

The Comanche and the Albatross

About Our Neck Was Hung

Col Michael W. Pietrucha, USAF

F-35. We have no other choice.

—Gen Mark A. Welsh III
Chief of Staff, US Air Force



The Air Force intended eventually to replace much of the post-Vietnam fighter fleet with the F-35A. This stealthy aircraft possessed advanced technology and was no more expensive than the aircraft it was designed to supplant. The Air Force sought to buy 1,763 F-35As—the number required to replace every F-16, A-10, and F-117 in service in 2001. Envisioned after the resounding success of the

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F-117 in the Gulf War, the program placed high emphasis on the utility of low radar observability. Designed to provide combat aircraft for the Air Force, Navy, and Marine Corps as well as a host of allies worldwide, the Joint Strike Fighter (JSF) would usher in a revolutionary improvement in American airpower.

Instead, the program has been troubled, characterized by the Pentagon's acquisition chief as "acquisition malpractice," and finds itself well behind schedule and over budget.¹ Rather than an affordable, capable fighter aircraft, operational in large numbers by 2015, the F-35 continues to arrive late and cost more than anticipated.² Program delays, unmet performance requirements, and spiraling costs have recently run full tilt into an austere budgetary environment dictated by the Budget Control Act of 2011.³ More significantly, the program emerged from decades of North Atlantic Treaty Organization (NATO)-centric Cold War experience; furthermore, the Air Force did not envision it either for the Pacific theater or for an adversary with China's air defense capabilities. In this light and despite more than a decade of development invested in the program, budgetary realities should serve as an impetus to reexamine the Air Force's participation in the F-35 program and the future of the fighter force.

We have choices—if we are willing to entertain them. The Army's treatment of the Comanche program offers an example of a bold move in aviation that allowed that service to both modernize and recapitalize. This example shows a potential way forward and should remind Airmen that the Air Force is essential for national security, that no individual aircraft has ever proven indispensable to national security, and that we should be wary of risking national airpower capabilities in our pursuit of a single type of platform. This article presents an alternative future structure designed to preserve the combat air forces (CAF) as an agile and combat-ready multipurpose force, restoring the "high-low" mix that the Air Force essentially abandoned in the 1990s.⁴ It offers a future force, called here the "alternate force"—one more broadly capable and affordable than the force that the current path will produce.

The Comanche

At the heart of any JSF discussion lies the belief that the program cannot be cancelled—that any attempt is doomed to failure because of the spread of the program structure in the United States and internationally. Despite any great unwillingness to end the program, doing so is certainly not impossible. Clearly, the Army's experience with the Comanche is instructive.

In 2004 the RAH-66 Comanche had been in development for 22 years, most of that time as a major defense acquisition program. Two prototypes had been built, and the program was healthy. Yet, the Army terminated it due to questionable utility, expected unaffordability, and the presence of a credible alternative. Acting secretary of the Army Les Brownlee, along with Gen Peter Schoomaker, the Army chief of staff, announced the termination, explaining that

we've examined closely our resourcing plans for aviation and concluded that some of the capabilities those funds would provide are no longer consistent with the changed operational environment. Therefore, General Schoomaker and I have recommended that the Comanche helicopter program be terminated and those resources reallocated to restructuring and revitalizing Army aviation. With the approval of the president and the Secretary of Defense, we began briefing key members of Congress this morning.⁵

Key to the arrangement that terminated the Comanche was repurposing of the programmed money entirely into Army aviation with Joint Staff and congressional consent. Today, the average age of the Army's rotary wing fleet is less than it was in 2004, the AH-64E is poised for the production line, the Army flies remotely piloted vehicles that it did not possess eight years ago, and the rotary transport fleet has been largely recapitalized—even in the Army Guard. In 2004 the Army courageously euthanized the program, and, despite fighting two wars in that time frame, its aviation arm benefited more than one would have expected had the Comanche continued in 2004.⁶ The Army managed the termination so astutely that it became a nonevent,

both politically and financially. Redirected into other Army aviation programs, the money largely went to the same contractors in the same districts that would have received the Comanche funding.

Admittedly, the parallels go only so far. The JSF program, which is much larger and currently produces aircraft, involves a number of international partners who have invested in the program at varying levels. However, the rationale for terminating the F-35 programming to allow a redesign of the tactical air (TACAIR) enterprise remains the same: *some of the capabilities those funds would provide are no longer consistent with the changed operational environment, and it does not serve either the United States or our partner nations to continue on the current path.*

The Challenges

Even if funding were unlimited, reasons might still exist for terminating the F-35. Specifically, its performance has not met initial requirements, its payload is low, its range is short, and espionage efforts by the People's Republic of China (PRC) may have compromised the aircraft long in advance of its introduction.⁷ Our assumptions about the operational environment, made more than a decade ago, do not match current reality with respect to either the threat (worse) or the potential adversaries (more diverse). The mission of the aircraft—to penetrate the most advanced air defenses and drop precision-guided munitions on critical targets of a peer adversary—remains questionable at best, especially if that peer is located in the Indo-Asia-Pacific region, where basing is limited, ranges are long, and potential adversaries have logistical advantages. Despite official pronouncements in support of the F-35 program, the Air Force must remember that its contribution to the nation is fundamentally more about *airpower* than about any particular aircraft. In a resource-constrained environment, commitment to the F-35 must be considered secondary in importance to the joint requirement for TACAIR.

A number of related challenges are associated with the future of the CAF. These problems are not limited to insufficient training resources; rather, they derive from a force-structure shrinkage that has continued for two decades. Financial imperatives that led to a force-structure drawdown in the first place have not gone away, leaving us with a number of critical hurdles to clear before the end of the decade:

1. The Air Force's capability for suppression of enemy air defenses (SEAD) has dwindled in the almost 20 years since retirement of the EF-111A and F-4G. The Air Force has not replaced either the aircraft or, critically, the trained aircrews (unlike the Navy, which has a growing force of EA-18G Growlers). The F-22, F-35, and B-2 are shorn of support capabilities that might enhance their effectiveness and must rely on Navy support.
2. The Air Force possesses no affordable, deployable light attack / armed reconnaissance capability that it can use for irregular warfare. Particularly limiting is the fact that, with the sole exception of the A-10, the service has no capability to operate fighter/attack aircraft from airfields that are too short or rough to handle fast jets. This liability has become a problem of global reach in that the Air Force cannot provide persistent air cover with TACAIR to large portions of the globe, even with tanker support. Without a carrier air wing available to provide short-term coverage, there are few remaining options for CAF support to far-flung forces. Had the Soviets not built large airfields in both Iraq and Afghanistan, we might have faced this problem a decade ago.
3. Basing opportunities are limited, and the vast majority of airfields worldwide remain incapable of supporting legacy or future fighters. The Air Force is neither prepared nor equipped to operate small force packages from very austere bases by using thin logistical pipelines and relying on local support. Distributing single squadrons of easily supportable aircraft over multiple airfields could well deliver a very effective combat capability difficult to counter, particularly in South America, Africa, and the Pacific. In

the Asia-Pacific, the ability to operate from fields 6,000 feet long more than doubles the potential basing and provides opportunities on island bases that cannot accommodate a longer strip.

4. The lack of absorbable cockpits has already drawn the Air Force's inventory of fighter aviators to a point where demand exceeds inventory and is projected to do so well past 2024. Even this date may be a product of the width of the chart and not the result of a plan to make the demand and inventory lines congruent again. Without a rapid infusion of hardware and an increase in the pilot-training pipeline, we will not have the fighter/attack aviators necessary to fill the squadrons and carry out all of the associated tasks, including conducting tests, training pilots, attending professional military education institutions, and filling the rated staff.⁸
5. The Air Force has no practical ability to supply combat aircraft to the air forces of partner nations that cannot afford the F-16—a deficiency that poses particular difficulties in building or rebuilding such air forces, particularly in Asia and Africa. The significant obstacle of procuring light air support aircraft for the Afghan Air Force will be further compounded by the lack of tactics manuals; established tactics, techniques, and procedures; or experienced aircrews to train Afghan pilots.
6. The Air Force has spent significant time and effort over the last 10 years improving both its own ability and that of our NATO partners with respect to close air support (CAS). Given a shrinking pool of ground attack aircraft and the increasing cost to operate them, the service already has insufficient sorties available to support CAS training for joint terminal attack controllers.
7. Regarding homeland defense, no armed platform occupies a niche between Customs and Border Patrol / Coast Guard helicopters and fast jets, posing a mismatch of capabilities any time we need to intercept slow-moving aircraft.

8. The use of costly, aging F-15 and F-16 aircraft for air sovereignty alert (ASA) roles remains an expensive overmatch in capabilities that a modern, less expensive airframe could relieve. This challenge is particularly acute for the Air National Guard, which has faced continuous loss of frontline combat capability as legacy fighters and A-10s are removed from the force.

Commitment to the F-35 makes every one of these issues worse, not only because the aircraft itself will not fill these gaps but also because the required funding effectively deprives the Air Force of the resources demanded to address them. At the heart of the disconnect lie two decades of vision that emphasizes the “all-fifth-generation” fighter force that consists solely of advanced low-observable fighter aircraft.⁹ This approach, which concentrates a notional future conflict against a peer adversary, relies heavily on the assumption that a fighter force designed for the most intense conflicts is automatically suitable for any contingency. The pursuit of this vision comes at a very high opportunity cost and invites a great deal of risk, both programmatic and operational.

Evaluating the Need for a Course Change

Pursuit of the full F-35 buy of 1,763 aircraft remains the articulated Air Force strategy—a plan that inflicts significant damage on the existing TACAIR fleet. Putting aside the impending loss of the newly upgraded A-10, the service has been engaging in an unprecedented force-structure drawdown throughout the total force, reducing fighter and attack strength across the board. In 2013, 17 fighter squadrons were grounded for lack of flying hours while the Air Force simultaneously attempted to increase the production rate of the F-35.¹⁰ The drive for large numbers of increasingly expensive F-35s has taken its toll on flying hours and upgrades for both the legacy fleet and the F-22. Hours for fighter aviators are roughly half of what they were in the Gulf War, placing the service’s aircrews in the unenviable position of flying less than the Chinese and some European allies.¹¹

The “fighter redux” has severely affected the inventory of the Air National Guard and Air Force Reserve, with some fighter and attack units transitioning from the A-10/F-16 to airlift or remotely piloted aircraft and others losing their flying roles entirely.¹² Although it garners short-term savings, this approach alters the role of the Air Reserve Component (ARC) as a strategic reserve and as a second chance to “capture” active duty aviators and maintainers who are leaving the regular Air Force. The ARC should be postured to regain a broad spectrum of aviation capabilities, reequip for the ASA mission, and capitalize on existing locations in proximity to Army and Marine Corps bases and training areas. A recapitalized ARC would include the full range of capabilities from the upgraded fourth-generation fighters through the OA-X and FT-X.¹³

Even a reduced buy of F-35s is problematic because of the high cost of supporting a JSF fleet of any size, given the doubling of unit costs since 2001.¹⁴ The test program for the aircraft remains about one-third complete, leaving the Air Force with quite limited visibility into the platform’s actual costs and capabilities. At this writing, the aircraft has only recently employed its first weapons on a test range. In many respects, the F-35 is a difficult aircraft to argue against because its potential remains largely unknown and discussions tend to address what the aircraft “can” do despite the absence of operational test data that actually determines how an aircraft performs. In this context, what the aircraft “should” be able to do or “might” accomplish is treated as established fact despite the lack of either testing or verification.

The Air Force has proven consistent in the pursuit of “fifth generation” fighters as an essential war-fighting requirement. One of the key shortcomings of this presumption is that it is largely “faith-based” in two respects. Firstly, despite the history of the F-35 program, it presumes that the capabilities we expect will be delivered. Secondly, it is based on a belief that radar low observability will remain effective against future air defense threats. Notably, that presumption of stealthiness rests on shaky ground. Although true for the F-117 against Iraq’s

Kari system in 1991, stealthiness is unlikely to remain so against an adversary that has two decades to prepare for US stealth fighters, which have much higher infrared, visual, and emitter signatures than did the F-117.¹⁵ Only eight years later, the latter aircraft proved vulnerable to a surface-to-air-missile system that had reached initial operational capability in 1959, and we should not presume that Russian and Chinese radar developers have wasted the intervening decades since the Gulf War.

The argument for the F-35 rests heavily on a threat environment that is far from global. In reality only Russia and China can pose the kind of antiaccess, area denial (A2AD) environment that justifies a massive investment in stealth. Air Force leadership is rightly considering other possible adversary capabilities of the future, but in reality only one operator of a true stealth fighter exists—and that is the US Air Force.¹⁶ That service has remained the sole operator of stealth fighters since the late 1980s. Even a decade from now, the F-22 inventory alone will likely outnumber all other models of foreign fifth-generation fighters combined.

The Air Force has not lost a plane to a hostile aircraft since the Vietnam War. The ground-based air defense threat has advanced significantly in the past two decades, but even though some extremely capable systems are available to potential adversaries, the number of nations able to purchase and operate them is quite limited. Outside China and Russia, no massive threat from an advanced integrated air defense system exists. Moreover, China is a poor example of a threat to cite if someone is trying to justify a short-ranged fighter with limited payload flown from island bases within range of overwhelming missile attack.

These facts make the risk calculation involved with prioritizing stealth over performance, range, and weapons loadout inherently suspect—and the F-35 might well be the first modern fighter to have substantially less performance than its predecessors. Admittedly, the classified status of many of its capabilities prevents full disclosure or public debate regarding this point. However, if we prioritize radar low observability as the primary consideration at the cost of many other at-

tributes necessary in a fighter, the stealth-based paths become stealth-limited paths. This priority may indeed sacrifice readiness, force size, magazine depth (ammunition supply), and other force structure to build and maintain a fleet of aircraft that has limited utility against the majority of TACAIR challenges worldwide, not to mention questionable capability in the A2AD environment of the Western Pacific.

A strategy based on the presumed ability to penetrate advanced air defenses is viable only if it does not prevent the pursuit of other strategies. If the force design is instead a niche capability usable only against certain adversaries under favorable conditions and only if that strategy is pursued, then we have significantly reduced our flexibility and have taken immediate airpower options off the table for the promise of a single new capability that is still more than a decade away. Pursuit of an expensive, modern, cutting-edge force has already cost us in terms of force size, structure, flying hours, and entire areas of expertise that we no longer have. In its quest of the F-22 and now the F-35, the Air Force has traded away its dedicated electronic warfare (EW) fighters, the training programs that supported them, and the EW-savvy crews who manned them, leaving fighter EW the purview of the Navy and Marine Corps. In light of the A-10's impending retirement, CAS is primed to go the same way as EW.

The Alternative

It is easy to criticize a developmental program; in fact, all advanced fighter programs endure robust criticism throughout their developmental lives. The strengths of any particular criticism are irrelevant in the absence of a genuine alternative. Unwillingness to investigate an alternative is not the same as not having one. The alternate force postulated here represents an attempt to illustrate that alternatives not only exist but also may present a more robust defense for the nation and its interests.

The fundamental objective of this force structure construct involves making a trade-off between a TACAIR force of limited numbers and narrow depth for a larger, more broadly useful one designed to tackle all of the Air Force's institutional challenges highlighted above. It does not entirely eliminate the F-35 force, given that we already have more of them than we ever had F-117s, but it effectively terminates the Air Force's participation in the program after fiscal year (FY) 2014. The objectives of this proposal are to

- maintain a limited number of F-35As (those already purchased) as a replacement for the capabilities lost upon retirement of the F-117;
- create a modernized TACAIR fleet consisting of a high-low mix of modernized legacy fighters, light attack aircraft, and multipurpose jet trainer / attack aircraft;
- recover some "sunk cost" of the F-35 program by using advanced systems to modernize older fighters, in effect fielding fifth-generation systems in fourth-generation airframes;
- restore the Air Force's SEAD/EW fighters and crews;
- expand the service's global reach capabilities by providing deployable TACAIR assets that can operate from short, rough airstrips on a logistical shoestring;
- increase the number of absorbable cockpits to the point where the Air Force can augment the inventory of fighter/attack aviators to meet requirements;
- invest in affordable, exportable "light combat aircraft" derived from Air Education and Training Command's T-X program;
- allow the Air Guard to maintain its position as the operational reserve and "relief valve" for experienced fighter/attack aviators while recapitalizing its portion of the CAF; and
- build a TACAIR force that can meet the nation's demands for air-power capabilities even in the face of increasing fuel costs and decreasing budgets.

This force design effectively captures sensors and systems intended for the F-35 and places them into new-build and refitted F-16s and F-15Es. To a great extent, this process is already occurring but without full funding. Such a realignment of future force structure terminates the F-35 in favor of advanced fourth-generation fighters, electing to defer stealth to a later generation. It involves a strong investment in improved fourth-generation aircraft, retains the A-10, and adds hundreds of OA-X, FT-X, and AT-X platforms.

Certain assumptions about the global context are necessary:

1. The most capable potential adversary remains the PRC with Iran and the Democratic People's Republic of Korea (DPRK) posing challenges of their own.
2. No significant change occurs in overseas permanent basing.
3. Air Force funding drops to sequester levels until at least 2024.
4. The PRC maintains its current spending levels and development of both combat aviation and theater ballistic missiles. No fundamental change occurs in governance of the PRC, Islamic Republic of Iran, or DPRK.
5. Continuous fighter presence remains a requirement in US Central Command's and/or US Africa Command's area of responsibility.
6. The existing B-2 and B-52 force is unaltered.
7. Fuel costs continue to increase.¹⁷

The force design reflects the reality that since Vietnam, the United States has been involved in far more irregular-style conflicts than regular ones—but that giving up a force designed to achieve coercive effects against a peer adversary amounts to an unwarranted risk. It expands upon the high-low mix model that gave us the F-16 and F-15 and builds a high-medium-low mix of TACAIR capabilities.¹⁸

Force Design

The existing F-22 fleet anchors the “high” end of the TACAIR mix. One oversize F-35 wing, modeled on the 37th Tactical Fighter Wing at Tonopah Test Range, Nevada, will fill the stealth fighter gap left by the F-117. The bulk of the high end will consist of upgraded F-15C, F-15E, and F-16C/D/F aircraft. Many of the upgrades to the fourth-generation fleet will be “harvested” from the JSF program, whereby advanced subsystems from the F-35/F-22 that are ready for fielding will be retrofitted into older fighter designs. In effect, this process is already happening with the F-15E and F-15C to some extent; upgrades of sensors and EW gear should be spread as far as possible throughout the force, including the B-52, not otherwise addressed by this article. The Air Force should purchase a limited number of new aircraft, with 60 F-15Gs and 72 two-seat Block 70 F-16Fs as the baseline. Such purchases are only partially additive. The Block 70 squadrons will be an in-place upgrade of Block 40 squadrons while the F-15G Strike Weasels are added to the force to replace the long-lost F-4G/EF-111A and the critical expertise that came with them.¹⁹ When economically feasible, existing fourth-generation airframes with significant service life remaining should be upgraded to a common standard.

The middle of the TACAIR mix will include the A-10 and combat variants of the T-X—the FT-X and AT-X. The A-10 is facing its own fatigue problems, and the introduction of the OA-X (see below) may allow the Air Force to reduce the A-10 inventory to a number that can credibly support operations on the Korean Peninsula. The service should procure the F-X, envisioned as a T-38 replacement, in three variants. The base airframe—T-X, essentially a modernized T-38 equivalent purchased off the shelf—would constitute the most numerous aircraft (400). The AT-X would take the form of an all-weather, combat-capable, multirole T-X with air-to-ground capability including guns, rockets, and precision-guided munitions. The FT-X would be a fully capable light fighter with a modern air-intercept radar and air-to-air-missile capability comparable to that of the F-16C. The FT-X is intended as a good fit for the Air

National Guard's ASA mission and for use as an aggressor. As such it might replace the Guard's F-16s that have reached the end of their service lives. Both aircraft would also serve as relatively low-cost, dual-role, exportable fighters/trainers (similar to the F-5A/E). The low end of the manned TACAIR spectrum is occupied by the OA-X, Air Combat Command's concept of a modern turboprop light attack aircraft—intended to be additive over and above existing TACAIR numbers except when A-10 units are upgraded directly. The OA-X will assume the burden of irregular warfare and counterterrorism deployments as well as provide ASA alert on demand.²⁰

The following offers a quick look at the future CAF without the JSF. In April of last year, members of Headquarters US Air Force / A8 ran a series of cost projections to 2023, using a tradespace analysis tool against the expected funding of the service's air superiority (AS) and global persistent attack (GPA) portfolios.²¹ This reality-based assessment used a budget baseline that locked in spending levels expected from the Budget Control Act of 2011, with a real defense budget growth of a paltry 0.3 percent. All F-35 procurement funds from FY 2014 to FY 2023 were redirected within the AS and GPA portfolios, which do not include the MQ-9, B-52, or B-2 aircraft.²² F-35 research, development, test, and evaluation funds are left intact for systems migration and maintenance of the aircraft already purchased although doing so will never be cost effective. The "sand charts" supporting this plan include sustainment as well as procurement costs. Table 1 reflects the recapitalized fighter/attack (plus B-1) total active inventory (TAI). The last two columns represent an increase in aircraft and cockpits compared to the FY 2013 programmed force extended (PFE) (1,763 F-35s). In some respects, this comparison is unfair. That is, the FY 2013 PFE overshoots the projected budget line (particularly beyond five years) by 10s of billions of dollars even before sequester while this alternate force stays within the sequester limits, with no gimmicks such as expected efficiency improvements or transfers from other portfolios.

Table 1. Alternate fighter/attack aircraft, TAI 2023

<i>Mission Design Series</i>	<i>Source</i>	<i>Regular AF</i>	<i>ARC</i>	<i>Total</i>	<i>Aircraft Delta</i>	<i>Cockpit Delta</i>
F-22	Existing	167	20	187	0	0
F-35	Existing	56	0	56	0	0
F-15C/D	Upgraded ^a	113	116	233	-16	-16
F-15E	Upgraded ^b	218	0	218	0	0
F-15G ^c	New Build ^d	60	0	60	+ 60	+120
F-16C/D	Upgraded ^e	377	361	738	-282	-282
F-16F	New Build ^f	54	18	72	+72	+144
AT-X	New Build	38	18	56	+56	+112
A-10C	Existing	60	90	150	-133	-133
FT-X	New Build	36	58	94	+94	+188
OA-X	New Build	132	108	240	+240	+480
Total Fighter/Attack		1,311	789	2,100	+91	+613

^a F-15C/D upgrades included infrared search and track, active electronically scanned array radars (APG-63v3), and the Eagle passive/active warning and survivability system (EPAWSS) upgrade to EW systems.

^b F-15E upgrades included APG-82 and EPAWSS.

^c The F-15G (called EF-15E by Boeing) moves the EW systems from the EA-18G to the F-15E+.

^d New-build aircraft were priced for both purchase and operation and maintenance in accordance with existing examples. F-15Gs were priced at \$110 million each, with the F-16F at \$70 million. The baseline for the AT-X was the Royal Air Force's Hawk T2, priced at \$33 million in adjusted dollars; the FT-X was priced at \$35 million. The OA-X was priced at the light attack / armed reconnaissance + 20 percent price at \$12 million each.

^e F-16C/D upgrades, which were largely applied to Block 40/42/50/52 aircraft, consist of the combat avionics programmed extension suite radar / EW upgrade plus a service-life extension.

^f The F-16F is a Block 70 F-16 modeled after the Israel Defense Force's two-seat, medium-range F-16I Sufa.

Under this projection, the fighter/attack force in 2023 includes 2,100 TAI aircraft, 91 more than the unconstrained PFE, with a concurrent increase in cockpits because every new aircraft is a two-seater.²³ Table 1 does not account for all of the money spent; B-1Bs were reduced (table 2).

Table 2. Alternate bomber aircraft, TAI 2013

<i>Mission Design Series</i>	<i>Source</i>	<i>Regular AF</i>	<i>ARC</i>	<i>Total</i>	<i>Aircraft Delta</i>	<i>Cockpit Delta</i>
B-1B	Existing	20	0	20	-18	-72

By 2023 the complete plan divests 18 B-1Bs, A-10s that have not already been rewinged, and the oldest F-16s in favor of 540 brand-new F-15Gs, F-16Fs, OA-Xs, AT-Xs, and FT-Xs. The Air Force's long-dormant EW fighters return, reducing dependence on the short-range EA-18G. Included in the reallocation are the entire GPA/AS sequester bill and munitions funding to 80 percent of desired war reserve as well as legacy modernization and upgrade. No training or range funds were raided. In the target year, production lines for the light combat aircraft (OA-X, FT-X, and AT-X) remain open, allowing for future purchases after the "bow wave" of expenditures subsides and for development of the long range strike bomber as well as the sixth-generation F-X. An alternative not only exists but also restores long-dormant capabilities and increases the size of the force.

Strategic Risk Management

The viability of the alternate force cannot be divorced from a discussion of force structure, which itself addresses expectations for twenty-first-century airpower. It is reasonable to assume that any conflict which involves the joint force also involves airpower application; consequently, we should give careful thought to what airpower brings to the fight.

Categorizing potential conflicts as "most likely" through "most threatening" and then making the case that the most threatening is of primary importance has become habitual. For the wars in Iraq and Afghanistan, the Air Force followed this approach—one that had the unfortunate effect of placing a heavy burden on legacy jet fighters that used only a fraction of their capabilities in these two wars. The ser-

vice's preferred structure emphasizes the most threatening conflict—often the descriptor for major combat operations with the established military forces of a peer or peer-like state.

The fifth-generation fighter is held up as a hedge against the most threatening scenario, as if we must use this particular aircraft to fight a peer nation. This attitude is typical of a cultural belief that superior technology will lead to American victory and that if we lack the most technologically advanced aircraft, we cannot prevail in war. This hardware-based, strategy-independent assumption fails to consider the possibilities inherent in an approach that encompasses a broad range of airpower capabilities in favor of a very specific niche capability. It is also demonstrably false. Clearly, we had a technological edge in Vietnam, rough parity in Korea, and, arguably, technological inferiority against the Luftwaffe. Yet, the outcomes of those conflicts did not align with the associated aircraft technological advantage.

Under the approach that has prevailed since 2001, any possible conflict other than the most threatening one is a lesser-included case that a stealthy niche force can handle effectively. In effect, the F-35 in particular is presented as having broad applicability that makes it inherently well suited to any form of conflict simply because it can handle the so-called high end, when in reality the data does not support this conclusion. Using Afghanistan as an example, we simply could not have afforded to deploy or employ F-35s in the fashion that we employed F-16s and F-15Es—based on the operation and maintenance (O&M) costs or the fuel consumption, to say nothing of the decremented airframe life.²⁴ The use of existing fourth-generation aircraft in Iraq and Afghanistan was itself far more costly than a comparable strategy pursued with modern light attack aircraft, making the “lesser included case” path very hard on equipment, logistics, and personnel.²⁵

Realistically, irregular conflicts are the most likely to occur, given that this has been the case throughout recorded Western military history.²⁶ Withdrawal from Iraq and eventual withdrawal from Afghanistan will not presage the end of US involvement in irregular warfare.

America is currently involved in Mali, the Philippines, Afghanistan, Pakistan, Yemen, Jordan, Uganda, and the Horn of Africa; Libya is a fading memory; and Syria remains a possibility. A very fuzzy dividing line also exists—a conflict with China over Taiwan might not prove most threatening to the United States if it remained a conventional battle. Further, a collection of irregular challenges might very well aggregate to provide a most threatening scenario, especially if it involved the collapse of a nuclear state or loss of access to critical resources, territory, or aspects of the global commons.

Making the “lesser-included” argument particularly weak is the assumption that forces constructed for a less intense, broader challenge are inherently inferior. Capabilities such as endurance, ordnance diversity, weapons payload, maneuverability, fuel economy, range, and rough field capability are not considered worthwhile in the face of a binary classification—stealthy / not stealthy. The environment in which a conflict occurs is one of the defining aspects of any war, unquestionably having an impact on the flavor of airpower capabilities that can be brought to bear. If all environments, strategies, and adversaries are lesser-included cases of the “stealth only” option, then large numbers of F-35s would make sense—if they are affordable. However, if that is not true, then we ignore the consequences of being unable to fight proliferating and widespread “most likely” scenarios—or the obvious consequences of treating irregular warfare challenges as a lesser-included case and flying the wings off our fast-jet TACAIR, despite a decade of hard data on the effect of this approach.

The all-fifth-generation force also ignores the wide applicability and deterrence value of having a flexible force that can do more than one thing well, particularly under uncertain conditions in a rapidly developing crisis. There is always value in deploying combat aviation forward if we can accept the risk. Such risk has nothing to do with an aircraft’s stealthiness but everything to do with how fast we can deploy airpower into austere conditions, with limited manpower, to conduct combat operations shorn of a fixed, preplanned basing structure. It

would be a much easier decision to deploy OA-Xs or AT-Xs into Ukraine today, even knowing that we risked their loss on the ground, than to accomplish the same task with F-35s. If US Air Forces in Europe currently possessed light combat aircraft (OA-Xs, AT-Xs, and FT-Xs) capable of operating on a logistical shoestring from Ukrainian airfields in poor condition, then the supreme allied commander, Europe, would no doubt sleep more soundly in the face of a Russian irregular threat—which by itself was enough to secure Crimea.

The battle between the most threatening and most likely scenarios leads to an infertile discussion of false trade-offs. The force structure built solely for the most threatening scenario is fundamentally flawed because it relies on a false assumption that the A2AD challenge can be mitigated solely by fifth-generation fighters—in particular, a short-range, long-runway fleet shorn of EW/SEAD support. A force structure that discards some tailored capability for most likely conflicts may be unable to meet the needs of the nation because it relies on a faulty assumption that such a force cannot provide coercive effects against a peer and is therefore of little value.²⁷ Both of these scenarios ignore basic lessons in the art of war. If we have more employment options from more places, then we have more opportunities to gain leverage against an enemy. If we intentionally minimize our list of possible options, then we allow our adversaries the luxury of building and training a force designed to counter a limited US Air Force.

End State

The broad approach taken in the design of this proposed alternate force results in an increase in the number of fighter/attack squadrons and a significant increase in the number of absorbable cockpits while reducing O&M costs over the PFE.²⁸ It recognizes that one of the primary drivers of readiness problems is the high rotational burden on the fast-jet fleet and creates a force structure that drives the vast majority of the rotational burden to the lowest-cost aircraft with the lowest O&M and lowest fuel consumption. The approach also backs up the global-

reach tenet with aircraft that can fight from unimproved airstrips. The capability to counter advanced air defenses is retained, but it returns to an approach proven in Vietnam and Operation Desert Storm—specialized aircraft with well-trained crews flying dedicated missions in support of strike aircraft. The current Air Force approach, which has relied entirely on the Navy for jamming support for 16 years, is reversed with a combined Weasel/Jammer capability in the F-15G. The F-35s already purchased are retained, and advanced capabilities will be available to satisfy commitments made to partner nations.

Collateral effects include the shifting of the burden of expensive low-observable fighter programs to the PRC, which cannot effectively use them to project power far beyond the mainland. Although none of the aircraft numbers lost in the fighter reductions of the last decade are regained, the average age of the fleet is slightly reduced. Inclusion of the F-16F adds a medium-range F-16 variant better suited to the Pacific theater. Adding combat aircraft types that are less expensive than the heavier fighters better positions the Air Force to engage effectively with emerging partner air forces, expanding our influence and opening up opportunities for burden sharing. Critically, with most purchases complete in 2023, it frees multiple billions of dollars for development and procurement of the long range strike bomber and/or a next-generation fighter program (F-X) after 2023—a bonus that the PFE never comes close to providing.

Climbing Out of the Readiness Pit

Money gained through termination of the JSF cannot be entirely dedicated to aircraft purchase and upgrade, particularly in a case such as this in which TACAIR TAI actually increases. Some aircraft programs, such as the F-X and OA-X, are designed to “make money” by meeting current demands with an O&M cost low enough that the procurement is eventually paid for in O&M savings. Adding fuel cost increases into the sustainment calculation is difficult and not attempted,

but this construct is more forgiving of that expense than the PFE because of lower fuel consumption.

The effectiveness of TACAIR depends upon giving particular attention to several other areas—readiness, for instance.²⁹ Having used readiness funds to pay for hardware bills, we must now restore the resulting decrease in readiness with funds dedicated to the TACAIR enterprise. The point of F-35 divestiture includes avoiding a permanent low-readiness state that is an extension of our current condition. The second area is magazine depth. Having temporarily given up the (presumed) capability to bring aircraft into the worst of enemy air defenses, we should not entirely relinquish the capability to hold defended targets at risk. This means additional investment in standoff weapons, including AGM-158 joint air-to-surface standoff and antiradiation missiles. It also entails an increase in improved air-to-air missile inventories and development of weapons that need not trade away performance and capabilities in order to fit into a JSF weapons bay. Finally, restoration of long-dormant anti-surface-warfare weaponry is a critical capability for the Pacific region. In the third element—systems, particularly sensors and communications—the fruits of F-35 development can be practically harvested without continuing the program itself by fielding and deploying the advanced radar, EW gear, and data links from the JSF program onto fighters and conventional bombers.

Conclusion

It is time for a rational discussion of the F-35. Such a dialogue would have to be free from the vacuum of a notional volume of contested airspace and consider the context of the complete CAF enterprise and its application across the globe. The F-35 program has long since passed the point where we can expect it to provide a substantial improvement in a broad war-fighting context over its predecessors. Designed for a European conflict that did not occur and a threat environment less advanced than the present one, the F-35 program offers little improvement over its predecessors and demands vast resources from diminishing funds.

Following the example of the Comanche program, we should consider cancelling the F-35 in favor of a robust, modernized CAF that emphasizes broad capabilities rather than occupying the short-range stealthy niche. Facing a decade of reduced budgetary authority, we must follow a prudent path towards recovery after more than 20 years of continuous combat operations. Doing so will help address a number of collateral issues, including force readiness, global reach, and the inventory of fighter/attack aircrews. Viable alternatives to the F-35 exist if we have the courage to examine them. ★

Notes

1. Dave Majumdar, "Kendall: Early F-35 Production 'Acquisition Malpractice,'" *DefenseNews*, 6 February 2012, <http://www.defensenews.com/article/20120206/DEFREG02/302060003/>.
2. Government Accountability Office, *Joint Strike Fighter: DOD Actions Needed to Further Enhance Restructuring and Address Affordability Risks*, GAO-12-437 (Washington, DC: Government Accountability Office, June 2012), <http://www.gao.gov/assets/600/591608.pdf>.
3. General Accounting Office, *Defense Aircraft Investments: Major Program Commitments Based on Optimistic Budget Projections*, GAO/T-NSIAD-97-103 (Washington, DC: General Accounting Office, 5 March 1997), <http://www.gao.gov/assets/110/106735.pdf>.
4. The high-low mix was the rationale for the procurement numbers of the F-15 and F-16. The F-15 was the high end, procured in limited numbers, and the F-16 the low end, procured in much larger numbers. The intent was to maintain a broadly capable force under post-Vietnam budget constraints.
5. Acting Secretary of the Army Les Brownlee, "Briefing on the Restructure and Revitalization of Army Aviation," Department of Defense, 23 February 2004, <http://www.defense.gov/transcripts/transcript.aspx?transcriptid=2122>.
6. Julien Demotes-Mainard, "RAH-66 Comanche—the Self-Inflicted Termination: Exploring the Dynamics of Change in Weapons Procurement," *Defense Acquisition Research Journal* 19, no. 2 (April 2012): 183–208, http://www.dau.mil/pubscats/PubsCats/AR%20Journal/arj62/Demotes-Mainard_ARJ62.pdf.
7. David Alexander, "Theft of F-35 Design Data Is Helping U.S. Adversaries—Pentagon," Reuters, 19 June 2013, <http://www.reuters.com/article/2013/06/19/usa-fighter-hacking-idUSL2N0EV0T320130619>.
8. "Aircrew Summit 2012, 21 June General Officer Steering Group VTC Brief," v7 (Washington, DC: Headquarters US Air Force / A30, 21 June 2012).
9. The imprecise term *fifth generation* is used generically to apply to modern fighter aircraft that have radar low observability as one of their primary design characteristics. Typically, it includes the F-22, F-35, Russian PAK-FA prototype, and J-20. The F-15, F-16, and F-18 are fourth-generation aircraft.
10. Brian Everstine and Marcus Weisgerber, "Reduced Flying Hours Forces USAF to Ground 17 Combat Air Squadrons," *DefenseNews*, 8 April 2013, <http://www.defensenews>

.com/article/20130408/DEFREG02/304080011/Reduced-Flying-Hours-Forces-USAF-Ground-17-Combat-Air-Squadrons.

11. Julian E. Barnes, "Warning Sounded on Cuts to Pilot Training: Air Force Responds to Cost Concerns by Reducing Flight Hours to 120 Hours or Less, Fewer Than Those of Allies—and China," *Wall Street Journal*, 19 December 2013, <http://online.wsj.com/news/articles/SB10001424052702304773104579268651994849572>.

12. The series of fighter force-strength reductions in the last decade has been collectively referred to as the "fighter redux" or "CAF redux." At least two major strength reductions have occurred, bringing the planned total fighter strength below 2,000.

13. The OA-X is Air Combat Command's proposal for a turboprop light attack aircraft similar to the Embraer A-29 Super Tucano or the Beechcraft AT-6B. The FT-X (sometimes the AT-X) is the proposed combat variant of Air Education and Training Command's T-38 replacement—the T-X.

14. Government Accountability Office, *F-35 Joint Strike Fighter: Current Outlook Is Improved, but Long-Term Affordability Is a Major Concern* (Washington, DC: Government Accountability Office, March 2013), 5, table 1, <http://www.gao.gov/assets/660/652948.pdf>.

15. Kari (*Irak* spelled backwards) was the French-built integrated air defense system possessed by the Iraqis prior to Desert Storm. It was only partially reconstituted after the Gulf War. The F-117A had no radar, data link, afterburner, or EW gear; in fact, it did not even use radio after crossing a hostile border.

16. Gen Mike Hostage (speech, Air Force Association, 17 September 2013), <http://www.af.mil/Portals/1/documents/af%20events/17SeptAFAGen%20HostageCOMACCSpeech.pdf>.

17. The global assumptions are based on current trends. Like any other set of assumptions, a radical event such as a new revolution in Iran or the fall of the regime in the DPRK is an unpredictable occurrence that would alter the list substantially. Internal US trends are perhaps easier to predict—congressional resistance to reducing the B-1 fleet is well established, the 2011 Budget Control Act is law, and fuel costs have been on a steady, upward trend for two decades (arguably four) despite increased worldwide production.

18. When the terms *high*, *medium*, and *low* are used in this context, they refer to their cost and to the intensity of the conflict for which they are optimized. "High-end" aircraft are expensive because of the advanced sensors, weapons, and communications required to conduct missions in contested airspace; "low-end" aircraft are less costly and designed for the parts of a campaign that do not demand operations in hostile airspace.

19. The F-15G is a modified F-15E+. Its EW systems are migrated from the EA-18G Growler, just as the migration of EA-6B systems to the F-111 Aardvark created the EF-111A Raven.

20. The MQ-9, funded from the intelligence, surveillance, and reconnaissance (ISR) portfolio, is left alone since it does not compete for funds directly with other TACAIR.

21. We did not utilize any funding from the ISR portfolio, which covers the MQ-9, or the global strike portfolio, which covers the B-52 and B-2.

22. The tradespace analysis tool includes not only purchase costs but also sustainment costs.

23. The two-seat fighter squadron is more expensive than its single-seat counterpart for obvious reasons. However, in an environment where we have insufficient cockpits to go around, the two-seat fighter squadrons double the number of absorbable cockpits without a concurrent doubling of costs.

24. Estimated O&M costs for the F-35 currently hover around \$32,000 per flying hour compared to the F-16's \$19,000; the A-10's \$18,000; and the F-15E's \$28,000 (Air Force Total

Ownership Cost database, FY 2013). By comparison, the Air National Guard's AT-6B test program operated for two years with an hourly flying cost of less than \$1,500.

25. For detailed discussions of the potential impact of a light attack aircraft on Air Force operations in Operation Iraqi Freedom and Operation Enduring Freedom, see Michael Pietrucha and J. David Torres-Laboy, "Making the Case for OA-X," *Air Land Sea Bulletin* 2010-1 (January 2010): 15-18; and Michael Pietrucha, "Logistical Fratricide," *Armed Forces Journal* 149, no. 6 (January/February 2012): 14-37.

26. Although the term *guerrilla warfare* derives from the Peninsular War in Spain against the Emperor Napoleon, historical examples of irregular warfare are legion. The Romans, for example, fought far more irregular conflicts than classical major combat operations such as the Punic Wars and had an adaptable military structure that varied by time and place, depending greatly on the nature of their adversaries.

27. A fifth-generation penetrating force is not necessary to produce coercive effects against a large, maritime-dependent nation. Approaches used against Japan in early and mid-World War II are but one example of an effective strategy that can be conducted with airpower and operated at a distance without the need for mass penetration of air defenses.

28. Absorbable cockpits—operational flying positions filled by fighter/attack aircrews—are a measure of the ability to develop and season aircrews.

29. Given this article's focus on TACAIR and the necessity of neglecting the bombers, it must be noted that readiness, system upgrades, and magazine depth are bomber issues as well.



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