



SMALL WARS JOURNAL

Finding Strategic Balance

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Journal Article | Dec 23 2013 - 12:19pm

Finding Strategic Balance: How Should the USAF Balance Continuing Irregular Requirements with High-end A2/AD[i] Requirements?

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How should the USAF balance continuing irregular requirements with high-end A2/AD requirements?
Should the USAF:

- A. Continue on the current path, purchasing an exquisite force of the most capable high-end platforms (F-35) able to penetrate and survive in a contested environment, assuming they can handle air operations in a more benign environment as a lesser included case, or
- A. Commit to a balanced force, trading some of our niche high-end fighter forces to finance investment in low-end aircraft more appropriate for irregular operations and shaping?

Fundamentally, is it better for the nation to seek to acquire 1,763[ii] exquisite F-35s, or should we accept small reductions in the F-35 program of record to invest in low-end forces used to build partnerships and carry the load of the Nation's many "low intensity" military missions. Is the nation in a better position with 1,763 F-35's and no low-end forces, or to acquire 1,739 F-35's and a balanced fleet of low-cost, daily employable IW-relevant aircraft (224 light attack aircraft + 115 light mobility aircraft)?



Two Force Structures Illustrated[iii]

This paper argues that the balanced force enables the USAF to better execute its range of global missions than the exquisite force. It further argues that balanced investment in an IW-capable low-end force actually is a more comprehensive strategy to counter A2/AD.

The balanced force enables a broader strategy of shaping and setting strategic conditions, opening up new avenues for engaging partner nations with developing air forces on the periphery of states of concern.

Moreover it protects and preserves our nation’s investment in the high-dollar, low-observable aircraft in the likely event that the USAF may be required to bring airpower effects in a more permissive environment.

In contrast, pursuing an all high-end, exquisite force *undermines the USAF’s global geo-strategy, reduces its freedom of action, perceived relevance, usability, and imposes significant costs on the USAF.*

Review of A2/AD and IW Requirements

In the latest defense strategic guidance (DSG), “Sustaining U.S. Global Leadership: Priorities for 21st Century Defense” the President and Secretary of Defense lay out Department’s efforts to *rebalance* and reform--in the context of an imperative of deficit reduction--through a *lower level of defense spending and* move from an emphasis on today’s wars to preparing for future challenges. It directs that:

“[t]he Joint Force will need to recalibrate its capabilities and *make selective additional investments* to succeed in the following missions:

- Counter Terrorism and Irregular Warfare.
- Deter and Defeat Aggression.
- Project Power Despite Anti-Access/Area Denial Challenges.
- Provide a Stabilizing Presence.
- Conduct Stability and Counterinsurgency Operations.
- Conduct Humanitarian, Disaster Relief, and Other Operations.”[\[iv\]](#)

Clearly the DSG considers both IW and A2AD important.

On the one hand, this recalibration prominently calls out requirements for investment in IW, which includes Counter-Terror, Counter-Insurgency (COIN), and STABOPS [which includes Foreign Disaster Response and Humanitarian Assistance/Disaster Relief (HA/DR)]. While the DSG directly states “U.S. forces will no longer be sized to conduct large-scale, prolonged stability operations, it nevertheless states “the United States will continue to take an active approach to countering these [irregular] threats by monitoring the activities of non-state threats worldwide, *working with allies and partners to establish control over ungoverned territories, and directly striking the most dangerous groups and individuals when necessary.*” [\[v\]](#) The guidance states that “global counter terrorism efforts will become more widely distributed and will be characterized by *a mix of direct action and security force assistance*” and that “we will continue to build and sustain tailored capabilities appropriate for counter terrorism and irregular warfare,” making clear a preference that “[w]henver possible, we will develop *innovative, low-cost, and small-footprint approaches* to achieve our security objectives, *relying on exercises, rotational presence, and advisory capabilities.*” [\[vi\]](#)

On the other hand, the DSG also directs selective investment in projecting power despite anti-access area denial challenges and in deterring and defeating aggression. It provides a planning construct that expects our forces to be “able to fully deny a capable state’s aggressive objectives in one region” while also “capable of denying the objectives of—or imposing unacceptable costs on—an opportunistic aggressor in a second region.” Within this context, it notes that “to credibly deter potential adversaries and to prevent them from achieving their objectives, the United States must maintain its ability to project power in areas in which our access and freedom to operate are challenged,” specifically calling out air-related threats such as electronic and cyber warfare, ballistic and cruise missiles, advanced air defenses, and, stating the

“U.S. military will invest as required to ensure its ability to operate effectively in anti-access and area denial (A2/AD) environments” and specifically calls out concerns such as China and Iran who “continue to pursue asymmetric means to counter our power projection capabilities.”

Recap of Current Balance of IW & A2/AD Capabilities in the Planned Force

The common understanding of “the ability to project power despite anti-access / area denial challenges” in the USAF refers to the ability of the Combat Air Forces to attack adversaries’ critical centers of gravity despite the presence of an Integrated Air Defense System (IADS). Successfully defeating an IADS typically requires generating adequate numbers of survivable aircraft to bypass, suppress or defeat such a system. There are several components to survivability in this context. The first is an adequate number of “tip of the spear” fifth generation fighters (F-22, F-35) and low observable bombers (B-2, LRS-B) which rely on low signatures to hide in the noise and strike unannounced. The second is to protect the existing less expensive and more numerous 4th generation aircraft fleet with Electronic Warfare and defensive systems (EW) to increase the noise (jam and spoof) and reduce the effectiveness of adversary anti-air systems. The third are similar efforts to protect the key enablers—C2ISR platforms and tankers. The last component is the survivability of the bases and logistics structures that allow for the generation of aircraft, and involves efforts to harden, disperse, provide warning and active defenses against adversary attacks (principally by “G-RAMM” Guided Rockets Artillery Mortars and Missiles, including cruise missiles).

With respect to appropriate aircraft acquisitions, for power projection vs. A2AD, the USAF has a small program to purchase only 80-100 Long-Range Strike Bombers (capped at \$0.55 Billion)[vii], but by far the most significant investment the USAF is making in projecting power despite A2AD is the F-35 Program of Record of 1,763 aircraft, which is the largest weapons system purchase both for the USAF and the DoD (total program is estimated to be between \$392 billion-\$1.1 Trillion)[viii] and the most obvious place to examine “trade space” between A2AD and IW.[ix]

The common understanding of dedicated USAF Irregular Warfare (IW) capabilities is concerned with aircraft appropriate to support operations in the five pillars of IW: Foreign Internal Defense (FID), Unconventional Warfare (UW), Counter-Terror (CT), Counter-Insurgency (COIN), Stability Operations (STABOPS) [which includes foreign disaster relief]. However, USAF IW capabilities are most typically used to advise and assist the developing air forces of partner nations to achieve internal security in permissive environments using a “by-with-and-through” approach.

The appropriate tools to provide advice and assistance to meet this national-level guidance are transferable-affordable-modular-interoperable (TAMI) light aircraft for mobility, ISR and strike appropriate for internal threats and US Airmen with expertise in them. While standard aircraft in the USAF inventory can participate in direct action it is principally two classes of aircraft: Light Attack/Armed Reconnaissance and Light Mobility (LiMA) that have been considered the IW-specific aircraft required to be able to conduct shaping of the Air Domain. In recent years, the USAF validated requirements for a Light Attack Armed Reconnaissance (LAAR)[x] and Light Mobility Aircraft (LiMA) and decided to acquire 15 of each before both programs were cancelled. Therefore presently the IW-dedicated force structure in the General Purpose Force (GPF) stands at zero. The remaining standing advisory capabilities consist of two regionally aligned Mobility Support Advisory Squadron (571 & 818 MSAS) and the 6th Special Operations Squadron (6 SOS)[xi] with a total combined annual operating budget of under \$10M.

From the perspective of balanced investment between A2/AD and IW in manned flying assets in the Programmed Force Extended over the planned F-35 acquisition period, the current ratio stands at 73:0.

Overbalance

The current investment to project power despite A2AD is unaffordable following sequestration reductions, especially with regard to procurement of fifth generation fighters. The investment is also likely overly robust for any single MCO scenario. Maintaining this level of investment in the F-35 crowds out other investments—investments which would result in a more balanced force structure at lower cost. While providing access to the battlespace and global commons will remain important, the capacity of these assets can be reduced to fund additional capabilities that optimize the performance of the entire force structure. Additionally, as A2AD capabilities both in Asia-Pacific and the Gulf increasingly threaten short-range fighter dependencies (bases, tankers, and critical enablers in the space and cyberspace domains), close-in operating concepts appear less attractive than concepts that can rely on longer-range assets such as LRS-B [xii].

Rebalance

The 2008 A9 Lessons Learned “Airpower in Irregular Warfare” states, “The USAF does not have a proper balanced force mix of MCO and IW assets.” What such a balanced force might look like was tasked by HQ USAF and reported in RAND’s 2010 report “Course of Action of Enhancing U.S. Air Force ‘Irregular Warfare’ Capabilities.” This analysis stated “there appears enough commonality between IW and conventional operations that fairly modest resource shifts and some new investments can ‘balance the force’ appropriately across irregular and traditional warfare mission needs,” and provided COAs for IW Force structure.[xiii]

Subsequently, the 2009 Future Capabilities game explored whether or not a “fully funded IW” force would be able to still cope with A2AD challenges. It created an alternate force structure that explored both “fully funding IW” and “fully investing in one conventional campaign against a peer competitor” while relaxing the requirement for a nearly simultaneous second conventional campaign, and found that the alternate force performed better in the primary conventional campaign, while being fully capable to fill global requirements for security force assistance, counterterrorism, and counterinsurgency operations.

To maintain the current plan to purchase an “exquisite force” represents one strategic choice: maintaining a ratio of A2/AD-to-IW of 73:0 both in aircraft and investment:

- 1,763 F-35s
- 0 LAAR/OA-X
- 0 LiMA

The alternate strategic choice is to pursue a “balanced force”, trading approximately one part of the A2/AD-dedicated force to have a more balanced ratio of 72:1 in investment dollars and 72:9 in aircraft procurements, resulting in approximately:

- 1,739 F-35s
- 224 LAAR/OA-X type aircraft (~\$3,767M) [xiv]
- 115 LiMA type aircraft (\$698M)

Importantly, for the alternate force to deliver value, the USAF cannot wait until the out-years, when it has already purchased 1,739 F-35’s to begin purchasing LiMA and LAAR-type aircraft. *An immediate on-ramp must be started.* The 2013 30-Year Aviation Inventory and Purchase Plan shows the USAF plans to

purchase 60 F-35's a year at full production.[xv] *The on-ramp to the balanced force would purchase no less than 24 LAAR and 12 LiMA per year for ten years (dropping the annual F-35 buy to 55), and ideally would purchase 48 LAAR and 21 LiMA per year (dropping the annual F-35 buy to 50), achieving full capability for phase 0 shaping operations within five years.*

The second “balanced force” provides adequate force structure for the USAF to conduct global air advising and equipping of developing partner air forces. More than one organizational construct are possible, but the most mature options would set up nine total squadrons of LAAR/OA-X aircraft (224 aircraft) including two FTU's assuming a constant forward rotation of at least one squadron, and would distribute the 115 LiMA aircraft across and regionally aligned squadrons in the existing MSAS or CRGs to service PACAF, USAFE/AFAFRICA, and AFSOUTH serviced by a single training squadron.

Which of these two forces is better for the nation?

Certainly the exquisite force is a highly capable force. Although the above cited RAND study says clearly that “IW operations are not a lesser included case of MCO,” many believe the exquisite force could tackle lesser included cases requiring ISR and strike in a permissive environment. Perhaps, but it is necessarily sub-optimized for such a role. Highly complex aircraft such as the F-35 are not only more costly, but far more complex and difficult to deploy and sustain, and has the same inherent disadvantages (only more extreme) that forced the USAF to purchase low-slow, persistent aircraft in Vietnam.[xvi] Pursuing such an option can be costly both to the USAF and the nation not only for IW conflicts, but costly to the fundamental purpose of maintaining a ready force for a conventional campaign.[xvii] The exquisite force is also incapable of executing the defense strategic guidance associated with shaping the global environment and preventing conflict – especially in the developing world.[xviii] Success here is critical because it is in the developing world that the grand game for influence and access is being played out that ultimately will shape the starting positions of any potential conflict of major or existential concern.

A Balanced Force Positions the USAF for Shaping and Prevention

Providing “forces to enhance military engagement, conduct security cooperation, build the security capacity of partner states, and deter adversaries to prevent conflict” is function assigned to the department of the Air Force in DOD directive 5100.01 “Functions of the Department of Defense and Its Major Components.” Further, both the National Security Strategy and Defense Strategic Guidance place a high priority on engagement and building partnership capacity (BPC) through security force assistance (SFA) and *innovative, low-cost, and small-footprint approaches* to achieve our security objectives, *relying on exercises, rotational presence, and advisory capabilities*. These statements reflect an overall change in the focus of national strategy where “prevention is the new victory.” Our policymakers look to the USAF to help build capacity in developing air forces in critical partners—partner nations who either face internal threats that undermine U.S. goals for stability and development or partner nations who border states of concern where engagement and capacity building can enhance deterrence or regional response to transnational threats. In this one specific area, exquisite forces are not capable and such activities cannot be considered a lesser included case. In contrast, a balanced force provides a robust force for Air Advisor operations with developing air forces in nations.

A balanced force provides the USAF and U.S. with options to shape the global air domain--especially with less developed partner air forces--options not available to the exquisite force, which has no aircraft appropriate, affordable, or sustainable by these partners.

A balanced force creates the advisory and IW expertise that can provide worldwide influence in areas a high-end force just cannot reach[xix], but areas critical to defense posture. In critical areas in Africa and Asia-Pacific, for example, light air provides the ability to operate where we cannot operate fast jets or

even C-130's—islands, commercial strips, dry lakebeds, unimproved strips. Such reach is critical to aims set forth in the Defense Strategic Guidance. It is also force-multiplying for us, and cost imposing to the enemy. Freed from massive infrastructure requirements, such as 10,000ft runways with arresting cables and massive fuel facilities, an aviation force can be sustained to a greater degree through existing indigenous support (such as 55-gal drums of fuel out of the back of pickup trucks), and significantly complicates adversary targeting because of the much higher number of potential operating locations. An enemy must spend significant effort at disproportionate cost to eliminate this force, because except in those areas defended by radar-guided missiles, such aircraft remain capable of bringing significant air power effects—patrol, interdiction, strike.

Building Partner Capacity with Light Aviation

The Guidance for the Employment of the Force (GEF), the critical document that translates National Security Strategy (NSS) into desirable end states, lists numerous critical partners where our national policy is to assist them in their internal defense / internal stability and security. In enumerating the four to eight “prioritized theater strategic end states” for each AOR, each section contains one or two such end states stating that “allies and partners must have the capability and capacity to provide for their own security, eliminate ungoverned spaces,” and “the capacity of violent extremist organizations (VEOs) and organizations committed to illicit trafficking is outweighed/countered and defeated by the capability and capacity of local governments.” Internal capacity against such irregular threats is a major thrust of OSD and Joint guidance. The market for such influence is not theoretical, nor is it trivial. Light aircraft are well proven in COIN.[xx] OSD is currently funding a non-standard fixed wing (NSFW) study, and preliminary results support the assertion that there is significant demand across a broad range of important partners,[xxi] that exceeds USAF current training capacity, mostly in the LiMA class. Earlier work by the USAF identified at least 27 countries that potentially serve as the basis for future demand of the LAAR program.[xxii]

LIMA as a Strategic Tool

Of these, LiMA (typically a twin-turbo-prop aircraft *similar to* a Twin Otter 400 or Cessna 208 at less than \$10M/copy) constitutes the broader capability since it empowers the host nation with the broadest range and least controversial internal applications of airpower—Passenger and Cargo Movement, Operational Support Airlift (OSA), Medical Airlift, Disaster Relief/Humanitarian Support, ISR, and airborne C2.

The ability to mentor partner air forces in the use of a LiMA platform is not just a tactical application of airpower but a strategic application as well, since it fundamentally alters the ability of a partner to sustainably extend legitimacy and governance, and apply the asymmetric visibility and mobility of airpower against irregular threats. The balanced force which includes 115 LiMA aircraft should be adequate to achieve this strategic effect, and the USAF already possesses the units to which they could be attached.[xxiii]

IW Shaping is a Counter A2/AD Strategy

A strategy which looks to secure the internal security of our partners is not solely an IW strategy, it constitutes the key vector by which we pursue other enumerated GEF end states such as “assuring critical access,” and guidance to “prioritize efforts toward enhancement of access and provision of robust basing.” The argument in favor of a balanced force is not an argument against A2/AD, but rather part of a whole-domain strategy to overcome it and set strategic conditions by building partner capacity.

Fifth and even fourth-generation aircraft are not appropriate and sustainable for almost all of the important

partners we need to cultivate to expand our options for basing and horizontal escalation. While selling an unaffordable, unsustainable jet to a partner may be acceptable purely as a commercial sale to keep a client state, it imposes upon us exactly the costs we are looking for true partners to burden share.

On the global chessboard, low-end, light aviation aircraft are the forward vanguards that help develop partners, cooperative security locations, and impose costs on the enemy to complement the queens, bishops, and rooks of hi-end A2/AD capabilities. If not dealt with, such low-end aviation can do damage to the enemy in any area absent a radar threat; if dealt with the exchange ratio is more favorable and forces them to expend resources across a wider area—much wider given the short strips they can operate from—and away from higher end assets. They represent the “coin of the realm” with regard to building partner capacity in key peripheral states in the pivot to Asia such as Indonesia, Philippines, Thailand, Malaysia, Burma, Bangladesh, Vietnam. Low-end, light aviation aircraft also help with “price point management” providing an “entry model” for developing air forces to begin interoperability and familiarity with US weapons systems. Failing to develop these new partners over the next two decades restricts USAF freedom of action by failing to put partner Air Forces in a position where they could, in 20 years, upgrade to higher end platforms, and continues the risky strategy of investing only in existing partners which are already under threat from adversary A2AD systems, such as is the case in East Asia.

Our strategic competition to counter A2AD and assure access does not end in Asia. We actively compete for influence in Africa, and to fail to offer a platform appropriate to the security needs and budgets of African states is to cede this influence to other nations, especially China and Russia who are willing to provide assistance in the form of appropriate aircraft and training. Renken, in his extensive thesis on Airpower in Irregular Warfare notes:

“What China is doing now, and has been doing for some time, is pursuing the role of being an alternate-hegemon. Instead of just intimidating its way to regional power (although it does that too), China may increase its hegemonic control by becoming an ulterior-provider of superpower assistance to nations on the fringe of US influence. China already focuses on a market segment of potential hegemonic subjects overlooked by the United States such as Vietnam, Laos, Cambodia, Iran, and several nations in Africa and Latin America. In Africa, China is selling military aviation hardware, such as the FC-1 to Zimbabwe and K-8s to Zambia and purchasing political alliances with major industrial ventures...While AirSea Battle envisions Anti-Access, Area Denial (“A2AD”) caused by high end defensive systems, China may realistically be able to steal away opportunistic nations who see them as the preferred patron. These nations can provide China a very benign form of A2AD by influencing diplomatic conditions, restricting basing and port access, or denying the USAF over-flight. There is no reason for the United States should leave its hegemonic flank undefended, but neither can this challenge be met with current force design. There are many nations in the Pacific, Africa, and Latin America who are looking for the opportunity to partner with a stronger power to keep external neighbors and internal unrest in check. Many of these nations need aviation/TACAIR assistance, but the USAF has nothing to offer them save F-16s and F-35s. The cost and complexity of purchasing a “mini-USAF” forces these nations to look elsewhere. For instance, nations like Indonesia are buying A-29 light attack aircraft from Brazil and are likely to seek training from either Brazil or Colombia. If the United States maintained an Av-FID force with expertise in TACAIR, that could have been another line of influence and access secured for the United States.” [xxiv]

The purchase of an aircraft is the purchase of a 30-year relationship to their security needs constrains our

ability to form relationships with developing air forces. Low-end aviation are the critical “entry models” that establish long-term training relationships that acculturate another air force and nation to USAF presence, practices and convey to their neighbors they are aligned with the US as a security partner of choice. Partners wish to buy what the USAF operates itself.

The purchase of a combination of a small fleet of LiMA and LAAR/OA-X type aircraft puts the USAF in a substantially different position to compete for influence and market-share globally, constraining the options of our adversaries and imposing costs on them. It opens up options for horizontal escalation, helps groom potential coalition partners, and begins to open future cooperative security locations that can be broadened over time to receive more capable US forces. The bottom line is that a balanced force, through developing Air Advising cadre and providing “right-tech” equipping options[xxv] for partners provides a more flexible and agile tool for improved defense worldwide.

A Balanced Force Provides Capability for Low-Footprint Direct Action

“To be effective, *forces must be suitable to the format of military operations where the nation wishes to use military force to assert its political will...that the geography may be physically challenging for air support, such as the shortage of suitable airstrips and fuel availability in much of Africa; or it may be politically challenging, requiring a lower footprint than the USAF air support is typically able to provide.* This is especially true in countries that may be willing to grant basing for a few SOF personnel or U.S. advisors and support aircraft, but who *are unwilling to have their airports converted into bases for a squadron of USAF combat aircraft and conspicuous uniformed support presence.*”[xxvi] It is highly likely that our nation will desire airpower[xxvii] support for Direct Action (short-duration strikes and other small scale offensive actions conducted as a special operation in hostile, denied, or diplomatically sensitive environments which employ specialized military capabilities to seize, destroy, capture, exploit, recover, or damage designated targets[xxviii]) missions in ‘austere’ areas requiring a low footprint. Current TACAIR forces are a poor fit for this mission, as clandestine forces may require a smaller footprint than even a single C-130. Even a small force of 4-6 fighters requires 50-100 support personnel, 8,000 feet of runway and arresting gear, and a minimum of 6,500 gallons of JP-8 per day just to fly a single sortie and large munitions storage area (MSA).[xxix] A more balanced force creates options for direct action.[xxx]

A Balanced Force Minimizes Costs in a Permissive Environment

Making the right strategic choice must also consider the possibility that the nation might call on the USAF to execute operations such as Armed Reconnaissance / Close Air Support (CAS) in a permissive environment. Should the USAF remain on its present course, the choice of the Exquisite Force would make executing operations such as CAS in Afghanistan very expensive and cost-imposing on the USAF. [xxxi]

As detailed in his thesis, *Airpower for Irregular Warfare*, Maj Jeremy Renken notes that “high-end assets cannot simply be re-purposed and re-scaled and expected to do well in IW,”[xxxii] noting specifically the complexity and fragility of such systems, and “the USAF is mortgaging most of its capabilities in kinds of small combat operations that are guaranteed to occur, in order to build a force that can succeed in the event of an unlikely MCO.” In addition, the A9LL report mentioned above notes: “Since the U.S. force structure was developed for MCO, there is an imbalance between the types and sufficiency of capabilities required for IW operations. The U.S. military has been forced to adapt these forces to IW...These forces are reasonably effective, but often inefficient. From an Airman’s perspective, aircraft like F-16s, F-15Es, B-1s...bring great capability to IW operations. Sustained operations of these platforms are extremely resource intensive and have extremely high operation costs in theaters where the U.S. has gained air

supremacy....these aircraft are employed at rates that are difficult to sustain over the long term without severe consequences for the health of the fleet. This may put at risk the air and space capability needed to defend U.S. national vital interests in a future MCO. Without alternative air capabilities for IW, the USAF is burning through MCO assets, shortening their lifecycles.”

In January 2010 issue of Air Land Sea Bulletin, Lt Col Michael W. Pietrucha, USAFR and Lt Col David J. Torres-Laboy, USAF examined the business case for OA-X in Afghanistan using the unclassified sortie rate at the time of 36 four-hour sorties every day. An AEF consisting of a single squadron of 18 OA-X were able to meet this requirement with no air refueling and fewer total aircraft than the full squadron of F-16's (24 aircraft) and half squadron of F-15's (12), and at roughly 5% of fuel costs. Comparison with the exquisite force is much more favorable. Over a year (4hrs/sortie x 36 sorties/day x 365 days = 52,560 flying hours per year), the cost difference becomes substantial.

A balanced force could execute this mission by deploying a LAAR/OA-X for approximately \$111M per year (52,560 hrs/yr x \$2,123/hr = \$111,584,880), and saving its F-35's. The exquisite force would not have this option[xxxiii], and a comparable effort to execute daily taskings in a permissive environment using the F-35 would cost \$1.6B/yr (52,560 hrs x \$31,900/hr = \$ 1,676,664,000)—15x as much--without accounting for air refueling, which adds substantial costs. This difference of \$1.565B is the equivalent cost to the nation of twelve additional F-35 acquisitions each year!

A Balanced Force Protects High-End Readiness for the High End Fight

Although likely to be spread over a large number of rotating F-35's, such an effort also imposes a recapitalization bill, as every year of conflict burns out the equivalent of 6.5 F-35s (52,560 hrs / 8,000hrs/airframe = 6.57 aircraft) or \$854M (6.57 aircraft x \$130M/aircraft = \$854M).

Over a five year period, not including the costs of air refueling or the costs of deployment/redeployment during rotation, *the cost the USAF would impose on itself of choosing an exquisite over a balanced force would be \$11.34B* (\$1.565B/yr O&M x 5 years + \$0.703B depreciation/yr x 5 years = \$11.34B), or the equivalent 87 aircraft or 3.6 full squadrons of F-35's (\$11,340M / \$130M per aircraft = 87.23 aircraft / 24 aircraft per squadron = 3.63 squadrons).

Using up aircraft life / depreciating high end aircraft in this manner could make a difference for a high-end conflict later on. The balanced force may have sacrificed one squadron of 24 F-35's to purchase nine squadrons of LAAR/OA-X, but in the above situation, all remaining 1,739 high-end aircraft are preserved from wear and tear. In contrast, the exquisite force, which began with 1,763 high end aircraft, has burned out as many as 33 aircraft (in airframe equivalent hours), starting the conflict with a significantly aged fleet.

A Balanced Force Liberates High-End Aircraft in the High End Fight

"High-quantities of low(er)-tech combat aviation forces are not only useful in IW. They are useful whenever the campaign design pursues a cumulative strategy of effects through tactical success." [xxxiv]

In every operational scenario, there are some things an LAAR/OA-X could do, that if you don't have one, you must send a fast-jet to do—perhaps two fast-jets depending on sortie duration. Every sortie that a LAAR/OA-X can take doing local Close Air Support is one fast-jet free to “go deep”; every sortie a LAAR/OA-X can do providing SOF-Support, Maritime Patrol/Counter Maritime[xxxv] is one fast jet free

to engage in higher end combat; every LAAR/OA-X available to provide armed reconnaissance in post-“day one” environment, or a Phase 4 environment, leaves the F-35’s available to sortie for a contested environment.

If we build an all high-end force, then we must allocate that force against all requirements. If we start with six F-35’s, we have six tails available for six sorties. If five of those sorties might involve local CAS, that leaves only one for more demanding missions requiring IADs penetration. Each F-35 purchases at least five LAAR/OA-X aircraft[xxxvi], each with substantially longer unrefueled sortie duration. If we trade one F-35, we now have five LAAR/OA-X and five F-35’s, and ten sorties total. The five LAAR/OA-X take the local CAS missions that leaves five F-35’s for missions requiring capability to penetrate or attack IADs.

What is the Opportunity Cost of a Single F-35?

It is possible to think about a reapportionment of procurement dollars not as a cost to the exquisite force, but rather an investment. A single F-35 borrowed today for a LAAR aircraft has a potential to net the nation 15 F-35’s worth of value over a 10 year period, by purchasing a small fleet of aircraft with lower operating costs.

An F-35 costs about \$130M per copy, and because it is optimized to perform in a contested environment, costs \$31,900 per flying hour to operate. Its expected service life of 8,000 hours[xxxvii], and importantly, "there is no precedent for stealth aircraft being eligible for SLEP due to design constraints and sealed structures." [xxxviii] For the flying hour program to maintain currency at 220 hours per PAA, the annual cost to operate a single F-35 is just over \$7M per aircraft.

Equipped with an exquisite force, the USAF imposes a cost on itself because any and all airpower missions must be conducted by exquisite aircraft. However, equipped with a balanced force, there will always be tasks that a LAAR/OA-X can perform in place of a fast yet where the USAF can either save money, or realize a multiplicative effect for the same dollar.

LAAR/OA-X proponents research suggests that credible figures for a mission-ready aircraft are about \$9-12M/copy (creating an F-35/LAAR purchase ratio of about 1:9) with airframe life as high as 12,000 hours, and demonstrated operating costs below \$2,200.

Seasoned dissenters believe that our acquisition system and maintenance system is incapable of purchasing and operating the aircraft at the cost which other air forces have demonstrated. However, even using the most conservative figures available: \$21.35M/copy (based on Afghan LAS LOA)[xxxix] with a service life of only 8,000 hours, and \$2,200 per flying hour to operate, the annual cost to operate at 220 hours per PAA is still <\$1/2M (\$484,000) per aircraft. Using this very conservative cost estimate, \$130M allows for the purchase of six LAAR/OA-X aircraft at a total of \$128M, each with an 8,000 hr airframe life, and a remainder of \$2M.

From a sortie and flying hour perspective, this trade creates huge leverage. For the same annual operating costs of \$7M, a total 3,190 hours could be flown (nearly 15 times as many hours). Those hours spread across six aircraft take up only less than 7% of their service life. To fly the same number of hours on the F-35 would cost \$102M, and put 3,190 hours on that airframe, wasting close to half of its programmed service life. Six aircraft can also fly six sorties simultaneously or be in six different places, where a single F-35 can fly just one at a time. Quantity has a quality all its own. Over a 10 year period the benefits of such a balance investment becomes even clearer. For the cost of every F-35 and its associated flying hour budget, the USAF purchases an additional 40,000 flying hours in a LAAR/OA-X. Were it to have no option but to fly those same hours on the F-35, the USAF would require an additional

budget of \$1.3 Billion (the equivalent of 10 F-35's!). It would also burn up the service life of those F-35's at a substantially increased rate (40,000 hours / 8,000 hrs per airframe = 5 F-35 equivalents), imposing an effective cost of an additional five F-35's. Altogether, and from a total cost perspective, over a 10 year period, trading a single F-35 and its associated fly hour budget for five LAAR/OA-X purchases so much capability via flying hours, that to do the same additional hours in the F-35 would cost the USAF/nation the equivalent of 15 F-35's! Those hours could either be saved or repurposed for higher end skill sets.

A Balanced Force Lowers Training and Operating Costs

The leverage discussed above applies to local training as well, such as requirement for JTAC qualification. Why fly an F-35 to qualify a JTAC at 15 times the cost when you could fulfill such qualification training with an OA-X? This is a very significant potential cost-avoidance. Filling the annual JTAC requirement of 28,404 hours with an LAAR/OA-X would cost at most \$60M, but the imposed cost of having to service this requirement with the F-35 is nearly \$1B annually, with a total imposed opportunity cost over the life of the F-35 buy of \$35.3B, equivalent to 272 F-35's![\[xli\]](#)

Fueling the Fight and the Strategic Vulnerability of Fuel Logistics Lines

Multiple Defense Science Boards (DSBs) and the creation of OSD and Service Operational Energy Offices show that energy/fuel savings are increasingly an emphasis area and a recognized strategic vulnerability. As already discussed, there are both contingency and training missions where a LAAR/OA-X could substitute for an F-35 if available, and the advantage or imposed cost is substantial. An F-35 burns 1,660 gallons per hour (GPH), 61% higher than the most gas-guzzling F-16 (1030 GPH), 115% higher than the lowest burn F-16 (770 GPH), 180% higher than an A-10, and 3320% (33x) the burn of a LAAR/OA-X (~50 GPH).[\[xlii\]](#) While fuel costs are accounted for in flying hour costs, they are increasingly their own metric, and drag a substantial logistics trail of tankers, fuel trucks, POL facilities behind them. The annual JTAC requirement discussed above would require 47.1 million gallons per year if serviced by the exquisite force, where it would only require 1.4 million gallons (*less than 3%*) if serviced by a LAAR/OA-X.[\[xliii\]](#) That is an annual imposed cost of an additional 45 million gallons (and \$104 million[\[xliv\]](#)) every year of not having a balanced force just to service our internal peacetime CAS training. Just to put that into perspective an annual savings of 45 million gallons per year is enough to fill 1,286 C-17s. [\[xlv\]](#) Imagine losing 1,286 C-17 sorties, and the attendant loss of global mobility imposed by an all exquisite force.

A Balanced Force Solves our Problem with Fighter Pilot Production

Combat power is not just the force structure, but the operators who can operate that force structure, their level of training, and the experience on the staffs that know how to employ that capability. For the USAF to be effective, it needs combat aviators with the requisite experience in all locations.

A recent article in the LA Times has highlighted the USAF has a current shortage of 200 fighter pilots that could grow to a shortage of 700 by 2021.[\[xlv\]](#) Solving this shortage is neither quick nor easy because the problem is not just the raw number, but the specific balance of experience, combat availability, and training pipeline capacity. Each of these strongly interacts with factors such as recruitment, retention and number of cockpits available for training, making it a very complex problem to solve. However, one of the constraints to solving the problem is an insufficient number of fighter aircraft to absorb, keep current, and provide the necessary experience to grow and maintain a sufficiently large and experienced cadre of combat aviators.

Aside from the capabilities it provides for the Air Force and the nation, the balanced force structure inherently and elegantly solves the USAF fighter pilot shortage. As noted above, if the USAF were to

purchase an OA-X at \$12M per copy, for the cost of a single F-35 squadron, it could purchase 9 OA-X squadrons and some 260-283 aircraft.

Each of the nine LAAR/OA-X squadrons could absorb 7 fight pilots (11Fs) and 7 weapons system operators (WSOs) (12Fs) per year, per squadron for a total of 126 combat aviators per year.

Were the USAF to pursue this option, within ten years (FY23), nine OA-X squadrons (which cost the same as 1 F-35 squadron) would have absorbed so many new pilots and WSOs that we would be net positive (+83) and on a steep flight-path to further improve.

Of the possible options that attempt to solve the fighter shortage by adding more fighter aircraft, purchasing an OA-X appears to be by far the most affordable and near term alternative with regard to acquisition. An OA-X solution is available immediately. The next best alternative, the T-X is years away even if we purchase new RAF Hawk T2s or Russian Yak-designed Italian Alenia Aermacchi M-346.[\[xlvii\]](#)

It is also the most affordable option for sustained operations and maintenance. The cost of an OA-X is significantly less than any jet alternative, and far less than the F-35. For the cost of one F-35 squadron's annual flying hour currency budget, 14 squadrons of LAAR/OA-X pilots could be grown and maintained.

A Balanced Force Better Mitigates Political Risk to the F-35 Program

*“We should ask what are alternative force mixes that might give commanders a more effective tool kit in a wider set of contingencies? So, for example, when it comes to American air power, the question is not a simple matter of F-35 yea or nay, as now is being framed in a raft of articles. Rather, bring in the operational commanders and planners and explore alternative options. **What might a theater commander do with a squadron of 13 F-35s versus the option of eight F-35s, two F-18 EF Growler electronic warfare/strike aircraft , four MQ-9 Reapers, and one Global Hawk spy plane -- and the extra \$182 million in savings?**” – Peter Singer, The Brookings Institution*

As reflected in the quote above, the USAF current procurement looks unbalanced to many external stakeholders, including the SECDEF[\[xlvii\]](#), OSD[\[xlviii\]](#), Congress, our sister services[\[xlix\]](#), and the analysts[\[i\]](#) who are trusted to provide for advice. Because they observe an absence of meaningful investment in low-end assets where they perceive an obvious need, they are less inclined to trust the USAF analysis of its core Air Superiority and Global Precision Attack mission areas, and therefore second guess our analysis, and seek to force a rebalance. USAF's lack of a clearly communicated strategy for building partnerships and light-end aviation in the face of direct guidance puts the USAF at strategic risk of being perceived as intransigent and unresponsive as was apparently the case when the USAF was perceived as only defending the F-22 when OSD was asking for more UAS CAPS. This perception that “it is like pulling teeth” creates unnecessary hostility and compromises our position to make our case to external stakeholders that we are under-resourced for a contested environment. We risk being characterized as pursuing our own agenda for the war we want to fight, rather than as smart stewards of the public trust by working the totality of the problems the POTUS & SECDEF are concerned with and have assigned to us.



F-35 as the Obvious Bill-Payer^[li]

Because of the very large program size, the F-35 provides an attractive sacrificial cash-cow for those of every alternate agenda, from budget cutters and Sister Services looking for a bill-payer. Even among airpower advocates concerned principally with the A2AD problem, the realities of the more distance-intensive pivot to Asia-Pacific call into question the sizing of the overall F-35 buy, many of whom are aware that the overall number (1,763) was derived from a 1:1 replacement of a larger legacy fighter force in times past (1997) rather than a current strategic need in a constrained budget environment.

“No one cares how much you know till they know how much you care.”-- Theodore Roosevelt.

The USAF may do as it has done in the past, standing on principle to build the most capable force we can afford against a high end threat, and is likely to meet with the same unfortunate result, seeing its program closely criticized, its TOA re-allocated, and being forced over its objections to acquiesce to external demands.^[lii]

The safer position for the USAF would be to dissuade and deflect these criticisms by pursuing a more balanced portfolio that is both “cost/capability balanced” on the low end, and “range balanced” on the high end. The purchase of a limited number of LAAR/OA-X accompanied by significant strategic messaging would be a clever Aikido^[liii] move, providing a highly visible signal for a relatively low cost investment.

Such an investment provides a barely marginal change in high end capability (24 F-35’s), but greatly reduces the risk of external hostility, the imposed costs of a protracted campaign, as well as the other benefits discussed above. It also puts the USAF in the excellent position to make a strong case for increased high-end investment at a later time, after the critics of USAF low investment in IW have been silenced, and the concerns of the nation refocused on the need for a more robust high-end end force to maintain balance and deterrence.

Moreover, the balanced force allows the USAF to mitigate problems or delays in the F-35 program by having an alternate plan it can supply to Congress, OSD, and the POTUS which can be immediately executed, rather than face a worse alternative put forward by other actors who would like to poach USAF Total Obligation Authority (TOA). A balanced force provides this option.

Summary

In conclusion, an A2/AD-to-IW investment ratio of 72:1 in a balanced force (vs. 73:0 in the exquisite force) is the better option for the USAF and the nation. It creates a broad capability to shape, prevent, and engage and build capacity in line with national guidance. It minimizes the costs should the USAF be asked to operate in a permissive environment, protecting high-end readiness for a future high end fight. It fills less demanding missions in a high-end fight liberating high-end aircraft to fly more demanding missions. A balanced force solves our fighter production program. Lastly, a balanced force better mitigates political risk for the F-35 program and satisfies stakeholders that wish to see the USAF balance risk more broadly.

The views expressed are those of the author and do not necessarily reflect the official policy or position of the Department of the Air Force or the U.S. government.

End Notes

[i] A2/AD is a Pentagon term-of-art for Anti-Access/Area Denial, a term for an strategy that seeks to prevent an opponent's access to the theater ("we have to fight to get to the fight") by attacking political access, bases, and sustainment (fuels, air refueling, etc.), and attempts to emplace weapons systems that deny an opponent the ability to operate in an area, such as Integrated Air Defense Systems (Surface-to-Air Missiles (SAMs), Fighters, and associated networked sensors (land-based, sea-based and airborne radar), and Command and Control (C2). Such a strategy aims to increase the ability to control one's near abroad and retain a favorable military balance by making it difficult, impossible, or at least very costly to deploy to and mass in theater, and operate in the contested area. CSBA's Andrew F. Krepinevich, Robert Work, and Barry Watts are credited with coining the term in their 2003 report "Meeting the Anti-Access and Area-Denial Challenge" available at <http://www.csbaonline.org/publications/2003/05/a2ad-anti-access-area-denial/>

[ii] Some see the word "exquisite" as pejorative, but this is the word was specifically used by former SECDEF Gates to refer to the JSF, "Thus the situation we face today, where a small set of expensive weapons programs has had repeated – and unacceptable – problems with requirements, schedule, cost, and performance ...I will pursue greater quantities of systems that represent the "75 percent" solution instead of smaller quantities of "99 percent," exquisite systems", Submitted Statement on DoD Challenges to the Senate Armed Services Committee, As Submitted by Secretary of Defense Robert M. Gates, Room SD-106, Dirksen Senate Office Building, Washington, D.C., Tuesday, January 27, 2009
<http://www.defense.gov/speeches/speech.aspx?speechid=1337>

[iii] Source: Re-illustrated by the author, concept adapted from Briefing "Perspectives on Strategy for A3/5" McKinsey & Company, Nov 2012

[iv] The DSG also lists missions not directly applicable to A2/AD or IW :

- Counter Weapons of Mass Destruction.
- Operate Effectively in Cyberspace and Space.
- Maintain a Safe, Secure, and Effective Nuclear Deterrent.
- Defend the Homeland and Provide Support to Civil Authorities.

[v] Department of Defense, Sustaining U.S. Global Leadership: Priorities for 21st Century Defense (Washington, DC: Department of Defense, January 2012), p.6 ,
http://www.defense.gov/news/defense_strategic_guidance.pdf

DoD Directive 3000.07, Irregular Warfare, 1 Dec 2008, also directs: “The Secretaries of the Military Departments shall ... [m]aintain expeditionary units organized, trained, and equipped ... to provide civil security, restore essential government function, repair key infrastructure necessary to government function and to sustain human life, and reform or rebuild indigenous security institutions until indigenous, international, or U.S. civilian personnel can do so.”

[vi] Department of Defense, Sustaining U.S. Global Leadership: Priorities for 21st Century Defense (Washington, DC: Department of Defense, January 2012), p.3 , http://www.defense.gov/news/defense_strategic_guidance.pdf.

[vii] Source: Aviation Week & Space Technology, “Boeing, Lockheed Martin Form New Bomber Team”, By Bill Sweetman, November 04, 2013, retrieved from the web on 25 Nov 2013

http://www.aviationweek.com/Article.aspx?id=/article-xml/AW_11_04_2013_p22-631732.xml

[viii] Reuters, “Pentagon sees ‘sufficient’ progress to boost FY15 F-35 output”, Andrea Shalal-Esa, Oct 29, 2013 <http://www.reuters.com/article/2013/10/30/lockheed-fighter-idUSL1N0IJ2KM20131030>

[ix] It is certainly worth noting that there are other potential trades that could free up dollars for investment in IW capabilities. However, internal to the USAF, the lions’ share of our acquisition funding over the next 10-20 years is for F-35, LRS-B, and tankers. In my analysis, we really need LRS-B and tankers, but we can arguably get by with fewer F-35s. Maj Renken in his thesis, also uses the number 214 for his LAAR fleet, and states on page 123, “The only way to free up room in the USAF budget for these aircraft is to reduce commitments to other niche TACAIR pursuits like the F-35.” He cites an F-35 cost of \$154.5M per aircraft. [The Average Per Unit Cost (APUC in 2012)O&M for IW forces is comparatively very low (15:1 cheaper than F-35 per flying hour) for USAF Title 10 employment, and that most or all of the employment costs in a BPC role are outside of DoD budget entirely, falling under Title 22.

[x] LiMA buy discussed here:

<http://www.airforcetimes.com/article/20110213/NEWS/102130317/Stalled-budget-halts-LiMA-program-s-progress> and LAAR <http://www.defensemedianetwork.com/stories/the-laar-lightweight-combat-aircraft-is-coming-to-the-air-force/> Note that LAAR Capability Production Document (CPB) approved by AFROC in March 2011; approved by Joint Requirements Oversight Council Memorandum (JROCM) on 5 July 2011; LiMA Capability Production Document (CPB) approved by AFROC in Sept 2010.

[xi] For more detail on these capabilities, see my article “Air Advising: A Critical Component of Joint Engagement” in Joint Forces Quarterly, June 17, 2013.

[xii] For a better balance, see my article “A Range-Balanced Force: An Alternate Force Structure Adapted to New Defense Priorities. Air and Space Power Journal, May 1, 2013

[xiii] RAND, Course of Action of Enhancing U.S. Air Force ‘Irregular Warfare’ Capabilities: A

Functional Solutions Analysis, 2010. The report suggested three mutually enhancing COAs who's total GPF force structure requirements together would collectively cost under \$7B in investment. They included:

- 400 OA-X[xiii] [12 operational squadron] for a total investment of \$4.3B (100 in COA1+300 in COA3)
- 135 Light Mobility Aircraft for a total investment of \$0.82B (30 in COA1 + 105 in COA2)
- 160 MC-12's (to the existing 37) for sustained ISR & PED at an investment of \$1.86B and allow 50 deployed [from four operational squadrons]. (30 in COA1 + 93 in COA3)

It is worth noting that COA1 was focused on supporting operations in Iraq/Afghanistan, and that subtracting out the COA1 number provides a force of 300 OA-X and 105 LiMA (for a total cost of \$3.735B), remarkably close to what is possible with a trade of a single squadron of 24 F-35's (\$3.120B).

[xiv] Note, I have chosen to use the number 224 from Renken's thesis vs. RAND's (300-400)

[xv] Department of Defense, Annual Aviation Inventory and Funding Plan Fiscal Years (FY) 2013-2042, March 2012, available at:

<http://www.defenseinnovationmarketplace.mil/resources/Annual%20Aviation%20Inventory%20and%20Funding%202042.pdf>

[xvi] "In reality, forces do certain things well and others poorly...It is impossible to imagine that the F-35, designed to operate at medium altitude, could provide the same close-in support of the A-10 it replaces...especially given the F-35 will not have nearly the same capacity to deliver forward firing ordinance [The A-10 carries 1150 rounds of 30mm ammunition...only the USAF version of the F-35 will carry a gun with about 180 rounds of 25mm ammunition] which is particularly useful when engaging in close proximity to ground friendly...the reason why the USAF had to adopt low-slow aircraft like the A-1, O-1, O-2, OV-10 and A-10 in the first place." Renken, p 113.

[xvii] For example Integrated Security Construct A (ISC-A)

[xviii] "USAF must be prepared to deploy aviation forces appropriate for all points along the spectrum of conflict from MOOTW to major combat operations (MCO)... Strategic effects, meaning those that meet military objectives in support of policy goals..not necessarily delivered by the USAF's 'strategic forces'" Renken

[xix] "USAF has essentially no ability to use TACAIR as an instrument of conversion [Renken details four "Methods of Active Control": Defeat, Capture, Containment, Conversion, where conversion is a capability to turn an ally's marginal military force into a useful one], ...USAF has been downright abysmal at providing the right kind of airpower to perform "containment" efforts in population centric warfare" Renken, p95

[xx] "Past experience with *widely dispersed operational zone using irregular forces* and minimal requirements for consumables [such as in Korea, Vietnam, Iraq, Afghanistan] *frequently forced the USAF to try to build up a tactical reconnaissance capability that it hadn't planned for...* despite the promises of various technical collection efforts, airborne FACs and *low-slow armed reconnaissance has repeatedly proven the most effective capability*

" Renken, p 41 *"none of the high-end solutions were nearly as effective as the original armed reconnaissance aircraft they replaced"* Renken, p 45.

Renken goes on to detail the effectiveness of such aircraft in Rhodesia, Angola, El Salvador and Guatemala, and that "the impact of ordinance far less important than light/spotter aircrafts' qualities as a versatile reconnaissance and stand-in mobility platform---something seen in Philippines, Vietnam, Angola and Yemen." Renken, p 46.

Renken also *notes a unique advantage of "spotter aircraft and light attack planes is the psychological advantage which airpower gives to the counterinsurgents. Multiple records reveal how much the constant pressure of patrolling air assets forces insurgents to avoid massing, wearing down their enthusiasm and their operational capacity. The psychological effect was as positive for the supported ground forces as it was negative for guerillas."* p 47, Renken notes this included *superstitious and false beliefs of what patrolling aircraft could see...including through roofs and walls*, and notes that in El Salvador, *a few shells from spotter planes was enough to convince insurgents that all aircraft were armed and ready to strike them.* (Renken p97) He also states that the "boost to morale, undefended vertical flank becomes one of the ground forces most valuable asymmetric advantages" and that the "psychological edge extends to engaging the contest population" including the use of pre-arranged signals from a human-intel network on the ground that use pre-arranged signals visible from air. Renken also notes that if the USAF had TACAIR assets that could be allocated for more persistent overwatch of friendly forces it would provide an entirely different set of metrics, as "When US airpower is overhead in IW, ambushes are simply less likely to occur." P18

A final critical advantage discussed by Renken is the ability of such aircraft to be co-located and naturally associated with land forces to build routine, persistent relationships and enable the kinds of combined arms teams that have proven crucial in IW.

[xxi] A3O-Q discussion with OSD SO/LIC, 9 Aug 2013

[xxii] Cited with permission from Lt Col Brandon Fuller, SAF/AQP F-16 & LAS Program Element Monitor, personal email, Monday, June 10, 2013

[xxiii] LiMA aircraft could be attached to the 571st or 818th MSAS or PACAF / USAFE CRGs)

[xxiv] Renken, Jeremy L, "Airpower for Irregular Warfare: Reconciling USAF theory and TACAIR design with the demands of Irregular Warfare and Special Operations", July 2012, p.105

[xxv] "The only difference between a "4th gen" capability of LAAR and a fighter jet is that the LAAR fly slower, lower and carry less ordinance. In return they can longer loiter over the battlefield due to low fuel consumption, are easier to base in austere locations close to supported forces, and offer better capability to use time-prove visual reconnaissance methods in conjunction with advanced sensors instead of total dependence on sensors alone. The assumption that LAAR is simply a technological regression is baseless. LAAR is a technological optimization to task." Renken, p 100 . Renken notes that both LAAR candidates, the A-29 and AT-6 are both capable of applying PGMs, useful in population centric warfare where controlling civilian casualties is critical. Renken, Jeremy L, "Airpower for Irregular Warfare: Reconciling USAF theory and TACAIR design with the demands of Irregular Warfare and Special Operations", July 2012

[xxvi] Renken, Jeremy L, "Airpower for Irregular Warfare: Reconciling USAF theory and TACAIR design with the demands of Irregular Warfare and Special Operations", July 2012, p.17

[xxvii] "Air support is vital. TACAIR is highly desired, but currently a poor fit for SOF support because of its footprint and logistical support demands...not designed to accommodate this highly expeditionary mission." Renken, p 117

[xxviii] JP 3-05, quoted in JP 1 quoted in Renken, p7.

[xxix] Renken, Jeremy L, "Airpower for Irregular Warfare: Reconciling USAF theory and TACAIR design with the demands of Irregular Warfare and Special Operations", July 2012, p.57

[xxx] SOF operators articulate "I need a simple aircraft that can rapidly deploy to unprepared strips, work with a minimum support footprint, be configured for missionized requirements, carry a little bit of firepower, and be crewed by someone who is trained to specific mission requirements...OV10s and A-1s come to mind." Renken page 7

[xxxi] For a comparison, we examined one Air Expeditionary Task Force (AETF 1) consisting of a squadron of F-16s and half a squadron of F-15Es flying 36 four-hour air refueled sorties per day (24 for the F-16, 12 for the F-15E). For the OA-X, AETF 2 consisting of two 18-PAA squadrons of OA-X, also flying 36 four-hour sorties per day, but with no air refueling....*In a nutshell, AETF 1 has a daily fuel requirement of 636,000 pounds at the base, plus roughly 420,000 pounds of tanker-delivered fuel, requiring six tankers which burn 160,000 pounds themselves. The total: 1,216,000 pounds of fuel per day, or over 65 million gallons per year at a cost of \$94 million per year...AETF 2 requires 60,000 pounds from the base per day or 3.2 million gallons per year with no tanker support at all, dropping the fuel cost to \$4.6 million per annum—roughly 5% of AETF 1.* Obviously, fuel costs are only a portion of the operations cost of aircraft. Compared with an OA-X estimated cost of around \$1,500/hour, the costs of the legacy fleet are high: F-15E—\$18,050, F-16C—\$9,019, KC-135R—\$8,483. The savings associated with a mix of OA-X and legacy forces are substantial, offsetting the purchase price of the OA-X in a relatively short timeframe, in addition to reducing the flying hours flown by the legacy fleet. In a long war that is likely to continue far beyond the 5-year horizon, we gain not only a significant addition to both our capabilities and capacity, but we gain additional breathing space to fund the necessary modernization and recapitalization of our high-end capabilities.

[xxxii] "High end assets cannot simply be re-purposed and re-scaled and expected to do well in IW" Renken, p 13. *"Aviation support to IW and counterinsurgency has been well studied. The overwhelming consensus that these kinds of warfare require rugged tactical mobility platforms and high quantities of lightly armed reconnaissance TACAIR that are simple, sustainable and made available for direct integration with ground forces."* Renken, p48

[xxxiv] Renken, Jeremy L, "Airpower for Irregular Warfare: Reconciling USAF theory and TACAIR design with the demands of Irregular Warfare and Special Operations", July 2012

[xxxv] Renken notes: "typical scenarios that drive war-planning include war with Iran in the Persian Gulf over their nuclear program; the ever-present threat of a short-notice invasion of South Korea from the North; or some sort of clash with China in the Pacific. Defeating or containing these threats poses unique

challenges where typical USAF TACAIR would be found wanting...low, slow TACAIR could fill a coverage and capability gap left by current TACAIR forces." Renken then discusses how for Iran, this would involve using the advantages of low-slow aircraft to deal with the large group of maneuvering maritime vessels. For Korea, flying CAS and air-based defense from unprepared landing strips and roads, radically raising survivability and flexibility and complicating adversary targeting. And for China, mitigating the interdiction of U.S. airfields by missile attack with forces that can operate from less prepared fields. In each case, freeing up fighters to conduction SEAD, counter-air and interdiction they are optimized for while allowing low-slow aircraft to get close for maritime defense against large numbers of small boats.

[xxxvi] NOTE: Here I am referring to Acquisition Program Unit Cost (APUC) vs. vs. Unit Recurring Flyaway (URF) which doesn't include the massive RDT&E bill amortized over the individual aircraft. Were I to use URF, the leverage would be significantly higher.

[xxxvii] Source: 2012 CAF Economic Service Life Update Memorandum dated 15 Jan 2013 signed from HQ USAF/A3/5 provided by Maj Jeremy Renken, A8P

[xxxviii] Source: Maj Jeremy Renken, Fighter Force Programmer, A8PC - Combat Forces, 10 Apr 2013.

[xxxix] LAS Per-unit price estimated based on total cost of total of the first increment of the contract divided by the total number of aircraft (\$427M/20 Aircraft = \$21.35M). This is an overestimation of the actual aircraft cost since the total contract includes more than just aircraft: Per Laura Price, Chief, Light Attack Branch AFLCMC/WWYA, WPAFB and Maj Jeremy M. Ponn, Country Director | Afghanistan International Affairs | Mid East Division (SAF/IARM), the initial increment of the LAS contract totals \$427M, and includes 20 aircraft and other key items and services such as site survey, certification and initial capability stand up. Cited with permission.

[xl] Per conversation with ERIC D. CHAPITAL, Lt Col, USAF, AF/A3O-ACJ Chief, CAS Branch, according to releasable data contained in the ACC brief to the Joint Fire Support Executive Steering Committee (JFS ESC) on 18 Mar 2013, the Average Sortie Duration for a CAS mission is estimated at 1.5 hours. Annually there is a requirement for 444 initial qual trainees requiring 5,550 sorties (8,325 flying hours). For continuation training, there are 2,231 JTAC authorizations which requires 13,386 sorties (20,079 flying hours) annually. That is a total annual requirement of 28,404 flying hours. At \$31,900 per flying hour, the cost to service this with the F-35 is nearly \$1B per year (\$906,087,600) compared to the high-end estimate for an OA-X/LAAR of \$2,123/hr is only \$60M (\$60,301,692). From now to the end of the buy of the F-35 that is 766,908 total hours. Divide that number by the service life of the F-35 (8,000 hrs), and that is the equivalent of burning out 96 F-35's in structural depreciation, with a replacement cost exceeding \$12B (766,908 hours / 8,000hrs/F-35 * \$130K/F-35=\$12.56B). The difference in total cost to service the JTAC requirement over the F-35 buy is \$22B ((766,908*\$31,900/hr)-(766,908*\$2,123/hr)= \$22,836,219,516), the equivalent of 176 F-35's. Add those two together, and the imposed cost of servicing the JTAC requirement with the JSF is an opportunity cost of \$35.3B, equivalent to 272 F-35's!

NOTE: While historic training events are accomplished in a 1.5 hr fighter CAS sortie, that could conceivably be reduced with a platform that flies longer sorties. For instance, in a 1.5 hour JTAC training event, 3-4 JTACS can cycle onto the mic. If the USAF had a platform that could be on station 3 hours, it might be able to get 2-3 JTACS' events. Assuming the 18,936 sorties could be reduced notionally by a

third by having a platform fly longer and allow the same number of events to be flown in fewer sorties, the USAF might only need 12,624 sorties at 3.5 hours (losing some transit time due to slower speed). Actual numbers from ACC suggest that they are getting 3-4 controls per flying hour, and that they could estimate 10 controls per 3-4 hour sortie.

Reviewer NOTE (emphasis added): "For instance, let's say that a JSF squadron allocates 1/10th of its annual sorties to CAS ((21 PAA x 180 sorties per year)/10 = 378 sorties per year) meaning that *50 JSF squadrons (essentially all of the combat coded squadrons) must keep CAS on their DOC statement to cover the burden* (50 x 378 sorties = 18,900 sorties). *An OA-X squadron of 18 PAA would more likely fly 50% of its missions as CAS.* While it would likely fly the same number of sorties, this means that each squadron could knock out about 1,620 CAS sorties per year. Of course you'd want JTACS to occasionally work with JSFs, but *for each squadron of OA-X, you could potentially allow 5-6 JSF squadrons off the hook to specialize in highly demanding skill sets like DEAD / OCA.* Combined with the OA-X's ability to loiter and do more training events, *splitting the JTAC training "50/50" between high-end and low-end assets means that you'd need 25 F-35 squadrons to dedicate 10% of their annual training to CAS and 4 x 18PAA OA-X squadrons... (or 18 x 21 PAA F-25 squadrons & 5 x 18 PAA OA-X, or 12 x 21 PAA F-35 & 6 x 18 PAA OA-X squadrons...the trade ratio is ~6 to 1).* That scopes your need to something like 120 OA-X in six ops squadrons to support CAS training. There is obviously FTU overhead to consider, as well as a host of other questions like do you really want 18PAA squadrons or *smaller "detachments" closely co-located with the supported US Army garrison.* Let's say the total (minimum) OA-X requirement is for 180 (I'm pulling a number out) That means (IMHO) I am looking at a worst case cost of 18M PUC vs. the F-35s \$130M PUC (procurement unit cost). I can still get 180 OA-X for the cost of 25 JSF and I can still expect significant annual savings in O&M related to support of the CAS enterprise. *Finally, conceptually, any argument for why F-35's need to be used in CAS are a little shaky IMHO.* I seriously doubt we'll put our ground forces in a position where we have to use stealth fighters to support them in the face of a functioning adversary IADS. If we are, I can only hope that we are supporting Rangers who are actively tasked to slit the throats of SAM operators. The more likely condition is that we'll be using the JSF in their external carriage (non-stealthy) config where they are a really expensive F-16 that can be expected to perform CAS with similar limitations (high, fast, and fuel limited)."

[xli] Source: Slide from 19 Oct 12 AF Energy Council "Burn Rate Changes" AF/A9RI (16Oct12) derived from AFTOC and SAF/FMCC. Cited with permission from Mr. Kevin Arthur, AF/A9RI, personal email, October 21, 2013."

[xlii] F-35 (1,660 GPH * 28,404 hours = 47,150,640 Gallons); LAAR/OA-X (50 GPH * 28,404 = 1,420,200); Savings (47,150,640 Gallons-1,420,200 gallons = 45,730,440 gallons); Source for F-35 burn from AF/A9RI brief "Burn Rate Changes" 16 Oct 2012 based on AFTOC and FAF/FMCC data. Cited with permission from Mr. Kevin Arthur, AF/A9RI, personal email, October 21, 2013."

[xliii] DLA FY12 costs for JP8/A1 are \$2.31/gallon; 45,730,440 gallons * \$2.31/gallon = \$105,637,316. DLA costs can be found here:

http://www.energy.dla.mil/DLA_finance_energy/Documents/Standard%20Prices/FY%202012%20Standard%20Pric

Independently AFTOC FY10 numbers state AvPOL costs per flying hour were \$5,212 for F-35 and \$224 for a T-6. Using these numbers results in a slightly higher savings of \$141.6M ((\$5,212 * 28,404 hours=\$148,041,648)-(\$224 * 28,404 hours=\$6,362,496)=\$141,679,152. Source FY10 Actual Costs

(AFTOC) Chart1: Operational (fully burdened) cost per flying hour.

[xliv] A C-17 holds 35,546 US gallons per http://wiki.answers.com/Q/How_much_fuel_is_in_a_C-17_Aircraft and a 747 holds 57,285 gallons. $45,730,440 \text{ gallons} / 35,546 \text{ gallons} = 1,286$ C-17 equivalents; $45,730,440 \text{ gallons} / 57,285 \text{ gallons} = 798$ 747 equivalents.

[xlv] <http://articles.latimes.com/2013/jul/22/business/la-fi-fighter-pilot-wanted-20130722>

[xlvi] Per email, 2/25/2013 MICHAEL W. PIETRUCHA, Col, USAFR, IMA to the PACAF A8/9, cited with permission

[xlvii] For example, see Sec Gates remarks, quoted above

[xlviii] OSD via QDR directed the USAF to invest in light mobility and light attack

[xlix] The Army and Marines routinely express concerns about our return to a focus only on high end

[l] For example, Peter Singer of Brookings, quoted above

[li] Source CSBA Strategic Choices for countering A2/AD brief

[lii] Consider for example USAF TOA from LRS-B and F-35 re-allocated to Navy 4th gen fighter procurement.

[liii] Aikido is a martial art that like Judo, initially goes with the thrust of an enemies attack, and then uses that momentum against them. It also approaches conflict by removing oneself from the line of attack, and then standing in a place from behind, where both attacker and defender share a similar perspective, and the defender is in a position to lead the attacker.

About the Author



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Lt Col Peter Garretson is a transformational strategist at Headquarters US Air Force. He is currently Division Chief of Irregular Strategy, Plans and Policy, where his focus is on how the United States can enhance the legitimacy of partner nations through a whole-of-nation concept called Aviation Enterprise Development (AED), and proactively shape the peacetime Air Domain to deliver positive foreign policy, security, and economic outcomes for the United States and its partners. He has previously served as an Airpower strategist and strategic policy advisor to the Chief of Staff of the Air Force on his Strategic Studies Group, and four years as the Chief of Future Technology for HQ USAF Strategic Planning. He was the first serving US officer to serve as a visiting fellow at India's premier strategic think tank, the Institute for Defense Studies and Analysis (**IDS**A) as a Council on Foreign Relations (**CF**R) international affairs fellow. Lt Col Garretson is a former DARPA service chief's intern, Los Alamos National Lab service academy research associate, senior pilot, and winner of the **NSS** Space Pioneer Award. Lt Col Garretson helped architect the Air Force Future Wargame Series from 2005-2009, as well as conceiving and executing the first-ever **multi-agency deflection and disaster exercise** and the first US-UK-France Trilateral strategic workshops. He was a collaborator in a number of strategic documents, including the 2011 National Military Strategy (**NMS**), the **NSSO Study**, the **UAS Flight Plan**, the Air Force **Vision for Learning, Air Force Energy Horizons**, DARPA 100 Year Starship, and was the initiator of the Air Force Strategic Environmental Assessment, Air Force Futures Group and **Blue Horizons** Program. He has published on a variety of topics including **space policy, space strategy, scenario based planning**, using Space & Energy to advance to **US-India Strategic Partnership, Space-Based Solar Power, Planetary Defense**, the role of **Science Fiction** in Strategic Planning, the Future of **Wargaming, Grid Computing, Augmented/Synthetic Reality**, and **Airpower in US strategy in Asia**, and is currently writing a book on a vision and grand strategy for America in Space.

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