The Hummingbird

(Technical Paper)

Issues with the Implementation of New Defense Programs and the Threat of Failure

(STS Paper)

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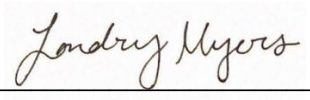
On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Signature  Date _5/13/2021_

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Introduction

In 2017, the limits of special operations forces were tested in an austere location in Niger by an ambush of armed militants. Due to the nature of the environment, close air support was unavailable, and this incident sparked the Air Force Special Operations Command to begin the Armed Overwatch program to fill the gap in air support (Tadjdeh, 2020). American air power plays a major role in supporting ground combat; therefore, the Special Operations command requested 75 aircraft built for close air support, intelligence, surveillance, and reconnaissance missions (Tadjdeh, 2020). These aircraft, known as light attack aircraft, are needed to gain an advantage over the enemy from a safer position when fighting in rough and remote areas alongside local allies. As the acquisition of these aircraft is still ongoing and there is not a standardized design, the American Institute of Aeronautics and Astronautics (AIAA) released a request for proposals for a light attack aircraft, challenging undergraduate teams across the nation to submit their unique designs to the competition. Thus, the goal of the technical project is to design a light attack aircraft that fulfills all of the competition's criteria and submit it to the AIAA.

As light attack aircraft are a new aviation technology for the military, there will be issues that arise upon implementation. Although "scientific advancements are critical to the United States to counter the economic and military advances of potential adversaries" (Carlisle, 2018, n.p.), they can cause more problems than improvements if the issues with manpower, training, and human factors engineering are not anticipated or addressed. With the number of organizations involved and the complexity of the defense system, it will be important to understand which issues will be the most prevalent to the acquisition of light attack aircraft. Further research will need to be conducted to understand the consequences of technological

advancements in the military and to see if there is any additional literature analyzing these consequences. Additionally, the research will be imperative to determine what issues will need to be considered specifically for the implementation of a light attack aircraft fleet and if there are issues that the literature failed to mention.

Design of Light Attack Aircraft for Special Operations Missions

The aircraft that the United States Special Operations Command (SOCOM) and the Air Force desire is a "rugged, highly maneuverable plane that can loiter and throttle-down so low and slow that pilots can visually acquire a target and destroy it with highly controllable fire" (Waltz, 2019, n.p.). Loitering requires the aircraft to cruise over a small area, and throttling-down refers to flying at a significantly reduced speed. These tasks are important in special operations missions as they improve surveillance, and troops and targets only cover a small portion of land. Since fighter jets are built for high speeds, they are not well suited for these missions. The environment in which special operations troops are stationed is austere, with no formal runways for takeoff and landing. To operate in these conditions, the AIAA requires the light attack aircraft design to have a takeoff and landing distance of less than 4,000 feet, while clearing an obstacle 50 feet tall. The low-set wings and lightweight design of the aircraft help to reduce the distance required for takeoff and landing, and the landing-gear is structured to withstand rugged terrain. A defining feature of the light attack aircraft is the lightweight turboprop engine, which can minimize the intake of foreign objects from the field and reduce flight speed. The preliminary design of the light attack aircraft and its key features are displayed in Figure 1 below.

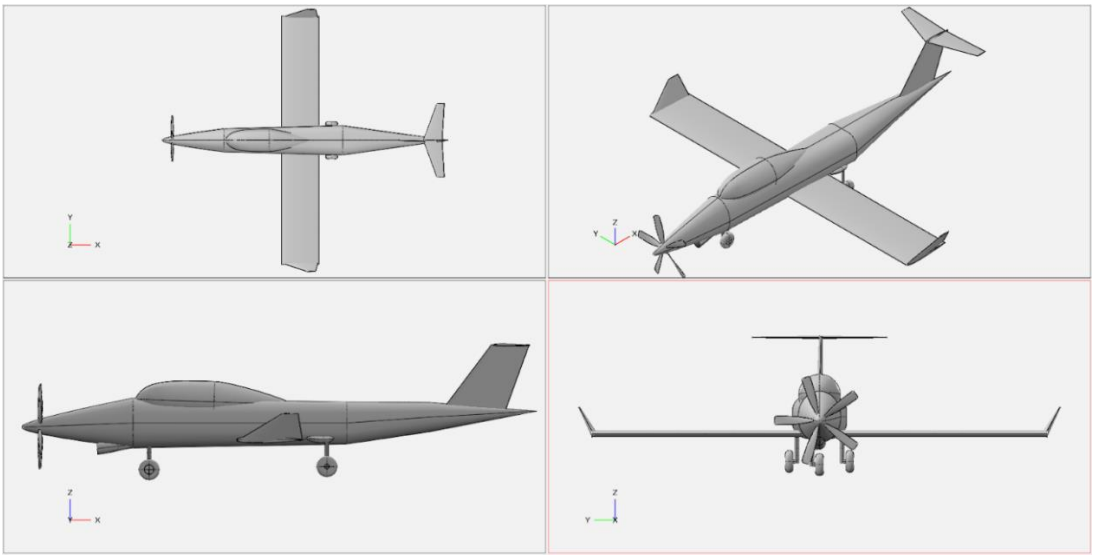

Figure 1: The technical design team's preliminary light attack aircraft design with low-set swings, landing gear, and turboprop engine.

The major difference between light attack aircraft and fighter jets is that these new aircraft are designed specifically for special operations missions and their unique environment. Fighter jets are much more expensive and advanced, causing officials to question their usage in low-risk missions as they compare it to "using a Rolex to drive a nail" (Losey, 2018, n.p.). In addition, the introduction of light attack aircraft into the military will allow the more advanced jets to be used in the high-risk, air combat missions for which they were designed.

As light attack aircraft are a new concept, there is not a standardized design that has been approved for implementation. Congress urged SOCOM and the Air Force to standardize a light attack aircraft concept following the light attack/armed reconnaissance (LAAR) program in 2009, but the web of organizations could not collaborate efficiently and the Air Force shut down the LAAR program in early 2020 (Waltz, 2019). In a final effort, the Air Force bought two AT-6 Wolverine aircraft and two A-29 Super Tucanos for experimentation (Losey, 2018). These aircraft led to controversy in the aerospace industry as the designs caused "some critics [to] fear

that sending a slower, more lightly armored, propellor-driven plane into battle… could put pilots at risk of being shot down or even killed" (Losey, 2018, n.p.). In an effort to mitigate this concern, the technical design team will study survivability in these aircraft and search for ways to minimize the risks to pilots. The future standardized design for light attack aircraft needs to be safe and reliable for the crew operating the aircraft, so the technical design team will keep this in mind throughout the design process.

For the technical project, the design team is tasked with designing a light attack aircraft that minimizes weight and cost for the US Air Force to potentially implement in special operations missions. The Request for Proposal written by the AIAA called for undergraduate teams from universities throughout the United States to design a light attack aircraft that fulfills the outlined requirements and mission profile. The requirements include takeoff and landing distance, payload, systems for survivability and weapons, and a minimum service life and service ceiling. A mission profile is included in the Request for Proposal, describing the operating conditions for takeoff, climb, cruise, loitering, and landing. The design created by the technical project team will be submitted to the AIAA in the form of graphical representations, descriptions of performance capabilities, and operational limits. The AIAA will receive designs from teams of undergraduate students across the country and decide on the winners of the design competition. The top three teams will receive awards for designing a light attack aircraft that excels beyond the listed requirements and capabilities.

Consequences of the Implementation of Technological Advancements in the Military

When implementing technological advancements such as new aircraft into the military, there are issues that arise due to the complex web of interaction between Congress, the US Air Force, Special Operations Command, and military personnel. These issues are outlined in a

technical paper by the U.S. Army Research Institute, which claims that "the military is one of the few societal institutions where manpower, training, and technology come together in a single forum, and must be well integrated for the organization to accomplish its mission" (Verdugo & Babin, 1990, p.1). When it comes to recruiting for the military, technological change creates more problems with acquiring manpower as it can increase the level of entrance requirements. As there is already a pilot shortage in the military, the addition of light attack aircraft could be problematic if there are not enough pilots to operate the new fleet (Tadjdeh, 2020). Additionally, acquiring new, mission-specific aircraft will require training for all of the operators, increasing military spending and demanding resources such as instructors and equipment. The final area of issues mentioned in the technical paper is human factors as the military will have to ensure that the "systems are designed incorporating the skills of those service men and women who will be operating and repairing them" (Verdugo & Babin, 1990, p. 11). If the operators are not equipped with the knowledge and tools to service the aircraft, combat efficiency will greatly decline once utilizing the aircraft in the field.

While it is evident that issues will arise as a result of the acquisition of a light attack aircraft fleet, it is not immediately obvious which issues will be the most relevant. Not all of the issues mentioned will result from this advancement in aviation technology, and it is possible that there are important consequences that have not been discussed. Additionally, the research discussed in the technical paper by the U.S. Army Research institute did not result in "definitive answers to how advances in technology have affected the military," but simply raised questions to guide future research (Verdugo & Babin, 1990, p. vii). Due to the complexity of the defense system and the network of organizations involved, there is a disconnect and lack of communication throughout the system, which may be a factor in the inconclusive research.

Similar to the system described in “Hurricane Katrina: One Year Later,” the multiple organizations fail to see issues in implementation as each group holds a different piece of the puzzle, but does not consider what can occur once the pieces are put together. The hurricane protection system in New Orleans failed because “the ‘system’ was not a system” (Anderson, 2006, p. 5); therefore, in order to prevent disasters with the implementation of light attack aircraft, SOCOM, the Air Force, and the government have to work cohesively as a system to understand possible issues before they arise.

The research approach for this topic will be to analyze the characteristics of light attack aircraft with the previously outlined issues in mind and determine which would be the most prevalent for this particular technological advancement. The information presented by Verdugo and Babin is not common; therefore, it will be important to see if there are any more recent papers that address new or different impacts that technological advancements have on the military. Once all of the published information is collected, additional research will need to be conducted to determine if there are any looming issues that were not mentioned and could affect the implementation of light attack aircraft. The sources can be compared and analyzed to understand how research papers and defense magazine articles differ in the way they frame the implementation of light attack aircraft to further understand the information that they portray. With the collective research regarding problems that may be caused by the large-scale acquisition of these aircraft, it is possible that measures can be taken to prevent or prepare for the issues to improve the implementation process.

Conclusion

The goal of the technical team is to design a light attack aircraft that is low cost and can achieve certain performance parameters. Once completed, the design is to be submitted to a

national competition run by the AIAA to assess the quality and originality of the design and whether it fulfills all of the requirements listed. If a standardized light attack aircraft design is successfully integrated into the Air Force fleet, it will provide close air support and further protection for special operations ground teams, and surveillance, reconnaissance, and intelligence capabilities for our military. In addition to its performance in the field, it will decrease the cost of special operations missions by replacing the expensive fighter jets. The purpose of the STS research is to understand the issues that result from technological advancements in the military and pinpoint the issues that are the most relevant to the implementation of light attack aircraft. Finding literature addressing these issues and determining whether there are issues that are not mentioned in the technical report by Verdugo and Babin will outline the possible consequences of light attack aircraft acquisition. Further analysis will bring focus to the most relevant effects and highlight the consequences that will need to be addressed to ensure successful implementation.

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