Light Attack Aircraft: A Modern Example of Military Technological Development Through SCOT

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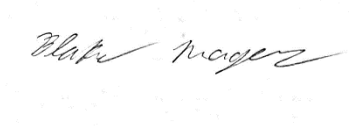
On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments



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The methods by which technologies are developed and utilized have been a subject that is debated by STS researchers for years. Ever since Pinch and Bijker's (1984) "The Social Construction of Facts and Artefacts," social construction of technology (SCOT) has been one of the most common theories surrounding technological development and can be applied to technologies within a broad range of usages, even including military technologies. The light attack aircraft (LAA) is a more recent aircraft concept that is being explored for its applicability in today's most common warfare environments. The LAA is a key example of SCOT in modern day technology as its development is a result of changing societal sentiment regarding U.S. foreign policy in the middle east. This paper will analyze the development of the LAA from its initial inspiration to its modern form today through the lens of SCOT.

SCOT Framework

The overarching theme of social construction of technology is that technology is shaped and interpreted by the stakeholders in society that the technology is relevant to. Since Pinch and Bijker's 1984 analysis of the bicycle through the lens of SCOT, the framework has spread to many different facets of technology. As military technology has expanded over the 20th and 21st centuries, it has become possible to view military technologies as product of SCOT as well. Michael Mosser's 2010 essay "The Promise and the Peril: The Social Construction of American Military Technology" analyzes how "social conceptions of technology are driving military innovation" (p. 93). In particular, Mosser (2010) argues that "American military technology is shaped by and influenced by American society's embrace of technology in general" (p. 95). One example that Mosser (2010) analyzes is the integration of unmanned aerial vehicles into military

technology. Mosser (2010) points out that many of the people flying drones for the U.S. military grew up playing video games at the virtual controls of military aircraft. Additionally, Mosser (2010) explains that American society perceives drones to be more effective and safer for American military personnel than their traditional aircraft counterparts.

In the case of the light attack aircraft, its development can be analyzed in a similar framework that Mosser (2010) outlines for military technologies like drones. Similar to Mosser's (2010) argument about drones, the LAA's development is driven by societal demand for a technological solution to a broad geopolitical issue for the United States. This framework of development consists of four main components including historical context, societal sentiment, stakeholder requirements, and closure and stabilization. In the case of the LAA, lengthy and expensive wars are the basis of the historical context that lead to U.S. society changing their opinions on direct U.S. military intervention in Middle Eastern countries. This led to the proposal of the LAA as a possible technological solution with the U.S., Iraqi, and Afghan militaries as relevant stakeholders. After aircraft manufacturers designed their proposed LAAs to satisfy the stakeholders requirements, the LAA reached a point of closure and stabilization where society and relevant stakeholders were satisfied with the LAA (Pinch and Bijker, 1984). It is important to note that while this technological framework takes most of its roots from Pinch and Bijker's (1984) original conception of SCOT, there are a couple differences. This framework is more attentive to broad societal sentiment than SCOT, and additionally while society was the driver for the LAA's development, it is not a stakeholder that physically uses the technology since the LAA is a military aircraft.

Historical Context

When using the SCOT methodology to analyze the development and implementation of a technology, it is essential to first understand how the idea for the technology was first created. In the case of the LAA, the spark comes from the geopolitics of the Middle East through the 20th and early 21st centuries due to U.S. foreign policy. While the history of U.S. involvement in the Middle Eastern region is extremely lengthy, this section of the paper will show the highlights of U.S. foreign policy with Iraq since the 1990s that helped create the need for the LAA. In 1990 Saddam Hussein was the president of Iraq. Under the Reagan administration the U.S. had attempted to improve relations with Iraq and establish stronger diplomatic relations with its leader, Saddam Hussein. In 1990 however Saddam began making public threats to Israel, an important U.S. ally in the region, and admitted to possessing chemical weapons that he would use to counter Israel's nuclear arsenal (McNamara, 2013, p. 10). Additionally, as McNamara states (2013), Saddam "demanded that the United States withdraw its forces from the region" (p. 10). This led to Operation Desert Storm where the U.S. attacked Iraq's forces in Kuwait and pushed Saddam's army back into Iraq.

After Desert Storm Saddam Hussein stayed in power as the President of Iraq by using his own military force to kill those who opposed his regime domestically (McNamara, 2013). Fast forward to 2003, the U.S. is on a mission to hold the countries that harbored the terrorists that were responsible for the September 11th attacks accountable. Many within the Bush administration believed after 9/11 that Iraq supported al-Qaeda and wanted to use this belief as a reason to invade Iraq, despite a lack of evidence supporting that claim (McNamara, 2013, p. 100). The Bush administration then came out with allegations that Iraq was in possession of weapons of mass destruction, which was enough to convince congress and the American people

that an invasion of Iraq was justified (McNamara, 2013, p. 106). Eventually the U.S. invaded Iraq, overthrew Saddam, and installed a democratic government, but the U.S. involvement in Iraq was far from over (McNamara, 2013). Due to the political vacuum that now was left as a result of overthrowing Saddam, Iraq became a breeding ground for anti-government groups and terrorists. As a result, the U.S. was not able to withdraw troops and stop fighting in Iraq until 2011 (McNamara, 2013).

Changing Societal Opinion on Foreign Policy

In the early stages of the U.S. involvement in Iraq, the war went largely according to plan. In a matter of months, the U.S. coalition forces were easily able to beat back Saddam's army and overthrow his government. The problem was that the U.S. was largely unprepared to set up and defend a newly installed democratic government in a country where anarchists and non-state actors were rampant (McNamara, 2013). This is true of other U.S. conflicts in the Middle East as well. As Simón (2016) notes, the U.S. goal in the Middle East was to set up democracy in countries in the region through direct military intervention. The flaws of this type of foreign policy became clear as the Iraq war stretched on for years after the 2003 invasion. At this point the U.S. spent trillions of dollars and lost the lives of American soldiers involving itself directly in the domestic issues of Iraq and later Afghanistan, without a whole lot to show for it (Simón, 2016).

When Americans came to the realization that advancing U.S. interests in the Middle East through direct military intervention was a much more expensive and lengthy process than originally thought, support for this type of foreign policy tanked. This trend is detailed clearly in figure 1 ("Public Sees U.S.", 2013). President Bush, recognizing the issues and declining

support for his foreign policy in the Middle East, came to an agreement with the Iraqi government in 2008 on “a progressive disengagement of US military forces" from Iraq (Simón, 2016). This plan was continued under President Obama, who withdrew U.S. troops from Iraq in 2011 and announced a plan to withdraw troops from Afghanistan by 2016 (Simón, 2016). The U.S. foreign policy in the Middle East had completely changed from the late 20th century to the early 21st. In 1991 the U.S. had 500,000 troops deployed to the Middle East, and in 2003 the U.S. sent 285,000 troops to the region, but by 2019 the number of U.S. troops in the Middle East dropped to just 35,000 (Karlin, Lustic, Satloff, & Wittes, 2019).

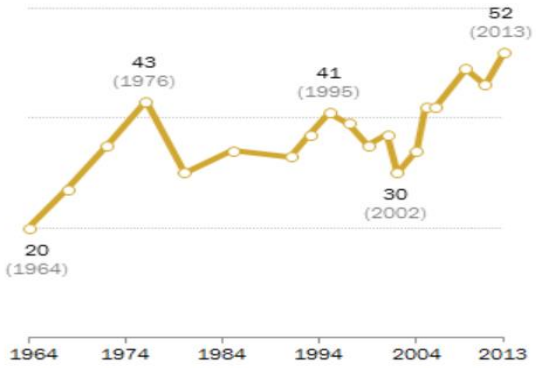

Figure 1: Percentage agreeing that ‘the U.S. Should mind its own business internationally and let other countries get along the best they can on their own’

By the end of President Obama’s administration, the U.S. had withdrawn most of its troops from the Middle East, a departure from the prior two and a half decades. Simply because the U.S. had less troop presence in the region did not mean that the U.S. gave up on its interests in the region. The United States now needed to find a way to protect its interests in the region like supporting democracy in countries such as Iraq and Afghanistan, protecting our allies in the area, and combating terrorists. One proposed piece of the solution to this problem is the Light

Attack Aircraft, a weapon that is dwarfed by other modern military aircraft, but one that could help the U.S. succeed with its new foreign policy strategy that our society demands.

Stakeholder Requirements of the LAA

Within the framework of SCOT, stakeholders and relevant social groups determine how technology is viewed and implemented. While the society in the U.S. was the social group that sparked the LAA's development, they are not directly involved in the operation of the LAA. When it comes to determining how the LAA is used and its goals, the relevant stakeholders are the U.S. Department of Defense and the militaries of the Middle Eastern countries that will use the aircraft. Both the U.S. and countries like Iraq and Afghanistan have their own needs and requirements for the LAA which are melded together to design the aircraft. The goal of the LAA for the U.S. military is not to create a new military aircraft that revolutionizes the U.S. Air Force. The U.S. Air Force already has highly advanced aircraft like the F-35 whose capabilities far exceed those of a potential Light Attack Aircraft. Instead, the U.S. needs the LAA to help strengthen the militaries of countries in the Middle East that are friendlier with the U.S. and need defense against threats to their government. Building a military aircraft with the interests of other countries in mind is a departure from the typical development of military technology in the U.S, which typically involves making new weapons as sophisticated as possible. By catering the development of Light Attack Aircraft to the needs of other countries, the aircraft can help advance the common interests of countries like Iraq and Afghanistan and the United States.

The U.S. still has lots of interests in the Middle East despite its significant troop withdrawal from the region, many of which can be helped by the LAA. One of the most central goals of the U.S. Department of Defense is to eliminate terrorists. The summary of the 2018 U.S. National Defense Strategy emphasizes how non-state actors (terrorist organizations) have

flipped the script on our military's current operating environment. The National Defense Summary (2018) states that "the homeland is no longer a sanctuary" (p. 3) and despite the defeat of the physical ISIS caliphate, many terrorists still exist in the region and are capable of disrupting U.S. interests in the region, as well as attacking the U.S. at home. Additionally, many members of terrorist organizations reside in densely populated urban areas, making them hard to find and eliminate. Due to the significant threat that terrorists still pose to the U.S, the LAA must be a highly effective air to ground engagement aircraft that can deploy modern precision weapons that the military of many current Middle Eastern countries cannot currently support with their aircraft.

Another key goal of the LAA program is to aid in the defense of Middle Eastern countries from domestic threats. This is a shared goal between the United States and the countries that are being threatened. The U.S. wants to keep stable democratic governments in the region, and the governments obviously want to keep their system of governance in place. Afghanistan is the best example of this currently, as the U.S. recognized Afghan government has struggled to maintain control over their country due to the presence of the Taliban. After the 9/11 attacks, the Taliban would not give al-Qaeda leader Osama bin Laden to the U.S., which signaled to the U.S. that with the Taliban in control of territory in Afghanistan there was a safe place for terrorists to be harbored (Biddle, Boot & Lemmon, 2020). Ever since then the U.S. has been involved in Afghanistan fighting on behalf of the Afghan government against the Taliban. As of 2019 only 53.8% of Afghanistan is under control of the Afghan government, while the other 46.2% is either contested or controlled by the Taliban (Biddle, Boot & Lemmon, 2020). With low U.S. societal support for direct military intervention in Afghanistan, the U.S. and the

Afghan government need the Light Attack Aircraft to help the Afghan Air Force defend their territory and fight back against the Taliban.

One final key goal of the Light Attack class of aircraft is to be a realistic, accessible, and smart aircraft for countries like Iraq and Afghanistan to operate. If money was no object in achieving the previously mentioned goals in the Middle East, then the U.S. could just sell a fleet of modern fighter jets to Iraq or Afghanistan and that would solve the problem. Iraq's defense spending budget for 2019 was $7.6 billion ("Iraq Military Spending", 2021), by comparison, the U.S. defense budget was $686 billion in 2019 ("DoD Releases", 2018). A modern F-15 fighter aircraft costs around $87.7 million per unit (Tegler, 2020), and an additional $40,000 per flight hour of operational cost (Mease, 2019). With a defense budget that is 90 times smaller than the U.S. budget, it is unrealistic for a country like Iraq or Afghanistan to purchase and operate aircraft like the F-15 on a large scale. Because of these budgetary constraints the LAA must be affordable to purchase and operate, something the U.S. has not been particularly good at when it comes to military aircraft development.

Closure & Stabilization / LAA Features to Satisfy Requirements

The main stakeholders that are relevant to the usage of the LAA are the U.S. Department of Defense, and the governments of Middle Eastern countries that the U.S. is trying to help. Each group has their own requirements for the LAA which are described in the above sections of this research paper. The citizens of the U.S. have made it clear that they want to minimize direct military intervention in foreign countries, and the LAA is a part of the solution to doing that. In order for the LAA to succeed however, its development must be melded to the needs of the previously stated stakeholders, and this is exactly what aircraft manufacturers are doing.

In order to achieve the U.S. goal of eliminating terrorists in the Middle East that could potentially pose a threat, there are some essential feature current and future LAAs are being designed with. Being non-state actors, terrorists do not live in defined areas that are easy targets. This means that for the LAA to be effective in striking terrorist sites, it must be very precise to avoid casualties. One of the current models of Light Attack Aircraft on the market is the A-29 Super Tucano. This aircraft has a few weapons features directed at making it accurate and effective in its anti-terrorism mission. The A-29 is outfitted with computer assisted weapons aiming, that helps eliminate human error from ordnance deployment ("EMB-314 Super", 2005). Additionally, the A-29 is equipped with a state of the art forward looking infrared camera (FLIR) that uses thermal imaging to aid in more precise targeting and makes night operations possible ("EMB-314 Super", 2005). Finally, the A-29 also supports guided air to ground weapons like guided missiles, making precision strikes on targets possible ("EMB-314 Super", 2005). All these features that Embraer baked into its A-29 LAA make the aircraft a very effective weapon at achieving the U.S. goal of striking terrorists.

Currently proposed designs of LAA also incorporate features directly aimed at achieving the common goal of defending the Iraqi and Afghan governments from threats like the Taliban, for example. Aircraft manufacturers knew when designing a LAA it was imperative to make the aircraft successful at achieving the above stated mission because defending democratic governance in the Middle East is the goal of all relevant stakeholders using the LAA. The A-29 helps meet this design requirement by having the ability to operate out of temporary austere airstrips ("Light Attack", 2018). Organizations like the Taliban control scattered territory within Afghanistan, which makes for unique operational environments (Biddle, Boot & Lemmon, 2020). By giving the LAA the ability to almost anywhere, the Afghan Air Force can more easily

execute its missions. In a discussion about the potential of the LAA in 2011, the then commander of the NATO Air Training Command said this about the LAA "the ability to dislocate the Taliban or Al-Qaeda from a village through the threat or actual employment of the LAS speed and firepower goes a long way to winning the hearts and minds of Afghanistan by demonstrating an ability to protect them from the enemy" (Ybarra, 2011).

Light attack aircraft that are in service today, as well as future designs of aircraft, do a good job of meeting their operational requirements, but they also do a great job of meeting their fiscal requirements. For the LAA to be successful for countries like Iraq and Afghanistan, it must fit their limited defense budgets. One key way that the LAA does this is by making the aircraft highly interoperable between militaries. The 2018 U.S. national defense strategy summary (2018) states that the U.S. plans to "deepen interoperability" in its defense strategy. By developing an infrastructure of interoperability, the U.S. can share light attack aircraft bases with other countries, seed its pilots into foreign military squadrons, and help train foreign pilots at our own training bases in the United States. All of this, as well as the smaller and lighter design of LAAs, leads to significantly reduced costs. The A-29 costs about $10 million per unit with an estimated operating cost of around $1,000 per flight hour (Gouré, 2019). This is far less expensive than the F-15 which costs $87.7 million per unit (Tegler, 2020), and $40,000 per flight hour (Mease, 2019). Additionally, by improving interoperability the LAA is logistically simpler for the Iraqi and Afghan Air Forces, making the aircraft more effective.

Conclusion

The relationship between SCOT and military technologies is a relatively new development. SCOT's focus on society being the driving force behind how technology is inspired is the what makes its implementation in military technologies so unique. The LAA is a

particularly interesting case of recent technological innovation because of the circumstances of its creation. For decades military technology has been built with the intent of making it as cutting edge and inventive as possible. This is because the countries working on the technology are trying to be a step ahead of their adversaries, without always considering the wishes of broader society. The LAA is a recent development that is centered around making the technology best suited to the needs of the Afghan and Iraqi governments, and not our own. But the U.S. did not come to this conclusion on its own, rather it was society's growing dissatisfaction with the decades long foreign policy of direct military intervention in foreign affairs not directly related to the United States. This shift in societal opinion forced politicians to come up with technological solutions, with the LAA being one of the outcomes. Society demanded the LAA reflect the needs of both the U.S. and Middle Eastern governments trying to keep stabilization in their country. While many new technologies, particularly military weapons, do not draw their origins to societal concerns, the LAA certainly does, and is an example of how society can utilize SCOT to drive desired change in all types of technology, including in the military.

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