

AP[®] RESEARCH 2016 SCORING GUIDELINES

AP Research Performance Task Rubric: Academic Paper

Content Area	Performance Levels		
1 Understand and Analyze Context	The paper identifies the topic of inquiry. 2	The paper identifies the topic, and describes the purpose and focus of the inquiry. 4	The paper explains the topic, purpose, and focus of the inquiry and why further investigation of the topic is needed by connecting it to the larger discipline, field, and/or scholarly community. 6
2 Understand and Analyze Argument	The paper identifies or cites previous works and/or summarizes a single perspective on the student’s topic of inquiry. 2	The paper summarizes, individually, previous works representing multiple perspectives about the student’s topic of inquiry. 4	The paper explains the relationships among multiple works representing multiple perspectives, describing the connection to the student’s topic of inquiry. 6
3 Evaluate Sources and Evidence	The paper uses sources/evidence that are unsubstantiated as relevant and/or credible for the purpose of the inquiry. 2	The paper uses credible and relevant sources/evidence suited to the purpose of the inquiry. 4	The paper explains the relevance and significance of the used sources/cited evidence by connecting them to the student’s topic of inquiry. 6
4 Research Design	The paper presents a summary of the approach, method, or process, but the summary is oversimplified. 3	The paper describes in detail the approach, method, or process. 5	The paper provides a logical rationale by explaining the alignment between the chosen approach, method, or process and the research question/project goal. 7
5 Establish Argument	The paper presents an argument, conclusion or understanding, but it is simplistic or inconsistent, and/or it provides unsupported or illogical links between the evidence and the claim(s). 3	The paper presents an argument, conclusion, or new understanding that the paper justifies by explaining the links between evidence with claims. 5	The paper presents an argument, conclusion or new understanding that acknowledges and explains the consequences and implications in context. 7
6 Select and Use Evidence	Evidence is presented, but it is insufficient or sometimes inconsistent in supporting the paper’s conclusion or understanding. 2	The paper supports its conclusion through the compilation of relevant and sufficient evidence. 4	The paper demonstrates a compelling argument through effective interpretation and synthesis of the evidence and through describing its relevance and significance. 6
7 Engage Audience	Organizational and design elements are present, but sometimes distract from communication or are superfluous. 1	Organizational and design elements convey the paper’s message. 2	Organizational and design elements engage the audience, effectively emphasize the paper’s message and demonstrate the credibility of the writer. 3
8 Apply Conventions	The paper cites and attributes the work of others, but does so inconsistently and/or incorrectly. 2	The paper consistently and accurately cites and attributes the work of others. 4	The paper effectively integrates the knowledge and ideas of others and consistently distinguishes between the student’s voice and that of others. 6

AP[®] RESEARCH 2016 SCORING GUIDELINES

9 Apply Conventions	The paper's use of grammar, style and mechanics convey the student's ideas; however, errors interfere with communication and/or credibility.	The paper's word choice and syntax adheres to established conventions of grammar, usage and mechanics. There may be some errors, but they do not interfere with the author's meaning.	The paper's word choice and syntax enhances communication through variety, emphasis, and precision.
	1	2	3

NOTE: To receive the highest performance level presumes that the student also achieved the preceding performance levels in that row.

ADDITIONAL SCORES: In addition to the scores represented on the rubric, readers can also assign scores of **0** (zero).

- A score of **0** is assigned to a single row of the rubric when the paper displays a below-minimum level of quality as identified in that row of the rubric.

AP[®] RESEARCH 2016 SCORING COMMENTARY

Academic Paper

Overview

This performance task was intended to assess students' ability to conduct scholarly and responsible research and articulate an evidence-based argument that clearly communicates the conclusion, solution, or answer to their stated research question. More specifically, this performance task was intended to assess students' ability to:

- Generate a focused research question that is situated within or connected to a larger scholarly context or community;
- Explore relationships between and among multiple works representing multiple perspectives within the scholarly literature related to the topic of inquiry;
- Articulate what approach, method, or process they have chosen to use to address their research question, why they have chosen that approach, and how they employed it;
- Develop and present their own argument, conclusion, or new understanding;
- Support their conclusion through the compilation, use, and synthesis of relevant and significant evidence;
- Use organizational and design elements to effectively convey the paper's message;
- Consistently and accurately cite, attribute, and integrate the knowledge and work of others, while distinguishing between the student's voice and that of others;
- Generate a paper in which word choice and syntax enhance communication by adhering to established conventions of grammar, usage, and mechanics.

**Are Multirole Fighter Aircraft a Cost
Effective Weapon in Today's Conflicts
Which Involve Counter-insurgency and
Asymmetric Warfare?**

Abstract

The United States has increasingly been engaged in conflicts against unconventional enemies such as terrorists and insurgencies. The growth of these conflicts has created a major shift in how the United States fights its wars as seen by the current War on Terror. However, the United States Military's air power capabilities are being strained and wasted on these conflicts. This is partly due to the nature of both the aircraft and the conflicts as being disconnected. The most distinguishable problem is in the use of multirole jet fighters by the United States which is geared toward winning a conventional war and save costs. Yet when faced with an unconventional enemy the pluralistic nature of the multirole platform is wasteful and results in ineffective tactics and expensive employment of these assets. The United States is in need of a new weapon for its air forces to fight insurgencies but there has yet to be an alternative fielded and the threat of insurgencies and terrorist organizations is growing. This paper analyzes whether or not the current model of multirole jet fighters is a capable and cost effective weapon for counter-insurgency operations and is suitable for future conflicts against enemies such as the Taliban or the current conflict with ISIS.

Are Multirole Fighter Aircraft a Cost Effective Weapon in Today's Conflicts Which Involve Counter-insurgency and Asymmetric Warfare?

The United States Military has put a large emphasis on airpower being key to its dominance around the world. Ever since the Second World War dominance of the skies has been the focus of the United States seen from the birth of the Air Force in 1947 to today. Conflicts such as the Vietnam War, the Gulf War, and Operation Inherent Resolve against ISIS being prime examples of the United States' reliance on airpower to fight wars.

An air force is a necessity for any country to be militarily strong such as the United States which has the largest airforce in the world and the responsibility of being a world superpower. The ability to strike anywhere in the world at a moments notice is only possible through air power and a dominance of the air space.

The backbone of any modern air force is the multirole fighter jet. A multirole fighter jet provides for a modern army flexibility, speed, and lethality on the battlefield, all within one airframe. Such a model of aircraft has provided unmatched air power for the United States Military since the Vietnam War where the first modern multirole jet fighters were put into US service. The multirole aircraft model is an exceptional platform

for a modern army fighting a conventional war. The ability to fly, fight, and win in the air and on the ground is an invaluable asset that the US military capitalizes on with multirole jet fighters.

However, in recent years the United States has been engaged in unconventional wars against non-state aggressors such as terrorist organizations and insurgencies present in Iraq and Afghanistan. These types of conflicts call for a different response by the military on all fronts. Ground, air, and naval forces must respond with new tactics, weapons, and techniques to effectively combat the threats faced in an unconventional war against an insurgency. Most notably, multi role jet fighters of today have had to adapt most to these conflicts as their main focus has been air superiority first and ground strike capability second.

Literature Review and Background

In the best intentions of preserving democracy and fighting terrorism the United States invaded Iraq and Afghanistan in 2003 and 2001 respectively. These conflicts can be classified as asymmetric warfare against insurgencies where the enemy is not organized in a conventional manner which can be combated bluntly. An asymmetric conflict is one of two belligerents with large gaps in physical power, such conflicts have existed historically but has grown exponentially with the emergence of terrorism and insurgencies. Insurgencies and terrorist groups such as the Taliban and Al Qaeda may have less power than the United States but capitalize on the weaknesses of its conventional military. These types of wars as researched by Ajey Lele, Ph.D are only growing in numbers and intensity which could prove problematic for the United States¹.

The United States had gone from preparing for a large scale conventional war during the Cold War era to fighting small wars against insurgencies. The United States has noticed the dramatic difference in the types of conflicts it has engaged in recently and had written a new field manual to create new tactics and strategies to respond to the conflicts in Iraq and Afghanistan. The United States conducts Counter-Insurgency (COIN) operations to combat threats such as the Taliban in Afghanistan. COIN operations are the efforts of a militarily superior force to eliminate Insurgencies and other enemy forces fighting an unconventional guerilla war. The DoD field manual created addresses the new guidelines for Counter-Insurgency operations². Such guidelines call for aircraft to provide suitable air support for ground forces to effectively secure areas of conflict. These guidelines are however very difficult for multirole jet fighters to follow as these aircraft were built for the sole purpose of being readily

available to take on the Soviet Union in a conventional war during the Cold War, not insurgencies in low intensity conflict zones.

A multirole jet fighter is an military aircraft designed to fight in air-to-air combat with an air-to-ground role as a secondary capability. These types of aircraft have been in service since the Vietnam War when the F-4 Phantom was adopted as joint service multirole fighter jet. In service with the United States Military today is the Air Force's F-16 Fighting Falcon and F-15 Eagle as well as the Navy and Marine Corp's F/A-18 Hornet and F/A-18E/F Super Hornet. The multirole aircraft in service with the United States today are known as 4th generation fighters, which are generally aircraft in service since the 80's. The reason for using and developing multirole aircraft is to reduce costs that would be expected if multiple single role aircraft were developed. Multirole aircraft are also utilized to bolster the ranks of an air force so that a military can conduct any operation with a decent sized arsenal of aircraft. Despite being capable of conducting any kind of operation multirole fighter jets such as the F-15C/D Eagle were developed with air superiority as the main mission of the aircraft³. This results in aircraft being less suitable for air-ground combat as seen by the creation of the F-15E Strike Eagle and a development of unmanned aerial systems (UAS) to better confront these missions.

Multirole jet fighters when used in COIN operations are less than capable than many of their counterparts at simple missions such as Close Air Support (CAS) and Intelligence, Surveillance, and Reconnaissance (ISR). Close Air Support is the ability of an aircraft to use weapons against a ground target in assistance to ground units. The use of ISR is to provide adequate intelligence for commanders and ground forces to effectively combat an elusive, persistent, and fanatic enemy such as those faced in Iraq and Afghanistan⁴. F/A-18E/F and F-16C/D were being used to conduct sorties, which are missions given to air units, in Iraq and Afghanistan to provide Close Air Support (CAS) and Combat Air Patrols (CAP) to assist ground units in the fight against insurgent forces yet these aircraft are not as well suited for the missions ground forces need conducted in COIN operations⁵.

However, there are alternatives used by the United States instead of multirole jet fighters. The A-10 Thunderbolt II ground attack aircraft is a slow, heavy, and old airframe used extensively by the United States due to its unmatched CAS capabilities. While the aircraft lacks any air to air capabilities it is a favorite of the military simply because it can conduct missions a multirole jet fighter cannot. Unmanned Aerial Systems (UAS) are alsoused abundantly within the military to provide ISR and precision bombing over an area for extended periods of time but are very expensive to maintain,

are slow to get to their target, and have a small weapon payload⁶. Rotary wing vehicles (helicopters) such as the AH-64D Apache are moderately capable of providing the necessary support for ground forces at the expense of speed and survivability. Fixed wing multi role jet fighters such as the F-16C/D, F-15E, and F/A-18E/F are capable multirole aircraft with extensive weapon systems and quick response time but are expensive to maintain, lack loiter capability, and are not able to provide the same visual confirmation of targets that an aircraft such as an A-10, Apache helicopter or a UAS could⁷.

A review done by retired USAF Col. Russell J. Smith on the viability of turbo prop fixed wing aircraft in COIN provides insight into the problems facing multirole jet fighters. The paper found that propeller driven aircraft such as the AT-6 Texan and A-29 Super Tucano were better suited at providing CAS and ISR in COIN operations better than any other aircraft in service with the United States for a fraction of the cost⁸. turboprop aircraft which are capable of similar weapon payload as multirole jet aircraft but are much cheaper to maintain, can loiter much longer, and provide visual confirmation from pilot to ground forces that jet aircraft lack. The only setback by turboprop aircraft such as the AT-6 and A-29 is the survivability and response speed which are necessary for CAS and other COIN operations to be conducted with safety, but there are countermeasures put into place such as early warning missile systems and kevlar protection for the cockpits to ensure protection for the pilot⁹. Based on the Counterinsurgency field manual created by the Department of Defense in 2006 the policy to achieve a reduction of civilian casualties and collateral damage from airstrikes could be met by turboprop aircraft such as the AT-6 and A-29 because of the ability for pilots to visually see their targets¹⁰. As well as providing proper COIN capabilities the turboprop aircraft would be well suited to replace the 4th generation multirole aircraft like the F-16C/D and F-15E in current use by the US Air Force to conduct CAS in austere and rugged environments such as in Iraq and Afghanistan.

Despite the growth of terrorism, insurgencies, and asymmetric unconventional warfare the United States has move very little toward developing aircraft to combat these threats. Former USAF Chief of Staff General Norton A Schwartz has argued that airpower is key to COIN operations yet the biggest gap in this capability is yet to filled by a suitable airframe¹¹. Instead the United States Military is still going forward with the multirole jet fighter model with the new joint service F-35 Lightning II Joint Strike Fighter (JSF). The F-35 JSF is a 5th generation multirole jet fighter being developed by Lockheed Martin and its partners to replace the older 4th generation multirole jet fighters and ground attack aircraft. These include the F-16 Fighting Falcon, F/A-18 Hornet and Super Hornet, the AV-8B Harrier, and possibly the A-10 Thunderbolt II¹².

The goal of the F-35 JSF is to be a formidable multirole jet fighter and the future of the United States Military but the aircraft is facing harsh criticism for its costs, performance, reliability, and capability. The aircraft, due to its multirole characteristics, is expensive and overly complex to be used in COIN operations as even the Pentagon has increased the number of MQ-1 Reaper UAS to cover the weakness of the F-35 JSF at air-to-ground operations¹³. The F-35 is being developed with the same weaknesses as previous multirole jet fighters but has the enhanced responsibility of covering 4 previous aircraft's roles and providing for 3 branches of the United States Military in the face of growing COIN operations¹⁴.

The United States Military is facing a crisis in which there is a suitable strategy for multirole jet aircraft to follow in the COIN role so that costs can be reduced, lethality increased, and reliability sustained. However in order for the improvements to be made to the military there must be more research into multi role jet fighters in service with the military to determine if they are cost effective tools and if there are any alternatives. While considering the constraints of civilian research into military and government documents the multirole jet fighter model should be investigated to determine its cost effectiveness in counter-insurgency operations and asymmetric warfare.

Inquiry

The current inventory of multirole aircraft in service with the United States has been the backbone of US airpower since the Gulf War with the average age of multirole fighter jets being around 25¹⁵. The old age of current multirole aircraft has shown that the aircraft have been very capable but also in need of a replacement. The model of multirole jet fighters has been a time tested strategy and is effective at conventional warfare, as seen by its success in the Gulf War which eliminated the Iraqi Air Force and enabled a ceasefire within 100 hours of the ground campaign¹⁶. Yet, in the face of an unconventional war against an irregular enemy, multirole jet fighters play a much smaller role in the conflict. In order to understand whether or not multirole jet fighters are cost effective in these COIN operations and unconventional warfare many factors must be studied, such factors include operational history in these types of conflicts, an analysis of aircraft capabilities as well as a comparison to other single role aircraft.

Data and Analysis

Operational History

A multirole jet fighter excels at air-to-air combat due to its design being specific to the role of air superiority, so it is of no surprise that when faced with conflict such as in Iraq and Afghanistan these aircraft lose their impact on the battlefield. The more recent COIN manual by the Army and Marine Corps have a smaller emphasis on air assets on ground combat¹⁷. This does not however dismiss CAS and ISR missions of multirole jet fighters. In order to understand the cost effectiveness of multirole jet fighters a study of the wars in Iraq and Afghanistan is necessary.

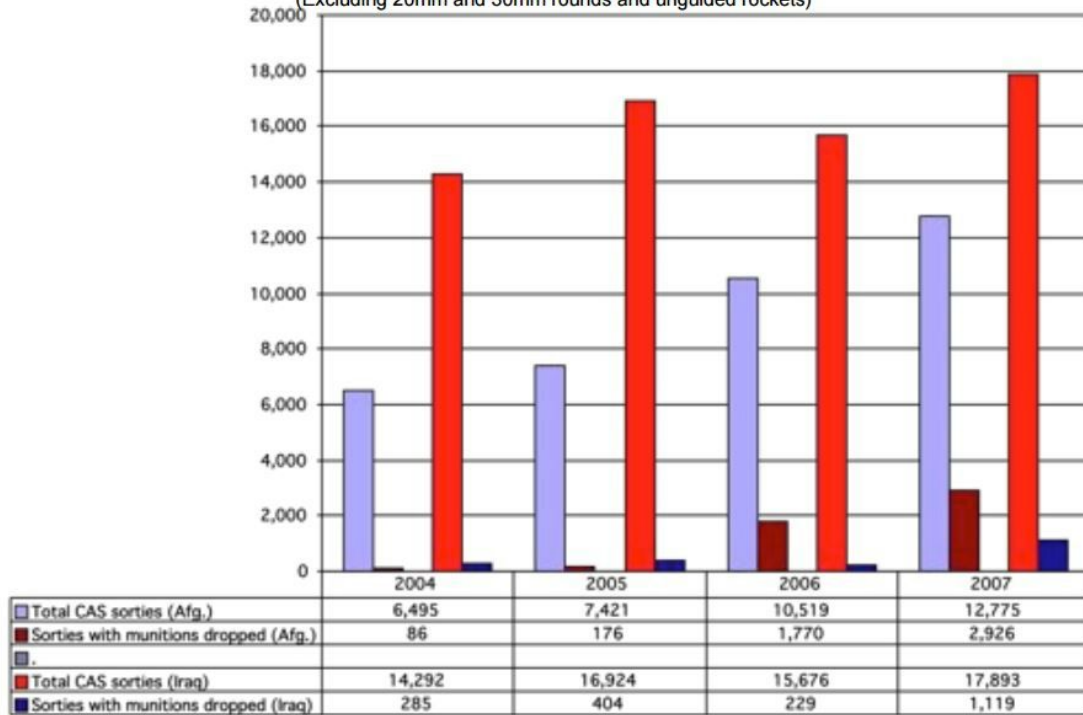
From 2004-2007 the United States had an intense usage of air combat sorties by multirole jet fighter aircraft including the F-16C/D, F-15E, and F/A-18E/F. These aircraft were the backbone of Operation Iraqi Freedom and Operation Enduring Freedom in Afghanistan. This graph created by the Center for Strategic & International Studies (CSIS) illustrates the usage of multirole jet fighters at CAS sorties¹⁸. The usage of multi role jet fighters to provide CAS seen within the graph demonstrates a unique characteristic of COIN operations. Within COIN operations an aircraft such as a F/A-18E/F Super Hornet may launch from an aircraft carrier and loiter on a combat air patrol (CAP) until a request for air support is called in. Until such an order is given the aircraft may loiter over the air space for several hours and return back to its carrier after multiple mid air refuels without dropping a single munition. On further calculations the total sorties conducted equals 101,995 yet only 6,995 dropped munitions on targets. This calculates to a 14:1 ratio of sorties to bombs dropped which is a very hefty expense that the military must pay if it is to provide adequate air support for ground forces. An F-16C/D Falcon costs \$11,270 for every hour in the air, the F-15E Strike Eagle; an estimated \$24,493 for every hour, both are multirole jet fighters that were used widely in Iraq and Afghanistan¹⁹.

The RAND Corporation conducted a study on the use of airpower in Operation Enduring freedom and found that in 2001 the F-15 only conducted 250 strike sorties which if applied the same statistics found by CSIS amounts to thousands of dollars wasted²⁰. Approximately \$6.1 million total and about \$437,375 for every sortie that dropped munitions on target, and that is only if each aircraft flew for an hour or less. The reason for choosing these specific articles of data is due to the constraints of accessing government documents and other works.

A reasoning for such wasteful tactics by the US Military is simply the nature of the conflicts that US forces are engaged in Iraq and Afghanistan. United States multirole jet fighters such as the F-16C/D, F/A-18E/F and F-15E carry various weapons and munitions that enable the aircraft to engage ground targets from both high and low altitude. Such weapons include Joint Terminal Attack Munitions (JDAM), Laser Guided Bombs (LGB), 20mm and 25mm cannons, Air to Ground Missiles (AGM), and Cluster Bomb Units (CBU)²¹. These weapons are lethal and difficult to use in an environment such as Iraq or Afghanistan where the possibility of collateral damage, civilian casualties, and friendly fire are high. The landscape may also hinder the usage of these weapons by aircraft as mountainsides, cave entrances, and buildings may hinder accurate, safe, and effective CAS²². This leads to a very careful implementation of these munitions on targets by ground forces where commanders must follow strict safety codes and guidelines for an aircraft to employ munitions on a target, one such example is the 9 line code Joint Tactical Air Controllers (JTAC) must use²³. JTAC's are specialists embedded with ground forces to effectively communicate with air assets so that accurate and effective fire support is provided. Unlike previous conflicts such as the Gulf War; targets cannot be indiscriminately be targeted, this is where multirole jet fighters lose their effectiveness.

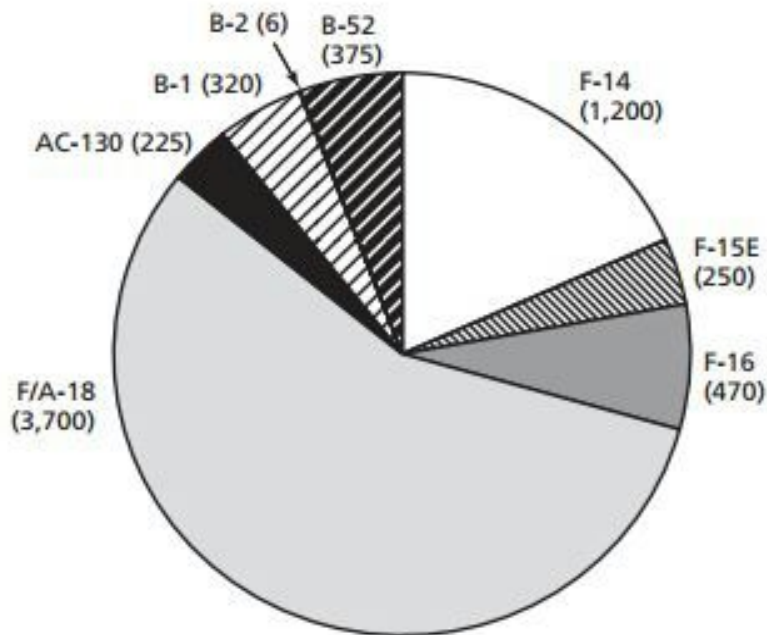
CFACC Total CAS Sorties and Sorties with Munitions Dropped: Iraq vs. Afghanistan

(Excluding 20mm and 30mm rounds and unguided rockets)



Source: CENTAF CAOC, 5 December 2007

Figure 6.2
Strike Sorties Through December 2001 by Aircraft Type



SOURCE: *Sea Power*, March 2002.

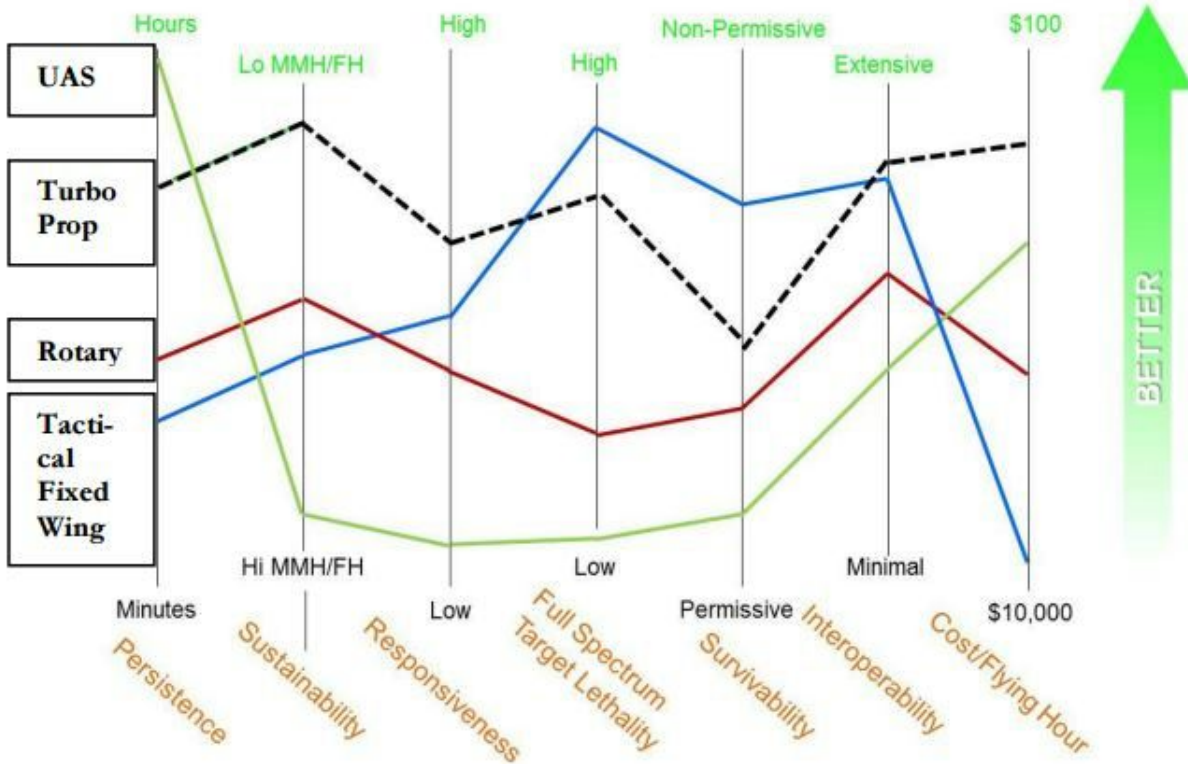
Capability, Reliability, and Effectiveness

Multirole jet fighters have the capability to engage ground targets but they are not always the best fit for such a mission especially in an unconventional war and in COIN operations. An F/A-18E/F Super Hornet may be able to strike anywhere in the world because of its range and capability but that often comes at a cost and many times a lack of capability. When comparing multirole jet fighters to their single role counterparts within the United States Military they more than often fall behind in terms of effectiveness and cost.

A multirole jet fighter may be capable of ISR, CAS, air-to-air combat, electronic warfare, and a number of other missions but is more often than not less capable than mission specific aircraft, especially in missions related to COIN operations. An example of how multirole aircraft fall behind mission specific aircraft is during the Gulf War when aircraft such as the F-16 and F-15E were out performed by the F-117 Nighthawk stealth fighter. The F-117 Nighthawk was the world's first aircraft utilizing modern low-observable stealth technology and was used entirely for ground attack roles²⁴. The F-117 accounted for less than 3% of the sorties flown by combat aircraft but scored

40% of all the targets that were destroyed in the war²⁵. There were only 42 F-117's involved in the war as well, a small number compared to the 292 F-16's and F-15E's present during the conflict. The F-117 outperforming other multirole jet fighters in air-to-ground missions raises concern over the viability of multirole aircraft in other roles aside from a conventional usage in ground attack.

The review by retired USAF Col. Russell J Smith analyzed the effectiveness of other airframes compared to multirole jet fighters in CAS and other COIN operations. Aside from the suggestion of using propeller driven aircraft to provide CAS the research into the capabilities of aircraft show that multirole jet fighters lose in most categories when conducting COIN operations²⁶. A UAS outperforms a multirole jet fighter in ISR, a helicopter provides longer CAS and overwatch capability, and turboprop aircraft provide the perfect fit for COIN operation. This reveals that multirole aircraft, while very lethal and very adaptable are not necessarily the greatest at every role they fill. This problem of having a "Jack-Of-All-Trades" aircraft leads to a lacking in multiple theatres of combat most noticeably air-to-ground and COIN operations. By fighting in wars where the full capabilities of a multirole aircraft are not needed; resources are wasted and combat effectiveness is dampened.



Discussion

The issues facing multirole jet fighters as cost effective weapons in the fight against terrorism and insurgencies lie within the design of the aircraft itself. The United States Military must be able to respond to all threats across the globe at a moments notice and aircraft like the F/A-18E/F Super Hornet or the F-15 Eagle cover this need. The ability to fill any combat role is a valuable tool for a quick response to any conflict. However, prolonged conflicts such as those in Iraq and Afghanistan against insurgent enemies calls for a more fine tuned response.

Multirole jet fighters are outmatched in COIN operations by older, slower, and seemingly obsolete aircraft simply because they fill the role better than they could. The A-10 is a slow aircraft with many airframes being over 30 years old yet the aircraft is expected to retire in 2022 due to its ability to provide CAS in a manner unmatched by any current or future aircraft²⁷. The model of multirole jet fighters is not an easily sustainable model for day-to-day duty such as what was required by forces in Iraq and

Afghanistan. Aircraft like the A-29 Super Tucano are being given to Afghan forces because of its effectiveness as COIN as well as its relatively cheap price tag²⁸. Having aircraft that can be dedicated to a singular role may not be logistically appealing but the cost savings and increased combat effectiveness may justify an increase in the number of aircraft the United States Military uses.

To parallel the problem of multirole jet fighters being cost ineffective in COIN operations and asymmetric warfare, joint service aircraft should be analyzed. A joint service aircraft is one that is developed to meet the needs of more than one branch of the military. The RAND Corporation conducted a research project into the cost effectiveness of joint service aircraft and found that these aircraft were developed to reduce costs but in reality had cost the military more²⁹. The reasoning for this was because the aircraft had to fill too many unique specifications for each branch of the military while maintaining uniformity among the services. This problem is similar to how multirole jet fighters must fill too many roles and as a result they are over equipped and more likely to waste resources, as seen by the number of sorties flown compared to sorties that dropped munitions from 2004-2007 in Iraq and Afghanistan. The F-35 JSF is the best example to visualize the problems of multirole jet fighters especially since current fighters have proven effective, just not as efficient as could be.

The F-35 JSF is being procured to replace the current inventory of aging aircraft in the United States Military for multiple branches. The aircraft is a 5th generation stealth fighter and has 3 variants The F-35A, F-35B, and F-35C, each developed for a separate branch but with similar characteristics and capabilities³⁰. The Aircraft has proven to lack in multiple areas to the point where the A-10's and F-15C/D's retirement has been delayed so that the gaps left by the F-35 JSF are filled³¹. The F-35 suffers from a pluralism in roles which takes away from its effectiveness as well as increasing its costs. The entire development of the aircraft amounts to over \$1.3 trillion among the United States and other partner countries.

Major flaws in concepts, design, and development of the F-35 JSF has lead it to fall short of many expected goals set by the United States for Lockheed³¹. The aircraft has advanced avionics, software, and stealth technology yet this leads to the average cost of an F-35A being \$105 million³². However, the increased features do not necessarily justify the jet fighter's price tag. The F-35 JSF, as a multirole jet fighter, has air superiority as one of its primary missions. The aircraft's stealth technology, beyond-visual-range (BVR) weaponry, and advanced information systems make it deadly on paper but not so much in practice. In trials the F-35 JSF had lost in close range "dogfighting" with an F-16C/D because of a lack of maneuverability³³. BVR

weaponry has been studied by the RAND Corporation as being ineffective and unreliable in air-to-air combat³⁴. The lacking capabilities of the F-35 JSF in air combat also stem to its inability to combat ground threats as effectively as current aircraft.

In COIN operations the F-35 JSF would be too expensive and overly qualified for such missions. The F-35 JSF is incapable of providing prolong strafing runs with its 25mm cannon due to a small ammo capacity and also lacks a large weapons payload without having to compromise its stealth characteristics due to having to mount additional weapons on the exterior of the aircraft. The F-35 JSF is also too fast and too fragile to engage in low altitude CAS mission and other COIN operations where visual confirmation is key. The F-35 like many of today's multirole fighter aircraft would have to fly high and fast to ensure its safety from surface-to-air-missiles and other anti-aircraft weaponry. This method is less effective at providing CAS, especially in COIN operations, where the pilot cannot visually confirm targets and incidents of friendly fire or civilian casualties are more likely to occur like the 2009 Kunduz airstrike that killed 90 civilians³⁵. The F-35 JSF is unsuited for CAS and service in COIN operations simply due to its complexity, cost, and lack of specialization.

Despite the obvious lack of capability provided by the F-35 JSF no new aircraft is being fielded with the United States Military to fill the gap left by COIN operations and CAS. The problem with aircraft such as the F-35 is the multirole model and the attempt to fit all specifications into a single airframe. Current and past multirole jet fighters have had this problem where the multiple specializations create an aircraft with capabilities that serve little to no purpose in specific missions which only drives up costs and decreases combat effectiveness. Canada Military has seen this problem with multirole jet fighters specifically the F-35 JSF where procurement of the aircraft has been criticized for its over abundance of capabilities in which Canada has no use for³⁶. For example the F-35 JSF has stealth and first strike capabilities while lacking supercruise (the ability of an aircraft to travel faster than sound sustainably) and arctic weather operability³⁷. The F-35 JSF is an all around decent aircraft for every single role needed by the military but in any specific role the aircraft lacks much like multirole jet fighters in service today.

Today's multirole jet fighters have proven themselves valuable in the wars the United States has engaged themselves in recently, from the Gulf War to the War on Terror. However, the model of multirole jet fighters is not a very sustainable in the face of growing terrorism and asymmetric warfare. Multirole aircraft tend to underperform when compared to their single role counterparts, both in air-to-ground and air-to-air³⁸. The F-22A Raptor for example, introduced in 2005, is a dedicated air superiority fighter

with some limited air-to-ground capability, yet is nearly unmatched by any other aircraft of today in air combat due to its focus and performance³⁹. Modern Propeller driven aircraft such as the AT-6 and A-29 are better suited at COIN operations than any other aircraft in service yet are not in service on a wide scale due to the predominance of multirole jet fighters that are ready to fulfill any role at a moments notice, albeit with a lack of specialized capabilities.

Conclusion

The trademark of the United States military dominance throughout the globe has been its airpower, marked by its usage of multirole jet fighters to bring the fight anywhere in the world in a moment's notice. However, with the growth of asymmetric warfare, terrorism, and insurgencies the United States must take on a more cost effective model for which air power can be sustained and delivered effectively. While the current model of multirole jet aircraft has proven useful it is not favorable to an inventory of multiple single role aircraft such as a dedicated light attack aircraft wing that could deliver the desired results in COIN operations⁴⁰. Multirole jet fighters are a valuable asset in the United States Military but a reliance on the model to conduct COIN operations is misguided when considering the many options available to the United States Military. A more responsible approach to aircraft development and procurement must be taken so that the United States Military can remain a military superpower and win wars, both conventional and unconventional.

Notes

¹ Lele, Ajey. "Asymmetric Warfare: A State vs Non-State Conflict." *Guerras Asimétricas: Un Conflicto Entre Estado Versus Actores No Estatales*, December 2014.

² United States of America. Department of Defense. Headquarters of the Army. *Counterinsurgency*. 3-33.5.N.P: Washington, D.C.: Headquarters, Dept. of the Army, 2006.

³ Department of Defense, Air Combat Command, Public Affairs Office "F-15 Eagle Fact Sheet." *U.S. Air Force*, United States Air Force , March 14, 2005.

⁴United State of America. *Intelligence, Surveillance, and Reconnaissance (ISR) Programs Issues for Congress*. By Richard A. Best. Washington, D.C.: Congressional Information Service, Library of Congress, 2004.

⁵ Pierpaoli, Paul G. *U.S. Conflicts in the 21st Century: Afghanistan War, Iraq War, and the War on Terror*. Edited by Spencer Tucker. December 2015

⁶ Department of Defense, Air Combat Command, Public Affairs Office. "MQ-9 Reaper Fact Sheet Display" *U.S. Air Force* United States Air Force, 23 September, 2015.

⁷ Davis, Arthur D., Major, USAF, Ret. *Back To Basics: Aircraft in Counterinsurgency*. Report no. 23. Wright Flyer Paper. Maxwell Air Force Base, Alabama: Air Command and Staff College Air University, 2005.

⁸ Smith, Russell J. "Light Attack to the Rescue Solving a Critical Capability Gap in Irregular Warfare." *Baltic Security & Defence Review* 15.1 (2013): 27-55. 2013.

⁹ Embraer Website. "Embraer EMB 314 Super Tucano." Embraer Defesa & Segurança. 2012.

¹⁰ United States. Department of Defense. Headquarters of The Department of The Army. *CounterInsurgency*. Mcwp 3-33.5. N.p.: United States Army, 2006..

¹¹ Schwartz, Norton. A., General, USAF, Ret. "Airpower in Counterinsurgency and Stability Operations" PRISM 2. No.2 National Defense University Press for the Center for Complex Operations. 2011

¹² United States. Government Accountability Office. *Joint Strike Fighter DOD Actions Needed to Further Enhance Restructuring and Address Affordability Risks: Report to Congressional Committees*. By Michael Sullivan. Washington, D.C.: U.S. Govt. Accountability Office, 2012.

¹³ Department of Defense, Air Combat Command, Public Affairs Office. "MQ-9 Reaper Fact Sheet Display" *U.S. Air Force* United States Air Force, 23 September 2015.

¹⁴ Lockheed Martin Website Lockheed Martin Corporation. "F-35 Lightning II." F-35 Lightning II. 2016.

¹⁵ *Fiscal Year 2016 Air Force Posture Statement*, House Appropriations Subcommittee on Defense Cong. (2016) (testimony of The Honorable Ms. Deborah Lee James, Secretary of the Air Force. General Mark A. Welsh III, USAF Chief of Staff).

¹⁶ Office of the Historian, Bureau of Public Affairs, United States Department of State. "The First Gulf War." Department of State - Office of the Historian. 2015

¹⁷ United States. Joint Chiefs of Staff. United State Department of Defense. *Close Air Support*. By Department of Defense. Washington, D.C.: Joint Chiefs of Staff, 2009.

¹⁸ Cordesman, Anthony H. *Air Combat Trends in the Afghan and Iraq Wars*. Report. Arleigh A. Burke Chair in Strategy. Washington D.C.: Center for Strategic & International Studies, 2008.

¹⁹ United State of America. Department of Defense. Office Of The Under Secretary Of Defense. *Fiscal Year 2015 Department of Defense Fixed Wing and Helicopter Reimbursement Rates*. By John P. Roth, Deputy Comptroller. Washington D.C., 2014.

²⁰ Cordesman, Anthony H. *Air Combat Trends in the Afghan and Iraq Wars*. Report. Arleigh A. Burke Chair in Strategy. Washington D.C.: Center for Strategic & International Studies, CFAAC, CENTAF CAOC., 2007

²¹ Baughner, Joe. "F-15 Eagle." *Federation of American Scientists*, 2000.

²² Lambeth, Benjamin S. *Air Power Against Terror: America's Conduct of Operation Enduring Freedom*. Report. National Defense Research Institute. RAND Corporation, 2005.

²³ United States. Joint Chiefs of Staff. United State Department of Defense. *Close Air Support*. By Department of Defense. Washington, D.C.: Joint Chiefs of Staff, 2009.

²⁴ Lockheed Website on F-117,. Lockheed Martin Corporation. "F-117 Nighthawk." Lockheed Martin. 2016.

²⁵ Cordesman, Anthony H., and Abraham R. Wagner. *The Gulf War*. Vol. IV. The Lessons of Modern War. Boulder, CO: Westview Press, 1996.

²⁶ Study developed by Whitman, Bradley, and Brown (WBB) for Hawker Beechcraft Corporation, 2007. Smith, Russell J. "Light Attack to the Rescue Solving a Critical

Capability Gap in Irregular Warfare." *Baltic Security & Defence Review* 15.1 (2013): 27-55. 2013.

²⁷ United States Department of Defense. Press Operations. "Department of Defense (DoD) Releases Fiscal Year 2017 President's Budget Proposal." News release, February 6, 2016.

²⁸ United States Department of Defense. DoD News, Defense Media Activity. "Afghan Soldiers Demonstrate Improvement, U.S. General Says." News release, January 19, 2016.

²⁹ Lorrel, Mark A., Micheal Kennedy, Ken Munson, Shmuel Abramzon, David L. An, and Robbery A. Guffey. *Do Joint Fighter Programs Save Money?* Report. Project Air Force. Santa Monica: RAND Corporation, 2013.

³⁰ Air Combat Command Public Affairs Office. "U.S. Air Force." *F-35A Lightning II Conventional Takeoff and Landing Variant Fact Sheet Display*. United States Air Force, 2014.

³¹ United State of America. Department of Defense. Inspector General. *F-35 Lightning II Program Quality Assurance and Corrective Action Evaluation*. Alexandria, Virginia: U.S. Department of Defense, Report No. DODIG-2015-092, 2015.

³² Air Combat Command Public Affairs Office. "U.S. Air Force." *F-35A Lightning II Conventional Takeoff and Landing Variant Fact Sheet Display*. United States Air Force, 2014.

³³ Lockheed Martin Corporation. News. "Joint Program Office Response to "War Is Boring" Blog." News release,. F-35 Lightning II. 2015

³⁴ Stillion, John, and Scott Perdue. *Analysis of Air Combat Past, Present, and Future*. Report. Project Air Force. RAND Corporation, 2008

³⁵ House, Peter B. *Left in the Dark - Failures of Accountability for Civilian Casualties Caused by International Military Operations in Afghanistan*. Publication. London, UK: Amnesty International, 2014.

³⁶ Lam, Danny, and Brian Paul Cozzarin. "The Joint Strike Fighter / F-35 Program: A Canadian Technology Policy Perspective." *Air & Space Power Journal* 28.2, 2014

³⁷ Supercruise is necessary for Canadian aircraft to travel long distances over its countryside and Canada has no interest in being an aggressor state so first strike capabilities and stealth technology are of little interest for its military. Metz, Paul. "Just How Good Is The F-22 Raptor?" Interview by Carlo Kopp. *Air Power International Vol.4 No.3*, 1998. Air Power Australia.

³⁸ Ford, Michael W. *Air-to-air Combat Effectiveness of Single-role and Multi-role Fighter Forces*. Master's thesis, United States Air Force Academy, 1994. Fort Leavenworth, Kansas: U.S. Army Command and General Staff College, 1994.

³⁹ Department of Defense, Air Combat Command, Public Affairs Office "F-22 Raptor Fact Sheet." *U.S. Air Force*, United States Air Force , March 14, 2015.

⁴⁰ Smyth, Paul. "Airpower and Counterinsurgency - Building on a Proper Foundation." *Air & Space Power Journal*, 2011, 115-26.

AP[®] RESEARCH 2016 SCORING COMMENTARY

Academic Paper

Sample: E

Content Area: Understand and Analyze Context — Row 1 Score: 6

Content Area: Understand and Analyze Argument — Row 2 Score: 6

Content Area: Evaluate Sources and Evidence — Row 3 Score: 4

Content Area: Research Design — Row 4 Score: 3

Content Area: Establish Argument — Row 5 Score: 5

Content Area: Select and Use Evidence — Row 6 Score: 6

Content Area: Engage Audience — Row 7 Score: 2

Content Area: Apply Conventions — Row 8 Score: 4

Content Area: Apply Conventions — Row 9 Score: 2

MEDIUM SAMPLE RESPONSE

"Are Multirole Fighter Aircraft a Cost Effective Weapon in Today's Conflicts Which Involve Counterinsurgency and Asymmetric Warfare?"

Content Area: Understand and Analyze Context — Row 1

The response earned 6 points on this row because the introduction clearly identifies a focused topic and purpose: the critical need for adaptation of multirole fighter jets and for rethinking current paradigms around military aircraft. The paper also points out the significance of the issue: new kinds of war against terrorist organizations rather than nation-states require different aircraft capabilities (see pp. 1–2).

Content Area: Understand and Analyze Argument — Row 2

The response earned 6 points on this row because the Literature Review covers several relevant sources with varying perspectives on military aircraft. Even though the perspectives are in consensus about the needs for aircraft in today's military conflicts, each takes a different angle on the issue, offering multiple perspectives (e.g., Smith's review of the turboprop fixed-wing aircraft, the Department of Defense reports, and General Schwartz's analysis offer multiple perspectives on the role of multirole jets for current combat situations, pp. 3–4).

Content Area: Evaluate Sources and Evidence — Row 3

The response earned 4 points on this row because each source is clearly relevant to the topic of multirole aircraft. Although the student uses military sources suited to the inquiry, however, the significance of the sources is implied more than explained. The paper did not earn 6 points because the sources are not evaluated and the implications for the student's argument are not stated.

Content Area: Research Design — Row 4

The response earned 3 points on this row because the approach is stated very briefly without explanation. The response did not earn 5 points because the method is not detailed or described in a way that would provide the reader with a full understanding of the steps taken to collect information or data according to the inquiry. Although the method is at best implied by the sources used, the response did not earn 7 points because it is not clear why the student used the chosen approach. There is no explanation of what was done or why.

AP[®] RESEARCH 2016 SCORING COMMENTARY

Academic Paper

Content Area: Establish Argument — Row 5

The response earned 5 points on this row because it offers an argument that the current use of multirole aircraft is not appropriate to the demands of today's version of warfare. It links its findings to the claim made about ineffectiveness of the multirole aircraft for current combat scenarios with relevant evidence. The response did not earn 7 points because the argument becomes repetitive, especially in the Discussion section (pp. 11–15), rather than moving into consequences and implications. For example, consequences of the argument for modern-day warfare are assumed but not explained, and there is little attention paid to the huge cost implications of switching out the U.S. military's aircraft fleet.

Content Area: Select and Use Evidence — Row 6

The response earned 6 points on this row because it supports the claims about the ineffectiveness of multirole aircraft with sufficient evidence. See the Literature Review (pp. 2–5) and the section on Data and Analysis (pp. 6–9) for examples of how evidence from multiple sources is synthesized to make the case.

Content Area: Engage Audience — Row 7

The response earned 2 points on this row because the graphs (p. 8, 9, and 11) are related well to the argument, though they are not explained in the text of the paper. In addition, the paper is divided into sections which identify the content for the reader. Although these, along with the graphs, do communicate the argument, the response does not earn 3 points because the organizational or design elements do not enhance the reader's ability to better understand the response's argument.

Content Area: Apply Conventions — Row 8

The response earned 4 points on this row because some of the citations of the graphs are missing within the body of the paper (p. 8 and 9 graph source mentioned, p. 11 graph source not mentioned), but most other sources are correctly cited, and the work of others is acknowledged and referenced (throughout). The response did not earn 6 points because the ideas of others are not integrated with each other and are not distinct from the student's voice

Content Area: Apply Conventions — Row 9

The response earned 2 points on this row because it follows conventions overall, with a few errors, but still clearly communicates to the reader. The response did not earn 3 points because the paper's meaning is communicated but not enhanced by the way the paper is written.