11</sup> In particular, the Air Force has difficulty meeting the maintenance demands of the F-22's unique low-observable coating, a critical component that gives the F-22 its stealth characteristics. This has contributed, in part, to the Air Force not meeting its goals for F-22 mission capability or aircraft availability rates in any fiscal year from 2011 to 2021.<sup>12</sup> In addition, program officials said that the F-22 has numerous maintenance challenges related to the decision to significantly reduce the number of aircraft produced. As a result of the decision to truncate the planned fleet in the fiscal year 2010 budget, according to program officials, fewer manufacturers were willing to invest the capital needed to continue producing parts for the aircraft. In fiscal year 2020, F-22 maintenance costs totaled over \$1.6 billion.

Subsequent to the release of the President's Budget for fiscal year 2023, the National Defense Authorization Act for fiscal year 2023 included a prohibition against the divestment of F-22 aircraft until at least fiscal year 2028.<sup>13</sup>

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<sup>11</sup>GAO, *Weapon System Sustainment: Aircraft Mission Capable Goals Were Generally Not Met and Sustainment Costs Varied by Aircraft*, [GAO-23-106217](#) (Washington, D.C.: Nov. 10, 2022).

<sup>12</sup>Mission capable rate is the percentage of total time when the aircraft can fly and perform at least one mission, and availability rate is the percentage of time that aircraft can fly compared to the total number of hours possible across the fleet.

<sup>13</sup>Pub. L. No. 117-263, § 143(a) (2022)(amending 10 U.S.C. § 9062). The Joint Explanatory Statement accompanying the Department of Defense Appropriation Act, 2023 stated that DOD needed to continue to refine the reforms, re-prioritizations, and retirements budget exhibit to include budget line-item details. It noted that the "current justification materials lack adequate details necessary to review all of the funding adjustments associated with re-prioritizations." 168 Cong. Rec. S8029 (Dec. 20, 2022) (joint explanatory statement to the Consolidated Appropriations Act, 2023, div. C, Dept. of Defense Appropriations Act, 2023). In response, DOD submitted a "Force Structure Changes Exhibit" in May 2023. Department of Defense, Report on Force Structure Changes for the Fiscal Year (FY) 2024 Defense Budget (May 2023). In this document, the Air Force continued to request divestment of the Block 20 aircraft and broke out estimated cost savings by appropriations category. In an effort to repeal the prohibition on divestiture, the Air Force submitted a fiscal year 2024 legislative proposal.



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## Air Force Made F-22 Block 20 Divestment Decision without Gathering and Documenting Critical Information, Including the Impact on Training and Testing Missions

The Air Force proposed to divest its F-22 Block 20 aircraft without gathering and documenting key information on how it would, among other things, conduct its training and testing missions without using these aircraft. The Air Force's fiscal year 2023 budget information identified key factors of the F-22 Block 20 divestment, such as training, mission capability, and costs; however, it did not specify how divestment would impact these factors. The Air Force's legislative proposal to rescind the congressional prohibition against divesting any Block 20 aircraft similarly did not enumerate key cost and training details among others.<sup>14</sup>

Air Force senior leadership told us that the Air Force faces a series of difficult decisions about how to balance the modernization of these, and other, aging aircraft with investments to develop more advanced capabilities to meet future threats. Specifically, the Air Force's legislative proposal included supporting statements that downsizing the current aircraft inventory would allow it to free up personnel and resources and find the right balance between meeting the current mission and investing in future capabilities. For example, the Air Force seeks to fund the Next Generation Air Dominance program—a family of systems that it intends to use to replace the F-22.<sup>15</sup> The proposal stated that from fiscal years 2024 to 2028, the Air Force estimated that it would save a total of approximately \$1.8 billion from divesting the Block 20 aircraft instead of operating and maintaining them.

However, the Air Force made the divestment decision without documenting and sharing critical information. In our review of the documents prepared in support of the Air Force's fiscal year 2023 budget, we found that there was limited information in the formal briefing relating to how it would (1) accomplish its training mission, (2) provide mission capability, (3) complete testing, or (4) account for future costs. In addition, the materials supporting the Air Force's divestment decision stated that these issues, along with their associated risks, required further analysis. We were not provided documentation that these issues were analyzed further.

Neither the fiscal year 2023 budget information nor the proposal to remove the legislative prohibition on divestment included supporting

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<sup>14</sup>Pub. L. No. 117-263, § 143 (2022).

<sup>15</sup>GAO, *Tactical Aircraft Investments: DOD Needs Additional Portfolio Analysis to Inform Future Budget Decisions*, [GAO-23-106375](#) (Washington, D.C.: Dec. 20, 2022).

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information on training, mission capability, testing, or potential future costs of divestment.

**Training.** The Air Force uses 30 of the 32 Block 20 aircraft for training and, if it divests of the aircraft, would have to find a way to replace this training capacity. For instance, according to Air Combat Command officials, who are responsible for training, pilots accomplish over 90 percent of their initial basic flight training in Block 20 aircraft. For the remaining learning objectives that are specific to Block 30/35, the officials stated that pilots receive additional training on those aircraft at their respective duty stations. Thus, without the Block 20 aircraft, some pilots would likely experience their first F-22 take-off and landing in a Block 30/35 aircraft. This would increase the wear and tear on these aircraft since, according to Air Combat Command officials, new pilots often have hard landings and make other mistakes that are tough on aircraft. The Air Force does not yet have a training system in place to better prepare pilots to fly the latest generations of aircraft, but it has one in development.<sup>16</sup>

According to Air Force fiscal year 2023 budget-related information, one potential course of action to replace training capacity in the event of divestment would be to reassign select Block 30/35 aircraft from combat units to training units. Air Combat Command officials stated that combat units generally have a total of 24 Block 30/35 aircraft to ensure there are 12 mission capable aircraft at a given time, due to availability concerns such as maintenance. However, if the Air Force reallocated Block 30/35 aircraft to training units to account for the loss of Block 20 aircraft, Air Force documentation noted this could potentially result in combat units having as few as 18 total aircraft. Air Force officials and budget documentation did not specify whether the Air Force planned to accept lower performance or attempt to increase maintenance costs and tempo to achieve the same number of flights with fewer operational aircraft. According to budget decision briefs, neither the costs to increase maintenance nor the potential for fewer flights were factored into the Air Force's decision-making process.

The James M. Inhofe National Defense Authorization Act for Fiscal Year 2023 required the Air Force to submit a report to congressional defense committees on the strategy and execution plan for conducting F-22 aircrew training.<sup>17</sup> While this report was due in June 2023, the Air

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<sup>16</sup>GAO, *Advanced Pilot Trainer: Program Success Hinges on Better Managing Its Schedule and Providing Oversight*, [GAO-23-106205](#) (Washington, D.C.: May 18, 2023).

<sup>17</sup>Pub. L. No. 117-263, § 143(b)(1) (2022).

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Force submitted it to Congress in April 2024, a delay of approximately 10 months. The Air Force stated that the report addressed congressional concerns about F-22 fleet composition changes. The report noted that if the Air Force divested the 30 Block 20 training aircraft, the flight training unit would be comprised of 23 Block 30/35 aircraft, seven fewer than the number of Block 20 aircraft currently assigned to this role.

**Mission capability.** The legislative proposal stated that the Air Force strategy is to focus resources on the Next Generation Air Dominance program among others. However, the Air Force did not include a strategy for how it would mitigate any potential capability gaps until this new aircraft under development is built, tested, and available for use by Air Force pilots. The Air Force has not publicly provided a date when the new aircraft would be available. Recent programs, such as the F-35 and T-7A, have faced delays in development, testing, and fielding. Officials from Air Combat Command stated the Block 20 could provide valuable capabilities to meet National Defense Strategy requirements in emergency situations even without being upgraded.

In December 2022, we recommended that DOD conduct an integrated acquisition portfolio review of all piloted fixed-wing tactical aircraft platforms, which would include F-22. We further recommended that the review should include an analysis of capability gaps and schedule, among other things.<sup>18</sup> DOD agreed with our recommendation and delivered its review to Congress in January 2024. However, a DOD official stated that the review did not address the divestment of Block 20 aircraft.

**Testing.** The Air Force has a limited number of F-22 test planes, two of which are Block 20 aircraft.<sup>19</sup> According to a 2023 Air Force issue paper associated with Block 20 divestment, the F-22 developmental and operational test programs are under-resourced. Specifically, this paper stated that the Air Force

- has limited testing capacity for Block 30/35 modernization efforts,
- does not have enough aircraft to test interoperability among aircraft in an operational environment, and
- could experience delays to its F-22 modernization programs.

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<sup>18</sup>[GAO-23-106375](#).

<sup>19</sup>In addition to the Air Force's two Block 20 test aircraft, Air Force officials stated that it has three additional aircraft that are akin to Block 20s that it uses for development and testing. The officials stated that the Air Force chose to keep these assets.

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Air Force modernization program office officials disagreed with the conclusions of the issue paper and stated that divesting the Block 20 would not impact their test schedule unless the Air Force chose to transfer Block 30/35 test aircraft to make up for the lack of Block 20 training assets. Further, although the paper identified testing issues, Air Force 2023 budget documentation, which preceded the issue paper, did not identify or address any testing risks.

**Potential future costs of divestment.** The Air Force would potentially incur future costs by divesting the Block 20 aircraft. One such cost is storing and maintaining the aircraft in a manner that the Air Force could put them back into service in the event it needs these aircraft for contingency operations. Air Force fiscal year 2023 budget documentation recognized the need to store these aircraft in specialized facilities but noted that the Air Force had yet to identify the costs of storing the aircraft. In fiscal year 2024, an initial Air Force estimate indicated annual storage costs of \$2.8 million for all 32 aircraft, mostly due to engine preservation requirements. According to Air Force officials, this estimate did not include costs to prepare the aircraft for storage or provide additional security measures for the aircraft. Further, the officials stated that the estimate is based on the aircraft being outside rather than inside storage facilities.

The Air Force budget documentation also did not assess the costs of increasing the operational tempo of the Block 30/35 aircraft should some of them be diverted for training or testing. As previously noted, if the Air Force chooses to use the F-22 Block 30/35s for training or testing, it will likely incur additional operations and maintenance expenses. The Air Force, however, did not include these costs when calculating the estimated savings from divesting the Block 20 aircraft.

We have previously found that the Air Force made an aircraft divestment decision focused primarily on fiscal constraints and without fully documenting the implications of divestment. Specifically, in 2016, we found that DOD and the Air Force did not have quality information about the full implications of the Air Force's plan to divest A-10 aircraft, including gaps that could be created by A-10 divestment and mitigation options.<sup>20</sup> We recommended that the Air Force fully identify mission gaps, risks, and mitigation strategies, and develop high-quality, reliable cost estimates of the savings from divestment before again proposing to divest its A-10 fleet. Although the Air Force did not agree with these recommendations, it subsequently conducted a study that found that the A-10 fulfilled some

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<sup>20</sup>GAO, *Force Structure: Better Information Needed to Support Air Force A-10 and Other Future Divestment Decisions*, [GAO-16-816](#) (Washington, D.C.: Aug. 24, 2016).

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National Defense Strategy objectives and priorities. In March 2019, the Air Force identified the need for the A-10 through the 2030s. However, Congress has recently allowed the Air Force to divest 21 of its 281 A-10 aircraft.<sup>21</sup>

We also found that building evidence involves a series of activities that can help decision makers obtain and document the information they need to address policy questions, such as whether to divest Block 20 aircraft. Our key practices for evidence-based policymaking state that agencies should assess the sufficiency of existing evidence, identify and prioritize needs for additional evidence, and generate new evidence as needed to make important management and resource allocation decisions.<sup>22</sup> In addition, agencies are to communicate results to key stakeholders who may need the information for oversight or to help the organization implement its decisions.

In this case, the Air Force focused its proposal to repeal the prohibition on Block 20 divestment on the potential cost savings from operations and maintenance without documenting the costs associated with divesting the aircraft. Lacking that documentation, the Air Force did not identify additional needed evidence to make a more fully informed divestment decision or communicate that key information to Congress. Until the Air Force provides this additional analysis, Congress is not well-positioned to act on the Air Force's request to repeal the prohibition on divestment of F-22 Block 20 aircraft.

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## Air Force Did Not Fully Assess and Document Options to Upgrade F-22 Block 20 Aircraft

In response to congressional language and after deciding to divest the Block 20 aircraft, the Air Force gathered limited information about upgrading the aircraft from the F-22's prime contractor. Further, the Air Force did not fully assess and document its upgrade options related to this limited information. The prime contractor noted that its estimate was not submitted in response to a formal request for proposal by the Air Force and should be considered "notional." Additionally, Air Force budget documentation did not assess the potential of upgrading the F-22 Block 20 aircraft.

After the Air Force proposed divesting the Block 20 aircraft in its fiscal year 2023 budget request, the House of Representatives included a provision in its version of the fiscal year 2023 National Defense

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<sup>21</sup>Pub. L. No. 118-31, § 137(b) (2023).

<sup>22</sup>[GAO-23-105460](#).

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Authorization Act to require the Air Force to upgrade Block 20 aircraft.<sup>23</sup> While this provision was not adopted in the final bill, in September 2022 the Air Force collected notional estimates for the cost and schedule of upgrading Block 20 aircraft from the F-22 prime contractor. According to the prime contractor, these estimates were derived from initial estimates prepared for the Air Force in 2017 and 2019, and then updated to reflect inflation and included certain assumptions about what updates were possible. Contractor officials told us that they combined the historical data with an internal cost model to create an informal estimate. This effort was not funded by the Air Force and the contractor did not deliver a formal documented product or provide source data. Contractor officials stated that they recommended the Air Force procure a formal engineering estimate if the Air Force needed higher fidelity. However, the contractor noted that a formal estimate in this case would still have unknown costs without additional study related to F-22 manufacturing and suppliers.

According to the estimate provided by the prime contractor, the cost of upgrading 33 F-22 aircraft to a configuration matching the current and projected Block 30/35 would be between approximately \$3.3 billion and \$3.6 billion. As such, the approximate cost would be at least \$100 million for each of the 33 upgraded aircraft. The total cost of the upgrades was comprised of two components.

- **Costs to match current planned Block 30/35 configuration.** According to the contractor, the approximate cost for upgrading Block 20 aircraft to a level identical to the currently planned Block 30/35 capabilities would range from \$2.7 billion to \$2.9 billion. These costs would include current ongoing Block 30/35 modernization efforts or those in development. The contractor based these costs in part on the data it provided to the Air Force to help it prepare a 2017 report to Congress on the cost to upgrade the Block 20. In that report, the Air Force noted that upgrading Block 20 aircraft would cost approximately \$1.7 billion and require an 11-year effort if initiated in fiscal year 2018.<sup>24</sup> A contractor representative stated that they used the cost figures reflected in the report and adjusted them to account for inflation and any capabilities added from 2017 to approximately 2027. The report stated that if additional funding was provided to the Air

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<sup>23</sup>H.R. 7900, 117 Cong., Calendar No. 467 (July 28, 2022). The passed legislation did not include the provision for the Air Force to upgrade the F-22 Block 20. Pub. L. No. 117-263, § 143 (2022).

<sup>24</sup>United States Air Force Report to Congressional Committees, *F-22A Block 20 Upgrade* (Aug. 2017).

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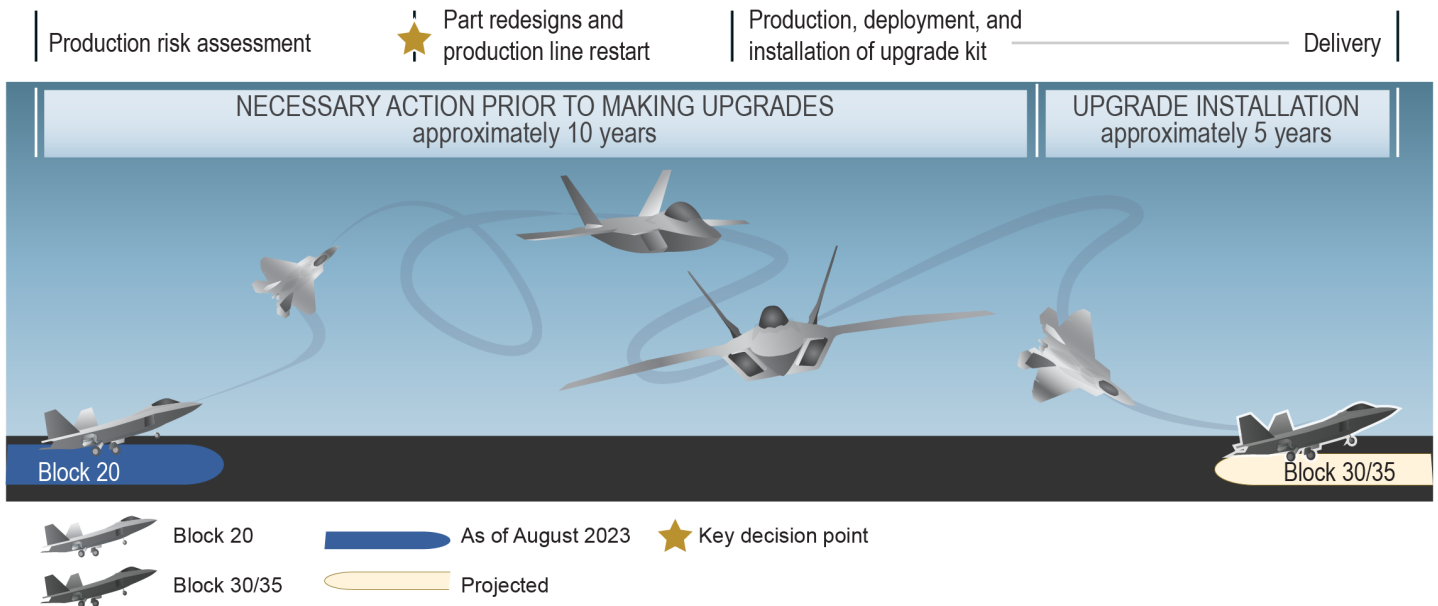
Force to assist with the Block 20 upgrades, the upgrades would provide a method of increasing the effective number of combat aircraft. According to Air Force officials, however, risks identified in the report, including those for manufacturing, have only worsened since 2017. The Air Force did not provide us with documentation on the extent of these risks nor ways to mitigate them.

- **Costs to match projected Block 30/35 configuration.** According to the contractor, the estimate also includes costs associated with Air Force future modernization efforts projected but not yet in development for Block 30/35 aircraft. The estimate stated these modernization efforts would cost approximately \$650 million to \$750 million. This part of the estimate assumes that Block 20 aircraft will eventually reach a matching configuration with a fully modernized Block 30/35 aircraft. A contractor representative noted the potential volatility of these future costs given that these modernization efforts would not take place until at least 2030.

The contractor also produced a schedule for upgrading the Block 20 aircraft which it described as “very notional.” Figure 2 is an illustration of an approximate 15-year timeline for upgrading the aircraft based on the contractor’s notional information. According to the Air Force’s 2017 report, the upgrade timeline would be 11 years.



**Figure 2: Illustration of Contractor Notional Schedule to Upgrade Air Force F-22 Block 20 Aircraft**



Source: GAO analysis of contractor information. | GAO-24-106639

Note: The schedule for potential upgrades is highly uncertain due to factors such as the extent of part design required to address obsolescence issues and whether the contractor could increase depot capacity.

The contractor estimated that the upgrade effort would take at least approximately 15 years due to factors including the time necessary to redesign parts from the loss of manufacturers or suppliers, restart production lines, and procure hardware. According to the contractor, an initial step to refine the schedule and begin the upgrade effort would be to conduct a review of parts obsolescence. This involves identifying parts that do not have active production lines. Parts not in active production lines, such as the radar and some avionics, would require the Air Force and the contractor to: (1) assess the feasibility of restarting the production line for that part, or (2) use a different part that can perform the same function and has an active production line. The second option may necessitate a redesign of the system associated with that part. While Air Force officials highlighted these and other risks, the Air Force did not conduct its own review or ask the contractor for additional information.

Although Air Force officials and a contractor representative stressed the importance of gathering additional key evidence to understand the

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schedule risks of Block 20 upgrades, the Air Force has not yet gathered and documented this information. According to Air Force officials, they did not pursue additional information associated with upgrading Block 20 aircraft beyond what the contractor provided. Nevertheless, an Air Force budget official assessed several elements, including the estimated amounts for management, engineering, and test support costs, to be high risk due to uncertainties in the data. Obtaining and documenting sufficiently detailed information would have enhanced the Air Force's decision-making process as to whether to upgrade the F-22 Block 20.

The contractor's estimate did not include an assessment for upgrading the Block 20 aircraft to a configuration other than matching the Block 30/35 aircraft. Air Force officials and a contractor representative stated that upgrading Block 20 to a different configuration than Block 30/35 could introduce operational challenges by having multiple versions of the F-22 aircraft. In other words, upgrading the Block 20 aircraft to a different configuration would have similar challenges to those that already exist between Block 20 and Block 30/35. In addition, an official from Air Combat Command stated that it has not been tasked by the Air Force to determine the level of capability to which the Block 20 would be upgraded. Neither the Air Force nor the contractor has assessed whether an alternate upgrade approach for Block 20 could provide potential benefits, such as improving Block 20 maintenance and sustainment rates. However, a considerable portion of the costs and timing for upgrades is due to the need to restart production lines for some equipment that is no longer being produced.

Our leading practices for evidence-based policymaking state that agencies should assess the sufficiency of existing evidence, identify and prioritize evidence needs, and generate new evidence as needed to make important management and resource allocation decisions.<sup>25</sup> In this case, the Air Force relied on a notional estimate provided by the contractor with limited information on the cost, schedule, and risks of upgrading Block 20 aircraft. Air Force officials stated that they did not pursue additional information associated with upgrading Block 20 aircraft because they deemed what they received to be sufficient. Air Force officials further stated that the expenditure of resources to develop additional information was unnecessary. Because the Air Force did not fully assess its options to upgrade, the Air Force and congressional decision makers have limited insight about the potential consequences of Block 20 upgrades and are

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<sup>25</sup>[GAO-23-105460](#).

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not well-positioned to make informed determinations about the future of these aircraft.

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## Air Force Did Not Ensure It Provided Key Information to Congress

As discussed above, the Air Force did not document key information regarding its decision to not upgrade and rather divest the F-22 Block 20 aircraft and, thus, has not communicated quality information to Congress.<sup>26</sup> The Air Force made its Block 20 divestment determination using its budget guidance. During our current review, Headquarters Air Force officials confirmed that the Air Force has not established any additional policies or procedures for collecting and analyzing information to achieve the objective of making fully informed divestment decisions. In addition, the Air Force does not have guidance to ensure that it provides relevant information on divestment determinations to Congress.

Federal standards for internal control state that management should use quality information to achieve the organization's objectives.<sup>27</sup> The Air Force's budget guidance does not mitigate the risk of making divestment decisions without key information. As a result, the Air Force did not provide necessary information to Congress, which could hinder its role as a decision maker. Congress prohibited the divestment of these aircraft until at least fiscal year 2028—providing time for additional study.

We previously recommended that DOD develop and promulgate department-wide guidance that establishes specific informational requirements to be met and documented before proposing divestment of major weapon systems that have not reached the end of their expected service lives. Specifically, in our 2016 report on the Air Force's plans to divest A-10 aircraft, we found that the Air Force did not have guidance in place to ensure that it provided quality information to Congress.<sup>28</sup> We found the Air Force did not have needed information on the full

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<sup>26</sup>DOD issued the Performance Improvement Framework in October 2022, intended as a guide for defining, identifying, tracking, and reporting on existing and planned reform initiatives across the department. One of the categories within that framework is optimization initiatives, which includes strategically divesting weapon systems to modernize or fund purchases in support of the department's higher priorities. In October 2023, we reported that DOD officials stated that full implementation of the Performance Improvement Framework—including consistent reporting and prioritization of reform efforts—will likely not occur until the fiscal year 2026 budget cycle. As a result, it is too early to determine the effectiveness of these efforts. GAO, *Defense Management: Action Needed to Advance Progress on Reform Efforts*, [GAO-24-105793](#) (Washington, D.C.: Oct. 18, 2023).

<sup>27</sup>[GAO-14-704G](#).

<sup>28</sup>[GAO-16-816](#).

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implications of A-10 divestment, including the gaps that could be created by divestment and options for mitigating any potential gaps. For example, the Air Force did not comprehensively assess potential mission capability gaps for close air support caused by the A-10 divestment, the effects of A-10 divestment on highly sought-after training, or the appropriate mitigation strategies for these issues. We further stated that the Air Force may face similar decisions in the future and did not have guidance to ensure that it is collecting quality information.

The Air Force, on behalf of DOD, did not agree with the recommendation and has yet to implement it. The Air Force stated that the department already has guidelines and robust procedures in place, through the budgeting and acquisition processes, to provide senior leaders with quality information with which to make divestment decisions. However, we reviewed the Air Force's budget guidance and found that it does not require the Air Force to provide key information to Congress regarding divestment decisions. We further stated in 2016 that without guidance, DOD may continue to divest weapon systems and overlook the kinds of capability, capacity, and cost issues that ultimately hinder the ability to best balance current demands and future needs. The Air Force, subsequent to our 2016 report, conducted a study and determined that the A-10 still fulfilled some National Defense Strategy objectives and priorities. The Air Force ultimately reversed course and did not divest the A-10 aircraft until recently when Congress authorized the retirement of 21 of the Air Force's 281 aircraft.<sup>29</sup>

Further, there is a complementary mechanism in statute for congressional oversight in limiting inactivation of battle force ships by the Navy.<sup>30</sup> The statute states that the Navy may not decommission or inactivate a battle force ship before the end of the expected service life of the ship, but this limitation may be waived if the Secretary of the Navy submits a certification to the congressional defense committees.<sup>31</sup> The certification

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<sup>29</sup>Pub. L. No. 118-31, § 137(b) (2023).

<sup>30</sup>10 U.S.C. § 8678a.

<sup>31</sup>The Navy is to certify that maintaining the battle force ship in a reduced operating status is not feasible; maintaining the ship with reduced capability is not feasible; maintaining the ship as a Navy reserve unit is not feasible; transferring the ship to the Coast Guard is not feasible; and maintaining the ship is not required to support the most recent national defense strategy. 10 U.S.C. § 8678a(c).

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must explain the rationale for the Navy's determination, as well as a description of the options the Navy assessed.

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## Conclusions

The Air Force and Congress face difficult choices about how to use Air Force resources to best meet current operational needs while also ensuring they have superior capabilities in the future. However, difficult decisions should be based on documented analysis. The Air Force has not collected and documented the information required to make a fully-informed decision on whether to keep the Block 20 aircraft in their current condition, upgrade them, or divest. Divestment decisions have far-reaching cost and operational consequences. The Air Force's legislative proposal and budget documentation—used to inform Congress of its decision to divest the Block 20 aircraft—documented only the operations and maintenance money it would save by not using these aircraft. Thus, the proposal and budget documentation did not acknowledge the value these aircraft have for training, testing, and operational support even without upgrades. As such, detailed guidance for the collection of tactical aircraft divestment information—including documenting the costs, risks, and gaps in capacity created by the divested asset—would better position Air Force leadership and Congress to make decisions for aircraft such as the F-22 Block 20. Without guidance, the Air Force may continue to make budget proposals to Congress that include divesting assets without documenting the impact of these decisions on its entire fleet.

## Matter for Congressional Consideration

Congress should consider requiring the Air Force to provide specific types of data and analyses to Congress before making determinations to divest tactical aircraft. These data and analyses should include: cost assessments inclusive of all relevant factors, gaps in capacity and capability created by the divested asset, and realistic strategies for mitigating those gaps as well as the cost of these strategies. (Matter for Consideration 1)

## Recommendations for Executive Action

We are making the following two recommendations to the Air Force:

Before making additional proposals to remove the prohibition on divesting F-22 aircraft, the Secretary of the Air Force should assess and document the cost, schedule, and risks associated with the divestment of these aircraft. (Recommendation 1)

With regards to upgrading the F-22 Block 20, the Secretary of the Air Force should better assess and document the cost, schedule, and risks associated with upgrading the F-22 Block 20 aircraft before making

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additional proposals to remove the prohibition to divest them.  
(Recommendation 2)

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## Agency Comments and Our Evaluation

We provided a draft of this report to the Air Force for review and comment. In its comments, reproduced in appendix I, the Air Force non-concurred with our two recommendations and provided no comment regarding our Matter for Congressional Consideration. The Air Force also provided technical comments, which we incorporated as appropriate.

In the Air Force's response to our first recommendation, it reiterated the context within which it made the Block 20 divestment decision. It cited the National Defense Strategy, as well as the Defense Planning Guidance, which the Air Force said directed it to take risk in the near term to modernize for the mid- and far-term China fight. It further stated that it selected the F-22 Block 20 aircraft for divestment based on factors such as: (1) the least number of aircraft affected, (2) operational cost, and (3) the aircraft being not-combat capable against China. The Air Force's comments noted that while more information can be useful in divestment decisions, Air Force leadership assessed the cost and schedule risks of maintaining F-22 Block 20 aircraft to be too great based on the information already gathered.

While we agree that the factors cited by the Air Force are key to making a divestment decision, the Air Force did not quantify or document the data to weigh the cost, schedule, and risks of divesting the Block 20 aircraft, including critical residual impacts to its fleet. For example, while the Air Force said that the Block 20s are not combat capable against China, it did not fully document its plans for training pilots without the Block 20 aircraft. If Congress lifted the prohibition on divestment, the Air Force recently stated that it is planning to use F-22 Block 30/35 aircraft—which are combat capable against China—to train pilots. Thus, while the Block 20 aircraft may not be combat capable against China, replacing their use as a training asset with aircraft that are combat capable against China negates this aspect of the Air Force's argument for divesting the aircraft. In addition, if the Air Force's plan is to maintain the current operational tempo of the Block 30/35s and use them for training, this would increase the costs associated with operating and maintaining the aircraft. This was also not documented and compared to the Air Force's estimate of how much it would save by divesting the aircraft. As we noted in the report, neither the fiscal year 2023 budget information nor the proposal to remove the legislative prohibition on divestment included supporting information. Specifically, neither Air Force submission included information on the impact to the Air Force's training mission or on the

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increased operational tempo of the F-22 Block 30/35 aircraft, among other things.

In the Air Force's response to our second recommendation, it outlined how and why it decided not to upgrade the Block 20 aircraft, particularly the prohibitive costs and schedule associated with the upgrades. While the Air Force's response summarizes the key factors it says were involved with making this decision, it did not provide documentation that quantified or documented the cost, schedule, and risks associated with upgrading these aircraft. The Air Force stated that it deemed the level of detail in the contractor's estimate sufficient to defer investing in the Block 20 aircraft. It also acknowledged that further studies could provide added clarity or validate data provided by the contractor but postulated that these studies would not have substantially changed the considerations that drove its decisions. However, the cost and schedule data cited by the Air Force were acknowledged as being only notional.

We respect the Air Force's need to make difficult budget decisions in the face of limited resources and having to provide the necessary tools to the warfighter. This does not, however, alleviate it of the responsibility to document the process and data it uses to make these decisions. As we noted in our report, government agencies—including the Air Force—have an obligation to Congress and taxpayers to demonstrate that they are fully considering the range of consequences of their proposed actions. Based on our review of the responses from the Air Force, we stand by our recommendations and the Matter for Congressional Consideration.

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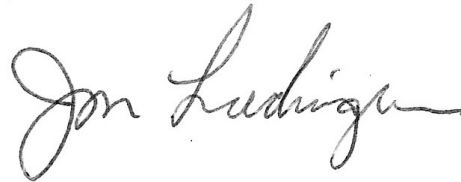
We are providing copies of this report to the appropriate congressional committees, the Secretary of Defense, the Secretary of the Air Force, and other interested parties. In addition, the report is available at no charge on the GAO website at <https://www.gao.gov>.

If you or your staff have any questions concerning this report, please contact me at (202) 512-4841 or by e-mail at [LudwigsonJ@gao.gov](mailto:LudwigsonJ@gao.gov). Contact points for our Offices of Congressional Relations and Public



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Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix II.

A handwritten signature in black ink that reads "Jon Ludwigson". The signature is written in a cursive style with a long horizontal flourish at the end.

Jon Ludwigson  
Director, Contracting and National Security Acquisitions

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*List of Committees*

The Honorable Jack Reed  
Chairman  
The Honorable Roger Wicker  
Ranking Member  
Committee on Armed Services  
United States Senate

The Honorable Jon Tester  
Chair  
The Honorable Susan Collins  
Ranking Member  
Subcommittee on Defense  
Committee on Appropriations  
United States Senate

The Honorable Mike Rogers  
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The Honorable Adam Smith  
Ranking Member  
Committee on Armed Services  
House of Representatives

The Honorable Ken Calvert  
Chair  
The Honorable Betty McCollum  
Ranking Member  
Subcommittee on Defense  
Committee on Appropriations  
House of Representatives

# Appendix I: Comments from the Department of the Air Force



DEPARTMENT OF THE AIR FORCE  
WASHINGTON DC

OFFICE OF THE ASSISTANT SECRETARY

*9 May 24*

SAF/AQ  
1060 Air Force Pentagon  
Washington, DC 20330-1060

Mr. Jon Ludwigson  
Director, Contracting and National Security Acquisitions  
U.S. Government Accountability Office  
441 G Street, NW  
Washington, DC 20548

Dear Mr. Ludwigson:

Attached is the Department of Defense (DoD) response to the GAO Draft Report, GAO-24-106639SU, 'F-22 AIRCRAFT: Air Force Needs to Better Document Options Before Making Critical Decisions,' dated February 23, 2024 and updated May 3, 2024 (GAO Code 106639).

Thank you to you and your team for continued partnership on an issue that remains critical to national security. While we did not concur with the recommendations as written, we appreciate the spirit in which they were generated.

My point of contact is Col James Pate who can be reached at James.Pate@us.af.mil or 571-256-0225.

Sincerely,

DALE R. WHITE, Lt Gen, USAF  
Military Deputy, Office of the Assistant Secretary of  
the Air Force (Acquisition, Technology & Logistics)

Attachment:  
As stated

CLEARED  
For Open Publication

May 20, 2024

GAO DRAFT REPORT DATED MAY 3, 2024  
GAO-24-106639SU (GAO CODE 106639)

Department of Defense  
OFFICE OF PREPUBLICATION AND SECURITY REVIEW

**“F-22 AIRCRAFT: AIR FORCE NEEDS TO BETTER DOCUMENT OPTIONS  
BEFORE MAKING CRITICAL DECISIONS”**

**DEPARTMENT OF DEFENSE COMMENTS  
TO THE GAO RECOMMENDATIONS**

**RECOMMENDATION 1:** Before making additional proposals to remove the prohibition on divesting F-22 aircraft, the Secretary of the Air Force should document and assess the cost, schedule, and risks associated with the divestment of these aircraft.

**DoD RESPONSE: NON-CONCUR:** The Air Force used selected criteria to inform its decision to request divestiture of the F-22 Block 20 aircraft. Based on the Defense Planning Guidance, which directed the Services to take risk in the near term to modernize for the mid and far term China fight, the Air Staff developed several legacy fighter divestment options for Air Force leadership. Of these options, the F-22 Block 20 aircraft were identified as the largest fighter offset based on the following criteria: least number of aircraft affected, operational cost, not-combat capable against China, and the prohibitive costs and schedule to modernize/upgrade.

In making this decision, the Air Force examined its tactical fighter portfolio in the context of the National Defense Strategy (NDS) requirements. Although F-22 Block 20 aircraft can still provide valuable capabilities, the aircraft are not combat representative, and the Air Force must prioritize programs in its portfolio that meet NDS objectives at a reasonable cost to the taxpayer. Without further modification, F-22 Block 20 aircraft do not meet these objectives, as they lack advanced capabilities and cannot carry the most advanced air-to-air weapons. After assessment of the F-22 Block 20 fleet, the Air Force adjusted the divestment to preserve unique test assets.

While more information can be useful in divestment decisions, Air Force leadership assessed the cost and schedule risks of maintaining F-22 Block 20 aircraft to be too great based on the information already gathered. This information, combined with the risk of delaying badly needed modernization, was the basis for Air Force leadership to submit a request to divest the F-22 Block 20 aircraft, as part of building the Air Force’s FY24 President’s Budget request. Since then, the enactment of the Fiscal Responsibility Act in June 2023 has placed further fiscal constraints on the DoD, and the Air Force will continue to focus on affordable capabilities.

Divestment is never a decision that is undertaken lightly but one that leadership must make, in close partnership with its stakeholders, when it becomes clear that a certain level of resources is no longer in the best interests of the Department or the taxpayer. In the instance of the F-22, when the Air Force decided in April 2009 to terminate production of aircraft, the case for upgrading F-22 Block 20 aircraft continued to degrade over time. In addition, without sales of the F-22s to other countries to enable the production line to remain active, the costs of investing further in the platform have and continue to rise. Over time, the F-22 has faced increasing challenges with aircraft availability, which GAO has noted in multiple reports. When faced with

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**Appendix I: Comments from the Department of  
the Air Force**

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these realities, and in light of a rapidly evolving threat, Air Force leaders decided that the Department needed to continue with its plan to divest the F-22 Block 20.

As for A-10 aircraft, GAO's March 2023 testimony about tactical aircraft noted that it is the oldest platform in the portfolio and across the Services, set to be replaced by the F-35A. In December 2023, Congress agreed to let the Air Force begin divestiture of A-10 aircraft. We are focused on tackling the F-35A's development and sustainment challenges, which GAO has also highlighted in recent reports. As part of its decision to divest the F-22 Block 20, Air Force leadership took into account the potential effects of diverting attention and resources from F-35A or F-22 Block 30/35 modernization efforts.

We are committed to ongoing communication with Congress about our tactical aircraft portfolio and how we will meet warfighter needs with capabilities that are effective against future threats while ensuring that they are affordable.

**RECOMMENDATION 2:** With regards to upgrading the F-22 Block 20, the Secretary of the Air Force should better document and assess cost, schedule, and risks associated with upgrading the F-22 Block 20 aircraft before making additional proposals to remove the prohibition to divest them.

**DoD RESPONSE: NON-CONCUR:** Recommendation 2 does not fully account for internal DAF analysis or for defense strategic guidance.

The Air Force evaluated the cost estimate generated by the contractor, with participation of Air Force personnel, as a basis for continued evaluation of capability requirements for the F-22 Block 20 aircraft. Both the estimated cost and the 12-year schedule to modify the F-22 Block 20 aircraft were significant factors in the decision to discontinue pursuit of an upgrade program. The capability benefit of upgraded F-22 Block 20 aircraft would be simply too late to provide substantial benefit to the near term or mid term defense posture for the Air Force, even if the costs were markedly lower. The level of detail in the estimate was deemed sufficient to defer investing in the F-22 Block 20 aircraft and, while further studies could provide added clarity or further validate recent data provided by the contractor, they would not have substantially changed the considerations which drove decision-making.

The capabilities needed for a F-22 Block 20 upgrade program were evaluated to determine the approximate estimate of cost and schedule needed to establish and deliver an upgrade to F-22 Block 20 aircraft. The estimating team used cost data generated by:

1. F-22A Production Restart Assessment 2017 (House Report 114-537)
2. F-22 Block 20 Aircraft Availability 2019 (HAC-D Report 115-769)
3. Actual cost of Fielded capabilities through 2022
4. Estimated cost to completion of current program execution (as of Aug 2022)
5. Estimated cost of approved requirement 2024 – 2028
6. Estimated cost of planned capabilities required to match F-22 Block 30/35 capability

The team evaluated the scope of a F-22 Block 20 upgrade requirement to derive an accurate schedule to accomplish tasks to field capability similar to F-22 Block 30/35 aircraft to establish a 9-year lead time for fielding ability. The top items driving cost, schedule, and technical risk of upgrading F-22 Block 20 aircraft were identified as:

1. Radar – The 4th generation of the APG-77 radar used in the F-22 Block 30/35 aircraft discontinued production in 2011 and is the most critical and costly component for a F-22 Block 20 upgrade program. Production restart, component obsolescence, and software/hardware integration present a significant challenge with concurrent DoD Radar development and production by the original equipment manufacturer.
2. Component Obsolescence – Many components have not been produced since the original F-22 production. Assessing the scale and scope of the redesign of required components would be needed.
3. Production Restarts – Efficiency would be hindered due to the low production volume (32 Radars) and competition with F-35 at key common suppliers.
4. Redesigns caused by key supplier no-bids – Key suppliers holding technical data rights and intellectual property rights may not be willing to produce parts for F-22 again due to other competing programs.

5. Staffing limitations – Staff at the Prime and sub-vendors have critical knowledge and skills not easily expanded to support an effort of the scale needed to upgrade the F-22 Block 20 aircraft while maintaining the scheduled delivery of capability upgrades required for the F-22 Block 30/35 aircraft to preserve a combat advantage against near peer adversaries.

The Air Force evaluated mission requirements, cost, schedule, risk, and industry capacity of a program to expand the operational performance of the F-22 Block 20 aircraft. Ultimately, Air Force leadership concluded that a F-22 Block 20 upgrade program would not deliver capability quick enough and instead, would pull industry capacity away from other higher priority programs. The significant investment required could be more effectively used to resource other Air Force priorities and capabilities.



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# Appendix II: GAO Contact and Staff Acknowledgments

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## GAO Contact

Jon Ludwigson, (202) 512-4841 or [ludwigsonj@gao.gov](mailto:ludwigsonj@gao.gov)

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## Staff Acknowledgments

In addition to the contact above, Laurier Fish (Assistant Director), Stephen V. Marchesani (Analyst-in-Charge), Christian Burks, Edward Harmon, and Christine L. Pecora made key contributions to this report. John C. Bumgarner, Gina Hoover, Tonya Humiston, William Laing, Jennifer Leotta, and Susan E. Murphy also made substantive contributions.

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