

Defining a Light Attack Aircraft and Understanding This Aircraft's Position in the Military

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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

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Introduction

Light attack aircraft (LAA) are a possible replacement for fighters and attack aircraft. In current times, they are not often utilized in combat, and support for them from the military has decreased over the last few years. While these aircraft are much less expensive than the current alternatives, they raise concerns about the safety of the pilots due to being less heavily armored than fighters such as the F-22 or the current F-35 programs. As said by Richard Aboulafia, who is the analysis vice president of an aerospace consulting firm, “That looks like a recipe to get people killed.” (Losey,2018). Even with this concern, the American Institute of Aeronautics and Astronautics (AIAA) shows that there is an interest in aircraft of these types due to an undergraduate design competition challenging college teams to design and submit their own LAA (AIAA,2020). Due to the cost difference between the types of aircraft as shown in Table 1, with LAA such as AT-6 Wolverine and the A-29 Super Tucano costing approximately one thousand dollars per flight hour and current fighter jet programs costing upwards of 60k per flight hour, the massive difference could lead to LAAs becoming a better option due to budgeting requirements and pressure from taxpayers (Gertler, 2019a, Ritsick,2020).

Table 1: Comparison of the cost per flight hour of common aircraft

| Aircraft Name | Operating Cost per Flight Hour |
|--------------------------------------|--------------------------------|
| AT-6 Wolverine and A-29 Super Tucano | \$1,000 |
| F-22 Raptor | \$60,000 |
| F-35 Lightning II | \$36,000 |
| A-10 Warthog | \$11,500 |

In comparison, other factors must be analyzed to understand why a fleet of these aircraft has not been built. The remaining sections of this paper describe the costs, capabilities, and shortcomings of LAA; explain how actor network theory (ANT) can be used to analyze the sociotechnical system of which these aircraft are a part; and argues that cost is only one of the factors that have impeded the building of a fleet. Ultimately, I argue that LAA are not a failure but instead being used for a different purpose (training rather than combat).

What Are the Costs, Capabilities, and Shortcomings of the Light Attack Aircraft

As stated in the introduction, LAA are small, fast, and agile support planes often powered by propeller engines and used for air-to-ground strikes that drop bombs or deploy machine guns. The military currently has a small group of fifteen of these aircraft as training fighters to get pilots ready for combat. The two current LAA are the A-29 Super Tucano designed by Embraer and the AT-6 Wolverine designed by Textron Aviation which is shown in Figure 1. Likewise, current attack aircraft such as the A-10 Warthog, the F-22 Raptor, and the F-35 Lightning II, are the forefront of combat aircraft with hundreds of combat missions flown (Ritsick, 2020). However, as shown in Table 1 of the introduction, these aircraft are expensive to fly, with the F-22 costing roughly 60 thousand per flight hour, the F-35 costing 36 thousand per flight hour, and the A-10 costing around 11.5 thousand per flight hour. This cost stacks up over time as these planes are used more and more, which can take a large chunk of money to fund. In contrast, current LAA usually cost about one thousand per flight hour. This is a massive cost difference, which can cause the military to spend less on these flights. However, these aircraft are not commonly used to carry out missions. This is strange, as the planes can provide the necessary air to ground support as the more commonly used aircraft. As said by Carafano

(2013), the issue that can arise with provided support is how much support is enough and how do you effectively decide when you are sending in “overkill” in a combat scenario. This concept is shown by when is it acceptable to send in one of the more heavily equipped fighters instead of a plane like this into a situation.



Figure 1: AT-6 Wolverine (Left) vs the F-22 Raptor (Right), notice the low wing design and the numerous missile and bombs connected to the hardpoints for ground strikes for the AT-6, while the F-22 has a sleek design meant to move fast and utilizes internal bomb bays to strike the enemy. (AT-6 Wolverine, n.d., Ritsick,2020)

Knowing the price per flight hour of these aircraft does not tell the whole story though.

Each new LAA costs approximately \$35 million. This price could factor into the decision to manufacture a fleet of LAA due to the massive upfront bill of creating just a single aircraft when the military already has a fleet of fighter jets and aircraft such as the A-10 Warthog at the ready. This also runs the risk of the aircraft technology becoming obsolete before the military gets its money’s worth out of the aircraft due to ever improving systems within an aircraft design. As more research is performed on aircraft, new ways of making the aircraft more efficient could make these aircraft lighter and able to carry more payload for longer times.

The other main issue with the LAA is while they are meant to be fairly quick and cheap, they are also very lightly armored (OA-X Experiment, 2018). While these aircraft may have the same capability for air-to-ground strikes such as bombs and gunfire, they are more susceptible

to ordinary fire from anti-air systems, heavier machine guns, or rockets that would be shooting at a plane flying overhead in a combat scenario. This is compounded by the fact that these aircraft usually do not fly faster than Mach 1 due to being propelled by a turboprop engine. Flying at these speeds allows the planes to go undetected for longer, due to the airplane not breaking the speed of sound. Due to this, if they come into a situation where the aircraft must retreat quickly, they will have to depend on maneuverability to avoid any ground fire or rockets fired from the ground or redundancy in the design of the airplane in case they are hit. This gives more risk for the pilots flying the mission, as the likelihood of being shot down increases due to the risks discussed in this section.

Knowing the costs and capabilities of the LAAs allows the inconsistencies in the understanding of these aircraft to be found. It is known that the aircraft have shortcomings, yet they can still be utilized for specific missions, which are currently undisclosed by the military, that are meant for an airplane of this caliber. Unfortunately, these aircraft are only used as trainer planes in current times, far away from any battlefield. This shows that cost is not the main factor behind the aircraft not being used in the field to effectively support ground troops in these particular combat scenarios.

Discovering the Factors that Influence the Light Attack Aircraft

To effectively understand the integration of LAA into the military requires understanding of the multiple factors that go into deciding what is sent on a mission, including its technical capabilities and the power structures and culture of both the military and the government. Utilizing this information, ANT provides a way to analyze the relationship in

between all of these factors and how they contribute to the aircraft not being used. As seen in Figure 2. where a technical, organizational, and cultural (TOC) framework was utilized to understand all of the different factors going into the aircraft, you can see that while there are many factors that are commonly thought of such as the military and government, there are also less intuitive points such as the public (due to taxes and support), the tendency toward overkill in deciding which aircraft to send, and concerns about safety for both the pilots flying the mission and the troops on the ground fighting.

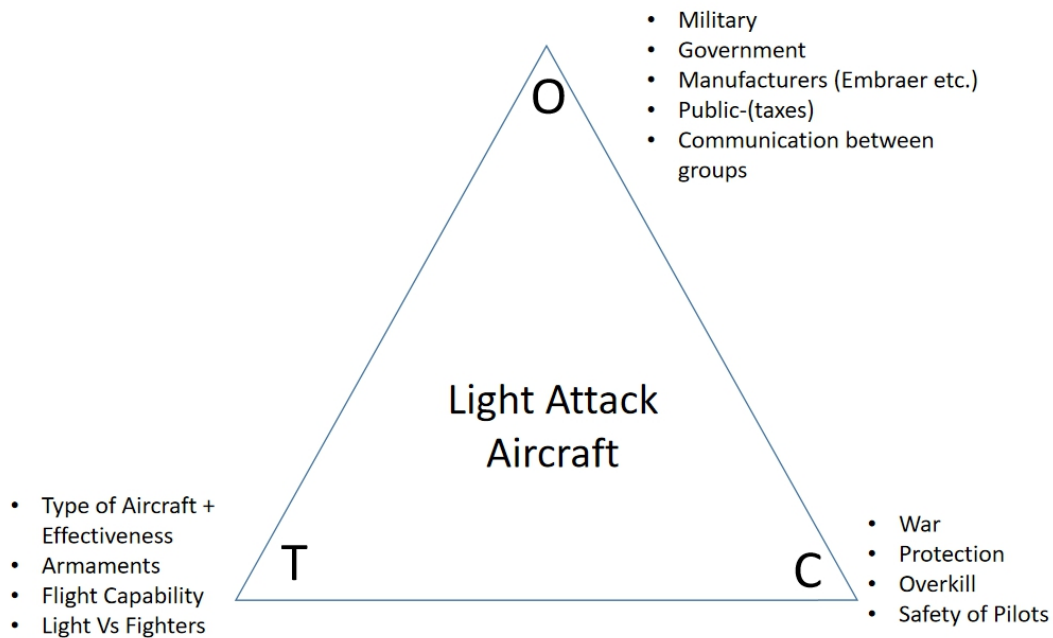


Figure 2: TOC Triangle of the Attack Aircraft

Utilizing this map, more can be gleaned about the state of the LAA in more than just the military sense. Interactions between the public, government, and manufacturers can be understood to give more information on the place of the aircraft and what the implementation of even a small number of them would mean. Utilizing “Diving in Magma” by Venturini (2009),

these interactions can be analyzed to sort through the limitless amounts of controversy and ethical problems that the implementation of LAA can bring up. This cartography of controversies in its simplest form is to “just look at controversies and tell what you see” (Venturini,2009). This approach values open mindedness with no specific methodology, observation from multiple viewpoints, and to focus more on the actors’ voice than your own expectations. This is utilized to narrow focus on controversies that are not cold, past, boundless, or underground and can be studied. Sorting through these limitless amounts of problematic issues such as the ethical issues of utilizing an attack airplane or even the ethics behind producing the attack airplanes and how the public perceives it, allows the researcher to focus on a specific topic without overstepping what can be effectively covered in a single paper or research project.

Continuing to use Venturini’s approach, the factors seen in the TOC can be analyzed to find a specific gap in the knowledge of the LAA. While the most obvious actors in this system are in the technical realm for this project, the light attack has multiple points in the organizational and cultural realms that are just as important if not more important than the technical specifications of an aircraft. In the organizational domain, this shows up in primarily the military and the public while the cultural aspect includes issues of safety for the pilots as well as the idea of “overkill” when sending reinforcements to teams on the ground. Knowing how much goes into the production and implementation of this aircraft raises the question of why the LAA are not commonly heard about in the way fighter jets and other aircraft are heard about currently. To answer this question, multiple actors must be considered in combination to

effectively understand both what is influencing this decision, as well as who is giving the final say in this project and where the disputes between groups are found.

Light Attack Aircraft's Place in Combat and the Military

As discussed previously, the LAA is an inexpensive aircraft that is not commonly used in combat scenarios. Analyzing the ANT to find the factors leading into this decision shows that while the military has the biggest contribution into these decisions, the government, manufacturers, and even the public have ways to contribute to this decision. Many people would effectively assume this is only a military decision based on the capabilities of the airplane; yet when this aircraft is mapped, it becomes much more complicated. For example, such a map reveals the pressure from manufacturers to create jobs for building the aircraft, gathering and manufacturing materials, and even transporting everything to the military. Understanding how each actor effects the implementation of these aircraft is vital to giving a clear answer to why these aircraft are not in use.

Public perception of the plane can have more of an effect on the implementation of an aircraft than commonly thought. In a study performed by Corman et al.(2015), it is shown that between 2002 to 2012 there was a clear trend that citizens believed that the government should decrease defense spending. Understanding this and knowing the price tag to create each individual plane is \$35 million, it can be easy to see that the public would not support the addition of a fleet of new planes that would have such a massive upfront cost. Even if the general public understood it would save money in the long run by allowing less money to be spent on fuel and maintenance. This can also be looked at in the other direction. The portion of

the public that supports the military completely would also take issue with the fact that the planes may not be able to make it to the battlefield fast enough while protecting the pilot from any return fire that the enemy combatants sent back towards it.

In terms of the military, knowing that the planes are lightly armored and more susceptible to enemy fire brings into question the safety of the pilots. Sending troops into a situation where they have a higher chance of being shot because of which plane is utilized is a difficult situation. Allowing your pilots to fly in conditions such as this while there are tried and true options such as the F-22 or planes such as the A-10 could be seen as putting them in unnecessary danger. This would make the LAA viable only for very specific missions, in which case it could not completely replace other common aircraft in combat scenarios. This would bring into play new situations where overkill is notably shown where the military would have to decide when the LAA would be enough to complete a mission without unnecessarily risking lives to complete it. There are also occasions when the LAA won't be enough and a larger craft is needed to effectively support ground missions with the needed firepower. Understanding the fact that it involves more risk for the military and the pilots in battle, reveals that the aircraft must either be developed further as time go on, or risk being left behind due to the value that is placed on human life.

To summarize, the LAA such as the AT-6 and A-29 have specific usefulness in very specific combat situations, yet they are not utilized in combat scenarios. Even knowing all of this, the LAA cannot be considered a failure. While they are being utilized as trainer planes for the time being instead of in combat missions, they still are being useful to the military. This use also keeps the overall implementation cost of the aircraft down by not procuring any new

amount of these aircraft. Combining this fact with the addition of the safety of the pilots, higher ups in the military will always prefer to spend more money if it means keeping the human in the plane safer than they would be otherwise.

Conclusion

In current times, the LAA's place is as a trainer airplane. These aircraft are meant to be highly agile and maneuverable while not sacrificing the capability of the planes. However, the issues with an aircraft such as this are primarily found in the massive bill to build a fleet of these planes would be extensive, which would find a hard time finding public support, as well as the issue of safety for the pilots who are flying the planes due to the lower armor and speed of the light aircraft. Knowing these issues and how they can influence the decision making of the military, ANT and the cartography of controversies effectively helps bring any of the small issues to light and why this aircraft is utilized as a training plane instead of a combat plane. This analysis of the LAA is limited somewhat because often the exact technical descriptions and broken-down costs of military planes are not available to the public. This is also limited by the fact that the general public is not normally privy to the inner workings of the military. While this analysis cannot assist in giving the LAA a new home in the military, it can be used to effectively show the public where the LAA will be utilized in current times and that the money spent on the small number of aircraft the military currently has did not go to waste.

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