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Ending F-22A Production

Costs and Industrial Base Implications of Alternative Options

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Summary

Background

The U.S. Air Force's F-22A Raptor is the world's most advanced fighter aircraft. Currently, Congress has authorized the procurement of 187 F-22As. The final production funding for the program of record is in fiscal year (FY) 2009, with the last delivery about two years later. After this, the Air Force will continue with contracts that provide for some modernization and sustainment work but no new production. Since Congress has prohibited the sale of the F-22A to other countries, there are no options to keep the production line active. RAND Project AIR FORCE was asked to evaluate various scenarios for the time that full-rate production is no longer an option.

Purpose

This monograph explores four options for maintaining a future F-22A industrial capability after the last aircraft is delivered. Descriptions of these options follow.[1]

Shutdown

In this option, the production line would close permanently once the last aircraft is delivered. Tools, special test equipment, and assembly fixtures would be either disposed of or reallocated to other activities, such as F-22A sustainment and modernization or other programs. Professional employees and production workers would be reassigned or let

[1] These options were selected prior to the decision to terminate F-22A production.

go. Production facilities would be reconfigured and reassigned to other work or vacated. This alternative does not include the cost of retaining tools that may be required for future performance upgrades or a service life extension program (see pp. 3, 14–20).

Shutdown and Restart

In this option, the production line would be shut down in a way that would facilitate restart. We assumed a production gap of two years.[2] This option requires significant planning for storage and maintenance of most tools, test equipment, technical information, and production facilities. Further, due to the complex nature of the F-22A design and manufacture, a core of highly trained engineers and production workers, as well as the industrial base capability, must be retained to make a smooth production restart possible (see pp. 4, 9, 21–32).

Warm Production

Under this option, a small number of aircraft would be produced until enough funds were available to return to full-rate production. All the means of production would remain in place, albeit used inefficiently. The low level of production would require a reduction of force, mothballing of some equipment and tooling, and subsequent rehiring and training of workers (see p. 4).

Continued Production

Under this option, production would continue at the current rate (see p. 5).

[2] Birkler et al., 1993, examined the effect of 11 aircraft, helicopter, and missile programs and concluded that the length of the gap did not correlate with recurring production costs at restart.

Results

Costs

Table S.1 shows the results of our analysis. It presents the aggregate costs of termination, hiatus, restart, and production, across the four options, utilizing common cost comparisons. Costs are in constant FY 2008 dollars, except for the final column, which lists total costs in then-year (TY) dollars, reflecting the Air Force's interest in the effect on future budget requirements.

Each production option compares the costs of an additional 75 aircraft.[3] The second column contains the sums of all hiatus, restart, and termination costs for each scenario. The third column contains flyaway unit costs, which are the sum of the target price curve (TPC),[4] propulsion, and other elements of flyaway cost, divided by 75; these range from a low of $139 million for the Continued option, to $154 million for Warm Production, to $179 million for Shutdown and Restart. The fourth column is the average unit cost (AUC), which includes all costs—hiatus, restart, termination, procurement, fly-

Table S.1
Total Cost, by Scenario (FY08$)

Options (2010–2016)	Hiatus, Restart, and Termination Costs ($million)	Flyaway Unit Costs ($million)	Average Unit Cost ($million)	Total Cost ($billion)	Total Cost (TY $billion)
Shutdown	79	—	—	0.4	0.5
Shutdown and Restart	513	179	227	17.0	19.2
Warm Production	111	154	213	16.0	17.8
Continued Production	79	139	173	13.0	13.8

[3] Each production option assumes a total of 75 production aircraft after Lot 9. This assumption was made to keep the Continued Production lot sizes comparable to previous F-22 production lot sizes and the total quantity comparable among all production options. Also, contractor-developed rates and factors did not allow for analysis beyond FY 2016.

[4] Details of what the TPC includes are discussed in Chapter Two.

away, and below-the-line[5]—divided by 75.[6] The fifth column contains total cost, which is AUC multiplied by 75, except for the Shutdown scenario, in which the $0.4 billion cannot be spread over any aircraft.[7] The final column lists total cost in TY dollars. Note that the Shutdown and Restart and the Warm Production options both impose a per-aircraft cost penalty (see pp. 34–52).[8]

From a total cost perspective, Shutdown has the lowest cost; Shutdown and Restart, the highest. Continued Production or keeping the production base warm with low-rate production falls in between.

Sustainment, Modernization, Technical Data Package, Contract Closeout

In terms of costs to the F-22A program, Shutdown would produce no additional costs above the baseline program of record in program sustainment, modernization, technical data package, and contract closeout. This does not imply that all these efforts have been fully funded in the Air Force Program Objective Memorandum or budget; rather, it indicates that requirements should not change due to a decision not to continue production after Lot 9, the last lot of the multiyear buy (see pp. 55–66).

Effect on the Industrial Base

One concern over shutting down the production line either permanently or for some interval has to do with the effect it would have

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5 Below-the-line costs are discussed in detail in Chapter Two.

6 Note that AUC is for the next 75 units only. This should be clearly distinguished from average procurement unit cost and program acquisition unit cost, both of which are calculations of cost of all units procured since the start of a production run, which would in this case include the 183 F-22As already procured (the program of record at the time of this analysis) plus the next 75.

7 Roughly $330 million (FY08$) of the total cost of each scenario represents program support sustainment activities that are currently funded in the production budget. These costs will transfer to the sustainment budget during a production gap and after termination. Although these sustainment costs are included in all scenarios for comparability, they do not represent additional or unforeseen costs of terminating production.

8 No matter what option is chosen, at some point the production will end, so there will be shutdown costs for every option.

on the aircraft industrial base. The F-22A is a complex aircraft that requires a range of highly technical skills. These skills reside in many firms that contract with the government or with a prime contractor to build or assemble portions of the aircraft. If the Air Force stops building F-22As, some of these contractors must work on other aircraft or turn their attention to other areas, perhaps even leaving the field of military aircraft production. Once a particular contractor enters a different field, it may be difficult to attract it back to aircraft production if a future need arises for its services. To gauge the effect of a shutdown on the contractor workforce, RAND surveyed the prime contractors to understand their perception of how a production gap may affect their vendors. The airframe prime contractors were reluctant to allow RAND to directly survey their vendors because they ascertained that the survey would make future negotiations between the prime contractor and the vendors difficult. Note that we examined only the effect of Shutdown and Restart because the other options either terminated production or continued it at some level.

Our analysis of the responses suggests that the prime contractors expect that only a few of their vendors would go out of business as a result of a two-year production gap. The prime contractor surveys indicated that about 20 percent of their subcontractors were at high risk (50 percent chance) of having issues that might compromise their availability. The biggest concerns in other areas were the unavailability of workers with security clearances for specialized skills or processes, general skilled labor, or facilities.

However, other issues are likely to hinder the program's restart capabilities. These issues include requalifying the vendor base, as well as concerns over the availability of skilled labor, processes, facilities, and tooling used by firms supporting F-22A production. All these issues are likely to affect suppliers' ability to provide the same parts when production starts again as they provided when it closed down. Some parts will be technologically obsolete; in other cases, the facilities dedicated to making those parts will have closed down or will have been diverted to manufacturing other parts (see pp. 67–76).