



**FIELDING INNOVATION LAB PROTOTYPES:
RESTRUCTURING THE MOBILITY AIR FORCE'S STAFF AND TEST AND
EVALUATION ENTERPRISE
GRADUATE RESEARCH PAPER**

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**DEPARTMENT OF THE AIR FORCE
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Abstract

The United States' ability to innovate and quickly field new technology will directly affect the outcome of the next near-peer war. The country that has the advantage is the one that can innovate and adapt the quickest. The United States' military acquisition process is outdated and heavily bureaucratic. To expedite the urgent requirements timeline, the Department of the Air Force established a flagship innovation program, called "Spark Tank" in 2017 (AFWerX, 2021b). The Spark Tank program involved creating individual innovation labs at each Wing, NAF and MAJCOM (Lauver, 2021). To date, no Wing Innovations have been fielded or incorporated beyond the wing level. This paper analyzes three specific case studies to determine how AMC staff and AMC OT infrastructure can be aligned to provide effective MAF-wide fielding support to AMC Wing Innovation Labs. The results analyze the ability for Wing Innovations to be validated by a 3-digit AMC office and reach a fielding recommendation by the Test and Evaluation directorate of AMC. The findings in this paper will allow AMC to field Wing Innovations across the MAJCOM in an expedited manner, meeting General Brown's intent of *Accelerate Change or Lose*.

Acknowledgments

I would like to thank the AMC Test and Evaluation Directorate, the AMC Innovation Office and the AMC Test and Evaluation Squadron. I would not have been able to complete this paper without their year-long support and help.

Kenneth Burch

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FIELDING INNOVATION LAB PROTOTYPES:
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I. Introduction

General Issue

The United States' ability to innovate and quickly field new technology will directly affect the outcome of the next near-peer war. At the crux of the issue is a military and technological arms race being played by the major militaries of the world. This is not a new concept (Brown Jr., 2020). Throughout history, militaries and countries have been trying to seek the advantage on the battlefield. When one country develops a new tactic or weapon, the other countries try to counter it in what is known as countermeasures (Dougherty, 2020). The new development and then subsequent countermeasures continue to happen and evolve throughout the course of the war. The country that has the advantage is the one that can innovate and adapt the quickest.

Problem Statement

The United States' military acquisition process is outdated and heavily bureaucratic. Figure 1-1 and Figure 1-2 describe, in detail, each step of the acquisitions process and provide an accurate timeline for certain types of developments. As recently as 2020, the Defense Acquisition Community re-published DODI 5000.02, which further documented the ability to expedite Figure 1-1's timeline to meet emerging requirements (USAF, 2020). Through DODI 5000.02, there is an established process to field a Joint Urgent Operational Need (JUON) in 18 months to two years from the validation of the

requirement (USAF, 2020). To be clear, a JUON, is defined as “a solution desired within days or weeks, to meet a specific high-priority need”, and not producing this need will “seriously endanger personnel or pose a major threat to ongoing operations” (Ibid). It can be argued that the current process is not sufficient if a JUON is needed in several days or weeks and cannot be fielded until 18 months to two years.

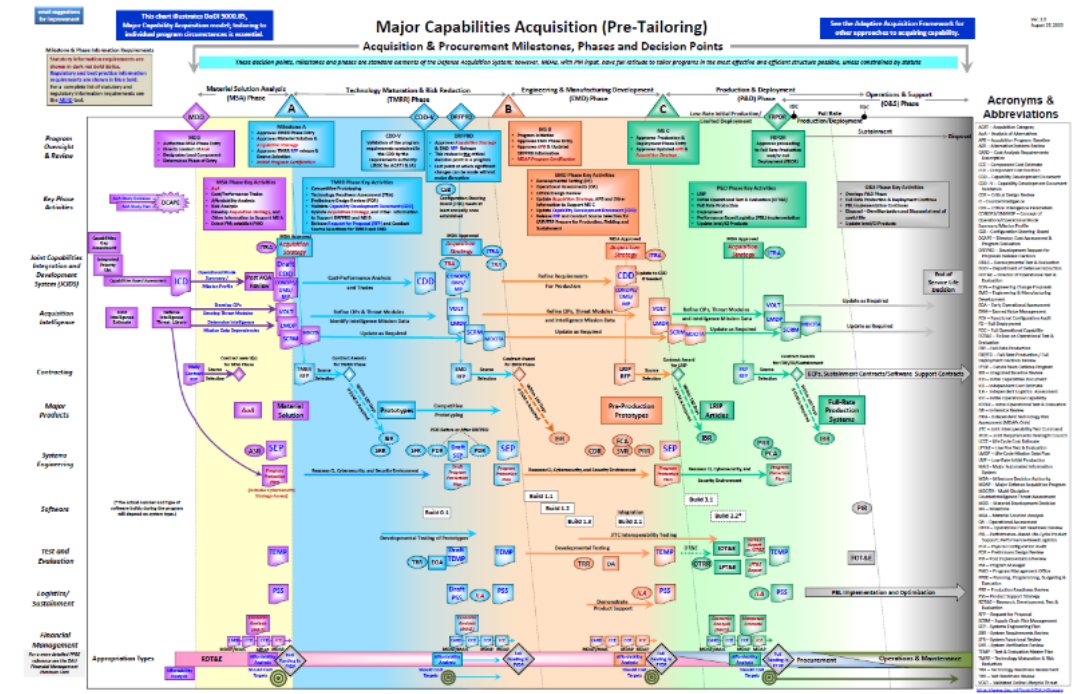


Figure 1-1: Acquisition

ADAPTIVE ACQUISITION FRAMEWORK

[\(Click here for the AAF Website\)](#)

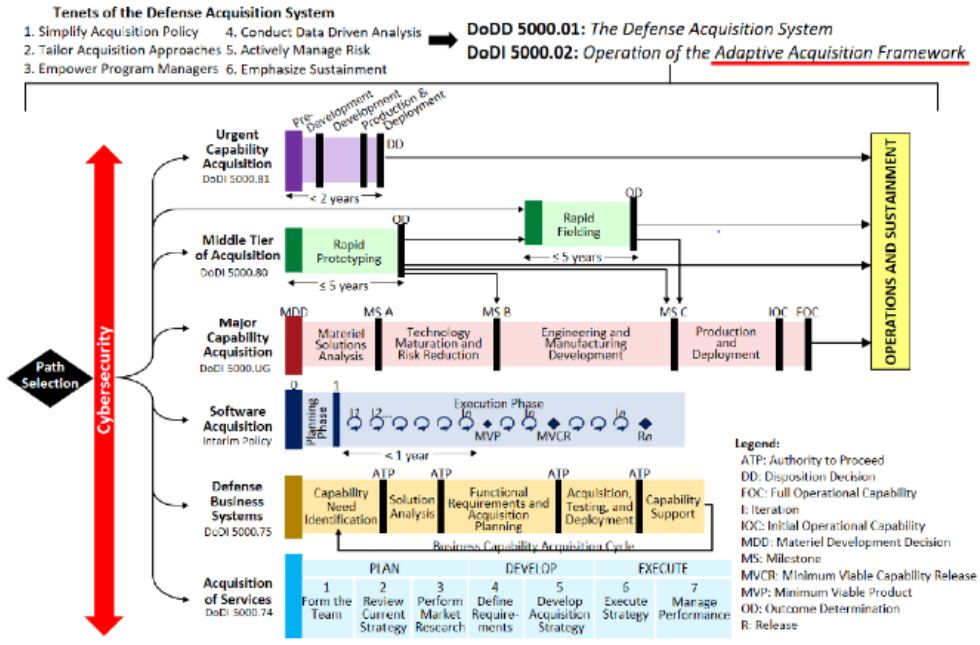


Figure 1-2: Adaptive Acquisition

To expedite the urgent requirements timeline, the Department of the Air Force established a flagship innovation program, called “Spark Tank” in 2017 (AFWerX, 2021b). The Spark Tank program involved creating individual innovation labs at each Wing, NAF and MAJCOM (Lauer, 2021). These labs allow Airmen and Guardians to draft, print and test individual products to be used while they are performing their missions (AFWerX, 2021b). Airmen and Guardians that partake in the innovation lab process follow a comprehensive set of checklists in the *Innovation Handbook*, published by AFWerX (AFWerX, 2021a).

Although this handbook is very comprehensive, it does not include enough resources to have the Airmen or Guardian’s prototype fielded above the wing level. For

example, the *Innovation Handbook* only lists AFWerX as a point of contact for any questions regarding fielding (AFWerX, 2021a). This one point of contact is very inefficient because it does not consider the other DoD Agencies that specifically help Wing Innovation Lab ideas gain fleet wide funding. Tesseract is an agency fielded at the Secretary of the Air Force (SAF) level designed to provide innovators access to “partners and funding” across the Support and Logistics (A4) enterprise (Tesseract, 2021). The agency’s sole purpose is to provide direct guidance and support to Airmen as they develop their prototypes. Furthermore, there are several other agencies such as SOFWerx, AFWerx, RSO, Kesslerun, and many more, designed to coach and mentor Airmen through their innovation processes (Ford, 2021). Figure 1-3 depicts the organizational chart for a Wing Innovation Cell.

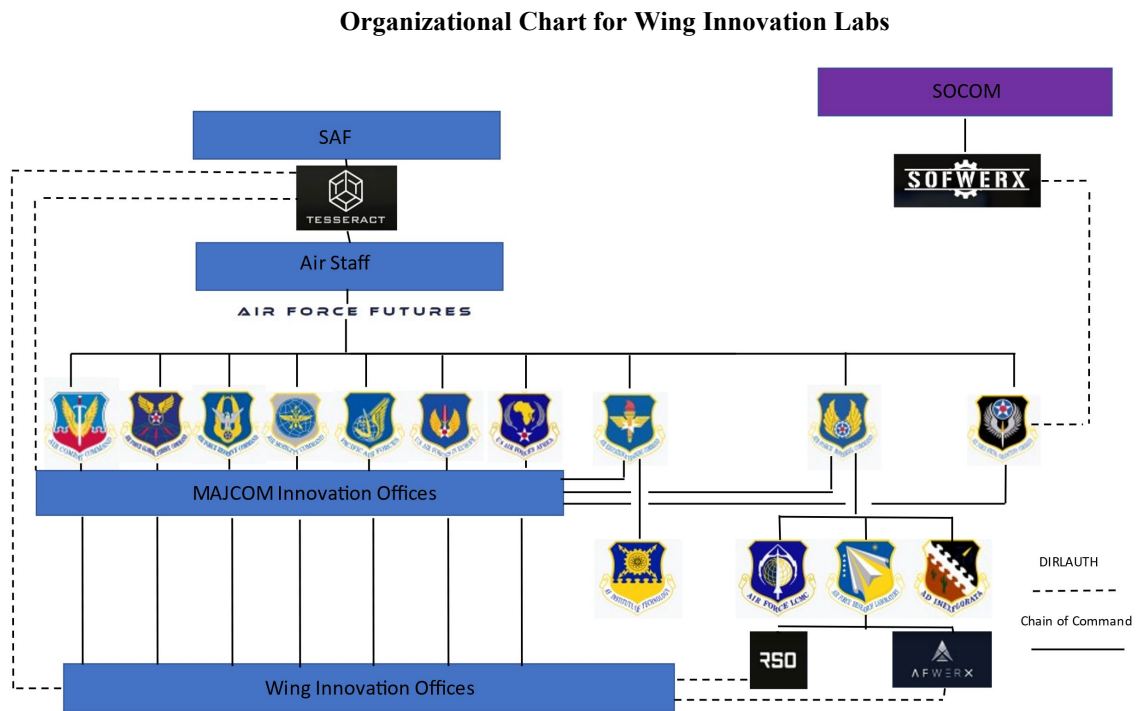


Figure 1-3: Wing Innovation Organization Chart

This organizational chart is not all encompassing but does an excellent job explaining the complicated organizational structure each wing innovator has to deal with while developing an innovative solution. For an all-encompassing spider network list of DoD innovation organizations, please visit <https://kumu.io/aflazo/def-innovation-ecosystem-map#def-ecosystem-map>. All the wing innovation offices work for their respective wing commander. After a wing innovation project receives the wing commander's support, the project is coordinated with the respective MAJCOM Innovation Office(AFWerX, 2021a).

Other organizations such as AFWERX outside of the wing innovation office's chain of command have authorized directed coordination authority. Adding an external agency to a process for which they have no authority or control, requires significant coordination at all levels of the chain of command to achieve synergy. For example, the innovation handbook is written by AFWERX (AFWerX, 2021a). This would naturally cause the wing innovator to work with AFWERX the most. However, AFWERX falls under Air Force Research Laboratory (AFRL), a NAF equivalent, in Air Force Material Command (AFWERX, 2022). Without adequate synergy, this adds to the bureaucracy of the process and incurs significant timing costs.

Another organization that is used by several wing innovators is Tesseract. Tesseract was created based upon the 2018 National Defense Strategy and falls under the Secretary of Air Force's Logistics, Engineering and Force Protection department (Tesseract, 2022). They have the resources and authority to affect change. At the SAF level, they can push down guidance and policy to the Air Staff and receive funding for the wing innovations (Ibid). Besides these two organizations, MAJCOMs have their own

organizations that deal with innovations. For example, Air Education and Training Command has the Air Force Institute of Technology. This academic institution routinely studies and tests innovative solutions to vast problem sets affecting the DoD (AFIT, 2022). The Air Force Material Command also has several NAF-level equivalent organizations designed towards the acquisition process, to include Air Force Test, Air Force Life Cycle Management Center and Air Force Research Laboratory (AFWERX, 2022).

Certain MAJCOMs have joint units that provide innovation assistance like SOFWERX for AFSOC (SOFWERX, 2022). Therefore, with several agencies that can work directly with a Wing Innovator, it is easy for that innovator to get confused about the acquisitions framework. Also, because of the complexity of Figure 1.3, Airmen are not reaching out or being assisted by these organizations enough to achieve a sustainable expedited urgent needs capability as outlined in DODI 5000.02 (USAF, 2020). No published guidance exists for wing innovation lab projects as defined in DODI 5000.02 (USAF, 2020). Without a clearly defined process, many individual innovators and, sometimes, the support agencies themselves, are confused and overwhelmed by the process.

Research Objectives/Questions/Hypotheses

The objective of this research is to examine Air Mobility Command (AMC) processes and manning in support of selected wing innovations. AMC Operational Testing (OT) infrastructure and directorate is within the DoD's acquisition network enabling wing innovations to have a direct on-ramp to the fleet wide fielding process.

Fielding wing innovations at the fleet wide level will reduce the number of innovations stuck at the wing level, increase fleet wide standardization of processes, and enable the USAF to achieve the CSAF's guidance of Accelerate Change or Lose (CSAF, 2020)

The AMC Staff is located at AMC Headquarters at Scott Air Force Base, IL, and AMC's Test and Evaluation Squadron (TES) is located at Joint Base McGuire Dix Lakehurst, NJ.

This paper will analyze the following question, "How can the AMC Staff and AMC OT be aligned to provide fielding of Wing innovations by the time of need?"

Research Focus

This research focused on the current structure, processes, and manning of AMC Staff related to wing innovations and assessed potential future alternatives. Furthermore, this research outlined the processes and responsibilities of the AMC Innovation Office at AMC Headquarters regarding leveraging MAJCOM 3-digit validation and support for wing innovations. Finally, this research used several case studies focusing on post facto wing innovations. Specifically, the case studies highlighted significant gaps and lessons learned in AMC's past and current processes. This research concluded with recommendations to make the current processes more collaborative and efficient using the gaps and lessons learned highlighted in the case studies.

Changing the culture of an organization is essential to achieve expedited and sustainable innovation (Col & Schoeni, 2018).

“[T]here are three basic ways of getting people to do what one wants done. One can force them to behave as one wishes them to. One can give them a set of incentives that aligns their interests with one's own. Finally, one can try to shape the values that they hold so that they will naturally want to do what you wish them to do (Parker & Hartley, 1997).

This paper focused on three case studies. The first case study involved AMC/TES's operational test of the Fail-Safe Mechanism (FSM). The FSM was an upgrade to the M-1 timer block and was developed in a Wing Innovation Lab (FSM Team, 2022). At the time there was no AMC-level support for wing innovations. As a result of the operational testing, AMC/TES created a Wing Sponsorship program, that works with Wing Innovation Labs while they are creating their solutions and AMC created the AMC Innovation office (AMC/TES, 2021). The second case study assessed the AMC/TES Wing Sponsorship program and the third case study studied the current processes on the AMC Staff regarding validating wing innovation requirements.

II. Literature Review

All industries face a rapidly changing technological environment. Businesses and military sectors need to establish clear and solid processes that both encourage and foster innovation (Conte & Vivarelli, 2014). This research examined the literature on innovation strategies for both commercial R&D and military acquisition.

Innovation Strategies

Innovation strategy is developed from five different components; technology, time, market, competition and cooperation (Wolf et al., 2021). The strategies that govern and make up the Wing Innovation Lab process include competition, time and technology. Competition is focused on gaining a strategic edge against adversaries. Time involves being the “first to the market” and thereby surpassing adversaries in technological development. Technology invests heavily in large foot-print and lengthy time-line R&D programs.

Parker and Hartley’s three other options for innovation strategy include coercion, competition and long-term partnering (Parker & Hartley, 1997). Long-term partnerships involve military-civilian long-term contracts. For the Wing Innovation Labs to obtain fleet-wide fielding, they must establish documented processes and partnerships with the acquisition community, including the AMC/TE.

Another acquisitions strategy is to search for dual-use technology. This is technology that can be used in both the commercial and military sector (Mendoza & Lhuillery, 2019). This type of technology can be expedited and fielded quickly due to minimal testing requirements. It is important to note that the Innovation Handbook

directs Wing Lab innovators to search for commercial products before building their own prototypes (AFWerX, 2021a). By doing this, many times a wing innovator can find an off the shelf commercial solution to the problem and focus on obtaining permission to acquire that item instead of spending time developing another solution in parallel.

Dougherty (2018) identified six government programs established by the DoD to foster rapid military innovation. According to Dougherty, all six are established using “top down” innovation strategies (Dougherty, 2018). As a better approach, he argues that “the cases imply that bottom-up military innovation benefits from the ability to advance a concept to the working prototype stage without needing to convince military stakeholders” (Ibid). Bottom up supports the Wing Innovation Lab concept and strengthens the plan to incorporate wing projects into the acquisitions process at the MAJCOM enterprise level. Numerous military agencies designed to foster and coach innovation ideas are less efficient when they are located at the SAF or HAF level. The acquisition MAJCOM level allows wing innovations to enter the acquisitions process with enough support, but at the same time not get bogged down with bureaucracy.

Commercial Sector Innovation

Wiesbock et al (2019) displays the Figure 2-1 innovation chart for digital product innovation (DPI).

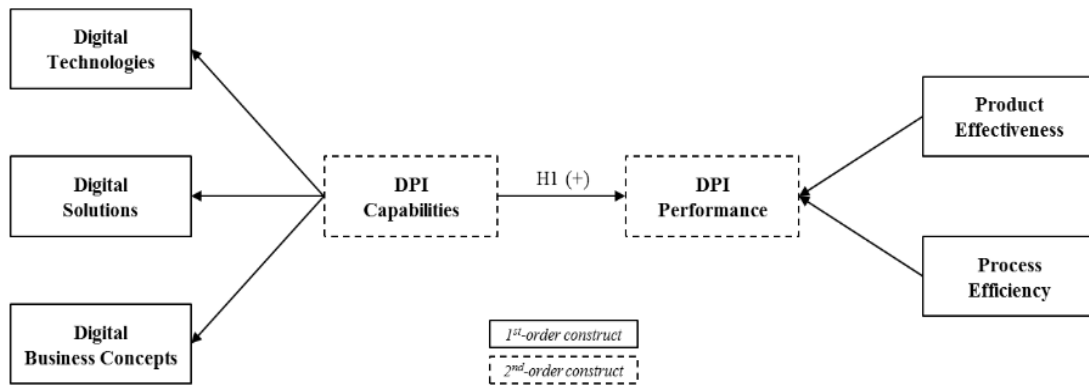


Figure 2-1: Digital product innovation

The author argues that businesses need to consider three things, digital technologies, digital solutions, and digital business concepts and then focus on product effectiveness and process efficiency (Wiesbock et al., 2019).

Bahcall (2019) created the concept of “Loonshots” which are crazy ideas that become industry transforming products. Bahcall argued that innovation labs and teams must be kept from the industry side of the business so that they can test ideas and fail before they succeed (Ibid.). This way, no ideas get crushed by the business while they are in the infancy stages. His argument sets the stage for why innovation cells are initially not in the acquisitions process. Instead, they are kept at the wing during their testing. The wing also funds any testing requirements during this time (AFWerX, 2021a). However, there is no established acquisitions on-ramp after this nurturing process is finished. Bahcall argues that there needs to be a “phase transition” to a supportive business and innovation environment for the loonshot to progress to after development (Bahcall, 2019).

Military Acquisition

Military acquisition is long and drawn out. The quickest acquisition time is two years (USAF, 2020). Mortlock (2020) argued that each milestone and each program office needed to be justified by a policy letter to continue operations. He further argued that the only way to get a quicker process is to reduce the size of the acquisition process (Mortlock, 2020). There is no question that the acquisition process is comprehensive. Mortlock would argue that if one is looking to accelerate the timeline, they must cut some of the steps in the current timeline, as opposed to accomplishing expedited or integrated testing.

Provaznik (2017) used the case study of the Tactical Assault Light Operator Suit (TALOS) program to advocate for a shorter acquisitions process. Provaznik detailed that the United States Special Operations Command challenged the legal validity and requirement of each milestone and expedited the TALOS program through the process (Ibid). The expedited process, less than 1 year from concept to demonstration, forced industry partners to work together for the greater good of the American people (Ibid). All-in-all, the TALOS program proved that industry partners can expedite production and supply the DoD with proven solutions. This capability is vital for Wing innovations because the Wing innovator develops a single prototype and must work with industry partners for sustainability and Air Force-wide fielding.

Case Study

Case studies are often qualitative in nature. A case study “can include single or multiple cases and can be limited to qualitative research” (Yin, 2014). In this paper, we look at multiple, or three different case studies. According to Feagin et al in his book, *A*

Case for the Case Study (1997), he argues that although most sciences are going away from single or multiple case studies, there is still a lot of value in small-scale case studies.

“With the advent of quantitative techniques and the wide-scale use of these techniques in the social sciences, we have experienced in the United States the regrettable result of neglect or a downplaying of research that employs the methods of case studies. We feel that the case study remains an extraordinary useful and important strategy for social analysis.” (Feagin et al., 1991)

According to Alex da Mota Pedrosa in his article, *Logistics case study based research: towards higher quality*, there are three main components to great case studies. The first component is transferability. Transferability suggests that one specific case study’s finding should be generalized so that it can be applied to several similar case studies (Pedrosa, 201 C.E.). This will be used when making recommendations in chapter IV. Although specific recommendations to specific processes may be included, the overall conclusion must be generalized enough to be incorporated with multiple MAJCOMs and multiple processes. The second component is truth-value. Often the researcher and informant or confidant within the field of study may have a different perspective of the event (Ibid.). It is important for the researcher to engage often with the informant or confidant to understand the specific culture and point of view of the community and at the same time understand the potential bias. This will be important when conducting interviews in this paper. The third component is traceability. Traceability refers to the documentation of the research process (Ibid.). This is the biggest part of the case study process because it involves documenting researched areas and methods of research to make the case study repeatable.

Summary

An emerging requirement needs to have a smaller acquisitions footprint (Provaznik, 2017). MAJCOM level support and an acquisitions road map allows Wing Innovation Lab projects to enter an accelerated acquisitions process, but still achieve the necessary requirements for fielding.

III. Methodology

Case Study Overview

This research analyzed three case studies. The first case study assessed the gaps and limitations in the Fail-Safe Mechanism project (FSM). The FSM project was a wing innovation in 2018-2019 and was selected because it was the only AMC wing innovation to be validated and tested. The FSM went through the operational testing portion of the acquisitions process without any initial well defined, matured, procedural oversight from the AMC A-Staff that holds the requirement authority.

The next case involved AMCTES's *Wing Innovation Cell Sponsorship Program*. This program was originally created to mitigate some of the limitations discovered during the FSM project and was selected to analyze the current processes in place. This case analyzed the effectiveness of the program and highlighted limitations of the current process in relation to Wing innovations. This research interviewed AMCTES regarding the FSM project and the Wing Innovation Sponsorship program

Finally, the third case analyzed AMC innovation processes. This case graphed the process and highlighted significant gaps in the process design. This research interviewed the AMC Innovation Cell regarding the FSM project and AMC staff's meeting frequencies for the validation of wing innovations. In addition, AMC/TE was interviewed regarding FSM and the legal barriers and process limitations to obtain a test request for Wing innovations.

Interviews

This research administered 18 interviews given over a two-year period. Innovation data was collected from AMC/TES and the AMC Innovation Office. The interviews analyzed innovation process effectiveness and identified shortfalls and gaps. The interviews were partially structured interviews. The interviews themselves had the following questions to start and guide the interviewee. However, their answers generated more questions than what was originally listed. The list below details the major offices and divisions that were interviewed over the two-year period.

1. AMC/TES interviewed regarding the FSM project
 - a. Can you chronologically walk through the test?
 - b. What were the biggest problems with the FSM test and can you explain?
 - c. Why is it still in testing?
 - d. What References can you provide me?
2. AMC Innovation Cell interviewed regarding the FSM project and AMC staff's meeting frequencies for the validation of wing innovations.
 - a. What was your involvement with the FSM Test?
 - b. What meetings do you have to discuss the latest wing innovations?
 - c. Are there any meetings on a regular basis that tried to validate the requirements for the wing innovations?
 - i. Who are these meetings with?
 - d. What other meetings need to occur, so it generates a program office status?
 - e. What are your biggest limitations or roadblocks?
3. AMC/TES interviewed regarding the Wing Sponsorship Program.
 - a. Please list any projects you helped work with at a Wing Innovation Office.
 - b. What did you help them with?
 - c. Did you utilize any AMC-Staff assistance?
 - i. Did they provide what you were looking for?

- ii. What offices helped you?
- d. Where is the project now?

Areas of Interest

The following questions were areas of interest (AOI) during this research:

1. Why did the FSM stay in Operational Testing for 2 years?

This AOI analyzed the roadblocks that affected the FSM program testing in AMC/TES. By analyzing these roadblocks, significant gaps and shortfalls were discovered. The purpose of this section was to highlight the overall weaknesses that were encountered and then to use these weaknesses to analyze the current processes put into place after the FSM program (AMC/TES, 2021).

2. How does AMC/TES's Wing Innovation Sponsorship program fix the gaps in the FSM case study?

This AOI involved analyzing the AMC/TES's Wing Innovation Sponsorship program. The purpose of this section is to highlight the strengths and weaknesses of this current program. (AMC/TES, 2021).

3. What are the processes in place for a Wing Innovation to receive validation and a test order?

This AOI involved analyzing the current AMC Staff meetings and processes to validate and create a program of record for Wing Innovations (AMC Innovation Office, 2022).

Assumptions/Limitations

1. Wing funds will cover the Wing Innovation Lab project testing during the design and testing phases.
 - a. Wing funding will fund testing requirements per the Innovation Handbook (AFWerX, 2021a). This assumption includes the notion that AMC/TES will be able to manipulate the Wing Innovation Lab test at a small level that does not affect the over-all budget of the project. Therefore, since the Wing is already funding the test phase, OT injections should be small and no impact to the overall budget.
2. AMC will use “Emerging Requirements Funds” to field approved Wing Innovation Lab projects.

This research examined how to get Wing Innovation Lab projects through the validation and testing phases of the acquisitions process and funding for fielding was not considered.

IV. Analysis and Results

Case Study 1: Fail Safe Mechanism (FSM)

Background:

The FSM was an upgrade to the M-1 Timer Block System. The M-1 Timer Block is used for airdropping Army equipment up to 15,000 pounds, “when a platform load is rigged for low-velocity airdrops”(US Army, 2016) . The M-1 Timer Block is typically used for C-130 airdrops. The M-1 Timer Block consists of seven components and is designed to open the chute during the airdrop (See Figure 4-1 and 4-2).

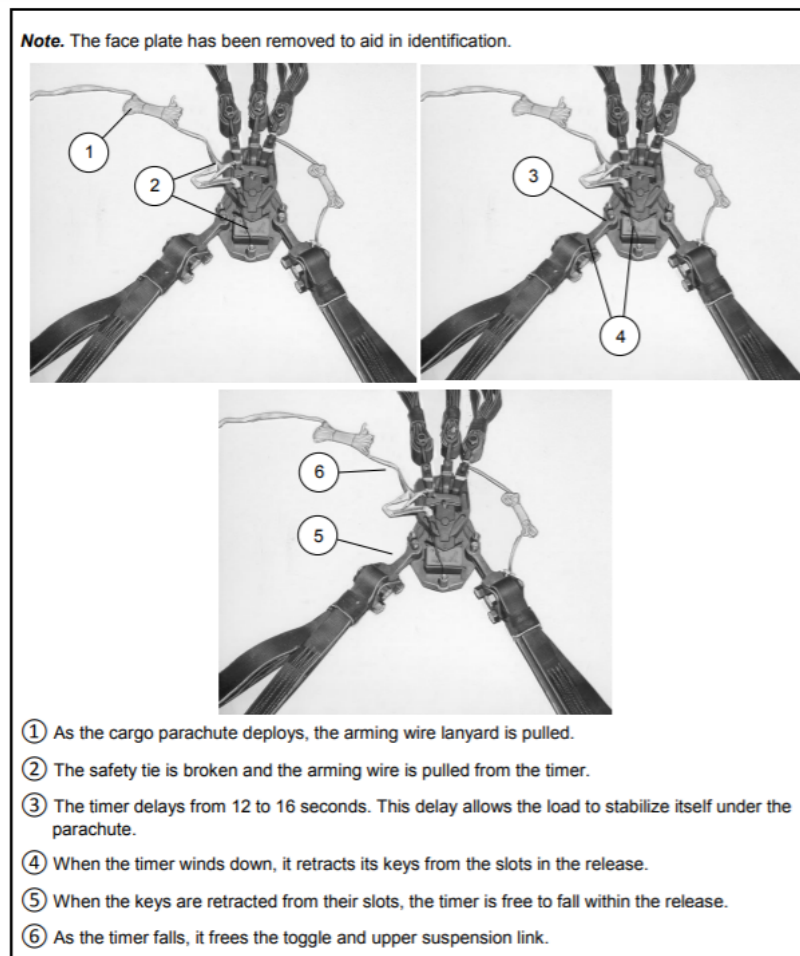


Figure 4-1: M-1 Timer Block Explanation (US Army, 2016)

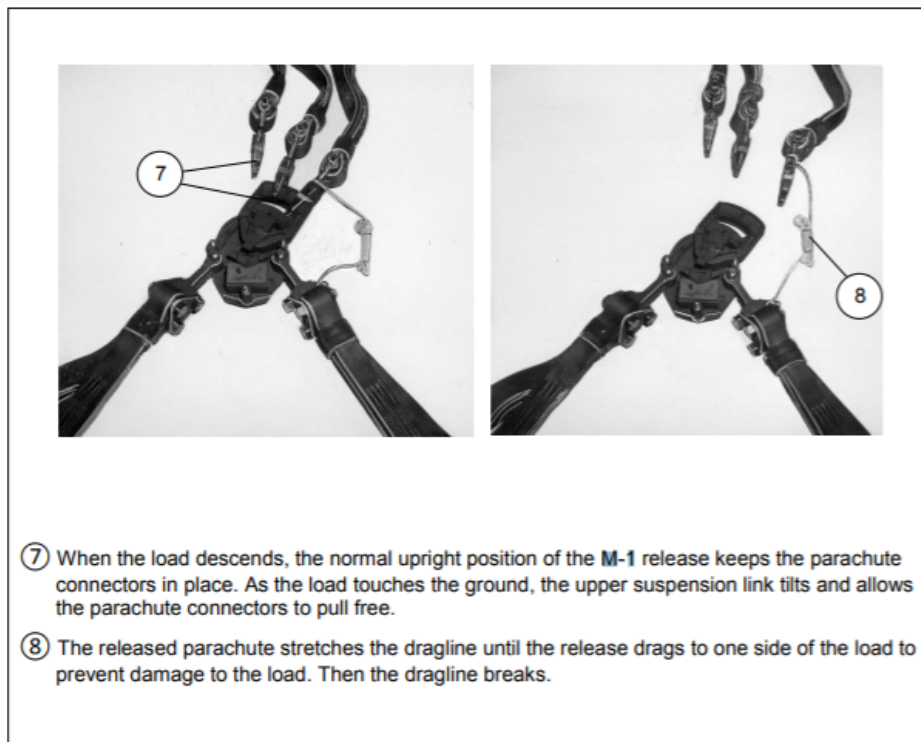


Figure 4-2: M-1 Timer Block Explanation (Continued) (US Army, 2016)

The M-1 Timer Block is mechanically designed to delay the release of the chute until the load contacts the ground (Peter et al., 2019). However, this system is only 98% reliable (Alton, 2020). Despite the high success rate, the 2% failure rate causes millions of dollars of damage over time when heavy cargo crashes to the ground after the M-1 timer block prematurely releases (Ibid). The crux of the issue is the design of the M-1 allows the releasing mechanism to slide downward and release the chute, see figure 4-3.



Figure 4-3: M-1 Releasing Mechanism (Alton, 2020)

During operational training, in Little Rock AFB, AR, a crew experienced a premature release of the M-1 timer block while performing a heavy load air drop. Since Little Rock Air Force base had an operational wing innovation lab, the rigging specialist began to develop a fail-safe block to the M-1 system. He utilized the innovation handbook and obtained the wing's support for his project. Overtime, he developed a 3-D printed product that was designed to block the releasing mechanism from deploying until contact with the ground (FSM Team, 2022). The product was originally called the *Alton Block* and over time was renamed the Fail-Safe Mechanism.

In January of 2019, the FSM product competed among 74 other innovations and won the AMC Phoenix Spark competition (Gotta, 2019). The Phoenix Spark competition is an award-based competition that ranks and awards the top wing innovation each year. The winners of the AMC award compete at the Air Force level later in the year and receive AMC funding and support for their innovation (Air Force Research Laboratory Public Affairs, 2022).

A month after the FSM won the Phoenix Spark award, AMCTES received a test order from AMC/TE to perform operational testing on the product (FSM Team, 2022). At the time, the test order was very vague and did not have the guidance or information usually found in a test request. This was because there was no established guidance, MAJCOM directorate support, or on-ramp for wing innovations into the acquisitions process at the time. The initial test request lacked a test requestor at the Action Officer (AO) level and 3-digit AMC office that validated the requirement (FSM Team, 2022).

The test requestor sets the test evaluation criteria for the operational test. Since there was no test requestor, there was significant time delay to receive evaluation criteria and these criteria often changed. In the end, the evaluation criteria called for the FSM to have a greater than 20% chance of preventing premature chute releases to achieve a satisfactory testing grade (Peter et al., 2019). Furthermore, when AMC/TES received the initial request, only one 3-D printed prototype existed. At the time, there was no sustainability plan for the FSM. A sustainability plan involves the mass production and fielding plan of the product, the crew and maintenance training for the product, and the overall maintainability and durability of the product.

The lack of guidance caused significant delays in the testing phases of the FSM. As a result, there were two total FSM Operational Utility Evaluations (OUEs) conducted over a two-year period (Lankford et al., 2021). The operational testing concluded in 2021. The first operational assessment failed the original FSM due to suitability. Specifically, there was a training discrepancy and the new procedures for rigging the FSM were not in accordance with established Tech Order (T.O.) guidance (Peter et al.,

2019). The slipknot applied to the FSM was not an approved airdrop knot (Peter et al., 2019)

After the procedures and knot were corrected, in accordance with joint air drop guidance, the second OUE passed the FSM (Lankford et al., 2021). However, because there was no established process for AMC support at the time of the test request, the FSM is still not fielded. As of January 2022, it is at the SPO project office awaiting a 1067, or modification proposal, before continuing to be implemented at the fleet-wide level (FSM Team, 2022). The FSM innovation highlighted significant gaps in the process for wing innovations. These gaps not only delayed the wing innovation from being fielded at the MAJCOM level, but they also created a series of roadblocks.

Strengths:

The Air Force created the wing innovation labs to empower airmen. The Air Force wanted to receive Subject Matter Expert opinion on innovations and created a program where the front-line operators can develop and create a solution to an issue they experience in the field. In this case, the original intent of the program was successful.

Weaknesses:

With no fundamental support from the MAJCOM level to wing innovations prior to the FSM project, there were three major limitations and gaps that prevented fleet wide fielding. The following major limitations to the FSM project are listed below:

- 1. There was no validation of requirements at the AMC 3-digit level.** The validation of requirements at the MAJCOM level is crucial for wing innovations. It essentially endorses the project and allows the project to be fielded across the

fleet at a later point. Currently, the Wing Innovation Handbook only requires wing commander support (AFWerX, 2021a). The initial thought process was that the wing commander would validate the requirements. Including coordination with the AMC 3-digit prior to wing commander validation could have ensured MAJCOM requirements validation process requirements are not skipped or introduced too late into the acquisitions process. No 3-digit validation delays the test request and test order that AMC/TES needs to create their test plan for the operational testing.

2. **There was no suitability plan built into initial design.** Dr. Roper once said, “The Air Force breaks every day and Airmen on the front line put it back together again” (Tesseract, 2022). In this case, that is exactly what happened. A crew experienced an issue, and an airman fixed it. However, during the design phase, there was no coordination with AMC/A3V or the Joint T.O. publication office. Building in the training documentation and maintenance plan is crucial to the long-term success of a project after fielding. This plan is usually included in the initial design phases of test projects included within the normal acquisitions framework(USAF, 2020). These factors are tested in the operational utility evaluation conducted by AMC/TES. Therefore, when it came time for the first operational utility evaluation, the FSM failed due to T.O. documentation and training (Peter et al., 2019).
3. **There was no project office assigned to the FSM program.** In the test and acquisitions world, the project office is responsible for creating the applicable

documents needed to test and field a product (AMC/TES, 2021). In this case, there was no assigned project office when AMC/TES originally received the order to test (FSM Team, 2022). This lack of support ultimately led to the current delay with the FSM of not having a modification report complete (Ibid.).

Case Study 2: AMC TES's Wing Innovations Sponsorship Program

Background:

AMCTES started the Wing Innovation Sponsorship program because of the deficiencies they encountered with the FSM Test. The FSM test took two years and resulted in two OUEs to reach a positive fielding recommendation by the operational test community (Lankford et al., 2021). Initially the squadron aligned the Wing Innovation Sponsorship program under the Director of Operation's staff. As each Test Director (TD) completed their initial training, the TD was assigned a base as their mentee (AMCTES Innovation Office, 2022). Each TD then communicated with their base's Wing Innovation Lab and provided mentorship on how to structure the initial development and prototype testing to account for suitability, training and other long-term problems that would be evaluated during operational testing. This program was developed to mentor and train the Wing Innovation Labs as a mentor/mentee relationship. In no way did this program interfere with the objectivity of AMCTES or the Operational Test community.

After two years of execution, AMCTES, restructured their Wing Sponsorship program in April 2022 (AMCTES Concept Guide, 2022). The Squadron created an innovation office that reported directly to the Squadron Commander. The overall goal of the innovation office is to work with, mentor, and train each Wing Innovation Lab so that their individual tests will incorporate important factors that will be evaluated during the fielding recommendation test (Ibid). By standing up an office for this duty, more attention can be focused on mentoring each wing innovation. The mentorship program will no longer be an additional duty for each test director, but instead a core function of the Squadron (Ibid).

Strengths:

Over the last two years, the AMCTES' Wing Innovation Lab Sponsorship Program mentored several projects. The Wing Innovation Lab at JB Charleston was developing a solution to a load master issue in 2020. During this time, the TD that was given the responsibility of JB Charleston's Wing Innovation Lab learned about the goal of the innovation project. Using their knowledge with the acquisition process, the TD knew that the University of Georgia was developing similar technology for this issue. The TD was then able to link the base and the university together so that they could share their experiences and knowledge (AMCTES Innovation Office, 2022). The linking of industry and front-line expertise usually only happens at Tesseract accelerator events (AFWerX, 2021a). However, due to the TD's expertise and knowledge in the acquisition process, they were able to guide the Wing Innovation Lab to a credible commercial vendor and expedite the fielding timeline, thus accomplishing the CSAF's goal of expedited acquisitions (Brown Jr., 2020).

The "Airfield of the Future" program can be another positive outcome of AMCTES' Wing Sponsorship program. Although the entire program is not a Wing Innovation Lab Project, subsets of the program are created and run by Wing Innovation Labs. For example, Joint Base McGuire-Dix-Lakehurst (JB-MDL) is one of the test bases for the program (AMCTES Innovation Office, 2022). Furthermore, commercial companies are planning on traveling to JB-MDL to work with front line Airman through the Wing Innovation Lab and test their products (Ibid.). The current construct of the AMCTES' Innovation Office is designed to support the Wing Innovation Offices with these types of events and tests (AMC/TES Concept Guide, 2022). Specifically, the

innovation office is working with the base innovation office directly and creating a master test plan that can objectively evaluate each prototype. The master test plan is an outline of areas of interests and evaluation criteria that can be used for each specific test (AMC/TES Innovation Office, 2022). The new form of reporting is designed to be objective and unbiased. This new form of operational test reporting will also expedite fielding requests meeting the CSAF's intent.

Weaknesses:

Each test must contain an objective and repeatable process used to reach a fielding recommendations (AMC/TES Concept Guide, 2022). The past and current constructs of the Wing Innovation Sponsorship program allow AMCTES to mentor and train wing innovations and keep their objectivity at the same time. This program allows each wing innovator to think about and build a suitability plan into their initial design. However, the program cannot advocate for validation of a wing innovation from an AMC 3-Digit Office. Furthermore, the AMC TE directorate also cannot advocate for validation across the AMC staff. By doing so, AMC's operational test infrastructure would lose their objectivity for fielding recommendations. Therefore, although AMCTES' Wing Sponsorship Program is very effective, it still cannot solve the validation issue of individual projects because this must be done by a 3-digit MAJCOM office (USAF, 2020).

Case Study 3: AMC Staff Wing Innovation Validation Process

Background:

During the FSM Project, there was no assigned AFMC project office when AMCTES originally received the order to test (FSM Team, 2022). The root cause of this issue was that the original requirement was never validated by an AMC 3-Digit office. Initial validation is critical to obtaining a fielding recommendations because it starts the documentation process needed for fielding. For example, an AF Form 1067 is required to modify aircraft. “The AF Form 1067 is the document normally used to initiate temporary modifications and permanent sustainment modifications for fielded systems and equipment” (AF A3/5, 2013). For programs below \$50,000,000, the lead MAJCOM can validate requirements and endorse the 1067 (Ibid.). Most wing innovations are below this dollar figure. Once the 1067 gets validated, the document gets sent to the SPO and an AFMC Project Office is assigned. This office coordinates with TE for operational testing (USAF, 2020).

In 2019, AMC Staff created the AMC Innovation Office. The AMC Innovation Office reports directly to AMC’s Director of Staff (DS) (Innovation Office Interview). This allows the AMC Innovation Office to be above each staff directorate which enables the office to coordinate wing innovations across the different AMC A-staffs. One of the duties of the AMC Innovation Office is to validate the requirements of each wing innovation (Ibid.). The AMC Innovation Office holds quarterly meetings with AMC/A3, AMC/A4, and AMC/A5/8 to validate requirements. However, these meetings are with the head of each A-staff and the DS. To get a 3-digit AMC office to validate the

requirements, the DS must go back and task the specific 3-digit office delaying innovation (Ibid).

After the Innovation Office receives AMC 3-digit validation of the Wing Innovation, the modification still needs to go through the 1067 process. This process has a monthly meeting which is led by AMC A5/8 (AMC Innovation Office, 2022). In the end, the wing innovation cannot be universally fielded without the approved 1067 and funding (Ibid.). These processes delay and prolong the wing innovation from achieving MAJCOM-wide fielding.

Strengths:

There are processes in-place for wing innovation validation and fielding. AMC's Innovation Office allows the wing innovation requirement to be validated by a 3-digit office (AMC Innovation Office, 2022). After the wing innovation is validated, it then enters the normal AMC process for modification, or the 1067 review and the normal operation testing and approval process (AF A3/5, 2013). After the 1067 is approved and a positive fielding recommendation is reached, it then enters the funding process (AMC Innovation Office, 2022). Altogether, AMC's current processes allow for a wing innovation to make it through validation and receive a positive fielding request.

Weaknesses:

The current processes do not provide expedited fielding of wing innovations. Currently, a wing innovation must be approved through three different meetings and an operational test before fielding approval (AF A3/5, 2013). Furthermore, these meetings are not aligned with each other. In terms of the FSM, fielding is still delayed due to the 1067 not being approved as of January 2022 (FSM Team, 2022). The FSM project is

three years old and still is not ready for fielding (Ibid). These weaknesses do not meet the overall intent of Wing Innovation Labs, which is to provide expedited innovations to front-line problems.

Investigative Questions Answered

1. AOI 1: Why did the FSM stay in Operational Testing for two years?

The FSM project stayed in Operational Testing for two years because of the following issues:

- i. There was no validation of requirements at the AMC 3-digit level.
- ii. There was no suitability plan built into initial design.
- iii. There was no AFMC project office assigned to the FSM program.

2. AOI 2: How does AMC/TES's Wing Innovation Sponsorship program fix the gaps in the FSM case study?

AMC/TES's Wing Innovation Sponsorship program fixes the gaps found during the FSM project by the following:

- i. The program mentors the Wing Innovation Labs about operational testing requirements to include suitability.
- ii. The program mentors the Wing Innovation Labs about operational testing requirements to include training.
- iii. The program enables Wing Innovation Labs to work with commercial partners in an expedited manner.

3. AOI 3: What are the processes in place for a Wing Innovation to receive validation and a test order?

AMC Staff has processes in place for a wing innovation to receive validation and a test order. However, the processes are not linked together and are time consuming. As of January 2022, no wing innovations have completely made it through these processes.

Summary

The three different case studies highlighted that there are still significant gaps in the expedited fielding of wing innovations. Each process created was designed to alleviate and correct the issues encountered during the FSM project. However, currently no processes are coordinated with each other. The lack of coordination delays the timeline of wing innovation fielding. Figure 4-4 details the limitations experienced during the FSM project and which process mitigates that issue now.

Description of Issue	FSM	AMC/TES	AMC Staff	FSM Timeline
AMC 3-Digit Validation of Wing Innovation	No	No	Yes	6 Months
Suitability Plan Built into Initial Design	No	Yes	No	1.5 Years
Training Plan Built into Initial Design	No	Yes	No	1.5 Years
Project Office Assigned	No	No	Yes	1.5 Years
1067 Approved	No	No	Yes	3+ Years

V. Conclusions and Recommendations

AMC is not the only MAJCOM or organization designed to help Wing Innovation Labs. Figure 1-3 shows some of the many organizations created to help field wing innovations at the Air Force-wide level. Specifically, there are two organizations that should integrate regularly with AMC staff to expedite wing innovations through the validation and fielding recommendations processes. These organizations are Tesseract and AFWerx. Both organizations have direct influence over policies and procedures and financial funding. Furthermore, both organizations already work directly with the Wing Innovation Labs on a regular basis. Therefore, by linking their involvement with AMC's existing procedures, wing innovations can be expedited and meet the CSAF's intent.

Recommendations for Action

. Currently, a wing innovation can be developed, validated, and fielded. However, the issue is with the time it takes for these processes to be complete. Using the FSM as an example, it has taken over three years and the project is still not fielded (FSM Team, 2022). Although the FSM is well within the capability of getting fielded because it is on the last step in the current process, this innovation timeline does not meet the CSAF's intent for accelerated innovations. These delays have a deterrent effect on wing innovators. This could be the reason that there have been zero AMC wing innovations fielded MAJCOM-wide in the first five years of the program.

To increase the velocity of the timeline, AMC's current processes should be adjusted. As seen in the FSM project, the current process uses a non-integrated approach that fails to achieve validation and a subsequent 1067 review until the end. This means

that training regulations cannot be written and no AFMC Project Office is assigned until after operational testing. The recommended adjustment is for AMC staff to begin regular communication with Tesseract and AFWerx.

Both Tesseract and AFWerx have influence regarding policies and funding. Tesseract is aligned under the Secretary of the Air Force (Tesseract, 2022). They have direct influence over Headquarters Air Force and can press the Air Staff to re-write policies and re-direct funding through the emerging requirements portion of each budget. AFWerx has influence regarding funding and policy as well. AFWerx is aligned within Air Force Material Command (AFMC) (AFWERX, 2022). AFMC has most of the Air Force’s Research and Development budget (AF A3/5, 2013). Furthermore, all the SPOs for the Air Force work under AFMC (AFWERX, 2022). Therefore, by working with AFWerx, AMC will be able to link SPOs, Air Force funding and the wing innovators together early in the development process.

Using the FSM project as an example, if AMC included AFWerx and AFMC early in the development of the prototype, the FSM may have been fielded already. As of January 2022, the FSM project is awaiting SPO approval (FSM Interview). Early coordination with the SPO would likely have expedited the fielding timeline.

Table 5.1: Office Capabilities with Integration						
Office Capabilities with Integration						
Description of Issue	FSM	AMC/TES	AMC Staff	FSM Timeline	Tesseract Involvement	AFWerx Involvement
AMC 3-Digit Validation of Wing Innovation	No	No	Yes	6 Months	Can work with Air Staff and validate requirements on an AF-Level	N/A
Suitability Plan Built Into Initial Design	No	Yes	No	1.5 Years	Can work directly with industry partners to develop prototypes	Can work with AFLMC and AFRL, all within AFMC
Training Plan Built Into Initial Design	No	Yes	No	1.5 Years	Can work with Air Staff and change policy requirement on an AF-level	Can work with the SPO within AFMC
Project Office Assigned	No	No	Yes	1.5 Years	Can work with Air Force Futures, within HAF/A5	Can work with the SPO within AFMC
1067 Approved	No	No	Yes	3+ Years	Can work with Air Staff and validate requirements/endorse 1067	Can work with the SPO early to endorse 1067

If AMC Staff coordinates with Tesseract and AFWerx monthly, each limitation found in the three case studies could be improved upon. Table 5-1 shows how Tesseract and AFWerx involvement could help expedite wing innovations. Both organizations have significant influence on policies and funding. If AMC's intent is to field wing innovations on a MAJCOM level, they must work regularly with these two organizations.

Figure 5-4 shows how the new command relationship should be moving forward between Tesseract and AFWerx. Both organizations should have DIRLAUTH with AMC Staff.

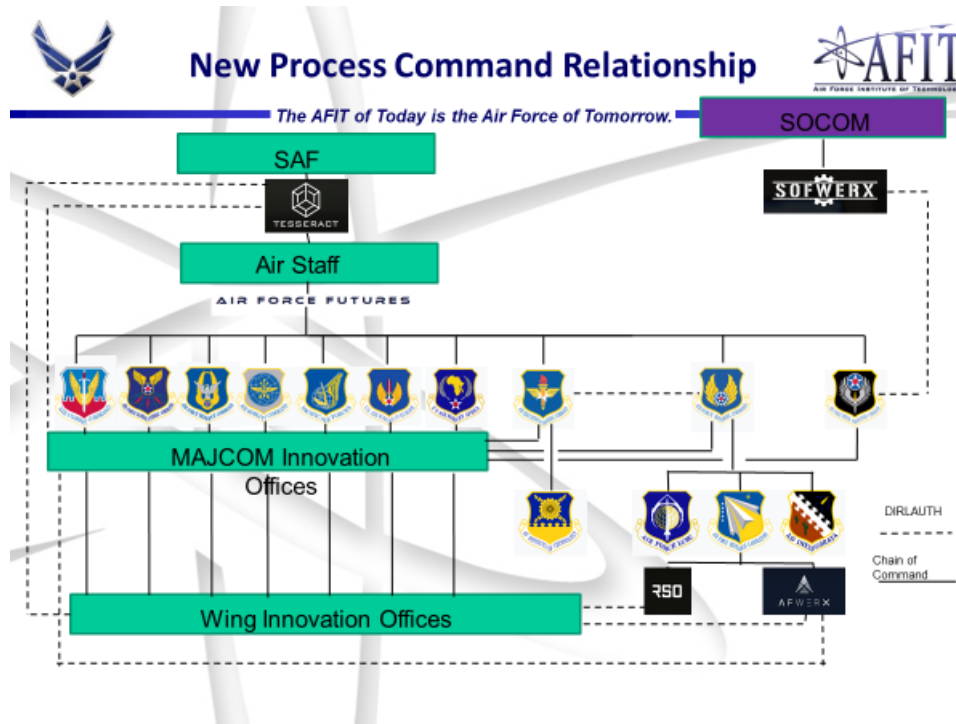


Figure 5-4

Specifically, both Tesseract and AFWerx should attend the AMC Innovation Office’s validation meeting that meets quarterly. Tesseract and AFWerx would then know the current ranking of Wing Innovations according to the AMC staff and can begin to coordinate with their respective partners. Also, AFWerx meets with Wing Innovation Labs once a month to share ideas and news with AFMC. AMC’s innovation lab and the A5 directorate should attend as well. These simple fixes to the current process will expedite the timeline and make it possible for Wing Innovations to be validated and reach a fielding recommendation.

Recommendations for Future Research

This paper examined how to get Wing Innovation Lab projects through the validation and testing phases of the acquisitions process and funding for fielding was not considered due to scope of the paper. This assumption was made to control the scope of the paper. However, future research should examine the Air Force's Emerging Requirements budget processes. In other words, how should the Air Force use the congressional appropriated *Emerging Requirements Budget* to fund the fielding of wing innovations?

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14. ABSTRACT The United States' ability to innovate and quickly field new technology will directly affect the outcome of the next near-peer war. The country that has the advantage is the one that can innovate and adapt the quickest. The United States' military acquisition process is outdated and heavily bureaucratic. To expedite the urgent requirements timeline, the Department of the Air Force established a flagship innovation program, called "Spark Tank" in 2017. The Spark Tank program involved creating individual innovation labs at each Wing, NAF and MAJCOM. To date, no Wing Innovations have been fielded or incorporated beyond the wing level. This paper analyzes three specific case studies to determine the "How can AMC staff and AMC OT infrastructure be aligned to provide effective MAF-wide fielding support to AMC Wing Innovation Labs?". The results analyze the ability for Wing Innovations to be validated by a 3-digit AMC office and reach a fielding recommendation by the Test and Evaluation directorate of AMC. The findings in this paper will allow AMC to field Wing Innovations across the MAJCOM in an expedited manner, meeting General Brown's intent of <i>Accelerate Change or Lose</i> .					
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