

**Flying Blind:
Most USAF Aircraft Operating Costs Are Unknown;
What Is Known Is Misreported**

By Winslow Wheeler

Summary

In General: While the costs to acquire (to develop and procure) US Air Force (USAF) aircraft have always been controversial, they have also been routinely reported and debated. That is not the case for the costs to operate and support USAF aircraft after they are deployed. Operating and support (O&S) costs are only rarely reported to the public, to Congress or even inside the Pentagon.

The few reports that are available are incomplete, inconsistent and misleading.

The data that are reported indicate that O&S costs for USAF aircraft are twice or more the cost to acquire them. Two-thirds of total aircraft costs are imperfectly known, if they are known at all.

Specifically: The data that are available show that newer aircraft are much more expensive to operate than the aircraft they replace, even when the latter are decades old and require extraordinary measures to keep them in service.

Despite promises that they would be cheaper to operate than the antiques they replace, the costs to operate and support modern stealth aircraft are remarkably high. In 2010, the cost per flying hour for the F-22 and B-2 stealth aircraft were over \$55,000 and \$135,000, respectively—tens of thousands, sometimes almost twice, the cost per flying hour of the aircraft they replace.

DOD's current estimates to operate and support the F-35 are not credible; actual costs can only be far more than currently estimated.

The costs to operate and support drones are badly understated; most of their integral ground operations, their extremely high loss/crash rates and potentially other major costs are not calibrated in the available data.

Conclusions: Congress has kept itself in the dark about these costs; even inside the Pentagon, many seem to be very poorly informed—or to be misinforming—about O&S costs.

The costs to operate and support aircraft after deployment need to be routinely reported both inside the Pentagon and to Congress, but before any Pentagon reports on this subject are to be believed, they must be audited and then made complete and accurate by an independent, competent authority such as the Government Accountability Office.

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Winslow T. Wheeler

Introduction

Most Pentagon observers are familiar with the unclassified Department of Defense (DOD) data for the cost to develop and procure (that is, to “acquire”) weapons. Even if the numbers are frequently understated, they are at least regularly reported and debated.¹ Little attention, however, is given to the cost to maintain, operate and modify the equipment after it is bought.²

Some do not appreciate that Operating and Support (O&S) costs for major weapon systems, such as aircraft, can be twice, sometimes more, the acquisition price. (For example, DOD currently predicts the F-35 Joint Strike Fighter program will cost \$379 billion to buy and an additional \$916 billion to operate.³) Despite the huge amounts spent for O&S, DOD’s public reports on that subject are rare, sometimes non-existent.

Early in a program’s history, there is virtually always a promise that it will be cheaper to operate than the aircraft it is to replace. That rarely turns out to be the case. This is no new phenomenon; just as the Air Force promised the F-22 would be cheaper (by 35 percent) to operate than the F-15, it also promised back in the 1970s that the F-15 would be cheaper to operate than the F-4 it replaced.⁴ The higher O&S costs are rarely divulged—or even the subject of inquiry—and when questions are asked, actual costs are masked by several layers of fog. What is available on scarce occasion is incomplete, and some of it is misleading.

The Hunt for the Data

The issue came up several weeks ago with journalist Stephen Trimble, who runs the informative and useful “DEW Line” blog. Trying to get some answers about the cost to operate and support Air Force aircraft, from our separate sources we both first came up with large spread sheets labeled “Logistics Cost Factors” for Air Force aircraft. On inspection, it became clear the spread sheets were excluding some major costs and confounding others by not wrapping them together in any coherent way.

Next we tracked down a spreadsheet labeled “Air Force Total Ownership Cost” (AFTOC) data, which sounded promising. However, those data too were incomplete: they were only the operating costs “direct” to the Air Force and did not include contractor support, which can be most of the cost of supporting certain aircraft, and the spreadsheet appeared to have excluded some other internal DOD costs.

Then, I was sent a more promising spreadsheet—even if it came with some caveats. It showed the “operational” costs to support aircraft, which included both “direct” Air Force costs and “initial contractor support.” The data was described as unclassified but distributed to only a very few in DOD or even in the Air Force. It was calculated per flying hour (cost per flying hour or CPFH) for all major USAF aircraft types (and some drones), and the spreadsheet was expressed in “constant” 2010 dollars – thereby permitting comparisons both between aircraft types and across years. As I commented to Steve Trimble, I had thought we had the “mother load.”

Problems in the Data

The caveats that came with the “mother load” spreadsheet seemed acceptable: 1) “initial” contractor logistics were included, but there could be more contractor logistics that were not included; 2) additional money in the procurement (and R&D) budgets to modify deployed aircraft were not included; 3) the first couple and last couple years for any aircraft were likely to be outliers due to disproportionate start up and phase out costs, and 4) the costs for drones were incomplete because they were only for the air vehicle, not their additional (and substantial) ground operating costs.

The caveats notwithstanding, there were some significant stories to be told from the spreadsheet, titled “Operational CPFH” in FY 2010 dollars. It is at <http://www.pogoarchives.org/labyrinth/08/03.xls>. (It is also available on request if you encounter downloading problems.)

Steve Trimble wrote up his analyses: find them at <http://www.flightglobal.com/blogs/the-dewline/2011/08/what-does-it-cost-operate-f-22.html> and <http://www.flightglobal.com/blogs/the-dewline/2011/08/exclusive-us-air-force-combat.html>.⁵

I certainly respect Steve Trimble’s expertise, but I saw the import of the data differently and wrote up my analysis separately.

Thinking I had addressed the data gaps in my analysis, I sent it to five experts (each with decades of experience in cost issues) for a peer review. I got an earful in response; they all made it clear to me that I had only the beginning of the story, not the final word.

They confirmed that the Operational CPFH spreadsheet I had was a significantly more complete database than the others and was distributed to only a few in DOD and the Air Force. But there were problems.

To put it simply: the costs not included in the spreadsheet were significant, and those missing costs were distributed inconsistently. The missing cost data was not hidden just in DOD’s procurement (and R&D) accounts, but also in the massive Operation and Maintenance (O&M) account. They include contractor logistics (beyond “initial”) and

could include support costs in depots once or twice removed from depots in direct support of the aircraft in question.

For example, as one reviewer helped me to understand, electronics gear for the Compass Call or Commando Solo versions of the C-130 aircraft might be handled in a depot, or a budget line, not attributed to the C-130 program. Indeed, on the CPFH spreadsheet, it is simply not credible that the electronics-stuffed EC-130J is cheaper to operate than the cargo version of the C-130J—as the spreadsheet would have us believe.

USAF Misreports Data

The costs are not charged to the aircraft program in question but instead to other, more generalized Air Force accounts in the O&M budget. There is a mismatch in the concept that the Air Force actually uses to pay for operating and supporting aircraft and what the Air Force reports, including to itself.

Some Air Force officials apparently know about the amounts not charged to the specific aircraft accounts, but they do not report them. This is done for internal bureaucratic/political reasons, including the desire to keep the appearance of the costs to support a particular program artificially low in order to help it in the bureaucratic budget wars inside the Pentagon—and with Congress when Congress bothers to show an interest in the data. In other words, officials in the Air Force deliberately misinform not just Congress (on such occasions) but also the Office of the Secretary of Defense even some in the Air Force.

The amounts missing from specific aircraft accounts varies across aircraft; the data for one aircraft type on the CPFH spreadsheet might be complete or fairly complete; another might be missing large amounts of cost.. According to the various experts who reviewed the data, the variance, if uncovered, would probably show favoritism for newer aircraft, such as the J model of the C-130, the F-22, etc.. These are the aircraft the bureaucrats tend to try to help—by understating costs—both inside the Pentagon and to external parties.

This behavior—the mismatch between actual costs and reported costs—has been around for decades. One source first saw it when he looked into B-1B operating costs in the 1980s; another said that behavior for the B-1B was nothing new.⁶

What the Available Data Do Say

All that said, including all the caveats and all the missing data, the Operational CPFH spreadsheet makes possible some important insights. Assuming that none of the data are complete, but that there is likely more cost missing from newer, more bureaucratically favored aircraft than others, the spreadsheet shows some remarkable numbers.⁷

According to the best available official Air Force data on the cost to operate these aircraft, the promises of lower (often dramatically lower) operating costs have proven to be false. The stealth aircraft stand out in this respect: They are far more expensive than the already steep costs for operating decades-old relics in the force.

The Extraordinary Cost to Support Stealth Aircraft: Since it was initially deployed in late 2005 until 2008, F-22 flying hour costs (as reported) trended downward. Meanwhile, costs to fly the increasingly aged F-15C (the aircraft the F-22 is primarily to replace and supplement) have risen. Both are logical trends for a new and an old aircraft, but even with the F-22 at a nadir and the F-15C at a zenith, the F-22 is almost \$10,000 thousand more per hour to operate.

Moreover, for 2009 – 2010 the F-22 has trended back up, and given its current problems regarding its stealth coatings, its oxygen system, and its grounding, the flying costs will increase in the years beyond 2010. (The grounding will obviously make per flying hour costs skyrocket in 2011.)

For 2009 – 2010, the F-22 is averaging over \$54,000 per hour; the F-15C is averaging almost \$35,000, a \$19,000 difference, which will surely increase.

The F-22 is showing itself to be not 35 percent cheaper to operate than the F-15C—as promised—but 56 percent more expensive.

Compared to the more complex, but on average newer, version of the F-15, the F-15E, the F-22 is 93 percent more expensive to operate. Except for some outlier years at the end of some of the other F-designated aircraft, the F-22 is by far the most expensive fighter on the spreadsheet.

The B-2A stealth bomber's CPFH cost has climbed in the last five years from \$86,402 in 2006 to \$135,182 in 2010.⁸

Despite the high costs derived from the B-52's approximate 45 year age, it operates at a cost roughly one half that of the B-2: The B-52 varied from \$45,319 per flying hour in 2006 to \$72,793 in 2010.

Even the highly problematic B-1B operates at costs well below the B-2: the B-1B has varied in the last five years from \$52,807 in 2007 to \$63,215 in 2010.⁹

So much for the myth that newer aircraft—especially stealth aircraft—can bring down operating costs relative to the decades old (expensive to maintain) aircraft they replace or supplement.

There are consequences, beyond cost. As Chuck Spinney pointed out years—actually decades—ago, these extraordinarily high operating costs also result in lower training tempos.¹⁰ While air combat fighter pilots received from 20 to 25 hours of in-air flight training per month in the 1970s and 1980s (an era not noted for high military readiness),

when I visited an F-22 unit in 2006, I was informed that F-22 pilots get 10 to 12 hours of in-air training per month, and it did not improve after that.¹¹

We do not know what additional CPFH costs are missing from unreported contractor logistics or indirect depot work for these aircraft. However, we do know from the decades of observations from the experts I talked to that it is probable that a higher proportion of missing costs related to the newer aircraft, such as the F-22 and the B-2a, than to the older aircraft.

Post-Deployment Procurement and R&D Costs Exacerbate the Cost of Stealth: I was also told that there are missing costs from the Procurement budget—and, I suspected, from the R&D budget. At least to the extent that the Air Force fully reports those costs in its annual budget request data, we can find them.

Reported procurement and R&D data to modify and update in service aircraft can be found in the committee reports to defense appropriations bills. Using the 2012 budget year as an example, the appropriations requests for modifications, fixes and upgrades to aircraft can be found in Congress' committee reports.¹² Those reports contain tables for "Aircraft Procurement, Air Force," including categories such as "Modification of In Service Aircraft."¹³

For 2012, the Air Force requested \$104 million in regular procurement for the F-22¹⁴ (although all 188 copies have already been procured in previous years), and it seeks an additional \$232 million for modifications. In the separate "Research and Development Air Force" account, it seeks \$718 million more. For the F-15 (all variants) the Air force seeks \$222 million in modifications and \$207 million in R&D. These amounts total –

- F-22: \$1,051 million.
- F-15: \$430 million.

For the B-2A, the Air Force seeks \$41 million for modifications and another \$49 million for something called "Post Production Support;" In the Air Force R&D account, the Air Force seeks \$341 million for the B-2A.

For the B-1B, the Air Force seeks \$198 million for modifications and \$5 million for "support." In R&D the Air Force seeks another \$33 million.

For modifications the B-52 would cost \$94 million, and for R&D it would cost \$133 million.¹⁵

Per aircraft type, the totals are -

- B-2A: \$431 million.
- B-1B: \$236 million.
- B-52: \$227 million.

Again, the oldest is the cheapest; the newest (more complex, “stealth” model) is the most expensive to support.¹⁶

The 2012 data from the DOD appropriations process is merely one point in time for these various aircraft, but a cursory review of several recent years shows the same pattern: the stealth aircraft are more expensive to modify and upgrade than the aging relics.

Modern stealth aircraft are not cheaper to operate; they are far more expensive. While precise numbers are unobtainable for the simple reason that the Air Force does not report them, even to itself, the broad trends are clear.

F-35: Although no data is entered for the F-35 in the “Operational CPFH” spreadsheet, other available data demonstrates some of the pitfalls. The 2010 F-35 Selected Acquisition Report purports a \$15,190 cost per flying hour for the F-35A, not including indirect costs. It is a cost just 15 percent above an allegedly commensurate cost shown for the F-16C/D. Further DOD analysis purports a total operating and support cost for the entire F-35 fleet of \$915.7 billion.¹⁷

These cost estimates are simply not credible. While the F-35 lacks a second engine or a thrust diverter for in-air maneuvering, in other respects it is much more complex than the F-22: multi-role design; STOVL, and several millions of additional lines of software code are major issues). The F-35 will be lucky to stay under the F-22’s currently reported \$55,000 CPFH estimate.

In addition, while the assertion cannot be documented at this time, it is my understanding that DOD has performed analysis that the F-35 cost per flying hour will be far more than the 15 percent increase over the F-16C/D that DOD publicly asserts. Time will tell.

Drones: The spreadsheet presents CPFH data on the MQ-1B, MQ-9A, (Predator and Reaper) and RQ-4A&B (Global Hawk) drones. The data is for the air vehicles only and does not include the cost of most ground control operations (or most probably other contractor costs). The data shown are neither complete nor comparable to those listed for manned aircraft. Beyond the unshown ground based operating and other costs, an additional factor to be considered for drones is the high loss rate they have demonstrated, which would seem to make the procurement of new, replacement vehicles a factor to add into operating and support costs. While the data is unconfirmed, one blog in the United Kingdom has compiled an impressive list of drone losses in Iraq and Afghanistan.¹⁸

C-5 and other Cargo Aircraft: Another interesting story is the C-5 cargo aircraft. The 2010 data for the various models of it vary from \$47,819 to \$91,921 CPFH. These are extraordinary costs for a cargo aircraft; they are above any other cargo aircraft and are also above other, seemingly more complex, fighter and bomber types. Moreover, we do not know what additional costs might be unreported on this spreadsheet for the C-5.

The C-5 also continues to spend prodigious amounts of money in procurement: in the 2012 DOD Appropriations request, one can find over \$900 million in the “Modification of In Service Aircraft” accounts, plus another \$59 million wedged into the “Overseas Contingency Operations” accounts that are supposed to be exclusive of costs to fight the wars in Afghanistan and elsewhere.

We also do not know what might be unreported for other cargo aircraft. As shown, the C-17 has a much lower CPFH of \$17,998 in 2010, which is roughly equivalent to the older “E” and “H” models of the C-130. The newest “J” model of the C-130 is shown as the cheapest of these major cargo aircraft to operate—at \$14,669 per hour.

The C-130J data, however, shows some anomalies: the EC-130J Commando Solo variant is full of electronics but it is shown as cheaper to operate—at \$13,822 in 2010. It is not plausible that a version full of communications and intelligence gear is cheaper to operate than the much less complex cargo variant. It appears that contractor or remote depot support, or both, are missing. That also raises the question whether cost data for the cargo variant of the C-130J are also missing; indeed, one reviewer commented that it was “hard to swallow” that the more complex C-130J is proving cheaper to operate than either the E or the H model.

On the other hand, the C-130E and H are both quite old, needing the resulting additional support. A different reviewer commented that the E and H have become so expensive that it could be that the J is cheaper. In any case, in the 1990s the Air Force promised that C-130J operating costs would be 20 percent less than the E and H models is replacing. Yet again, the promise has not been kept according to the CPFH data, and it is possible that missing data make the story worse.

Conclusions

What these data are telling us is that the whole affair requires an audit.

It is simply unacceptable that to research the cost to support aircraft, one has to search high and wide to find any Air Force data and then has to search again when the first data provided had gaping holes. The search, of course, did not end on the second or even third round: the data presumed to be “the mother load” was found to be more complete but also full of problems.

We also have no grand totals for the costs to keep the various types of aircraft in the inventory throughout their lifetime. Those presumably prodigious amounts are completely missing for most aircraft.

On the (conservative) assumption that total O&S costs for these aircraft are roughly twice the cost to acquire them, it is quite astonishing that so many in the Pentagon and Congress are so in the dark.

The costs to operate and support aircraft after deployment need to be routinely reported both inside the Pentagon and to Congress, but before any Pentagon reports on this subject are to be believed, they must be audited and then made complete and accurate by an independent, competent authority such as the Government Accountability Office.

Endnotes

¹ These data are in DOD's Selected Acquisition Reports (SARs); SARs are written for specific weapons, but they are frequently not available to the public; the summaries across major weapons are publicly available at <http://www.acq.osd.mil/ara/am/sar/>.

² A major exception is the serious attention Chuck Spinney has given in the past to O&S costs. One example is a major section of his "Defense Death Spiral" study from 1998. See pp. 32-46 of this work at <http://pogoarchives.org/labyrinth/01/05.pdf>.

³ Neither of these estimates are credible' both are understated; see below.

⁴ Chuck Spinney reminded me of this when he commented on a draft of this paper; he documented the F-4/F-15 story when he wrote "Defense Facts of Life" back in the late 1970s. The text of "Defense Facts of Life" appears not to be available on the internet, but it can be ordered from Amazon.com and other booksellers.

⁵ I have one correction to Steve's comments: the sources on these data did not assert that the "operational" data (discussed at length here) on "Fifth Generation fighters" was "not an accurate measure;" it was the "Logistics Cost Factors" and "AFTOC" data they said were incomplete and inaccurate.

⁶ Perhaps the first study that made its way to the public in recent times on these kinds of issues was Chuck Spinney's "Defense Facts of Life," which was widely reported on, even internationally, in the late 1970s and early 1980s.

⁷ In reviewing these numbers, it should be remembered that one major rationale for buying newer aircraft was the high cost of maintaining, operating and upgrading the aging aircraft to be replaced, such as the F-15 and the B-52. Specifically, in the late 1990s, the high cost to operate the then 30 year old B-52s was a major selling point for the B-2, and the Air Force promised DOD and Congress that operating the F-22 would be 35 percent cheaper than the F-15.

⁸ The B-2A fleet is tiny, just 20 aircraft. The jump in CPFH in 2008 may have been—at least in part—the result of the crash of one aircraft, which altered the denominator for the calculation from 21 to 20. Subsequently, in 2010, a second aircraft was grounded for more than a year as a result of a "minor" engine fire. See <http://www.flightglobal.com/blogs/the-dewline/2011/08/b-2-mishap-evolves-from-minor.html>.

⁹ Although it is retired, the stealth light attack bomber, the F-117A, showed the same relationship to analogous aircraft. Before it was retired in 2007/2008, the F-117 cost over \$30,000 per hour to fly. That compares to the approximate \$16,000 to \$19,000 CPFH for the F-16C (which has comparable—but better—range and payload as a bomber).

¹⁰ See Spinney's analysis at <http://pogoarchives.org/labyrinth/01/05.pdf> referenced above.

¹¹ Of course, with the entire F-22 fleet grounded in 2010, it is quite worse now. Interestingly, the Air Force has made it clear it does not believe training in simulators is an acceptable surrogate; it has announced that if the groundings continue, F-22 pilots will lose their certification to fly that aircraft and will only regain their certification once they are able to fly their F-22s, not their simulators. It is also clear that this requirement is not a mere formality.

¹² For example, the House Appropriations Committee Report for the FY 2012 DOD Appropriations bill. Find it at Thomas for HR 2219 at <http://www.gpo.gov/fdsys/pkg/CRPT-112hrpt110/pdf/CRPT-112hrpt110.pdf>.

¹³ See page 175 of the HAC Report.

¹⁴ See p. 174.

¹⁵ See p. 237.

¹⁶ Because the B-2A fleet is so small [roughly one-third the other aircraft] its cost per aircraft per flying hour would be much more expensive [by a factor of roughly three] if these costs were to be expressed in terms of CPFH.

¹⁷ See p. 53 of DOD's 2010 F-35 Selected Acquisition Report, available at <http://www.fas.org/man/eprint/F-35-SAR.pdf>.

¹⁸ Find this blog at <http://dronewarsuk.wordpress.com/drone-crash-database/>.

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