# Evaluating Pilot Progression in Army Special Operations Aviation after the Withdrawals from the Iraq and Afghanistan Wars

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# Executive Summary

## Problem of Practice

During the first decade of the Global War on Terrorism (GWOT), Army Special Operations Aviation (ARSOA) recruited from a large population of combat-experienced Army aviators. However, following the troop drawdowns in Iraq and Afghanistan, ARSOA experienced a decrease in the average total rotary wing flights hours of incoming recruits. The decrease in aviation experience caused ARSOA leadership to question if recruiting policies and training programs needed to change to adapt to the changing experience levels of ARSOA recruits.

## Project Questions & Findings

**Project Question #1:** Does a decrease in the flight hour level of ARSOA recruits increase the duration of Basic Mission Qualified (BMQ) to Fully Mission Qualified (FMQ) progressions?

Finding #1: There is not a statistically significant relationship between incoming aviator flight hours, previous years of aviation experience, or number of previous deployments and the duration of BMQ to FMQ progression.

**Project Question #2:** If there is an increase in the duration of BMQ to FMQ progressions, what organizational changes can ARSOA make to mitigate the adverse effects to operational readiness associated with less experienced recruits and longer progressions?

Finding #2: From 2012 to 2021, the duration of BMQ to FMQ progressions decreased from 20 months in 2012 to 17 months in 2021.

Finding #3: From 2012 to 2022, the flight hours of the average ARSOA recruit decreased from 1200 to 950 hours, or approximately 20%, and the average years of previous aviation experience of the average ARSOA recruit increased from 5 to 6 years.

## Recommendations

1. ARSOA should identify metrics that characterize a successful unit member.
2. ARSOA should specify which knowledge, skills, and behaviors (KSBs) are most desirable in a recruit.
3. ARSOA should create a single data management system with qualitative and quantitative data that is accessible to key leaders.
4. ARSOA should establish a data management and analysis section within the organizational staff.

# Organization Context

## Partner Organization

The partner organization for this study is an organization within Army Special Operations Aviation (ARSOA). The organization provides Special Operations Aviation (SOA) support to joint, coalition, and interagency partners in support of national strategic objectives at the direction of the Secretary of Defense (SECDEF) and the Commander of the United States Special Operations Command (USSOCOM). ARSOA provides rotary wing aviation support to the ground forces throughout SOCOM such as Naval Special Warfare Groups (NSWG), Special Forces Groups, Air Force Special Tactics Squadrons (STS), Marine Special Operations (MARSOC), and a variety of other elements that operate under the Commander of USSOCOM.

## ARSOA's Assessment and Progression Timeline

ARSOA recruits from a pool of experienced aviators throughout the Department of Defense (DoD). This practice contrasts from the hiring processes of conventional Army aviation units who receive junior aviators directly from flight school. Aviators who desire to serve in ARSOA apply by submitting various documents including flight records, evaluation reports, and a resume. If deemed to be a suitable recruit, applicants are invited to attend a week-long assessment with the organization. The assessment process consists of a variety of tests that evaluate a potential recruit's physical fitness, psychological health, personality attributes, and skills as an aviator. If recruits pass assessment, they are enrolled in "Green Platoon," where they are taught advanced flight maneuvers. Upon graduation from Green Platoon, recruits are assigned to operational units as "Basic Mission Qualified" (BMQ) aviators. BMQs then begin progression to "Fully Mission Qualified". If aviators fail to progress to progress to FMQ within

a prescribed timeline, they are removed from ARSOA and pursue employment elsewhere within the DoD.

## Problem of Practice

From 2012 to 2022, ARSOA experienced a decrease in the average flight hour level of incoming aviators. This decrease in experienced applicants presented potential training, resourcing, risk mitigation, and personnel management challenges for leaders within the organization.

Two decades of sustained combat operations in support of the Global War on Terrorism (GWOT) in Iraq and Afghanistan provided ARSOA with access to an abundant supply of combat-experienced aviators with high levels of rotary wing flight hours. ARSOA developed programs of instruction (POI) designed to teach experienced aviators to conduct highly advanced helicopter maneuvers in challenging and austere environments. However, the worldwide drawdown of deployed military forces that culminated with the complete withdrawal from Afghanistan in August 2021 represented a transition point for ARSOA leaders.

During the 2010 to 2015 timeframe, it became apparent to ARSOA leaders that incoming aviators lacked the combat and flight experience that the organization became accustomed to during the peak years of the GWOT. ARSOA leaders perceived that the reduced experience of incoming aviators increased progression timelines and extended the time required to advance aviators from Basic Mission Qualified (BMQ) to Fully Mission Qualified (FMQ). Some ARSOA leaders suspect that a decrease in aviation experience caused second and third order effects such as increased aviation accident rates, less force projection in the form of combat-capable crews, fewer hours flown, and an overall decrease in the quality of the product that

ARSOA provided to its Special Operations customers. Without adequate research, analysis, and potential alterations to recruiting or training policies, the organization could experience significant long-term personnel management impacts. Additionally, a change to POI or other personnel management policies without validating the existence of the perceived problems as identified by ARSOA leadership could cause unanticipated harm to the organization.

ARSOA developed courses of action that ranged from alterations to the training POI to adjusting training plans in operational units to react to the changing experience level of incoming aviators. To inform the decision making, ARSOA tasked the unit personnel officer to gather data from the recruitment office and existing data within the personnel section. The unit began cataloguing the flight hour level of incoming aviators in 2012. However, there remained a significant data gap for a variety of other metrics after the aviator arrives to the unit such as aviator progression timelines, corresponding aviation accidents, and previous years of aviation experience. Further exacerbating the problem is the need to provide enhanced training for junior aviators in a resource-constrained environment with increased fiscal scrutiny.

## Project Questions

There are two project questions in this study:

1. Does a decrease in the flight hour level of ARSOA recruits increase the duration of Basic Mission Qualified (BMQ) to Fully Mission Qualified (FMQ) progressions?
2. If there is an increase in the duration of BMQ to FMQ progressions, what organizational changes can ARSOA make to mitigate the adverse effects to operational readiness associated with less experienced recruits and longer progressions?

## Project Stakeholders and Potential Contributions

ARSOA is the primary stakeholder for this project. The results will directly inform the programs of instruction (POI), personnel management, and training policies for ARSOA. However, the decrease in experience levels of incoming personnel is not isolated to a single DoD organization. Adjacent organizations throughout SOCOM, the DoD enterprise, and any government or civilian organization that habitually recruits from a pool of experienced applicants for positions in highly skilled professions stand to gain insight from this project.

# Literature Review

This literature review consists of three sections; the importance of work-specific experience in highly skilled professions, current DoD talent management efforts, and quantitative methods to scrutinize experience. The first section of the literature review explores research into the importance of professional experience in professions outside of the military and the relevance of the research to ARSOA to provide a framework to guide the project. Next, the literature review examines the ongoing efforts within the multiple military branches to develop and implement processes to improve talent management. Exploration of the efforts of the joint enterprise helps to inform potential methods and programs that can be applied to a similar problem set. Lastly, the quantitative nature of this project and the complicating factors of studying a federal organization necessitates deliberate methodology and survey mechanisms that are accessible to federal employees using federal computer systems. The third section of this literature review examines methodologically similar studies of federal organizations.

## Does Experience Matter in Highly Skilled Professions?

Although there is a gap in military literature that discusses the significance of experience in highly skilled professions, there are numerous articles that explore the topic across many professions in the civilian sector. These pieces of literature are directly applicable to the research conducted for ARSOA by assessing whether experience matters in highly skilled professions and how best to recruit and retain desirable employees.

In 2000, the National Research Council (NRC) published a report designed to connect research findings with teaching practice in classrooms. The report found that experts do not only possess a depth of knowledge of their subject matter, but also the ability to "conditionalize" their knowledge into a connected a usable format (Committee on Developments in the Science of

Learning, 2000). The report studied experts in chess, physics, mathematics, electronics, and history. The study found that foundational knowledge is more significant to pattern recognition and problem solving, two traits that are valued in highly skilled aviators, than once believed. The NRC determined that foundational knowledge improves the ability to learn and retain new information, and therefore facilitates progression to an expert status.

The NRC report built upon the work of Adrian De Groot who studied chess masters compared to less experienced, yet very skilled, junior chess players. De Groot found that it is impossible for humans to identify and analyze all possible moves in a chess game. Thus, he evaluated players on their ability to evaluate potential moves (depth) and their ability to exhibit realistic expectations for their capabilities (breadth) (De Groot, 1965). De Groot found that chess masters and skilled junior chess players exhibited the same amount of breadth and depth in their chess moves. However, chess masters consistently made better moves than their less experienced counterparts. Thus, De Groot concluded that experience does matter in chess because experienced chess masters gained the ability to develop a better solution. However, De Groot's research focused on chess players who gained expert status and not on the identification of hiring practices that could be implemented to identify high performing recruits for highly skilled professions that increase the likelihood of recruits attaining expert status.

Despite De Groot's findings, there is reason to question how relevant experience is to hiring practices in an age when technology advances rapidly. The research of Schmidt and Hunter into predicative validity will provide the primary framework for this project. In the 1930s and 1940s, the Theory of Situational Specificity dominated recruiting strategy research. The Theory of Situational Specificity suggested that small differences in professions made it impossible to use predicative validity in evaluating the success of potential employees. In this

context, predictive validity refers to predicting how well an applicant will perform in an occupation during the hiring and assessment process. However, reassessment in the 1970s found that many of the studies that supported Situational Specificity suffered from sampling error due to small sample sizes. Therefore, meta-analysis with an emphasis on sound quantitative methodology became prevalent (Schmidt and Hunter, 1998).

Schmidt and Hunter found that a combination of general mental ability (the cognitive ability to solve complex problems) tests and work sample tests are the greatest assessment tools for highly complex technical jobs, such as being an aviator. The same study found that once service in highly complex professions extended beyond five years, the benefit of experience becomes less significant when compared to the cognitive ability to solve the problems demanded by the profession (Schmidt and Hunter, 1998). This research will help to inform data collection by examining the prior aviation experience of aviators entering ARSOA. Namely, to determine if there is a noticeable different in the success of aviators with less than five years of experience and those with greater than five years of experience prior to assessing for selection into the unit. Moreover, the analysis will examine the applicability to GMA and work sample tests for use by ARSOA during the assessment process.

Further research built upon the work of Schmidt and Hunter applied the findings to practical application in the private sector. In the technological era, years of experience in an industry does not guarantee proficiency (Sullivan, 2000). While it is true that experience does not guarantee a superb performance, experience within highly technical professions deserves consideration. In his work, Sullivan did not suggest that experience unimportant. He suggested that experience is merely a single factor among a variety of factors to consider when recruiting and hiring employees and that experience becomes less significant as the advancement of

technology increases (Sullivan, 2000). Thus, this piece builds upon the work of Schmidt and Hunter by suggesting that not only is a skills-based assessment and a GMA useful in hiring practices, but also that the GMA should be weighted more heavily.

The work of Sullivan as well as Schmidt and Hunter focused on professions within the technological sector, machinists, welders, and carpenters. Although these professions are like that of an ARSOA aviator, they differ by lacking the instinctive response capabilities of a pilot, and the years of training required to react instinctively. A recent study on the significance of experience on the performance of professional soccer players helps to inform the exploration of experience and performance in highly skilled professions that require quick reaction time (Bykova and Coates, 2020). Successful helicopter pilots and professional athletes share the attributes of intuitive decision making when time is short, and the ability to conduct detailed analysis when time permits. The study found that a combination of intuition and deliberation when performing in high tempo situations is a critical characteristic of highly skilled athletes. When given the time to make an informed decision, problem-solving methodology proved to be most important. When being pressed by an oncoming defender, experience, and the ability to react instinctively proved to be of the utmost significance. Most significantly to this project, the study found that the ability to rapidly read patterns in the game is one of the most valuable traits in highly skilled athletes (Bykova and Coates, 2020). A common phrase in Army aviation is "he/she was holding on to the stabilator," meaning the pilot fell behind the movement of the aircraft and became unprepared to anticipate an upcoming event. The literature suggests that the ability to identify patterns and anticipate upcoming events is an important trait in skilled athletes, just as the work of the NRC and De Groot found that pattern recognition is a valuable attribute of experts.

Endsley further explored the concept of pattern recognition as it relates to situational awareness (SA) using the Situational Awareness Global Assessment Technique (SAGAT). Endsley's research is unique among the research studied because it specifically addresses available tests to evaluate pilot SA. SAGAT is a tool used to evaluate the SA of individuals based on occupational requirements that consists of timed occupation-specific questions. Of note, Endsley's study utilized fixed wing fighter pilots, and not rotary wing SOF aviators. Endsley's study found a ten to one mean SA score of experienced pilots compared to junior aviators. Endsley attributed the increased SA of experienced pilots to attention sharing, spatial skills, perceptual speed and pattern matching ability (Endlsey, 2017). This finding connected the work of De Groot, the NRC, and Bykova and Coates who all suggested that experience is an important measure of future job performance with that of Schmidt and Hunter and Sullivan who suggested that GMA and skills-based testing are more relevant. This relationship suggests that while experience does matter in recruiting employees for highly-skilled professions, GMA and skills-based tests should be integrated into the assessment process.

## What is the DoD Doing in the Post-GWOT Era to Improve Talent Management?

There is a gap in the literature that specifically addresses how military elements can recruit soldiers, sailors, marines, or airmen for service in a highly specialized profession, such as SOF aviation. However, the need for change in how the DoD places employees in positions is widely acknowledged by senior leaders within each of the respective military branches (Odierno, 2015 and United States Marine Corps, 2021). Under current Army and Marine Corps policy, this acknowledgement is limited to developing resumes for intra-branch movements and position changes. There is not identifiable literature that examines if, and how, Army SOF aviation needs

to change recruiting or training practices to reflect a shift in the experience level of incoming recruits following the troop drawdowns in Iraq and Afghanistan.

The number of US troops deployed to Iraq decreased precipitously from 170,000 in 2007 to 4,000 in 2012. Similarly, the number of US troops deployed to Afghanistan peaked at approximately 100,000 in 2011 before decreasing to 10,000 in 2015 (Congressional Revenue Service, 2021). Figures 1 and 2 below depict the rises, peaks, and subsequent drawdowns in both Afghanistan and Iraq.

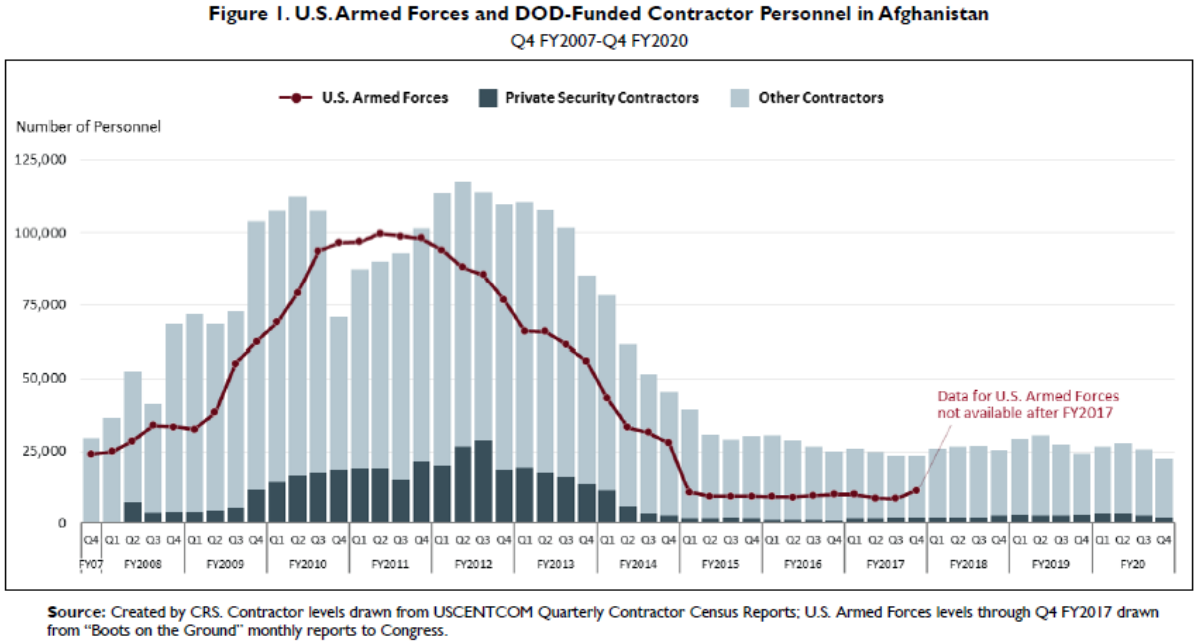
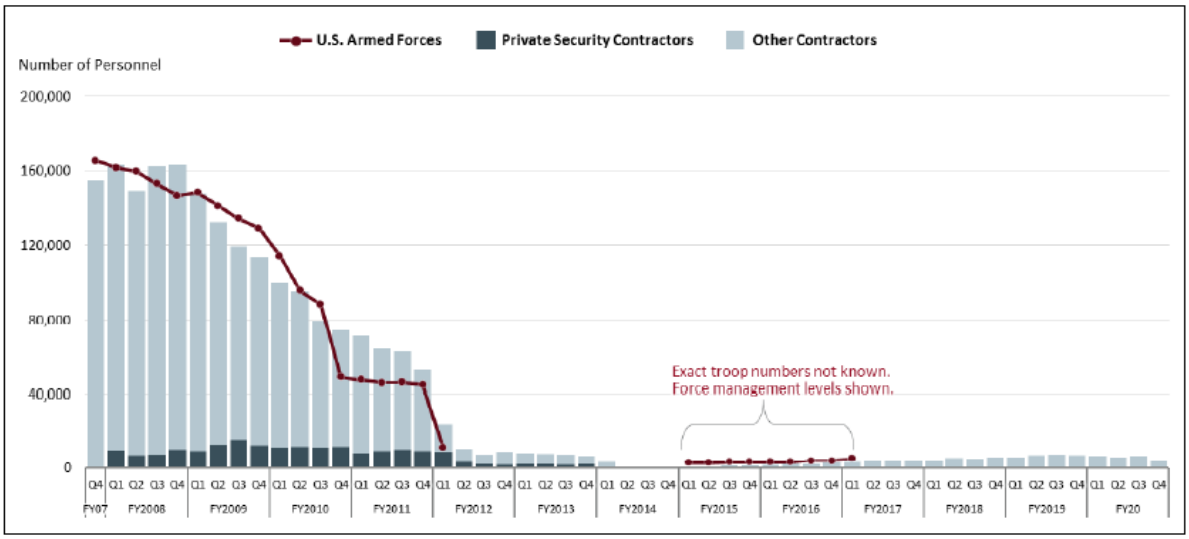



Figure 1: US Armed Forces and DoD-Funded Contractors in Afghanistan 2007-2020

**Figure 2. U.S. Armed Forces and DOD-Funded Contractor Personnel in Iraq (2007-) and Syria (2018-)**
(Q4 F72007-Q1 FY2014; Q1 FY2015-Q4 FY2020)




**Source:** Contractor levels drawn from USCENTCOM Quarterly Contractor Census Reports and depicts the number of DOD-funded armed private security contractors as a subset of all reported DOD-funded contractors; U.S. Armed Forces levels from Q4 FY2007-Q1 FY2012 drawn from "Boots on the Ground" monthly reports to Congress. U.S. Armed Forces levels for Q1 FY2015-Q1 FY2017 drawn from White House semiannual "War Powers Resolution Report" to Congress.

Figure 2: US Armed Forces and DOD-Funded Contractors in Iraq and Syria 2007-2020

The troop-level drawdowns marked a transition for the Army from a force comprised of combat experienced soldiers throughout all ranks and positions to a force of disparate experience between senior leaders and inexperienced junior employees with minimal combat experience. Following the drawdowns, the Army began focusing efforts on talent management designed to place people in positions that best suited their careers and the military based on unique individual skills or background to improve retention and leverage existing experience. In 2015, former Army Chief of Staff General Ray Odierno stated that the Army is approaching talent management "from a position of advantage, with the most combat-seasoned force the Army has ever had" (Odierno, 2015, p. 13). At that time, the Army possessed the most combat experience in its history. In 2023, the Army is no longer the same combat-experienced force, introducing a new challenge to Army leaders with respect to talent management.

In 2020, the Army introduced the Assignment Interactive Module (AIM) as part of its Army Talent Alignment Process (ATAP). AIM is an online program that allows Army Officers

to submit resumes and apply for positions and allows unit commanders to select officers based on both their preferences and their skills. In future iterations of AIM, the program will include knowledge, skills, and behaviors (KSBs) selections to easily identify job applicants with specific attributes. AIM decentralized the assignment process by providing soldiers and unit commanders greater buy-in (Greenberg et. al., 2020). Although the application process is commonplace in the civilian sector, AIM is revolutionary for the Army. However, the scope of use limits AIM. Because it is used by the entire Army and all the varying military occupational specialties (MOS) within the Army, AIM lacks the specificity and personal feel that SOF organizations seek in the recruiting and selection processes.

In 2021, the Marine Corps instituted a similar program to AIM titled US Marine Corps Talent Management 2030. Like AIM, the Marine Corps Talent Management Program is not recruiting focused, but retention and placement focused. The goal of the program is to specify talents or capabilities that are required for jobs, and then to identify Marines who possess the requisite skills. In his article outlining the goals for the program, the Commandant of the Marine Corps emphasized the need for a data-driven approach to talent management (United States Marine Corps, 2021). The end state for the Marine Corps is to place their employees in positions that they are better suited for to incentivize Marines to continue to reenlist. Furthermore, the Marine Corps' program shares the goal of decentralizing personnel management and affording both servicemembers and commanders greater buy-in.

The establishment of programs designed to refine talent management processes is not isolated to the services (Army, Air Force, Navy, Marines). Organizations within USSOCOM are beginning to institute organization-level programs tailored to the needs of specific SOF elements. For example, the U.S. Army John F. Kennedy Special Warfare Center and School (SWCS)

recently began developing and implementing Talent Management Profiles (TMPs) to manage incoming recruits to Special Forces, Psychological Operations, and Civil Affairs. The TMP consists of five parts: behavioral, interpersonal, peer rankings, physical performance, cognitive, and personal input (Roberson et al, 2022). In its current form, the TMP uses the same methodology as the Army's AIM and the Marine Corp's Talent Management model by creating a resume for use by Special Operations command teams to hire potential servicemembers for specific positions. However, the process also gathers data so that SWCS can adjust the training pipeline as necessary to reflect the strengths and weaknesses of incoming recruits. The concept of the TMP is directly applicable to ARSOA, although the exact process does not necessarily translate. There are significant differences in the desirable attributes of a SOF operator and a SOF aviator. However, the creation of the TMP reflects SWCS's acknowledgement of the school's need to change recruiting and training based on the change in experience levels of incoming recruits.

## What Quantitative Methods Are Available to Researchers to Analyze Experience?

The Congressional Revenue service conducted research that studied troop and contractor levels deployed to Afghanistan and Iraq from 2007-2020. This research provides insight into the rise and fall of troop levels deployed to these theaters from 2007 to 2020 and demonstrates how the war efforts shifted between the two countries. The study showed that troop levels in Iraq peaked at approximately 170,000 in 2007, and then fell drastically to 4,000 in 2012. Alternatively, troop levels in Afghanistan peaked at 100,000 in 2011 and fell to 10,000 by 2017. Of note, Central Command (CENTCOM), the Geographic Combatant Command (GCC) responsible for the middle east, stopped reporting troop levels in 2017 (Congressional Revenue Service, 2021). These figures connect to the research from the first section of this literature

review, which questions if experience matters, by pinpointing specific years during which aviators are less likely to possess combat experience. For example, based on the data in Figures 1 and 2, after 2012 ARSOA recruits are unlikely to possess Iraq combat experience and after 2017 ARSOA recruits are unlikely to possess Afghanistan combat experience. Thus, the work of the Congressional Research Service may help to determine if flight experience in Iraq is more valuable than flight experience in Afghanistan, or if either are significant in predicting progression timelines. If ARSOA experienced a significant increase in the duration of BMQ to FMQ progressions from 2012-2017, then it is possible that combat experience in Iraq is a valuable contributor to aviator proficiency. The same possibility is true for combat experience in Afghanistan if ARSOA experienced a significant increase in the duration of BMQ to FMQ progressions from 2017 onward. Furthermore, the research offers useful examples of how linear regression can be used to depict multiple variables in a meaningful way.

As the work of the NRC, De Groot, and Bykova and Coates analyzed the importance of experience in highly skilled professions by analyzing professional soccer players, the work of Charlson demonstrated an effective method to use statistical analysis to explore the importance of experience by analyzing medical professionals. Charlson's work examined the difference in resource utilization between medical residents and attending physicians (Charlson, 2004). The researchers accomplished this by analyzing the number of outpatient and inpatient treatments and associated costs recommended by both attending and resident physicians. The total cost associated with each attending and resident physician provided a single variable that could quantify the cost of an individual medical doctor's recommended treatment. The comparison of costs associated with the diagnoses of new and seasoned medicals doctors is reminiscent of a study of junior and experienced aviators utilizing aviation metrics such as total flight hours and

progression timelines. While the Congressional Revenue Service study effectively used linear regression, Charlson relied heavily on descriptive statistics to depict trends. Furthermore, Charlson utilized multivariate models to control for numerous factors in the study. Particularly, Charlson used the PROC GENMOD function in SAS to control for correlation within individual physicians. Although SAS will not be used for this project, a function like PROC GENMOD is a useful tool for controlling for correlation among specific aviators.

The use of qualitative methods of analyzing the effectiveness of programs and employees is common within the DoD, as well as in the civilian sector. However, historically large-scale government qualitative projects are implemented after the publication of government policy documents that justify the need for the conduct of the project. For example, in 2015 Congress mandated the creation of the National Commission on the Future of the Army (NCFA) with the primary purpose of providing unbiased recommendations to Congress to address ongoing tension and disagreement between the Active Duty and National Guard Components of the Army. However, the NCFA identified multiple tertiary objectives to include evaluating the size of the Army compared to the Navy and Air Force when evaluated through a shift in strategic priorities from the Middle East to the Pacific (Dubois and Cancian, 2016). The NCFA coincided with the troop drawdowns in Iraq in 2012 and Afghanistan in 2015. Consequently, the NCFA final report made multiple recommendations, to include developing a pilot program to facilitate new Army recruitment methods and the creation of a unified personnel management system that allow greater commander and employee buy-in. The latter recommendation served as the catalyst for AIM and ATP. The former resulted in the creation of the Army's Consolidated Recruiting Program (Ham et. al., 2016).

In 2022, the Assistant Secretary of the Army, Manpower and Reserve Affairs commissioned the RAND corporation to evaluate the Consolidated Recruiting Program (CRP). The NCFA and the RAND report are indicative of motivations throughout all the military services to modernize and evolve recruiting programs. However, while other literature focused on talent management from a retention framework, this research approaches talent management from a recruiting framework.

RAND conducted a quantitative and qualitative research of the CRP that utilized a mixed methods approach consisting of both statistical analysis and focus groups. The RAND report provides insight into how to develop specific and measurable variables for use in statistical analysis when studying a large, personnel-driven organization. The RAND study used total enlistment contracts, high-quality contracts, and Army enlistment contracts as a percentage of total DoD contracts signed within a specific geographic area to evaluate the CRP. With these variables, RAND used a combination of descriptive statistics and T-tests to analyze the data. Uniquely, the RAND corporation defined a p-value less than .10 but greater than .05 as marginally statistically significant. Although the authors of the RAND study did not state why they chose to add an additional measure of statistical significance outside of $p<.05$, it may provide a useful tool when evaluating similar data using statistical methods (Orvis et. al., 2022).

The RAND corporation determined that the CRP did not improve Army recruiting in a statistically significant way (Orvis et. al., 2022). However, the qualitative data yielded from these focus groups meshed effectively with the statistical quantitative data to provide a well-rounded definition of a high-quality recruit. As it pertains to ARSOA, similar methodology can be used to define both quantitatively and qualitatively the requirements for a potential employee

to be considered a high-quality recruit.  However, a mixed methods approach is outside of the resource capability of this research project.

# Project Questions

## Conceptual Framework

This project is framed conceptually by the concept of predicative validity used by Schmidt and Hunter in their research of experience in highly-skilled professions. This framework is appropriate for the study because it is among the few available in existing literature that specifically studies the validity of professional experience in subsequent performance in highly skilled professions. Key aspects of the study are the flight-hour level of ARSOA recruits, years of experience that ARSOA aviators possessed prior to recruitment to the organization, and corresponding metrics of success such as progression timelines and the number of aviation accidents. Through this framework, and building upon the work of Sullivan, Bykova, and Coates, the NRC, and De Groot it can be determined if incoming flight-hour level is an effective metric to determine success within ARSOA. Furthermore, given that ARSOA is unable to affect the flight-hour level of incoming recruits, the framework offers the opportunity to identify areas of emphasis that ARSOA can focus on to improve operational readiness.

## Project Questions

Two project questions guided this study:

1. Does a decrease in the flight hour level of ARSOA recruits increase the duration of Basic Mission Qualified (BMQ) to Fully Mission Qualified (FMQ) progressions?
2. If there is an increase in BMQ to FMQ progressions, what organizational changes can ARSOA make to mitigate the adverse effects to operational readiness associated with less experienced recruits and longer progressions?

# Project Design

## Data Collection Plan

The project subdivided data collection into two categories: survey and existing data. ARSOA is a data-driven organization that compiles annual data on a variety of variables. However, changes in software, metrics, and organizational priorities from 2012-2022 caused incongruities in data collection. Thus, a survey filled the gaps in existing data. The project used the Qualtrics program to conduct the survey. The design of the survey minimized the number and complexity of question to encourage maximum participation. All ARSOA Rated Crewmembers (RCMs) received an invitation to voluntarily (not command directed) participate in the survey using existing email distribution lists.

## Data Collection Tools and Instruments

Data compilation for the four independent variables and single dependent variable for use in the creation of a predictive model took place using existing ARSOA data in conjunction with various staff sections and using a survey issued specifically for this research project. The sources and tools used for data collection are outlined in Table 1 below. Close coordination took place with the ARSOA recruiting office and personnel management section to utilize existing data for the flight hour level of incoming ARSOA recruits from 2012 to 2022. This data played a pivotal role in the project by providing flight hour data for the entire ARSOA population from 2012 to 2022, thus allowing for comparison between the entire population and survey respondents using conditional means and variation analysis.

It is critical to note that data collection for this study is limited to Rated Crewmembers (aviators) and does not include Nonrated Crewmembers (staff, crew chiefs, and maintenance personnel). The survey served as the data source for FMQ to BMQ timelines, total number of

flight hours prior to assignment to ARSOA, years of aviation experience prior to assignment to ARSOA, and total number of deployments (non-ARSOA). The survey did not capture duration of combat deployments to avoid applying arbitrary timelines to justify what constitutes a valid combat deployment. However, the fact that the summation of combat experience is not accounted for in this study is a limitation.

The compilation of annual Aviation Class A to D accidents occurred through use of an existing data management program operated by ARSOA as well as by survey. Class A-D accidents are reportable to the ARSOA Commander and are catalogued. However, the survey provided the highest accident experienced by survey respondents. A comparison between the total aviation accidents experienced by ARSOA each year and the highest aviation accident experienced by a survey respondent validated the survey accident responses. The same data management program that provided the total ARSOA aviation accidents each year also provided the data of ARSOA's total annual flight hours ARSOA from 2013-2022. Total annual flight hours provide insight into the operational tempo (OPTEMPO) of ARSOA, and provided context for aviation accident and duration of BMQ to FMQ progressions.

Variables, sources, and associated timelines are shown in Table 1 below.

| Variable | Type of Variable | Source | Timeline |
|---|---|---|---|
| BMQ to FMQ Progression Timeline | Dependent | Survey | 22NOV22-15DEC22 |
| Flight Hours Upon Arrival | Independent | Survey/Recruiting Office | |
| Years of Aviation Experience Upon Arrival | Independent | Survey | |
| High Aviation Accident Experienced | Independent | Survey | |
| Total Number of Deployments | Independent | Survey | |
| Annual Aviation Accidents Class A to D | Independent | Existing Data Management Program | 01NOV22-15DEC22 |
| ARSOA Annual Hours Flown | Independent | Existing Data Management Program | 01NOV22-15DEC22 |

Table 1: Data Collection Tools and Timelines

The survey consisted of five questions. The survey questions are outlined in Table 2 below. The survey format and questions are also outlined in Appendix A.

| Survey Question | Answer Options |
|---|---|
| What year did you complete Green Platoon? | Yearly selections from 1990-2022 |
| How many years of aviation experience did you have as an RCM prior to attending Green Platoon? | Numerical selections from 1-30 |
| How many total military rotary wing hours did you have as an RCM prior to attending Green Platoon? | Blank selection for input of hours |
| If you are an FMQ, how many months did it take you to progress from BMQ to FMQ? | Numerical selections from 1-48, with additional selection for greater than 48 months, and people who are not yet an FMQ. |
| How many separate combat deployments did you have as an RCM prior to attending Green Platoon (total deployments, not duration of time deployed)? | Numerical selection from 0-20 |
| While serving as a member of ARSOA, what is the highest class of aviation accident you have experienced as a rated crewmember? | Class Selections from A to D as well as “I have not had an accident” |

Table 2: Survey Questions

As shown in Table 1, data collection took place simultaneously because only the survey yielded previously uncollected data. All other data came from existing data provided by ARSOA.

The work of Schmidt and Hunter informed the first and second questions of the survey. Using these questions, it could be determined if there is a specific range of previous aviation experience or hour level which equates to success as an ARSOA aviator. Furthermore, the fifth question of the survey built upon the work of the NRC, De Groot, and Bykova and Coates by determining if years of experience could yield instinctive reaction to prevent aviation accidents.

## Data Triangulation

Data obtained from existing records showed ARSOA trends in total flight hour, previous flight experience, and aviation accidents from 2012-2022. Total annual hours flown, and accident data showed if there is an increase in aviation accidents when controlling for the flying hour program (as the number of hours flown increases, it is likely that the number of aviation accidents also increases). Similarly, the average flying hour experience of recruits showed if there is a positive or negative trend to better inform the subsequent statistical analysis conducted using the survey data.

## Data Analysis

The survey provided the data for statistical analysis, as all other available provides only annual totals and averages without adequate sample size. Statistical analysis measured relationships between the dependent variable and respective independent variables in order as outlined in Table 1. First, graphics of the conditional means of each of the variables depicted trends in each variable over time. Next, statistical analysis between each IV and the DV identified the strength of relationships between the variables. The types of variables and the corresponding statistical analysis are shown below in Table 3.

| Variable | IV/DV | Unit of Measure | Method of Statistical Analysis |
|---|---|---|---|
| FMQ to BMQ Progression Timeline (in months) | Dependent | Months (Ratio) | • Conditional Means<br>• Linear Regression<br>• K-Fold<br>• Monte Carlo |
| Flight Hours Upon Arrival (in hours) | Independent | Hours (Ratio) | |
| Years of Aviation Experience Upon Arrival (in years) | Independent | Years (Ratio) | |
| Total Number of Deployments (Non-ARSOA) | Independent | Total Number (Ratio) | |
| Annual Aviation Accidents Class A to D (highest class experienced) | Independent | Highest Class Experienced (Interval) | |
| Annual Aviation Accidents Class A to D | Independent (not used in model) | Total Number of Accidents (Interval) | Conditional Means |
| ARSOA Annual Hours Flown | Independent (not used in model) | Total Number (Ratio) | Conditional Means |

Table 3: Variables and Statistical Analysis Methods

As shown in Table 3, all variables are continuous except for aviation accidents, which is discrete. However, in lieu of the large size of the sample (n=437), analysis of aviation accidents employed the same statistical analysis as did continuous variables. First, conditional means depicted trends of each variable chronologically. Next, a density plot of BMQ to FMQ progression timelines confirmed a normal distribution for use in a linear regression model. Linear regression consisting of each of the four independent variables provided p-values to show statistical significance and to build a predictive model. A p-value of .05 determined statistical significance of independent variables. Lastly, the linear regression's $r^2$ and subsequent K-fold and Monte Carlos analysis evaluated the accuracy and precision of the predictive model for use in predicting the duration of BMQ to FMQ progressions in the future.

## Analytical Concerns

Sampling error is the greatest analytical concern in this study. A disproportion of survey respondents for a given year could induce error associated with an inadequate sample size. Variable validity evaluation took place within the context of time to identify trends within the context of changing DoD strategic policy, such as troop levels deployed in Iraq and Afghanistan. Furthermore, the study utilized professional progression as the dependent variable, which inherently takes time to occur. The evaluation of the accuracy of the survey occurred within the framework of total favorable recruits within a given year. However, professional attrition and inadequate time to progress induced error into this study. For example, although the period for this study is 2012 to 2022, it is likely that many members of ARSOA who began service in 2012 either retired or pursued employment with other organizations. Similarly, BMQ to FMQ progression constitute the first project question of this study. However, the scope of the timeline of the study ensured that some survey respondents have not yet progressed to FMQ because sufficient time has not yet progressed, and not because of a negative trend within ARSOA.

To assess the validity of the survey respondent size compared to the total population, the project used conditional means and variance of previous flight hour experience and total population. For example, the ARSOA recruiting office provided data with the number of favorable recruits for each year from 2012 to 2022. The comparison between the number of favorable recruits for a given year and the number of survey respondents from the same year to provide insight into the validity of the number of survey respondents within a given year. However, a disproportionate variation in this data does not invalidate the survey results for a given year due to attrition within the population. For example, fewer survey respondents who graduated green platoon as the duration of time increases is expected because of retirement and

termination. The attrition rate of a given green platoon graduation year over time is unknown and thus cannot be accounted for in the quantitative analysis. Therefore, the study placed greater emphasis on comparison between the favorable assesses and survey respondents from 2015 to 2022.

# Data Collection and Analysis

## Demographics of Survey Respondents Compared to Total Favorable Recruits

Based on the data provided by the ARSOA recruiting office, 768 soldiers favorably assessed from 2012-2022. Aviators comprised 430 of the 768 favorably assessed soldiers. There are 437 aviators currently serving in ARSOA. The survey yielded 231 total responses, constituting a 52% response rate when compared to the total aviator population. After limiting the survey data to those who graduated green platoon between 2012 and 2022, a survey sample of 177 respondents remained (n=177). Figure 3 below shows the size of the total population (n=430) of favorable recruits compared to the number of survey respondents (n=177) during the same time and Table 4 shows the percentage of survey respondents as a function of total favorable recruits each year from 2012 to 2022.

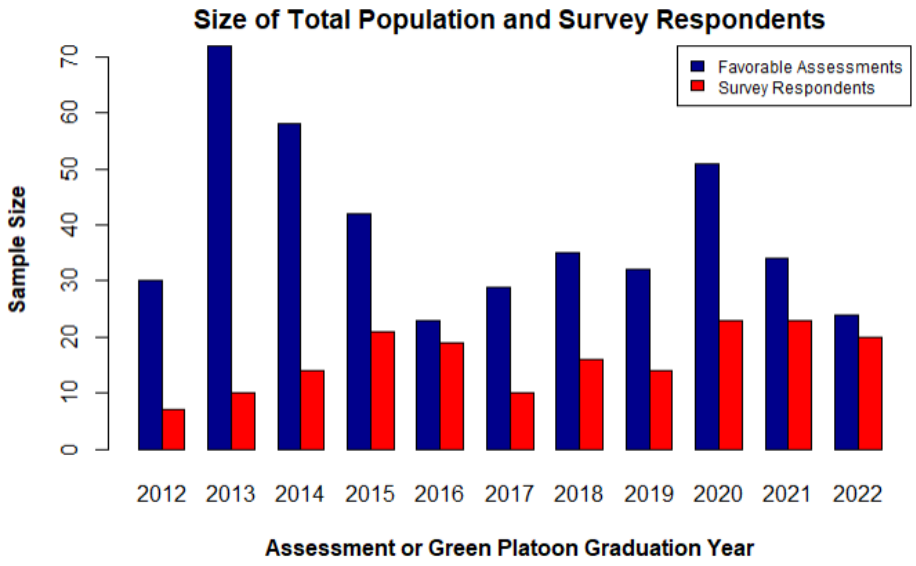



Figure 3: Size of Total Favorable Recruits and Survey Respondents (2012 to 2022)

| Year | Total Favorable Recruits | Survey Respondents | Percentage |
|---|---|---|---|
| 2012 | 30 | 7 | 23% |
| 2013 | 72 | 10 | 14% |
| 2014 | 58 | 14 | 24% |
| 2015 | 42 | 21 | 50% |
| 2016 | 23 | 19 | 82% |
| 2017 | 29 | 10 | 34% |
| 2018 | 35 | 16 | 51% |
| 2019 | 32 | 14 | 46% |
| 2020 | 51 | 23 | 45% |
| 2021 | 34 | 23 | 67% |
| 2022 | 24 | 20 | 83% |

Table 4: Percentage of Survey Respondents to Total Favorable Recruits (2012 to 2022)

Figure 3 and Table 4 show that the survey responses from green platoon graduates from 2012 to 2014 is low when compared to total recruits during the same time (14% to 24%). However, aside from sampling error, there are several possible reasons from why this discrepancy occurred. As mentioned in the analytical concerns section, attrition and retirement could account for the discrepancy in respondents and total recruits from 2012 to 2014. These factors cannot be accounted for with the data available and do not invalidate the survey data. Nonetheless, the data from 2012 to 2014 is not excluded in lieu of the considerations associated with attrition and retirement. Despite the seemingly low response rates of green platoon graduates from 2012 to 2014, other data, such as average incoming flight hours, can be used to show if the sample is representative of the overall population.

In contrary to the number of survey respondents from 2012 to 2014, Table 4 shows that survey responses from green platoon graduates from 2014 to 2022 are high when compared to the total amount of favorable recruits during the same time (46% to 83%), except for 2017 which

yielded a 34% response rate. These response rates yield high confidence in the validity of the survey data relative to the total population.

Figure 4 depicts the average flight hours of survey respondents and the total population from 2012 to 2022.

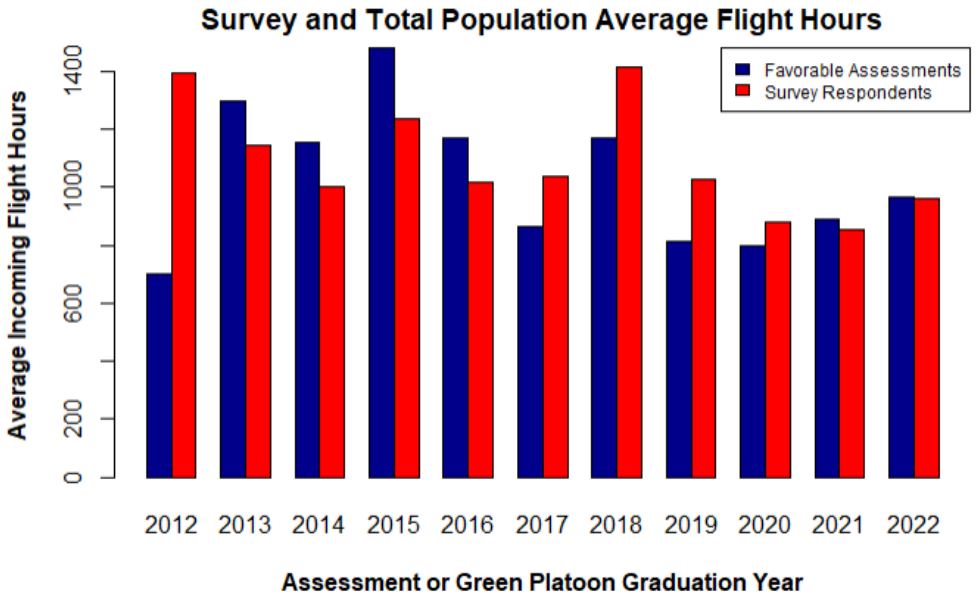



Figure 4: Survey and Total Population Average Flight Hours 2012 to 2022

Figure 4 shows significant differences in the flight hour of survey respondents and favorable recruits from 2012 to 2016. However, from 2017 to 2022, the flight hour data between the survey respondents and favorable recruits is proportional relative to the survey sample size and total population. Table 5 below shows the mean and standard deviation of flight hour level for both the total population and survey sample.

| Data Source | Mean | Standard Deviation |
|---|---|---|
| Total Population | 1086 | 736 |
| Survey Sample | 1041 | 700 |

Table 5: Flight Hour Mean and Standard Deviation of Total Population and Survey Sample

As shown in Table 5, the survey sample had a slightly lower average flying hour (approximately 4% less) than the total population, however the difference is negligible. Thus, from Table 5 and

Figure 4 it is concluded that when accounting for attrition and retirement, the total sample size of survey respondents and the corresponding flight hours of the survey respondents are valid when compared to the same statistics for total favorable recruits.

## Flight Hour Level of Incoming ARSOA Aviators from 2012 to 2022

Figure 5 below shows the flight hours of every incoming ARSOA aviator from 2012 to 2022 with an average trend line based on data provided by the ARSOA recruitment office.

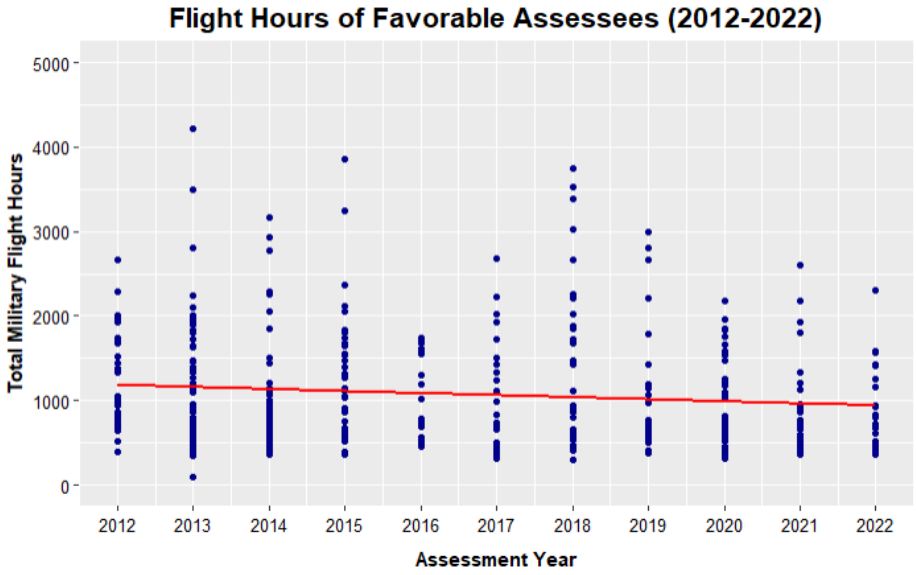



Figure 5: Flight Hours of Favorable ARSOA Recruits (2012-2022)

As shown in Figure 5, the average flight hour experience of incoming ARSOA aviators decreased from 2012 to 2022 from 1200 to 950 hours, a decrease of approximately 20%. Figure 6 depicts the average flight hours of the survey respondents with an average trend line from 2012 to 2022.

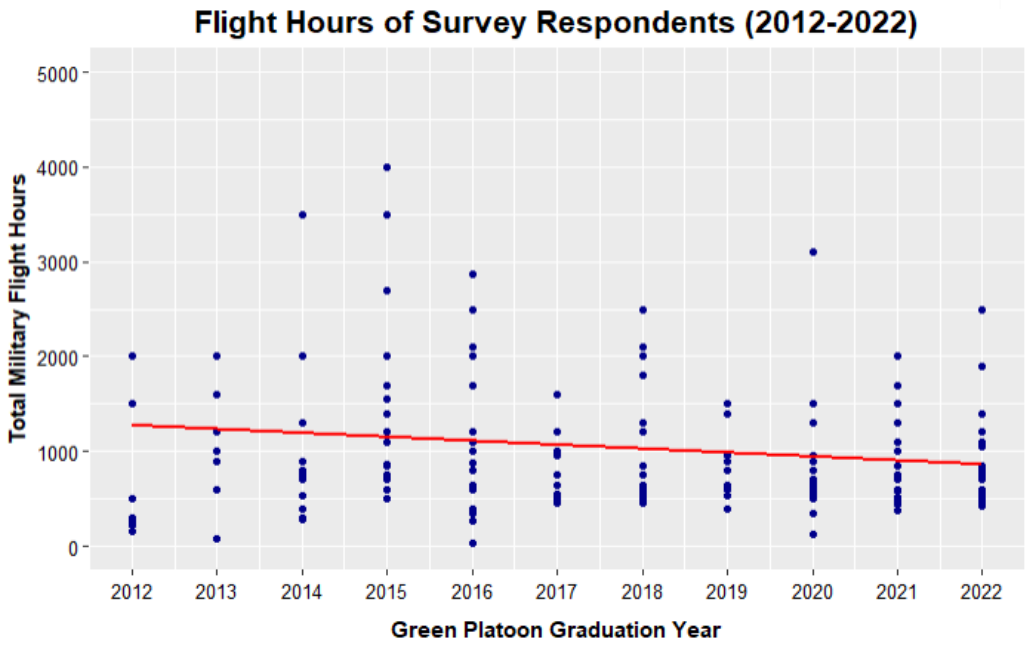



Figure 6: Flight Hours of Survey Respondents (2012-2022)

As shown in Figure 6, the average hour level of survey respondents decreased from 1250 hours in 2012 to 950 hours in 2022, a decrease of approximately 24%. This result suggests that, with respect to flight hour level, the survey sample accurately depicts the total population as depicted in Figure 5. There are observable trends in the variance of flight hours chronologically in Figures 5 and 6. Figure 7 depicts the variance of flight hours for survey respondents and the total population from 2012 to 2022.

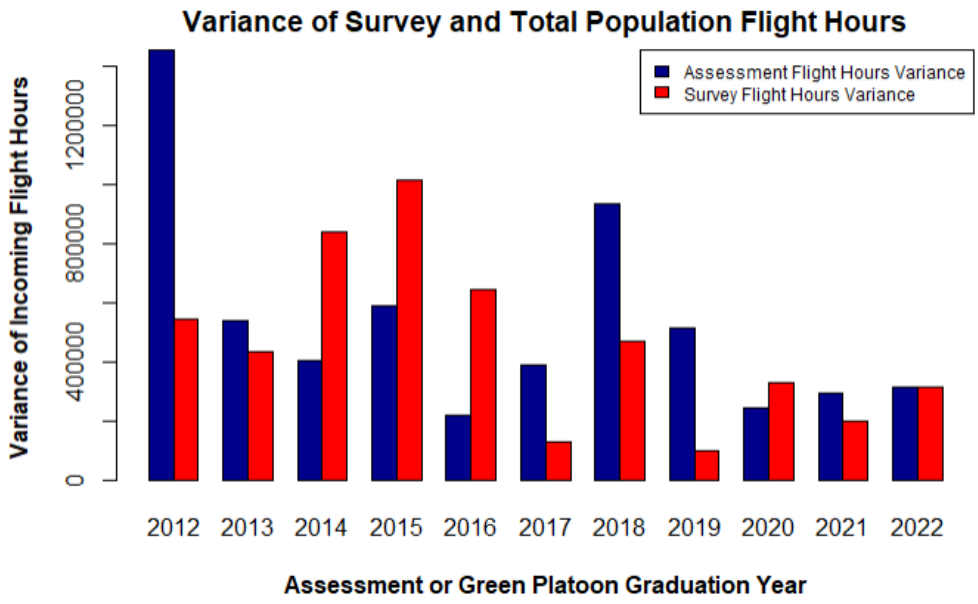



Figure 7: Variance of Survey Respondents and Total Population Previous Flight Hours

Figure 7 confirms that the variance in flight hours of incoming aviators generally decreased from 2012 to 2022. This finding supports the findings of Figures 5 and 7 by showing that as time progressed, the decrease in incoming flight hours became less likely to be attributed to random fluctuation.

Next, an analysis of previous years of aviation experience provided data to analyze the importance of years of experience when recruiting for highly skilled positions. Figures 8 depicts the years of previous aviation experience prior to assessing for survey respondents with a trend line from 2012 to 2022.

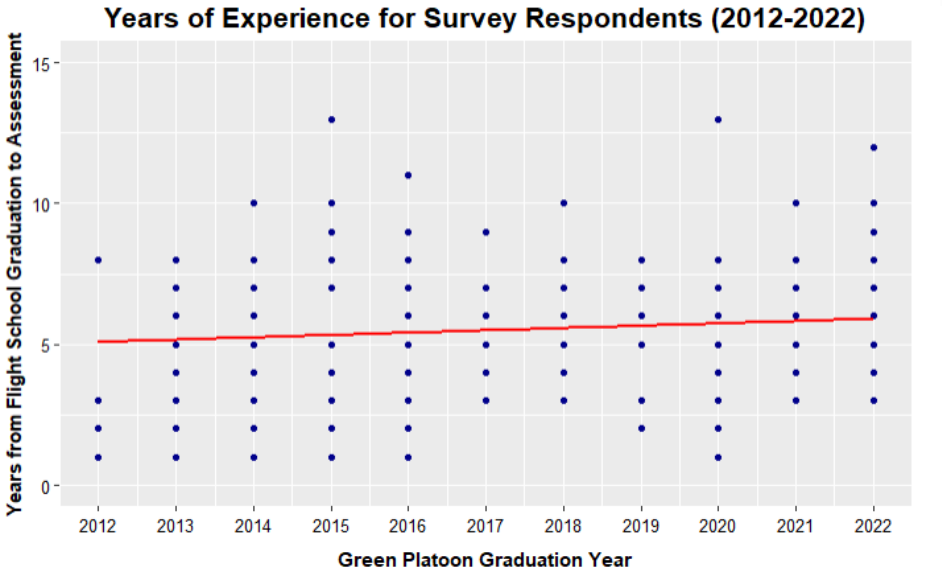



Figure 8: Years of Aviation Experience Prior to Assessing (2012-2022)

As shown in Figure 8, the previous aviation experience of the average recruit increased marginally during the time study from five to six years.

## BMQ to FMQ Progression Timelines from 2012 to 2022

Study of the duration of progression from BMQ to FMQ from 2012 to 2021 provided insight into the first project question of the study. The timespan studied decreased to 2021 for the purposes of this analysis because there are no FMQ survey respondents who graduated Green Platoon in 2022. When the survey sample size decreased to include only FMQs, 112 survey responses remained (n=112). Thus, 78 of the 190 survey responses from the timeframe studied are BMQs and have not yet progressed to FMQ. Figure 9 shows the average duration of BMQ to FMQ progression from 2012 to 2021.

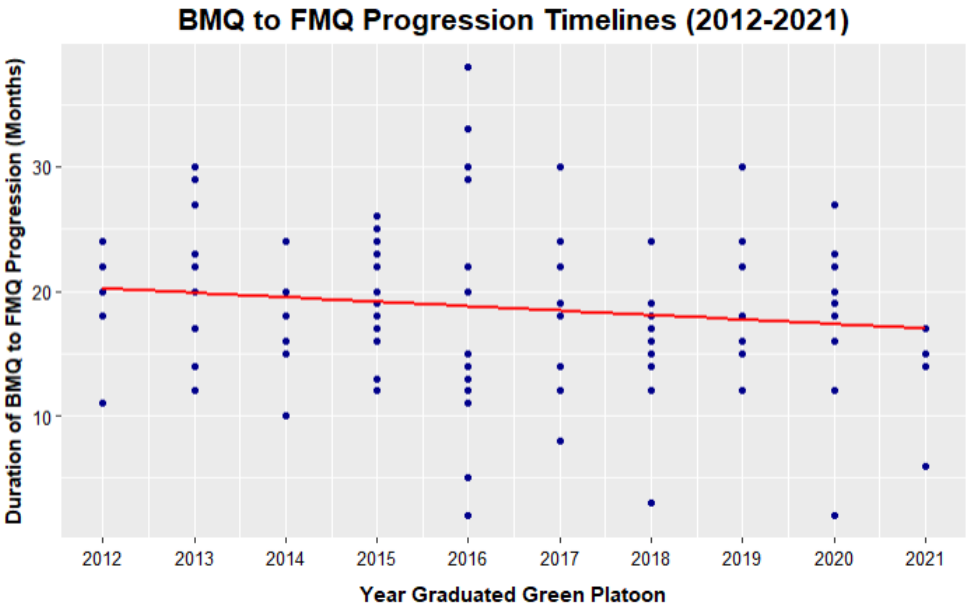



Figure 9: Duration of BMQ to FMQ Progression from 2012 to 2021

Figure 9 shows that despite a decrease in the average flight hour experience of incoming aviators from 2012 to 2021 as shown in Figures 5 and 6, the duration of BMQ to FMQ progressions decreased from 20 months in 2012 to 17 months in 2021. Figure 10 shows the conditional means for the duration of BMQ to FMQ progression by year.

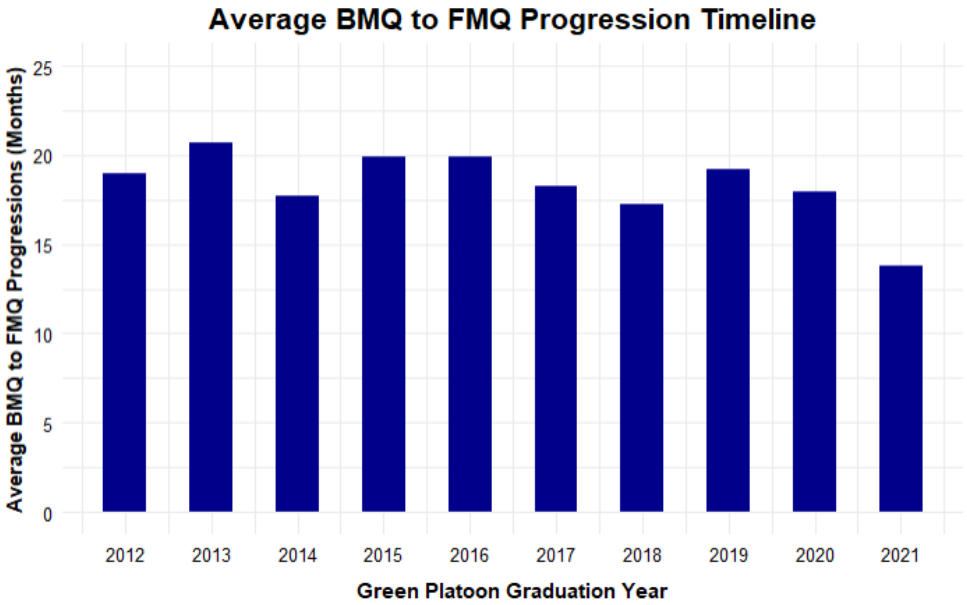



Figure 10: Average Duration of BMQ to FMQ Progression from 2012 to 2021

The data shown in Figure 10 is consistent with the linear plot in Figure 9, depicting a general decrease in duration from 2012 to 2021. Although the average duration of BMQ to FMQ progressions decreased from 2012 to 2021, abrupt increases occurred in 2013, 2015, and 2019.

The relationship between progression timelines in Figure 9 and years of previous experience Figure 8 are inconclusive with respect to their linear relationship. Figure 11 provides greater insight into the relationship of these two variables.

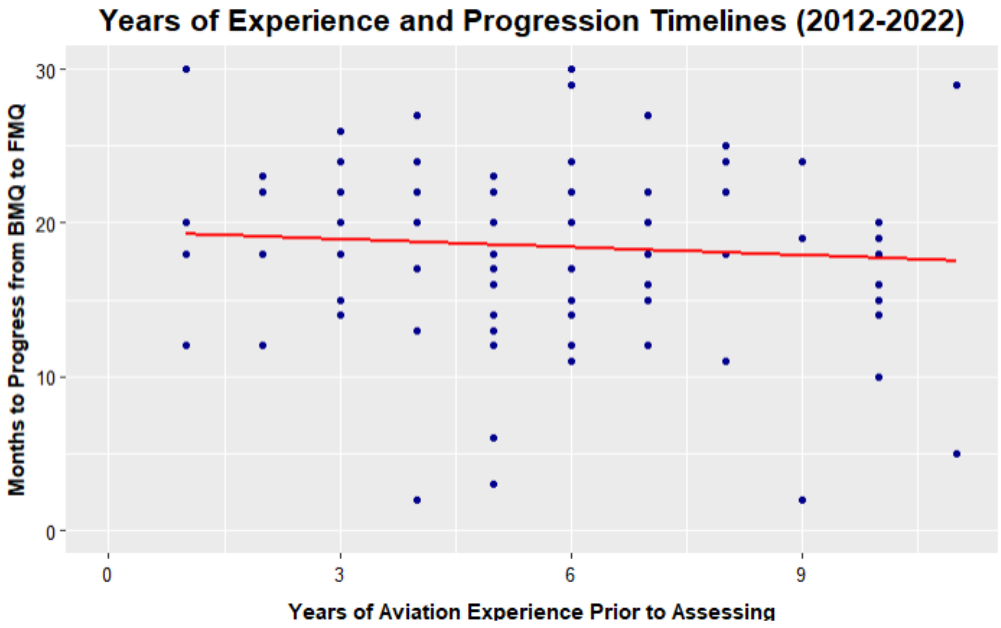



Figure 11: Years of Previous Experience and BMQ to FMQ Progression Timelines

As shown in Figure 11, the average progression from BMQ to FMQ changed negligibly with respect to years of previous aviation experience. On average, an additional 8 years of experience equates to only a 2 month decrease in BMQ to FMQ progression timelines. However, several outliers are observable in Figure 11, indicating that a bivariate regression may not accurately depict the relationship between these two variables. Thus, the analysis required multivariate regression to evaluate the strength of the relationship amongst other variables.

## Aviation Accident Analysis

In addition to the total flight hours of recruits, aviation accidents are another variable monitored by ARSOA leadership to determine the health of the organization, the proficiency of its aviators, and the effectiveness of the training program. Figure 12 below depicts the total number of aviation accidents by class of accidents from 2010 to 2022. Data is not available for 2015. The severity of the accident is indicated by the associated letter in descending order. Class A accidents are the most severe while Class D accidents are the least severe reportable accident.

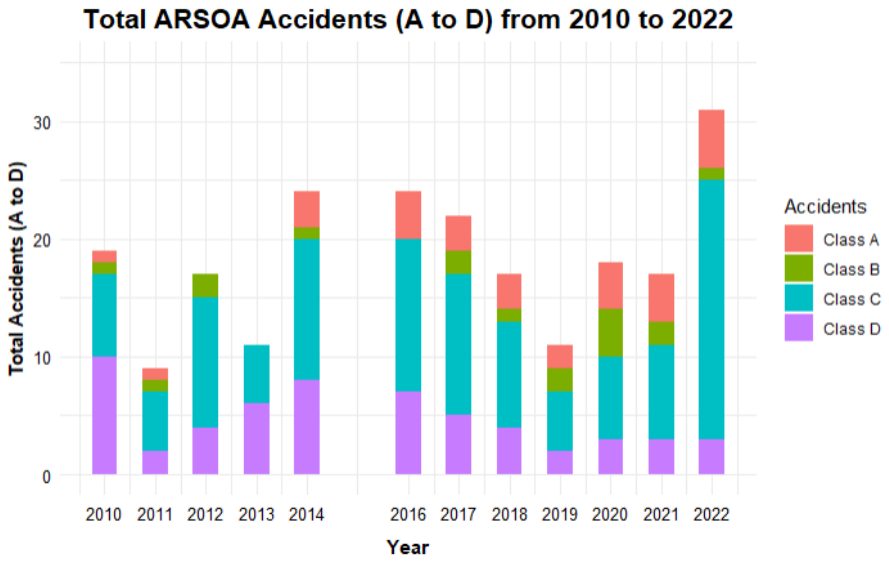



Figure 12: Total ARSOA Accidents (Class A to D) from 2010 to 2022

Figure 12 shows noticeable increases in ARSOA accidents in 2014 and 2022. Furthermore, Figure 12 shows that the class of accidents remained proportionally consistent throughout the timeframe studied, except for an increase in Class C accidents in 2022.

The survey asked respondents to identify the highest level of accident they've experienced while serving in ARSOA. Figure 13 below depicts the highest accident experienced by all survey respondents.

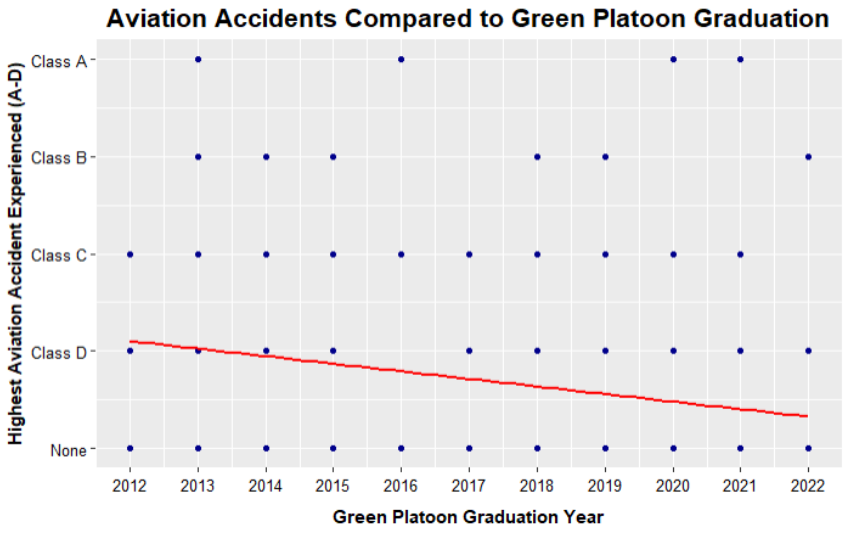



Figure 13: Highest Aviation Accident Experienced by Green Platoon Graduation Year

As shown in Figure 13, the likelihood of experiencing a severe accident increased with seniority. This finding is anticipated with the assumption that as time spent flying increases, it becomes more likely that an aviator will experience an accident. However, the number of survey respondents who never experienced an accident is surprisingly low. 129 of the 190 survey respondents, or 67%, never experienced a Class A to D accident. Figure 14 depicts the mode of the highest accident experienced by green platoon graduation year.

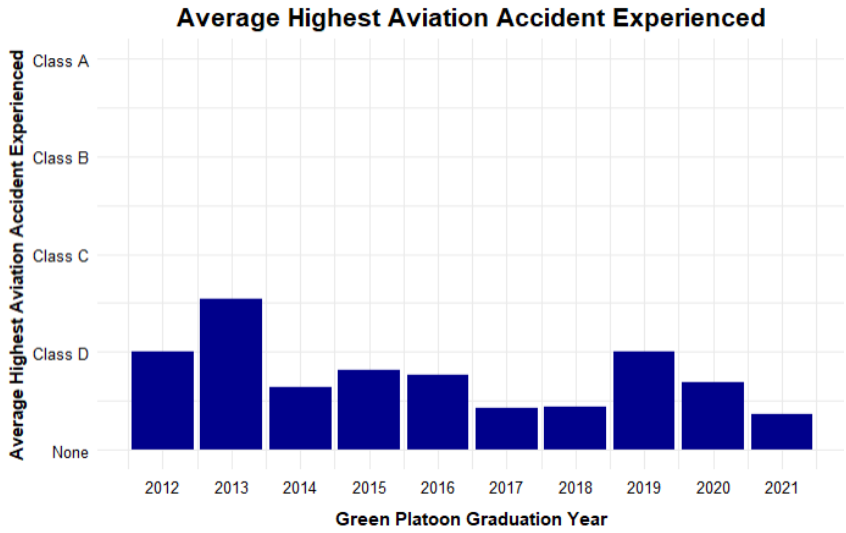



Figure 14: Mode of Highest Aviation Accident Experienced by Green Platoon Graduation Year

Figure 14 shows that the severity of aviation accident is not linear with seniority. There are two noticeable rises in the average accident level for green platoon graduates in 2013 and 2019. The results from Figure 12 validate the survey responses from Figure 14, considering that green platoon graduates in 2013 and 2019 experienced high than normal aviation accidents and the peaks for total ARSOA aviation accidents occurred in 2014 and 2022.

## ARSOA Flying Hour Program

Annual hours flown by ARSOA is not used in the linear regression model because only total hours annually are available, and not total hours flown by the survey respondents for a given year. However, comparison between total hours flown and the previous trend analyses provides context for the variable studied within the framework of annual organizational operational tempo (OPTEMPO). The source of flying hour data is limited to 2013 to 2021 by the organization's data management program. Figure 15 depicts total hours flown by ARSOA each year from 2013 to 2021.

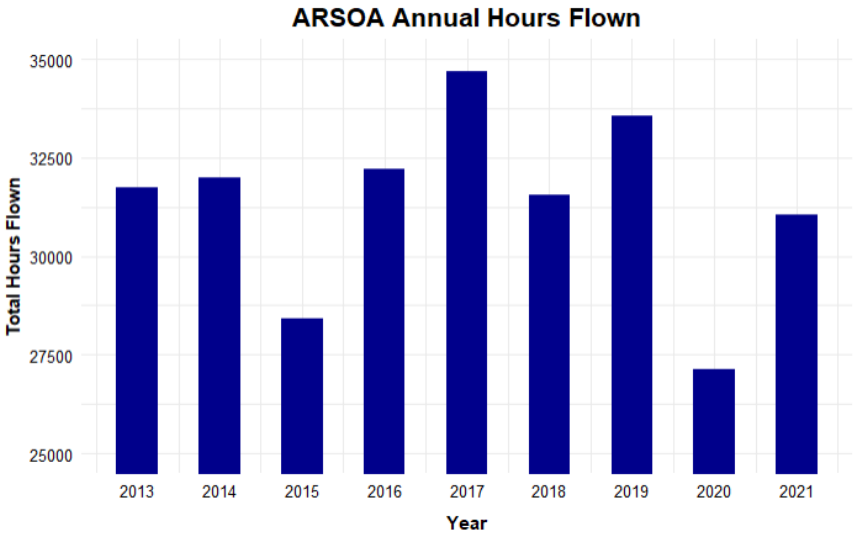



Figure 15: Total ARSOA Hours Flown from 2013 to 2021

Figure 15 shows an inconsistent number of hours flown from 2013 to 2021, ranging from 27,300 to 34,500 annual hours flown. The decrease in 2020 is attributable to the onset of the COVID-19 pandemic and the corresponding cancellation of significant training events and the onset of social distancing. Additionally, abrupt increases in total flight hours are observed in 2017 and 2019.

## Linear Regression of BMQ to FMQ Progressions

The study employed linear regression to build a model to predict the future duration of BMQ to FMQ progressions and to identify areas of focus for ARSOA. The density plot in Figure 16 below shows that BMQ to FMQ progressions for the 112 FMQs (n=112) that participated in the survey are normally distributed with the greatest percentage of progressions taking place between 17 to 21 months.

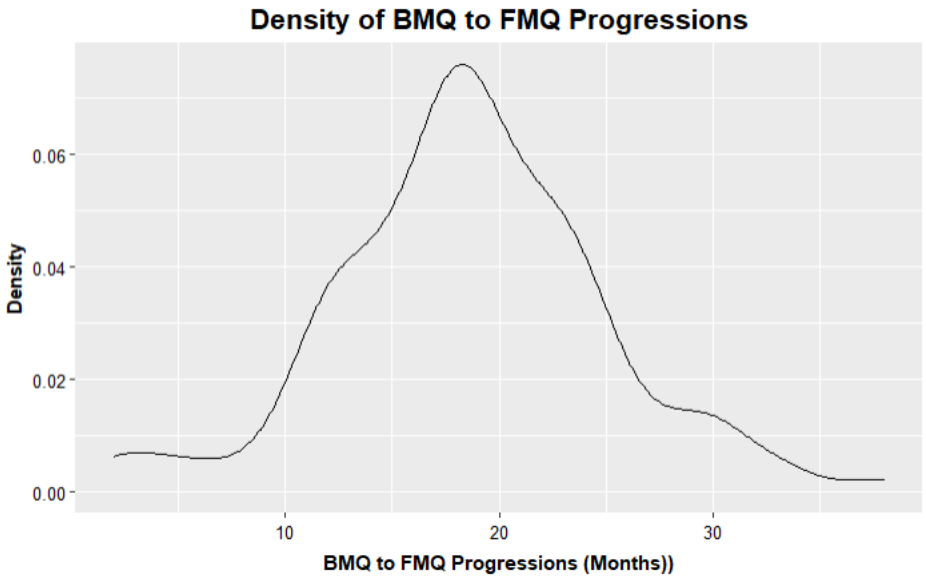



Figure 16: Density Plot of BMQ to FMQ Progressions

BMQ to FMQ progression (in months) served as the dependent variable for the linear regression model. The independent variables consisted of years of experience, total flight hours upon prior

to assessing, total number of deployments prior to assessing, and the highest level of aviation accident experienced. The results of the linear regression are shown in Table 6 below.

| Independent Variable | Estimate | Standard Error | P Value |
|---|---|---|---|
| Years of Previous Experience | -.282 | .359 | .434 |
| Total Hours of Recruit | 0.001 | .001 | .709 |
| Number of Previous Deployments | -.554 | .531 | .299 |
| Highest Accident Experienced | 1.138 | .541 | .038 |

Table 6: Result of BMQ to FMQ Progression Linear Regression Model

As shown in Table 6, the fitted regression model is not statistically significant and poorly accounts for the variation in the data ($r^2$=.033, F=1.895, p=.117). Of the four independent variables used, the only variable found to be statistically significant (p<.05) is highest aviation accident experienced.

## K-Fold and Monte Carlo Analysis

A K-Fold aided in the determination of the ability of the predictive model to accurately and precisely predict the duration of BMQ to FMQ progressions. The model utilized 20 K Folds. The RMSEs are low (generally distributed around 1-3%), as shown in Figure 17. However, there is a second rise in the density of RMSE at approximately 9%, indicating a high distribution.

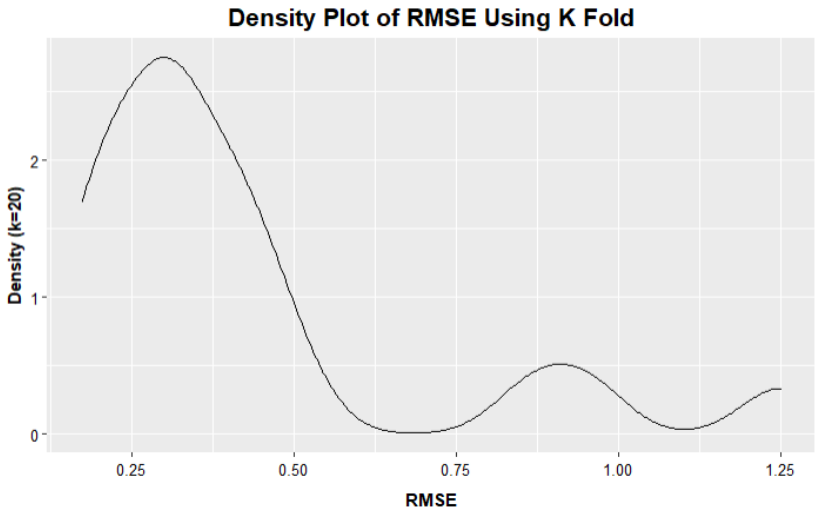



Figure 17: Density Plot of RMSE Using K Fold

The low RMSE of the high density of K Folds, roughly distributed from 1% to 3%, indicated a high degree of accuracy, while the high distribution ranging to approximately 9% indicated a lack of precision in the model. Thus, the use of the K Fold proved inclusive, requiring further investigation.

Next, a Monte Carlo simulation using 1,000 simulations showed two noticeable increases in RMSE density at approximately 3.5% and 5.5%, as shown in Figure 18.

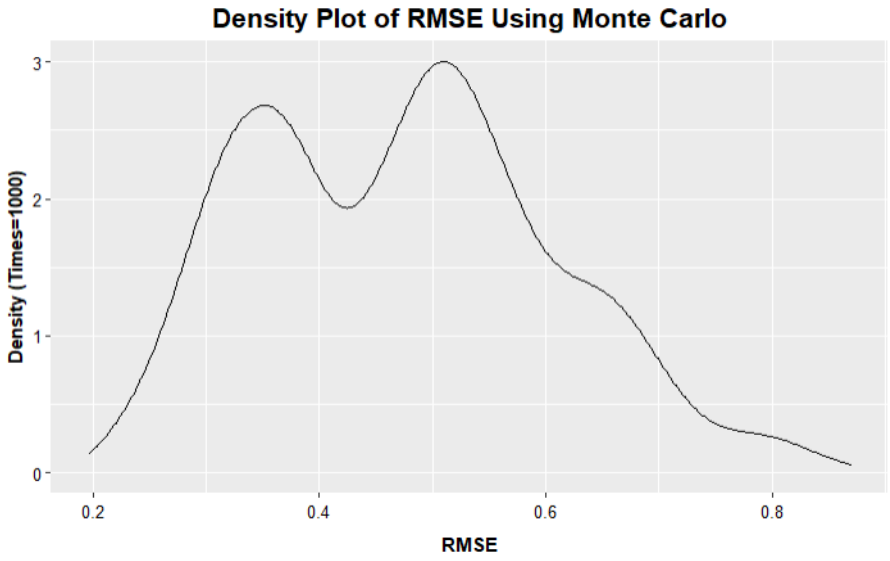



Figure 18: Density Plot of RMSE Using Monte Carlos Analysis

Although the Monte Carlo model indicated two distinct and noticeable densities of RMSE, the range of RMSEs differed significantly than identified in the K Fold model. An overlay of the two models demonstrated that the K Fold and Monte Carlo models did not corroborate each other.

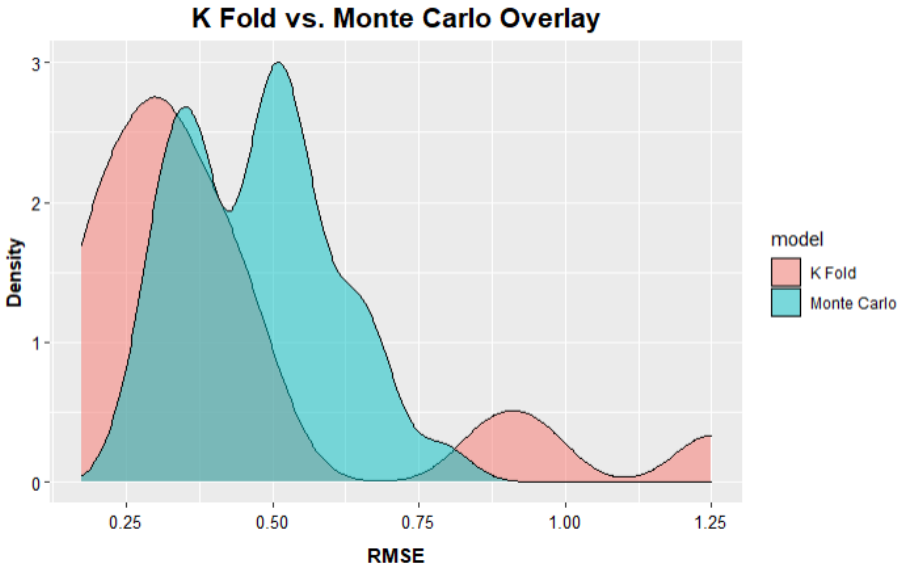



Figure 19: Overlay of K Fold and Monte Carlo Model

As shown in Figure 19, the K Fold and Monte Carlo overlays did not corroborate each other. While the Monte Carlo RMSE ranged from approximately 3.5 to 5.5%, the K Fold model RMSE ranged from approximately 1-3% and then again to 9%. Thus, Figure 19 showed that the linear regression model did not accurately predict the duration of BMQ to FMQ progressions.

# Findings and Recommendations

## Data Convergence

**Finding #1: From 2012 to 2022, the flight hours of the average ARSOA recruit decreased from 1200 to 950 hours, or approximately 20%, and the average years of previous aviation experience of the average ARSOA recruit increased from 5 to 6 years.**

This finding confirmed the suspicion within ARSOA that the average flight hour experience of incoming aviators decreased in the last ten years. Thus, the study concluded that from 2012-2022 ARSOA recruited lower-hour aviators with greater years of previous experience.

**Finding #2: From 2012 to 2021, the duration of BMQ to FMQ progressions decreased from 20 months in 2012 to 17 months in 2021.**

This provides initial indications that the answer to the first project question is no, a decrease in flight hours does not increase the duration of BMQ to FMQ progressions. The decrease in the average flight hours of incoming recruits compared to the increase in the average years of experience and the decrease in the average duration of BMQ to FMQ progression suggests that years of experience are more important than flight hours in decreasing the duration of BMQ to FMQ progression.

**Finding #3: There is not a statistically significant relationship between incoming aviator flight hours, previous years of aviation experience, or number of previous deployments and the duration of BMQ to FMQ progression.**

This finding answers the first project question by showing that the flight hour of incoming ARSOA recruits does into increase the duration of BMQ to FMQ progression. Although the average flight hours of the average incoming ARSOA aviator decreased, the decrease in flight hours did not contribute to an increase in the duration of BMQ to FMQ progressions in a

statistically meaningful way. In response to the second project question, the linear regression model found that the only variable with a statistically significant relationship to the duration of BMQ to FMQ progression is the highest average aviation accident experienced. Thus, previous numbers of deployments and previous years of experience do not warrant further inquiry by ARSOA. However, the use of K-fold and Monte Carlo modeling determined that the predictive model, which utilized aviation accidents as an independent variable, did not accurately or precisely predict the duration of BMQ to FMQ progressions. To develop a reliable and accurate predictive model, ARSOA should continue inquiry into unit retention and the occurrence of aviation accidents.

## Data and Literature Consistency

The project found that the average progression from BMQ to FMQ changed negligibly with respect to years of previous aviation experience. On average, an additional eight years of experience equates to only a two month decrease in BMQ to FMQ progression timelines. This finding contradicted the work of Bykova and Coates (2020), the NRC (2000), and De Groot (1965) which found that years of experience are crucial indicators of achieving expert status. However, these researchers studied experts established within in highly skilled profession, and not potential recruits. The work of Schmidt and Hunter (1998) better related to the project findings.

Schmidt and Hunter suggested that beyond five years of experience, GMA tests out prioritize work ability tests when recruiting for highly skilled professions. The project found that years of experience increased from five to six years during the time studied, suggesting that current ARSOA recruiting practices align with the work of Schmidt and Hunter, and that GMA or skills-based tests should be prioritzed within the ARSOA assessment process.

A purely quantitative methodology resulted in only one of four independent variables showing statistical signficance. This approach contrasted with the mixed methods approach used by the RAND Corporation in the evaluation of the CRP. Similar to the RAND study, the use of a mixed methods approach to include qualitative data in addition to the collected quantitative data could have provided value to the overall findings. A mixed methods approach also supports the integration of knowledge, skills, and behaviors (KSBs) as utilized in the Army's AIM systems. Schmidt and Hunter suggested prioritizing GMA tests or skills-based assessment and Sullivan suggested that personal attributes and congitive ability out-prioritize years of experience. A qualitative approach could help to fill the gaps in the quantitative data by adding data from KSB analysis currently in use by ARSOA, particularly as the rate of technology advancement increases within the organization. However, as shown by Endsley, GMA tests and skills-based assessment are not necessarily qualitative. Use of tests similar to the SAGAT by ARSOA could help to identify KSBs that specifically applies to ARSOA recruits.

## Limitations of Findings

The study found abrupt increases in the duration of BMQ to FMQ progressions, the highest average aviation accident experienced, and the ARSOA annual flying hour program in or near 2013, 2015, and 2019. For example, aviators who graduated green platoon in 2019 averaged a higher class of aviation accident than those who graduated green platoon from 2014 to 2018. The relationship of this finding to the drawdowns in Iraq in 2012 and Afghanistan in 2017 are worth subsequent investigation. Additionally, subsequent analysis should study the number of hours flown by an aviator in a single year in relation to the number of accidents each year compared to the average duration of BMQ to FMQ progression. This research could build

upon the ARSOA annual flying hour program to show relationships amongst aviation accidents and hours flown.

Utility of the statistical significance of the highest aviation accident experienced in relation to the duration of BMQ to FMQ progressions is limited as it is unknown whether the survey respondents experienced the aviation accident before or after progressing to FMQ. Therefore, it is unknown if experiencing a higher class of accident as a BMQ extends your progression to FMQ, or if an extended progression from BMQ to FMQ is statistically likely to cause a significant accident as an FMQ. However, the finding shows that either experiencing an accident as a BMQ or FMQ is related to the duration of BMQ to FMQ progression. Subsequent research should specify if an accident occurred as a BMQ or as an FMQ.

The use of a linear regression model limited this study, as only one of four independent variables showed statistical significance and the multivariate linear regression model poorly predicted the duration of BMQ to FMQ progressions. Subsequent research is required to identify and gather data on potential predictors. Furthermore, methods other than linear regression may be better suited to create a predictive model for the duration of BMQ to FMQ progressions. Specifically, data partitioning and subsequent modeling may be useful in evaluating BMQs and FMQs as separate populations, rather than as a single population. Additionally, the unknown rate of attrition caused a data gap that created uncertainty in the validity of survey response rates from green platoon graduates from 2012 to 2015 and potentially decreased the predictive value of the multivariate regression model.

Although the project found that the duration of BMQ to FMQ progressions decreased, the study did not determine the reason for the decrease or potential adverse consequences. The study found that previous years of experience, flight hours, and deployment experience did not affect

the duration of progressions in a statistically significant manner. Thus, the reason for the decrease remains unknown. Potential reasons include a decrease in standardization or requirements or the drawdowns from Iraq and Afghanistan, or low retention rates. For example, at face value, a decreased progression timeline could be perceived as a positive finding. However, its retention rates are low within the organization, then ARSOA likely decreased the requirements to progress to FMQ to meet personnel requirements, potentially resulting in the increased rate of aviation accidents. Further investigation is warranted by ARSOA to determine if the decrease in progression duration contributes to an increase are aviation accidents or other negative outcomes.

## Recommendations

This project resulted in four primary recommendations:

1. **ARSOA should identify metrics that characterize a successful unit member.** Possible metrics include the duration of BMQ to FMQ progression, length of service within the organization, aviation accidents experienced, flight hours prior to experiencing an accident, duration of time spent in a position prior to reassignment, and operational tempo. The study found that a single metric is not holistic enough to universally describe a successful unit member. Thus, the composite measurement should not be a single characteristic, but a combination of multiple metrics that accurately characterize a successful unit member. Furthermore, by using a combination of metrics, ARSOA will recruit a variety of potential employees with varying degrees of experience in different skill sets while still possessing the baseline requirements of a successful unit member.
2. **ARSOA should specify which knowledge, skills, and behaviors (KSBs) are most desirable in a recruit.** Once identified, a skills-based assessment that evaluates the

identified KSBs should be integrated into the ARSOA assessment process. The KSBs should be position-specific and not limited to aviators. Integrating a combination of KSBs with the metrics in recommendation #1 will align ARSOA's assessment process with existing literature and aid to fill the gaps in desirable personality traits in potential employees that quantifiable requirements, such as total flight hours, cannot identify.

3. **ARSOA should create a single data management system with qualitative and quantitative data that is accessible to key leaders.** This study utilized data from multiple sources and required the use of a survey to close existing data gaps. Specific data gaps included the duration of BMQ to FMQ progression, aviation accident data and attrition rates. Additionally, the study found that the range of data availability varied and that ARSOA collected no data on certain variables in various years. For ARSOA to progress as a data driven organization, similar studies will be conducted in the future to evaluate and reevaluate implemented changes. Improving existing data collection techniques will facilitate rapid and accurate assessments in the future.
4. **ARSOA should establish a data management and analysis section within the organizational staff.** The capabilities of the existing staff limit the ability of ARSOA to improve as a data-driven organization. Data research and analysis is tasked to existing ARSOA staff members as an additional duty. Current staff members have neither the expertise nor the time available to conduct detailed and accurate data analysis. The creation of a data management and analysis section could help to proactively provide professional data-driven recommendations to ARSOA leadership in a timely manner.

## Concerns for Organization to Consider When Implementing Recommendations

ARSOA constantly evolves, and thus the creation and implementation of adaptive personnel metrics for a successful ARSOA unit member are critical. When developing and identifying metrics and KSBs for ideal ARSOA recruits, the organization must develop an adaptive process that can be altered to reflect changing technology, equipment, and the KSBs of potential recruits. The process created should be like SWCS's adaptive TMP. Failure to do so could cause ARSOA to select recruits for assessment that do not possess the KSBs desired by the current mission.

Collection and compilation of valid and reliable data for multiple variables throughout the large organization will require buy-in from all ARSOA leaders. ARSOA is a DoD organization and thus participation can be command-directed. However, a certain degree of cultural change is required to obtain full organizational buy-in, particularly from influential members of ARSOA. The findings of this study should be distributed. When distributing the findings, leadership should place emphasis on the findings that contradict ill-informed organizational beliefs. This distribution will help to provide the reasons for personnel management change to obtain organizational buy-in.

## Responsibilities for Recommendation Implementation

The ARSOA personnel management officer should assume responsibility for the identification of metrics that identify a successful ARSOA unit member and for the identification of corresponding KSBs. The ARSOA operations officer should assume responsibility for the creation of a consolidated data management system and for the establishment of a data management and analysis section.

## New Competencies and Resources Needed

ARSOA is limited by the DoD in the total number of personnel assigned to the unit. Furthermore, the number of personnel, by position, assigned to each military unit is mandated by the DoD. Therefore, to create a data management and analysis section immediately ARSOA must remove positions from an adjacent section, which requires the acceptance of risk by ARSOA leaders in other areas. In the long term, submitting the application and receiving approval to add additional positions to an existing unit is a lengthy and heavily scrutinized process.

## Connecting Recommendations to Literature

The work of Schmidt and Hunter supports the current ARSOA practice of recruiting aviators with five to six years of previous aviation experience. Additionally, the work of Sullivan and Bykova and Coates found that although experience is important, it is not the most important trait in recruiting for highly skilled professions. Thus, the decrease in flight hour level of incoming recruits is not problematic, particularly because it was shown not to be statistically significant to the duration of BMQ to FMQ progressions. A possibility of these two findings is that experience is not a problem, however retention may be. If retention is low, then ARSOA is forced to generate FMQ faster to maintain the requisite personnel disposition, thus decreasing the duration of BMQ to FMQ progressions. The decrease in progression duration could cause an increase in aviation accidents in lieu of less experienced FMQs. However, this project also found that the number of annual aviation accidents are not increasing, except for 2022. Thus, further investigation of the relationship between retention, BMQ to FMQ progressions, and aviation accidents is warranted.

# Conclusion

From 2012 to 2022, ARSOA recruited aviators with decreasing flight hours, with more years of experience, and yet the duration of BMQ to FMQ progressions decreased. Furthermore, incoming flight hours, previous deployment experience, and years of experience did not impact the duration of an ARSOA aviator's BMQ to FMQ progression in a statistically meaningful way. These findings align with existing literature that suggests that although experience is important, beyond five years of experience, personality traits become the most significant factor in predicting performance in highly skilled professions. From 2012 to 2022 the average ARSOA recruit possessed between five and six years of aviation experience. Therefore, ARSOA should focus future recruiting studies on desired knowledge, skills, and behaviors (KSBs) in ARSOA. However, first ARSOA must define which KSBs are desired in ARSOA recruits.

The lack of available existing data presented the greatest limitation to this study. Although the ARSOA recruiting office collected detailed data on the flight hours of ARSOA recruits, the organization did not catalogue data on ARSOA aviators once they are assigned to the unit. In addition to desirable identifying and measuring desirable KSBs, ARSOA needs to identify and record quantifiable variables that could add to future studies and inform future human resource management decisions. For ARSOA to collect, catalogue, and analyze this data in a meaningful way, the organization must establish a data management and analysis section. With the establishment of a data management and analysis section and the identification of desirable KSBs, the ARSOA recruiting system could be changed or enhanced to recruit and retain the most desirable Army aviators despite changing experience demographics.

# Appendices

## Appendix A: Survey

*Survey Consent.* All data obtained from this survey is anonymous. There will be no personally identifiable information (PII) collected from participation in this survey or attached to any survey responses. The data obtained belongs to ARSOA and will be presented to ARSOA leadership to facilitate informed decision-making based on identified trends and qualitatively relationships. By submitting your answers to the following survey questions, you consent to allow your answers to be used for the purposes of the aforementioned analysis.

- ◯ I consent to the use of my anonymous answers from this survey for subsequent analysis.

*Question 1.* What year did you complete Green Platoon?

[ ▾ ]

*Question 2.* How many years of aviation experience did you have as an RCM prior to attending Green Platoon?

[ ▾ ]

*Question 3.* How many total military rotary wing hours did you have as an RCM prior to attending Green Platoon?

[ ]

*Question 4.* If you are an FMQ, how many months did it take you to progress from BMQ to FMQ?

[ ▾ ]

*Question 5.* How many separate combat deployments did you have as an RCM prior to attending Green Platoon (total deployments, not duration of time deployed)?

[ ▾ ]

*Question 6.* While serving as a member of ARSOA, what is the highest class of aviation accident you have experienced as a rated crewmember?

- ◯ I have not experienced a Class A to D accident as an ARSOA RCM
- ◯ Class D
- ◯ Class C
- ◯ Class B
- ◯ Class A

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