

AIR COMMAND AND STAFF COLLEGE

AIR UNIVERSITY

**COST EFFECTIVE AIRPOWER FOR THE LONG WAR AGAINST  
VIOLENT EXTREMIST ORGANIZATIONS**

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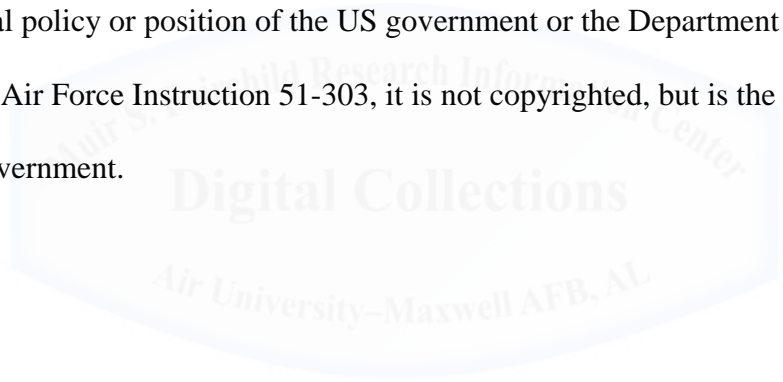
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## **Abstract**

This research identifies a more cost effective way to employ airpower in small conflicts and specifically Operation INHERENT RESOLVE (OIR). The goal is not to recommend replacement of or reduction in F-35s, but rather to pinpoint specific areas where the United States Air Force (USAF) can realize operational cost savings to help ease the financial burden of more expensive modern weapons systems. A brief study of airpower, military doctrine, and strategy in the historical context of small wars leads in to how the United States and coalition partners are conducting operations in OIR. The crux of the research is a compilation of unclassified data on the current cost of employing airpower in OIR. The data show that an investment in a light attack aircraft could result in substantial operational cost savings of at least \$1.3 billion per year if the USAF utilized light attack in lieu of front line fighters and bombers for strike missions in OIR. Though further research is recommended utilizing more precise classified data, the available data present a clear case for utilizing a commercial off-the-shelf (COTS) light attack aircraft as a strike platform for OIR and smaller wars in general.

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## **Introduction**

After more than a century of military aviation, no one disputes the important role airpower has played in small wars; however, US leadership has failed to equip the military to efficiently combat the threats faced in small wars while maintaining readiness for the higher end fight. Today, both national defense strategy and military doctrine address the issue of smaller conflicts, specifically focusing on the threat of violent extremist organizations (VEOs) and counterinsurgency (COIN) warfare. One need look no further than Iraq, Syria, and Afghanistan to see the current embodiment of airpower in a small war against Da'esh and Taliban fighters. A closer look at OIR reveals a mass of front-line fighters and strategic bombers executing tens of thousands of hours of strike missions against a relatively ill-equipped, outmoded force of violent extremists. Those tens of thousands of hours represent a substantial operational cost and considerable stress to the USAF budget. The time to pursue a more efficient means of employing airpower against the low-end threat is long overdue, and a light attack aircraft can provide the desired military effects for a significant reduction in operational cost. This paper specifically examines four light attack turboprop aircraft (AT-802U, OV-10G+, A-29B, and AT-6C) as viable options to satisfy the role of a notional light attack strike aircraft. USAF leadership and Congress need to aggressively pursue a light attack option to avoid excessive costs per flight hour in the low-end fight as well as reduce the wear and tear on the nation's front-line fighters and bombers. Failure to do so will result in a continued decline in the readiness of front-line air assets as well as an Air Force that is substantially and consistently over budget.

## **Airpower's History in Small Wars**

Military and political leaders alike should take heed of the significant role airpower has played in small wars. Both history and current military doctrine indicate that small wars (e.g. counter-terrorism and COIN operations) such as those faced in the US Central Command (CENTCOM) area of operations (AOR) are generally protracted conflicts and a mainstay of American foreign policy.

Historically, military commanders did not reserve airpower for only major state-on-state conflict. Since arriving on the battlefield, US military leaders utilized airpower extensively in smaller conflicts. For example, the Marine Corps successfully employed airpower during the Banana Wars in Haiti, the Dominican Republic, and Nicaragua in the first two decades of the 20<sup>th</sup> century.<sup>2</sup> Even during the Cold War, when US forces were doctrinally focused on a major war with the Soviets, US airpower faced a counterinsurgency in Korea in the early 1950s as well as South Vietnam in the early 1960s. At the same time, the Soviets supported numerous other insurgencies in Africa and Latin America.<sup>3</sup> Later in the 1980s, the United States provided aircraft, training, and support to the governments of Guatemala and El Salvador to aid in their civil wars.<sup>4</sup> When the Soviet Union fell at the end of the 20<sup>th</sup> century, insurgencies and small wars continued to thrive as insurgents turned to deviant forms of globalization instead of the Soviets to fund their endeavors. As of 11 September 2001, VEOs thrust their way to the forefront of US foreign policy with the attacks on the World Trade Center and Pentagon. The subsequent wars in Afghanistan and Iraq have endured in one form or another for the past decade

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<sup>1</sup> We wish to thank Lt Col Joel Bius for his guidance, patience, and thoughtful comments and suggestions. All errors found therein are our own.

<sup>2</sup> James S. Corum and Wray R. Johnson, *Airpower in Small Wars: Fighting Insurgents and Terrorists* (Lawrence, KS: University Press of Kansas, 2003), 11-12.

<sup>3</sup> *Ibid.*, 1-2.

<sup>4</sup> *Ibid.*, 2.

and a half with American airpower at the forefront of both. Though coalition forces are making progress in Iraq, Syria, and Afghanistan, the end of the fight against VEOs is not in sight, and airpower will continue to play a role in said fight. The future of US airpower, therefore, is unlikely to see a change in the trend of airpower employment in small wars.

Although throughout the 20<sup>th</sup> century US military doctrine primarily focused on major state-on-state war, US doctrine and strategy evolved over the past decade to address the issue of smaller wars. VEOs thrive in today's globally connected environment, and US military doctrine gradually shifted away from Cold War and Desert Storm principles to address the enduring nature of the fight against VEOs and the higher likelihood of smaller wars. In 2008, the Army TRADOC manual *Commander's Appreciation and Campaign Design* addressed the issue stating, "The services developed much of their doctrine, organizations, and equipment during the Cold War in preparation for war between states. At the time, this type of war was the most dangerous threat to our Nation's survival, but it was not the most likely form of conflict—then or now."<sup>5</sup> Additionally, major strategic documents such as the National Security Strategy and the National Military Strategy of 2015 espouse the enduring nature of the fight against VEOs.<sup>6</sup>

More recently, military leaders have embraced the "four plus one" notion, referring to China, Russia, Iran, and North Korea as the "four" and VEOs as the "plus one" threat. Despite the call of US military leaders to re-focus on state-on-state conflict, the "plus one" of the "four plus one" threat remains a daunting challenge that can emerge anywhere in the world. In August 2016, General Dunford, Chairman of the Joint Chiefs of Staff, specifically identified the self-

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<sup>5</sup> TRADOC Pamphlet 525-5-500, *United States Army Commander's Appreciation and Campaign Design, Version 1.0*, 28 January 2008, 4, <http://www.tradoc.army.mil/tpubs/pamndx.htm>.

<sup>6</sup> US Department of Defense, *The National Military Strategy of the United States of America 2015* (Washington, DC: Office of the Chairman of the Joint Chiefs of Staff, June 2015), 2-4; and Barack Obama, *National Security Strategy February 2015* (Washington, DC: Office of the President of the United States, February 2015), 1, 9-10.

proclaimed Islamic State or Da'esh as not only an issue in Iraq and Syria, but also one spreading through Afghanistan, Libya, and potentially throughout Africa.<sup>7</sup> Despite the prolific nature of the Da'esh threat, the wars in the CENTCOM AOR do not dominate the news cycle as they did when the US had significant numbers of troops on the ground; however, those “plus one threats” remain a steadfast and costly aspect of American foreign policy.

Although plus one threats only comprise one fifth of the “four plus one” threat concept, they pervade American military action as victory over plus one threats often eludes military leaders, resulting in protracted conflicts. Treaties will not resolve a conflict with violent groups like Da'esh and Al Qaeda. There is no government or regime to conquer, but rather an ideology or a culture. Resolution of hostilities requires acceptance from those individuals within said cultures, whose perceptions and desires can be fickle. As a result, prolonged campaigns in dynamic operational environments will characterize future conflicts with groups clinging to radical ideologies. The Air Force 3-2 Annex on Irregular Warfare (IW) points out that wars such as those currently faced in Iraq, Syria, and Afghanistan require a long-term strategy characterized by “patience and adaptation” which will significantly impact equipment wear and tear.<sup>8</sup> The bottom line is that military leaders cannot achieve swift, decisive victories in wars against plus one threats, and said VEOs comprising the plus one threat are now global in nature.

Though VEOs are proliferating further outside of the Middle East, the CENTCOM AOR remains the most conflict-ridden region for any Geographic Combatant Commander, and a resolution to hostilities is not forthcoming. General Joseph Votel, USCENTCOM Commander,

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<sup>7</sup> Jim Garamone, “Dunford Details Implications of Today’s Threats on Tomorrow’s Strategy,” Defense.gov, 23 August 2016, <https://www.defense.gov/News/Article/Article/923685/dunford-details-implications-of-todays-threats-on-tomorrows-strategy>.

<sup>8</sup> Curtis E. Lemay Center for Doctrine Development and Education, “ANNEX 3-2 Irregular Warfare,” *Air Force Doctrine*, 12 July 2016, 12.

put it plainly: “There are no easy victories or quick wins in the USCENTCOM area of responsibility – ours is an area of protracted struggles and conflicts... Prevailing in this AOR requires resolve and resiliency.”<sup>9</sup> In other words, the fight in the CENTCOM AOR is not going away any time soon. The current fight against Da’esh is no exception. The very name Operational INHERENT RESOLVE implies a protracted engagement. CENTCOM identifies the name of the operation as an indication of the “unwavering resolve and deep commitment” to eradicate the power and influence of Da’esh and like groups both in CENTCOM as well as throughout the globe.<sup>10</sup> Da’esh, despite recent setbacks and loss of territory, is unlikely to be eradicated in the near future. The steadfastness of the Da’esh threat can be attributed to the availability of angry, poor Muslims, the continuation of the Israeli-Palestinian plight, and the potential to shift strategy back to terrorism. Fawaz Gerges points to two major factors contributing to the longevity of Da’esh. The breakdown of the state in the cradle of the Arab world coupled with the sectarian clash of Sunnis and Shias provide Da’esh with the trade space needed to recruit, train, and inspire frustrated Sunni Muslims. As long as Civil Wars remain unresolved in Iraq, Syria, Libya, and Yemen, Da’esh will have a foundation of angry military-aged-males.<sup>11</sup> These Sunni Muslims will form the core of plus one threats for future conflicts.

Additionally, Da’esh (as well as similar Salafi-jihadist groups) will continue to use the Palestinian plight as a source of inspiration for their current forces as well as recruitment.<sup>12</sup> Given the continued disparity over a two-state solution in the Israel-Palestine relationship, Salafi-jihadists worldwide will likely utilize the conflict as a source of motivation for years to

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<sup>9</sup> Gen Joseph L. Votel, USA, “USCENTCOM Command Narrative,” CENTCOM.mil, 29 August 2016, <http://www.centcom.mil/ABOUT-US/COMMAND-NARRATIVE/>.

<sup>10</sup> US Central Command, “Combined Joint Task Force – Operation Inherent Resolve (CJTF-OIR),” CENTCOM.mil, <http://www.centcom.mil/OPERATIONS-AND-EXERCISES/OPERATION-INHERENT-RESOLVE/>.

<sup>11</sup> Fawaz A. Gerges, *ISIS: A History* (Princeton, NJ: Princeton University Press, 2016), 260.

<sup>12</sup> *Ibid.*, 261.

come. Furthermore, Middle East analysts argue that the liberation of Mosul and Raqqa will not signify the end of Da'esh. Many think Da'esh will “shift back to terrorism” in lieu of building a caliphate, as much of that capacity will be reduced once their major urban areas are under coalition control.<sup>13</sup> Whether discussing Da'esh specifically or Salsfi-Jihadist plus one threats in general, both will likely endure for many years and remain an issue for coalition forces.

The plus one threat, therefore, clearly embodies the modern flavor of protracted small war, as history and doctrine have shown us. The next section will specifically discuss how US and coalition forces tackle the immense problem of plus one threats as well as airpower's role in the fight against Da'esh in OIR.

### **Airpower's Contributions to the Operation INHERENT RESOLVE**

On 10 September 2014, President Obama announced the formation of a broad international coalition to defeat Da'esh emphasizing, “Our objective is clear: We will degrade, and ultimately destroy, Da'esh through a comprehensive and sustained counterterrorism strategy.”<sup>14</sup> This statement reflects August 2014 UN Security Council Resolution 2170, “terrorism can only be defeated by a sustained and comprehensive approach involving the active participation and collaboration of all States... which is why our first priority is to encourage others to join in this important endeavor.”<sup>15</sup> “In that endeavor,” as Secretary of State John Kerry has said in a meeting with NATO counterparts the same month, “there is a role for every country to play.”<sup>16</sup> Several nations joined the US in the war on terrorism. Australia, Canada, France,

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<sup>13</sup> Wilson Brissett, “Mosul, Raqqa Not the End of ISIS,” *Air Force Magazine*, 21 November 2016, <http://www.airforcemag.com/DRArchive/Pages/2016/November%202016/November%2021%202016/Mosul,-Raqqa-Not-the-End-of-ISIS.aspx>.

<sup>14</sup> US Central Command, “Combined Joint Task Force – Operation Inherent Resolve (CJTF-OIR).”

<sup>15</sup> US Department of State, “The Global Coalition to Counter ISIL,” State.gov, <http://www.state.gov/s/seci/index.htm>.

<sup>16</sup> US Central Command, “Combined Joint Task Force – Operation Inherent Resolve (CJTF-OIR).”

Jordan, the Netherlands, and the United Kingdom have conducted strikes in Syria and Iraq together with the United States.<sup>17</sup> One of the lines of effort Kerry and Secretary Hagel set forth to degrade and defeat Da'esh is providing military support to US partners.<sup>18</sup> The Combined Joint Task Force – Operation Inherent Resolve (CJTF-OIR) is tasked “by, with and through regional partners, to militarily defeat Da’esh in the Combined Joint Operations Area in order to enable whole-of-coalition governmental actions to increase regional stability.”<sup>19</sup> The sustained US effort is reflected in the name INHERENT RESOLVE. The name reflects “the unwavering resolve and deep commitment of the US and partner nations in the region and around the globe to eliminate the terrorist group Da’esh and the threat they pose to Iraq, the region and the wider international community.”<sup>20</sup>

The fight against Da’esh is very complex. Air Force Lt. Gen. John W. Hesterman III, Combined Forces Air Component commander for CENTCOM, stated in 2015, that the coalition was facing one of the most complex operational environments to date. "There is no, and never has been, a well-developed target set for that which is necessary to do what we've done in the past," Hesterman said.<sup>21</sup> In that complexity, airpower enabled nearly every victory. In the war against Da’esh, airpower supported ground forces regaining territory, while removing thousands of enemy fighters from the battlefield and eliminating most of Da’esh's oil refining capability.<sup>22</sup>

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<sup>17</sup> HT Media Ltd., "INHERENT RESOLVE STRIKES TARGET ISIL IN SYRIA, IRAQ," *US Fed News Service, Including US State News*, 20 October 2016, <http://aufric.idm.oclc.org/login?url=http://search.proquest.com/aufric.idm.oclc.org/docview/1830370584?accountid=4332>.

<sup>18</sup> US Department of State, "The Global Coalition to Counter ISIL."

<sup>19</sup> CJTF-OIR, "Mission," Operation Inherent Resolve website, <http://www.inherentresolve.mil/>.

<sup>20</sup> US Central Command, "Combined Joint Task Force – Operation Inherent Resolve (CJTF-OIR)."

<sup>21</sup> SFC Tyrone C. Marshall Jr., USA, "Coalition Air Power Leads Fight Against ISIL, General Says," *Targeted News Service*, 5 June 2015,

<http://aufric.idm.oclc.org/login?url=http://search.proquest.com/docview/1686177321?accountid=4332>.

<sup>22</sup> Marshall, "Coalition Air Power Leads Fight Against ISIL, General Says."

The CJTF organizes its tasks and missions along three lines of effort; lines linking multiple tasks and missions to focus efforts to establishing conditions at the strategic and operational levels.<sup>23</sup> In support of one of these efforts, the CJTF will “enable the military defeat of Da’esh in Iraq and Syria by striking Da’esh across the breadth and depth of the so-called ‘caliphate’ throughout both countries.”<sup>24</sup> As of 28 February 2017, the US and its coalition partners have conducted a total of 18,666 strikes (11,245 Iraq / 7,421 Syria), of which the US has conducted 14,704 (7,639 Iraq / 7,065 Syria).<sup>25</sup> These numbers highlight that although strike planning in IW should utilize Partner Nation (PN) airpower to the maximum extent possible, many PNs such as Iraq and Syria are often unable to relieve the burden of airpower on US Air Forces.<sup>26</sup> Despite the effort of a diverse coalition, USAF assets alone (i.e. not including US Navy) have flown more than half of the strike sorties.

The US manned aircraft that provide tactical airpower in OIR, excluding support aircraft, are the following: A-10, B-1, F-15E, F-16, and F-22.<sup>27</sup> Although the F-22 is primarily designed to achieve air superiority with stealth technology, its fifth-generation sensors are mostly used in OIR to provide other coalition aircraft with Situational Awareness. The other aircraft provide kinetic effects in Close Air Support (CAS) and Air Interdiction missions, or provide (non-traditional) Intelligence, Surveillance, and Reconnaissance. Targets, according to Department of Defense (DoD) issued press releases, include oil tanker trucks, tunnels, bridges and supply routes, various weapon systems, weapon and financial caches, and buildings.<sup>28</sup>

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<sup>23</sup> CJTF-OIR, “Campaign,” Operation Inherent Resolve website, <http://www.inherentresolve.mil/>.

<sup>24</sup> Ibid.

<sup>25</sup> US Department of Defense, “Operation Inherent Resolve,” Defense.gov, [https://www.defense.gov/News/Special-Reports/0814\\_Inherent-Resolve](https://www.defense.gov/News/Special-Reports/0814_Inherent-Resolve)

<sup>26</sup> Lemay Center, “ANNEX 3-2 Irregular Warfare,” 14.

<sup>27</sup> Oriana Pawlyk, “Air Force F-16s Fly the Most Sorties Against ISIS, B-1s Drop Most Bombs,” *Air Force Times*, 24 March 2016, <https://www.airforcetimes.com/articles/air-force-f-16s-fly-the-most-sorties-against-isis-b-1s-drop-most-bombs>.

<sup>28</sup> HT Media Ltd., “INHERENT RESOLVE STRIKES TARGET ISIL IN SYRIA, IRAQ.”

It may not be surprising that bombers like B-52s and B-1s are capable of providing CAS in this war. After all, these platforms are perfectly capable to deliver precision bombs. However, even though bomb delivery itself is not necessarily platform specific, dedicated bombers will never be an optimum CAS platform because they simply were not designed for that purpose. Although the B-1 bomber has played a significant role in the battle against Da'esh, it did not do so in a way for which it was originally designed. The airplane was designed to penetrate the high-end threat during the Cold War. Some of its design characteristics, like long endurance and the ability to carry a vast amount of air to surface weapons, can be beneficial supporting the ground battle. But a B-1 is not as agile as smaller airplanes and it does not have any direct fire weapons, which are preferred when friendly troops are in close vicinity of the enemy or in case of increased risk of collateral damage. This illustrates that although a variety of aircraft can provide tactical airpower, not all platforms can do it in the most effective and efficient way, because they were simply not designed to do so.

Besides efficacy, there is another reason why not all aircraft are equally suitable to provide tactical airpower against groups such as Da'esh. Some airplanes are just too expensive to operate for that specific task. Using a high-end aircraft to fight a low-end threat is like using a Ferrari as a cab in New York. It is not the best use of the Ferrari and certainly a lot more expensive than operating with a car more suited for the job. Tasking a B-1 (or for that matter, an F-15E, F-16, or F/A-18) for CAS is a lot more expensive than a smaller aircraft. Fuel and maintenance costs alone are significantly higher.<sup>29</sup> That makes the war against Da'esh not only very complex, but also very expensive.

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<sup>29</sup> Air Force Instruction (AFI) 65-503, *US Air Force Cost and Planning Factors*, 23 February 2017, Table 15-1, <https://www.my.af.mil/gcss-af/USAF/ep/globalTab.do?channelPageId=s6925EC1350500FB5E044080020E329A9>.



## Commercial Off-the-Shelf Aircraft Suitable for Current Operations

The USAF spends at least \$1.5 billion a year in operations and maintenance (O&M) cost providing tactical airpower for OIR, assuming average sortie durations of five hours for fighter aircraft.<sup>30</sup> This substantial cost coupled with the enduring nature of plus one threats should give military and political leaders pause. As the Congressional Research Service noted in 2007, “Identifying and fielding systems and methods that can combat terrorists *cost effectively* will likely be an important challenge to overcome [in the Global War on Terror (GWOT)].”<sup>31</sup> If the war continues for another 15 years the USAF could be looking at a tactical aviation OIR O&M cost of \$22-43 billion,<sup>32</sup> with a Department budget that is already \$60 billion above expected budgets within the five-year defense plan.<sup>33</sup> It is time to seriously consider minimizing operational cost to allow for research and development, modernization, and training across other mission areas. The Director of Defense Budget Analysis at the Center for Strategic and International Studies noted that OIR placed a significant stress on the DoD and that it “is leading to more maintenance costs, and it is forcing the Air Force to make tradeoffs in its modernization programs.”<sup>34</sup> Light attack aircraft represent an opportunity for the Air Force to invest a modest amount of money now to save billions of dollars in the future as well as preserving flight hours on its front line fighter fleet.

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<sup>30</sup> AFCENT Public Affairs, “AFCENT Airpower Summaries,” 31 January 2017, <http://www.afcent.af.mil/Portals/82/Airpower%20Summary%20-%20January%202017%20v2.pdf?ver=2017-02-09-020450-370>; Pawlyk, “Air Force F-16s Fly the Most Sorties Against ISIS, B-1s Drop Most Bombs.”

<sup>31</sup> Brett Blake, “AT-6: The Best USAF Investment for the Long War,” Research Report (Maxwell AFB, AL: Air Command and Staff College, 2007), 6.

<sup>32</sup> The \$22 billion cost for flying hours in OIR over the next 15 years assumes sortie rates and proportion of missions flown by aircraft remain the same and average sortie duration is five hours. The \$43 billion dollar cost assumes that F-35 eventually takes over A-10 and F-16 hours at a cost of \$21,842 per hour.

<sup>33</sup> Senior Air Force leader who works USAF budget, address to Air Command and Staff College, 24 Feb 2017.

<sup>34</sup> Allyson Versprille, “Air Force Modernization at Risk as Maintenance Costs Continue to Climb,” *National Defense*, April 2016, <http://www.nationaldefensemagazine.org/archive/2016/April/Pages/AirForceModernizationatRiskasMaintenanceCostsContinuetoclimb.aspx>.

Since the beginning of the GWOT, the US government has flirted with the idea of a dedicated light attack aircraft designed to specifically meet the needs of COIN operations. The US Navy executed two programs to test the concept of “an inexpensive, simple, nimble combat aircraft capable of long loiter and on-call reconnaissance and attack duty, able to operate from austere airfields under primitive conditions and to deliver precision ordnance and employ state-of-the-art technology including electro-optical and infrared sensors, laser-guided munitions...and encrypted radios and night-vision gear.”<sup>35</sup> Despite these tests, senior leaders, such as current Secretary of Defense James Mattis, acknowledge using modern fighters to target individuals with AK-47s or provide security for friendly patrols “amounts to overkill,” and the US government has made little progress towards purchasing aircraft specifically for the long war against plus one threats.<sup>36</sup> To use a baseball analogy, the tragedy of this failure is that the USAF continues to mortgage its future strength in the fight against plus one threats while cheap capable relief pitchers sit in the dugout.

With light attack aircraft fighting on two continents and in three wars, it is beyond dispute that they possess the necessary capabilities to combat plus one threats and provide these capabilities more cheaply than modern fighters and bombers. The AT-802U Air Tractor, OV-10 Bronco, and A-29B Super Tucano have proven combat records. The Air Tractor has the lowest public profile of the three but Jordan and the United Arab Emirates operate it effectively. The US Government recently approved the sale of 14 AT-802Us to Kenya for \$418 million, approximately \$29 million per aircraft.<sup>37</sup> The AT-082U is a single engine civilian crop duster

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<sup>35</sup> Robert F. Dorr, "Combat Dragon II Demonstrates OV-10G+ Bronco Capabilities," *Defense Media Network*, 13 June 2013, <http://www.defensemmedianetwork.com/stories/combat-dragon-ii-demonstrates-ov-10g-bronco-capabilities/>.

<sup>36</sup> Ibid.

<sup>37</sup> Qualitative Military Edge, “AT-802U,” 2 March 2017, <http://militaryedge.org/armaments/at-802u/>.

heavily modified for the light attack mission. Equipped with a full complement of modern avionics and sensors, the Air Tractor can carry 8,000 pounds of ordnance on 15 hard points including 500-pound class smart bombs, rockets, AGM-114 Hellfire and .50 caliber machine guns making it the most heavily armed of all four aircraft. Cruising at 180 knots it can travel 1300 nautical miles (NM) remaining airborne for just over seven hours at a cost of approximately \$400 per hour.<sup>38</sup>



**Picture 1: AT-082U Air Tractor pictured with 500-pound laser guided bombs, Hellfire missiles, laser guided rockets. (IOMAX)**

Similar to the AT-802U in capabilities but more well-known is the OV-10 Bronco. The OV-10 was the USAF's answer for a cheap attack aircraft in Vietnam and successfully fulfilled the Forward Air Controller (FAC) roll in that conflict and in Operation DESERT STORM. The OV-10 is a twin-engine light attack aircraft design by North American Rockwell in the 1960s. Little information is available on the modern version of the OV-10, due to classification, but the legacy aircraft cruised at 244 knots, significantly faster than the Air Tractor, covering the same range in just under five hours endurance. While holding half of the hard points as the Air

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<sup>38</sup> Airforce-Technology.com, "Air Tractor AT-802U Surveillance and Light Attack Aircraft, United States of America," airforce-technology.com, <http://www.airforce-technology.com/projects/air-tractor-at-802u-surveillance-and-light-attack-aircraft/>.

Tractor its maximum payload is comparable. Modern versions of the OV-10 forwarded for consideration in the light attack mission are fully equipped with modern avionics and smart weapons.



**Picture 2: OV-10G+ Bronco pictured with an external fuel tank and integrated sensor under the nose. (Nick Thomas)**

The Bronco's impressive combat record of yesteryear made it the perfect candidate for the US Navy's Combat Dragon II test in 2015. Two OV-10G+'s, equipped with a full complement of modern avionics and weapons, deployed to US Central Command in May 2015. They successfully flew 120 combat missions over a span of 82 days in support of OIR. Details remain classified but reporting at the time indicated a successful test, proving the OV-10s could operate within the threat environment and effectively strike targets and support friendly forces.<sup>39</sup>

While information is limited on the OV-10's performance in OIR, the A-29 Super Tucano's combat record has been highly publicized. Colombia purchased 25 A-29s from Brazil in 2006 to replace their aging OV-10 fleet.<sup>40</sup> The Brazilian company Embraer builds the A-29 at \$9-14 million per aircraft, half the cost of the AT-802U in the recent Kenyan contract. It is a

<sup>39</sup> Dorr, "Combat Dragon II Demonstrates OV-10G+ Bronco Capabilities."

<sup>40</sup> Sebastien Roblin, "The Deadly Super Tucanos of South America," *War Is Boring*, 10 September 2016, <https://warisboring.com/the-deadly-super-tucanos-of-south-america-32934b879627>.

single engine attack aircraft with five hard points as well as fully modern avionics and smart weapons. However, as the Super Tucano is a Brazilian aircraft, US smart weapons are not seamlessly integrated as with the other two aircraft. It possesses no capability for the AGM-114 Hellfire. It carries 3,400 pounds, approximately half the payload of the Air Tractor or OV-10, but possesses better range and endurance. Cruising at 281 knots it can travel over 1,500 nautical miles and remain airborne over 8.5 hours at a cost of \$500 per hour. Designed from the ground up as a combat aircraft, it has two internal .50 caliber machine guns and low-pressure tires to enable dirt field landings similar to the Air Tractor and OV-10.



**Picture 3: A-29B Taxiing at Moody AFB with auxiliary fuel tanks, rocket pods, and a sensor under the fuselage. (Image A1C Dillian Bamman, USAF)**

The A-29 has a proven combat record in South America and Afghanistan. The A-29 flies in the Colombian, Brazilian, Ecuadorian, Chilean, and Afghan Air Forces. It serves as the Colombian Air Force's primary strike aircraft against the Revolutionary Armed Forces of Colombia (FARC). In February 2008, five A-29s led by three A-37s targeted and killed FARC spokesperson, Raul Reyes, in a highly contentious cross-border raid into Ecuador. Then in 2010, A-29s dropped 14,000 pounds of ordnance, killing Mono Jojoy a FARC commander. In March 2012, finally equipped with smart weapons, A-29s targeted and killed Alfonso Cano, a top

FARC leader. Four more FARC Front Commanders would fall prey to the A-29 that year. By 2013, the FARC had lost 42 commanders, three times as many as the previous decade. While the A-29 was not solely responsible for this campaign, its capabilities allowed the Colombian Air Force to increase pressure from previous years.<sup>41</sup> Its combat record clearly demonstrates that a light attack aircraft is up to the task of COIN. The A-29 also beat out the AT-6 for the USAF's Light Air Support contract and provided 20 aircraft for the Afghan Air Force, which began flying the aircraft in March 2016.<sup>42</sup> Initial reports from the last year are positive with the presence of the A-29 reducing Afghan Air Force reaction times by fifty percent.<sup>43</sup>

While the A-29 won the USAF Light Air Support contract for Afghanistan, its competitor the AT-6 remains a viable option for light attack. Made by Beechcraft, the AT-6 is remarkably similar to the A-29, sharing the same engine. The AT-6, however, was not designed as a combat aircraft from the ground up; instead, it is a weaponized version of the T-6A Texan II trainer. Due to T-6A as a baseline, the AT-6 is smaller and lighter than the A-29B with reduced capability on unimproved surfaces due to its high-pressure tires. It possesses similar payload and performance data when compared to the A-29 but with a slightly better power to weight ratio. The AT-6 truly distinguishes itself by having a standard US mission system with the ability to integrate weapons such as the AGM-114 Hellfire.<sup>44</sup> It also has similar maintenance and supply chains as the USAF T-6A trainer fleet allowing for some efficiency in training and logistical support.

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<sup>41</sup> Roblin, "The Deadly Super Tucanos of South America."

<sup>42</sup> Robert F. Dorr, "Light Attack Aircraft: The Super Tucano, the AT-6 and the Blue Kool-Aid," *Defense Media Network*, 5 August 2013, <http://www.defensemianetwork.com/stories/light-attack-aircraft-the-super-tucano-the-at-6-and-the-blue-kool-aid/>.

<sup>43</sup> Roblin, "The Deadly Super Tucanos of South America."

<sup>44</sup> Sydney J. Freedberg, "Hawker Beechcraft's AT-6 Guns For Embraer's Super Tucano: Rival Planes Compared," *Breaking Defense*, 1 March 2012, <http://breakingdefense.com/2012/03/hawker-beechcraft-at-6-texan-ii-guns-for-super-tucano-as-air-for/>.



**Picture 4: A pair of AT-6Cs with the flight lead armed with external fuel tanks, five hundred pound laser guided bombs and guns pods, and the wingman carrying Hellfire missiles and laser guided rockets. (Aero Defense eNewsletter)**

Some authors argue that a light jet is better suited to fill the light attack role for the USAF, but this would be a mistake. Turboprop aircraft hold the advantage in fuel efficiency, survivability, maintenance requirements, and foreign object damage. These advantages negate the 100-150 mph speed advantage of light jets over turbo props. In his article “Stop Disrespecting the Turboprop,” Michael Pietrucha makes these arguments clearly. First, below 460 miles per hour, turboprops are more efficient than jets. Pietrucha notes, “an F-15E pilot could taxi on the ground for 6 to 8 minutes and burn the same amount of gas one of our proposed aircraft would use up during an hour of flight time.”<sup>45</sup> This lower fuel consumption not only means a more efficient cost per hour for a turboprop aircraft, but also decreased logistical requirement at operating airfields, allowing aircraft to be dispersed and based further forward.

This dispersion and forward basing of turboprop aircraft is further enabled by reduced maintenance requirements and the ability to operate from unimproved airfields. The engine used in the AT-6 and A-29 can run for 2,250 hours before requiring a full inspection, almost four times longer than jet engine inspection requirements. This would allow A-29s or AT-6s to

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<sup>45</sup> Michael W. Pietrucha, “Stop Disrespecting the Turboprop,” *War is Boring*, 23 January 23 2017, <https://warisboring.com/stop-disrespecting-the-turboprop-c00acd3ff3a#.pp9lsqsek>.

operate at forward bases for over two years before having to rotate back to a consolidated higher-level maintenance facility.<sup>46</sup> Not only does the engine design allow for reduced maintenance cost, but it also enables operations from unimproved surfaces. Turboprop engines can divert or filter engine air intake to prevent foreign object damage. All of the aircraft examined thus far have demonstrated this capability successfully.

Turboprop aircraft are more survivable in the threat environments faced when combating plus one threats. The primary threats are small arms, light anti-aircraft fire, and man portable air defense systems (MANPADS) that target aircraft heat signatures. Modern fighters negate the small arms and light anti-aircraft fire by flying above their effective altitudes, a feat that turboprops can also accomplish. At these altitudes however, larger, louder jets are detectable by the enemy and can be targeted with heat seeking MANPADS. A turboprop's smaller visual and audio signature reduces detection probability. Additionally, if detected it presents the smallest heat signature possible. Its exhaust is quickly mixed with the ambient air at a 60 to 1 ratio, reducing its temperature quickly, while jets have 1000 degree exhaust plumes that MANPADS are designed specifically to target.<sup>47</sup>

Despite these disadvantages compared to turboprop aircraft, Textron Airland developed their Scorpion jet as a possible light attack aircraft. While no contracts have been written for the Scorpion, Textron estimates a \$20 million per aircraft cost with \$3000 per flight hour.<sup>48</sup> This would certainly be a best-case scenario. Current operational light attack jets all cost more than Textron's advertised price points for the Scorpion. When compared with the \$10-20 million per aircraft and \$300-500 per flight hour of the aforementioned turboprop examples the Scorpion

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<sup>46</sup> Pietrucha, "Stop Disrespecting the Turboprop."

<sup>47</sup> Ibid.

<sup>48</sup> Pietrucha, "The Pentagon Has Two Choice for Light-Attack Planes," *War is Boring*, 3 April 2016, <https://warisboring.com/the-pentagon-has-two-choices-for-light-attack-planes-2e4306197b1e#.5b05u2u6f>.

could cost \$370 million more per year to operate while providing less flexibility in maintenance and forward basing, as noted by Pietrucha.<sup>49</sup>



Picture 5: Textron Airland Scorpion with 500 pound laser guided bombs and Hellfire missiles. (Getty Images)

The four turboprop aircraft examined (AT-802U, OV-10G+, A-29B, and AT-6C) all have demonstrated the required capabilities a light attack aircraft needs to provide against plus one threats. They possess the necessary loiter time, forward basing ability, sensors, and weapon capabilities to shoulder the main burden in the fight against plus one threats. Taken in sum, they represent a notional OA-X, the USAF's future light attack aircraft. The OA-X should be a turboprop that costs no more than \$20 million per aircraft and less than \$1000 per hour to operate. It has modern avionics capable of dropping smart weapons and connecting via datalink to modern fighters. It carries a minimum of 3,000 pounds of ordnance and can remain on station for eight hours if required while operating from unimproved forward airfields. This notional aircraft certainly meets the requirements listed in the Combat Dragon II proof of concept: "an inexpensive, simple, nimble combat aircraft capable of long loiter and on-call reconnaissance

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<sup>49</sup> Pietrucha, "Stop Disrespecting the Turboprop." Three hundred seventy million dollars more per year for light jet vs. turboprop is based on number of OIR sorties in 2016 (21,181) assuming an average seven-hour sortie duration at \$500/hr for turboprop and \$3000/hour for light jet.

and attack duty, able to operate from austere airfields under primitive conditions and to deliver precision ordnance and employ state-of-the-art technology including electro-optical and infrared sensors, laser-guided munitions...and encrypted radios and night-vision gear.”<sup>50</sup>

### **Potential Cost Savings by Utilizing Light Attack Aircraft**

Like Secretary Mattis, current Air Force and Congressional leadership all support the concept of light attack. Senator McCain released a white paper titled “Restoring American Power.” He noted, “The Air Force is the oldest, smallest, and least ready in its history. The Air Force has divested over 400 combat fighters in the last five years alone and now has only approximately 1,100 combat-coded fighter aircraft. This is well short of the requirement stated in the 2012 Defense Strategic Guidance for the Air Force to maintain 2,250 total fighter aircraft in order to field 1,200 combat coded fighters.”<sup>51</sup> To fix this issue he called for the purchase of 300 low cost fighters by 2022.<sup>52</sup> The Air Force Chief of Staff, General Goldfein, was quick to support this idea, approving tests of a new commercial off-the-shelf (COTS) light attack aircraft in the summer of 2018 at Holloman AFB, NM.<sup>53</sup> Goldfein has been quoted as supporting the A-29B, AT-6C, and the Scorpion’s participation in the test. Asking of industry, “Do you have, commercial off-the-shelf low-cost, that can perform this mission?”<sup>54</sup> As we have seen the OA-X aircraft listed clearly meet Goldfein’s requirements as a low cost COTS option for light attack; however, the Scorpion remains a dark horse.

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<sup>50</sup> Dorr, "Combat Dragon II Demonstrates OV-10G+ Bronco Capabilities."

<sup>51</sup> Sen John McCain, "Restoring American Power," (Washington, DC, 2017), 12.

<sup>52</sup> McCain, "Restoring American Power," 13.

<sup>53</sup> Rachel Karas, "Goldfein: Air Force to Begin Light-Attack Aircraft Search the Summer," *Inside Defense*, 3 March 2017, <https://insidedefense.com/daily-news/goldfein-air-force-begin-light-attack-aircraft-search-summer>.

<sup>54</sup> Vivienne Machi, "Goldfein: Search for New Light Attack Aircraft May Begin by Spring," *National Defense*, 18 January 2017, <http://www.nationaldefensemagazine.org/blog/Lists/Posts/Post.aspx?ID=2403>.

The Air Force has previously been down this road with light attack and stalled due to lack of funding. In the summer of 2016 former Air Force Chief of Staff, General Welsh, said at a Defense Writers Group breakfast “I’d love to build a new CAS airplane right now while we still have the A-10 [and then] transition the A-10 community into the new CAS airplane. We just don’t have the money to do it.”<sup>55</sup> The reality is that the investment required to purchase an OA-X can be found in O&M cost per flight hour (CPFH) savings from the fight against plus on threats. Jeffrey Cowan noted in his paper “A Full Spectrum Air Force” that the USAF investment in a light attack aircraft provides a “direct cost savings of operating a COIN aircraft and the indirect cost savings of operating a COIN aircraft in place of current fighter/attack aircraft. The operational cost of operating a COIN aircraft vice a legacy fighter is quite striking.”<sup>56</sup>

The USAF could save at least \$1.3 billion dollars per year in O&M cost if it exclusively flew an OA-X to meet strike requirements instead of its front line fighter and bomber force. According to AFCENT airpower summaries for 2016, the USAF flew 21,181 CAS, Escort, and Interdiction sorties in OIR.<sup>57</sup> Specific breakdowns of sorties and hours per aircraft type were unavailable due to classification, but according to an Air Force Times article published in March 2016 the percentage of missions covered by each aircraft were the following: A-10 – 27%, B-1, 7%, F-15E – 30%, F-16 – 33%, and F-22 – 3%.<sup>58</sup> Operations and maintenance cost per flying hour (CPFH) for each of these aircraft is A-10 - \$5,534, B-1 - \$38,910, F-15E - \$20,037, F-16 - \$8,205, and F-22 - \$34,309.<sup>59</sup> Assuming that the aircraft maintain their portion of the sortie

<sup>55</sup> Marcus Weisgerber, "Air Force Wants New Plane to Replace A-10, Fight ISIS," *Defense One*, June 2016, <http://www.defenseone.com/technology/2016/06/air-force-wants-new-plane-replace-10-fight-isis/129136/>.

<sup>56</sup> Jeffrey A. Cowan, “A 'Full Spectrum' Air Force,” Research Report (Maxwell AFB, AL: Air Force Fellows, 2009), 18.

<sup>57</sup> AFCENT Public Affairs, “AFCENT Airpower Summaries.”

<sup>58</sup> Pawlyk, "Air Force F-16s Fly the Most Sorties Against ISIS, B-1s Drop Most Bombs."

<sup>59</sup> AFI 65-503, *US Air Force Cost and Planning Factors*, Table 15-1.

share in OIR and on average fly a five-hour sortie duration the total flying hour cost of OIR in 2016 would be \$1.5 billion.<sup>60</sup> If an OA-X flew 21,181 sorties with two-hour longer average sortie duration of seven hours, at a cost of \$1000 per hour, it would cost \$148 million dollars in flight hours saving the Air Force \$1.3 billion dollars per year.

Due to classification of actual data from OIR these numbers are estimates, but they are conservative estimates that would indicate that \$1.3 billion per year would be the minimum achieved, due to likely increases in CPFH, hidden capital costs, and tanker sortie costs. First, as the F-35 becomes operational and the USAF divests the A-10 and F-16, the OIR average CPFH will increase, as the F-35 will cost two and a half times as much per flight hour in O&M cost as the F-16, and four times as much as an A-10.<sup>61</sup> If F-35s flew all the estimated A-10 and F-16 hours in 2016, it would raise the cost from \$1.5 billion to \$2.7 billion.

Second, O&M CPFH estimates mask the cost of using limited airframe lifetime hours. Airframes are designed only to fly a limited number of hours before being retired or structurally reinforced. The initial purchase price of the aircraft should also be divided out across the designed life expectancy. In essence, every hour you fly is one you cannot get back and have paid for during the initial purchase. The O&M cost per flight hour numbers do not include this recapitalization cost. Brett Odom explores this in his article “Why Sloppy Accounting is Destroying the US Fighter Inventory” stating that “by including only marginal operating costs and ignoring the capital costs of its assets, commanders are incentivized to over utilize aircraft, and to use them for relatively low quality missions where a cheaper alternative might serve

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<sup>60</sup> The assumption of a five-hour sortie duration is based on the authors’ recent experience flying A-10s from Incirlik AB, Turkey, and F-18s in Operation INHERENT RESOLVE. In addition, assuming a three hour on station time for aircraft, which was typical during the authors’ deployments, an aircraft traveling at seven nautical miles per minute from Al Udeid AB, Qatar or Al Dafra AB, UAE would fly a 5.5 and 7.5 hour sortie respectively.

<sup>61</sup> AFI 65-503, *US Air Force Cost and Planning Factors*, Table 15-1.

better. Second, by obscuring the true cost of operations, the services hide the true cost of the tradeoff, leading to an overinvestment in capability and an underinvestment in capacity.”<sup>62</sup>

Ultimately he estimated that the true CPFH is likely double that listed by the DOD. In our savings estimates we did not factor this in for current aircraft but *did* double the estimates of OA-X CPFH from \$500 to \$1000 per hour in order to factor in a large margin of error.

Third, the annual \$1.3 billion in savings only factors in tactical aircraft costs when in fact replacing modern fighters with the OA-X would have significant savings in the tanker force. There were an additional 13,064 tanker sorties supporting mostly fighter refueling. Assuming these were all KC-135 tankers (the cheapest to operate) and that they had the same five hour average sortie duration the flying hour cost in tankers would be approximately \$703 million. While replacing modern fighters with the OA-X would eliminate a significant portion of the tanker requirement, we could not accurately estimate the percentage of tanker hours dedicated to fighters, so we ignored this potential additional savings.<sup>63</sup>

Even with these conservation efforts, critics will argue that replacing all fighter sorties with OA-X sorties will not be possible. The operational needs will require some presence of modern fighters when unique missions call for longer range, heavier ordnance, or there is an increased threat. They are certainly correct, but coalition or joint partners readily provide these capabilities. Given the rising average cost of flight hours as the F-35 becomes operational, the failure to account for recapitalization cost in CPFH, and the potential tanker savings, the \$1.3 billion dollars per year savings appears to be a valid if not conservative estimate, but further exploration should be undertaken with classified data.

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<sup>62</sup> Brett Odom, "Why Sloppy Accounting is Destorying the US Fighter Inventory," *Fighter Sweep*, 28 August 2016, <https://fightersweep.com/6140/the-real-cost-per-flight-hour-of-military-aircraft/>.

<sup>63</sup> AFCENT Public Affairs, "AFCENT Airpower Summaries," and AFI 65-503, *US Air Force Cost and Planning Factors*, Table 15-1.

Assuming a generous price tag of \$20 million per aircraft for 300 aircraft, the OA-X program could pay for a 300 aircraft buy within five years through O&M cost savings. Buying the OA-X in bulk is key, as a large buy of aircraft enables the USAF to ensure predicted O&M cost savings and correct two current shortfalls by increasing aircraft available for JTAC training and fighter pilot absorption into the combat air forces. The USAF must buy enough force structure to completely satisfy the light attack requirements of combatant commanders while ensuring enough OA-X force structure at home to train pilots for the light attack mission. The stateside units would be tasked with transitioning pilots into the OA-X and then seasoning them for deployment.

These stateside units' mission would align perfectly to provide the USAF with five to seven squadrons of aircraft available to meet JTAC training requirements, which have become an increasing burden on already over tasked fighter and bomber units.<sup>64</sup> Since the 1990s the USAF has tripled the number of JTACs, which has tripled the number of live aircraft controls those JTACs require for currency. At the same time the USAF has decreased from 54 to 31 fighter squadrons, reducing its capacity to train JTACs.<sup>65</sup> This issue came to the forefront during the A-10 divestiture debate in 2015 when the USAF's CAS Summit grappled with the reality that 70% of all JTAC training in 2014, and 50% in the previous five years, was conducted by the A-10.<sup>66</sup> Reduction in A-10 force structure placed JTAC training at risk without cost effective alternatives. Five to seven stateside OA-X squadrons could fill this shortfall cost effectively. By shouldering the responsibility for JTAC training, OA-X squadrons would allow front line fighter

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<sup>64</sup> Brendan McGarry, "Air Force Sees Rising Demand for Joint Terminal Attack Controllers," *Military.com*, 10 March 2015, <http://www.military.com/daily-news/2015/03/10/air-force-sees-rising-demand-joint-terminal-attack-controllers.html>.

<sup>65</sup> Lt Col Langdon Root, "Fighter Enterprise Redesign," (briefing, CAF Update Webinar, 17 January 2017).

<sup>66</sup> Col James Meger, 355<sup>th</sup> Fighter Wing Commander (CAF Focus Week Out Brief, Davis-Monthan AFB, AZ, March 2015).

and bomber units to focus on training for major combat operations against near-peer competitors. Front line units would cease to train against plus one threats or deploy for those missions.



## Conclusion

According to US doctrine and official comments by military and civilian leaders the fight against plus one threats will continue to be an enduring military mission. While airpower plays a critical role in these conflicts, history and modern experience has shown that it does not require modern fighters. From Korea to Vietnam, and the civilian wars in Guatemala and El Salvador, as well as today's modern insurgencies, light, cheap, but effective airpower has paid dividends. In Vietnam, the USAF brought the OV-10 into service as a cheaper alternative to modern fighter aircraft to execute the COIN and FAC mission. Today the US Navy tested the OV-10G+ in OIR for many of the same reasons. The fight against plus one threats requires cheap, forward based, and responsive airpower.

In budget-constrained environments, the USAF historically looks to protect modernization with the hope, like in Vietnam, that preparation for big wars meant preparation for small wars. While this may be true, we have seen that it fails to understand fully the cost incurred by operating front line forces in small wars. The USAF spends at least \$1.5 billion for flight hours in OIR alone, not counting aircraft recapitalization costs or tanker support sorties. While budget-hawks call for the protection of modernization programs, a modest investment in light attack (\$6 billion) could pay for itself within five years and then pass on long-term cost savings to modernization and readiness budgets by fighting plus one threats cost effectively.

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