Financially Fully Mission Capable for the Long-Term? A Strategic Look at Military Retirement

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We create a retirement pay multiple (RPM) to assist military service members, at any point in their career, with determining whether they are on track to retire and maintain their living standard. This strategic financial planning tool helps these servicemembers assess whether they are fully mission capable (FMC) in their personal financial lives. The RPM incorporates myriad relevant financial factors, including taxes, Social Security, participation in the Department of Defense's recently established Blended Retirement System (BRS), actuarial life expectancy, inflation, and military pay growth rates. An associated online calculator also permits customization of these factors.

Keywords: financial planning, retirement readiness, military personnel, fully mission capable

INTRODUCTION

A fundamental responsibility of the Department of Defense (DoD) is to maintain mission readiness. Conventionally, military personnel think of readiness in terms of staying current with their job-specific training, obtaining and maintaining required certifications, and ensuring equipment and systems they use or maintain are fully mission-capable (FMC). While a focus on day-to-day tactical readiness is important, military personnel must also remain cognizant of longer-term strategic readiness. This requires putting plans in place today to ensure units are mission capable for the foreseeable future. These planning activities are undertaken at the DoD level and within each military branch using iterative planning processes. The National Defense Strategy, along with other strategy documents captures the results of these planning efforts.

Legislative and DoD leaders have long recognized the importance of investing in the individual warfighter to enhance longer-term readiness. These investments have materialized in many forms and have

become more critical as military jobs have become more technical. Through the decades, the military has spent vast sums on building barracks, family housing, and physical fitness facilities; funding extensive chapel and morale, welfare, and recreation programs; and subsidizing education and training programs. In recent years, this holistic view of warfighter readiness has expanded further with various leaders calling attention to the financial well-being of the individual servicemember. While laudable, these efforts merit additional emphasis.

Survey assessments of the financial preparedness of military servicemembers/warfighters provide informative and concerning results. As a whole, it appears progress has stalled in getting servicemembers and their families to think about their retirement mission-readiness. The Financial Regulatory Authority (FINRA) conducted the National Financial Capabilities Survey (NFCS) in 2012, 2018, and 2021 to assess military members' financial behavior. In the 2012 survey administration, over 40 percent of servicemembers responded that they had never tried to figure out how much they should save for retirement. This figure drops to 33 percent by 2021. As of 2012, almost one in four said they do not have a retirement savings plan at work when in fact they do. In 2018, the numbers improved somewhat, but the trend worsened in 2021 when almost 28 percent of military members erroneously reported not having a retirement plan at work. Over 78 percent reported in 2018 that they had calculated an amount necessary to retire, a meaningful increase over the previous report; yet again, this number trended in the wrong direction, to 67 percent, in the most recent (2021) report.

Self-reported optimism levels and exposure to financial hardships are even more concerning. In 2018, approximately one-half (51 percent) reported that they strongly agreed with the statement, "I worry about running out of money in retirement." On a 7-point scale, with 7 meaning "strongly agree," military families averaged 5.9 in agreeing with this statement. The 2021 report does not ask these two questions, yet in the 2021 survey, administration almost half of military servicemembers reported they took out a loan (47 percent) or hardship withdrawal (46 percent) from a retirement account. Additionally, Asch et al. (2023) find that over 25 percent of active duty servicemembers are considered as having low or very low food security in 2018, suggesting one potential use for such withdrawals. Thus, one can infer that they would remain worried about their ability to thrive financially in retirement.

In sum, it appears that while some military servicemembers may now think they know how much money they need to retire, the majority are worried they will not have enough. Half are tapping into retirement accounts for present-day spending. They are worried about the perceived gap between what they will need and anticipate having, with over half indicating they *strongly worry* about running out of money in retirement. This all indicates there is much work yet to be done in helping our military servicemembers identify whether a retirement funding gap exists for them. And if such a gap does exist, it will help identify a need to alter their financial behaviors.

Remedying these problems will help servicemembers get on a better path financially, but perhaps as important institutionally, it could help the military service branches address some problems. For instance, quantifying the retirement benefits of a military career could improve recruitment and retention efforts. The Department of Defense Office of the Actuary assesses that 19 percent of a group of entering servicemembers will attain 20 years of service (i.e., retire), composed of 60 percent of officers and 16 percent of enlisted.[1] A mechanism for increasing recruiting and retention of military personnel could be beneficial to reduce turnover and increase these retirement figures. If a tool were made available for recruiters and retention specialists to use in promoting the long-term financial benefits of serving a full twenty-year career, it could reduce some of the expense of ongoing recruiting. On many levels, retaining talent is a better option than accepting an 80 percent pre-retirement attrition rate.

The numbers of concerned military families remain quite staggering, especially considering all of today's financial marketing targeted at helping people find their 'number' for retirement adequacy. Perhaps the relative youth of military servicemembers instills complacency, making retirement planning seem like something they have plenty of time to address. Alternatively, some military servicemembers may believe that their defined benefit (DB) retirement pension will fully provide for their retirement needs. Servicemembers are atypical in belonging to the 15 percent of the general population with a DB component to their pension. Notably, with the recent changes to the military retirement system, the DB component of

their retirement has decreased by 20 percent, from 50 percent of final years' pay to 40 percent of final years' pay. This DB component can lead military servicemembers to mistakenly assume they will be financially comfortable after they retire from the military.

While the military retirement program is, in fact, generous, it unfortunately will not fully sustain a pre-retirement lifestyle. This pension has recently been converted to the Blended Retirement System (BRS) plan that has defined contribution (DC) and defined benefit (DB) elements. BRS retirees will have 20 percent less wealth in DB form but will receive up to 5 percent in matching DC contributions. Jennings et al. (2018) show that the new pension system will not provide better retirement security unless markets perform abnormally well. By itself, it is reasonable to assert the military pension will not completely generate retirement adequacy; it is not designed to do so.

Thus, key questions become: What is a military servicemember's so-called retirement number and are they on track to reach it? Some years ago, investment firm ING (now Voya) ran a series of ads about knowing your *retirement number*. As we understand the ad, the *retirement number* was the dollar value that an individual needed to fund a comfortable retirement. Once this is identified, it can then be determined whether the individual's current savings, given reasonable future returns and stated contribution rates, are sufficient or not.

The purpose of this paper is to assist with strategic personal financial planning by helping answer the retirement adequacy question in terms and a format familiar to military servicemembers. We do so with a recognition that military servicemembers have tactical financial concerns (e.g., food insecurity) that might supersede long-term financial planning. Retirement adequacy is framed in a pay table format that servicemembers are generally quite familiar with. Further, we develop an associated online calculator that empowers any military servicemember to assess whether they are currently on track with their retirement savings. Our approach is a specialized extension and expansion of Skinner (2007), whose analysis focused on an older, non-military population.

We scale the retirement-adequacy dollar value to annual salaries and we label this the *retirement pay multiple (RPM)*. These multiples are akin to wealth-to-income ratios others have used in calculating optimal life cycle consumption smoothing savings rates. RPMs can be considered milestones or indications that a servicemember is on the path to a successful retirement outcome *if the model assumptions hold (e.g., they keep saving as planned, returns occur as modeled, lifestyle remains similar, etc.).* In contrast, other characterizations of the "retirement number" are indications of being ready for immediate retirement. That is, no further savings are necessary and retirement can commence.[2] Going through this retirement forecasting process represents the necessary strategic financial planning military servicemembers should undertake.

Background and Literature Review

Retirement savings research typically begins with the standard life-cycle model with utility derived over a lifetime from individual consumption and leisure. This theory describes ideal lifetime spending and saving patterns. Equal consumption throughout life is desirable and given this desire, people should borrow when their income is low and save when it is high. Doing so enables consumption smoothing, which avoids steep drops in consumption that are disproportionately painful; this is a normative approach that maximizes lifetime utility (Ando & Modigliani, 1963).

Numerous papers attempt to identify optimal savings rates using some version of the life-cycle model. Maximizing lifetime utility requires consumers to consider numerous factors such as mortality probabilities, investment rates, discount rates, inflation, and future Social Security and pension benefit levels. To give individuals useful wealth benchmarks for retirement preparedness, Skinner (2007), for example, utilizes a simple retirement savings ratio. He uses the salary multiple, or "Nonhousing-Wealth-to-Income Ratio." This number represents the multiple of the annual salary that a person should hold as spendable net worth to smooth their consumption during their lifetime. The required salary multiple changes as an individual progresses through the working years and approaches retirement. For instance, Skinner (2007) finds that, at age 50, a person should have saved 2.9 times the current annual salary to smooth

lifetime consumption into retirement (see Table 1; the 2.9 entry is Skinner's base scenario, which includes several underlying assumptions).

Skinner's rule-of-thumb calculations flexibly permit an individual of any age with any salary or earnings to determine whether they are on track to fully fund their retirement with their existing savings. For this reason, we elect to use Skinner (2007) as the primary model that we will build upon. If individuals have retirement savings above the Skinner earnings multiple, then their anticipated retirement lifestyle is fully funded based on plausible assumptions about inflation, investment returns, desired lifestyle, and other pension sources, including Social Security. Conversely, a savings-to-income ratio below the identified retirement-adequacy number means the anticipated retirement lifestyle is underfunded.

We are unaware of an existing calculator that incorporates effective retirement planning analysis for US military servicemembers. But considering the planning tools available to the general population we have found that these tools permit a range of inputs that burden the user with required financial information (i.e., risk parameters, assumed rates of return, etc.), which many investors are ill-prepared to provide. The requirement to provide such sophisticated financial inputs frequently leads to overly optimistic prognostications. This is problematic since a significant portion of the general public lacks financial literacy or even basic numeracy. Given the results in the military subsample of the *National Financial Capability Study* (FINRA, 2018), it appears military servicemembers do not have significantly better financial literacy.

Positive household economics suggests that those from less educated and less affluent backgrounds are more likely to make financial miscalculations (Campbell, 2006). Likewise, overconfidence can often lead people to make misguided financial decisions (Puri & Robinson, 2007; Balasuriya et al., 2010). Additionally, financial decision-making can also be impaired because of inexperience, as many investors fail to correctly calculate portfolio returns (Glaser & Weber, 2007). A calculator that provides too many open-ended choices is suboptimal given the aforementioned limitations.

The military is disproportionately composed of individuals from less affluent and less educated backgrounds. While 95 percent of military officers have four-year college degrees or higher, two-thirds of all military servicemembers (i.e., enlisted and officer) have less than an Associate's degree. Nearly 82 percent of the military consists of enlisted personnel. According to the 2018 Department of Defense (DoD) Demographics Report, Profile of the Military Community, most enlisted members (80.5 percent) have a high school diploma and/or some college experience, while few have an Associate's degree (10.5 percent), a Bachelor's degree or higher (8.4 percent).

Given these realities, some research suggests tools with fewer and simpler inputs may be more effective. Bi et al. (2017) used a 2008 *National Longitudinal Survey of Youth*, which studied a nationally representative sample of 12,686 individuals born between 1957 and 1964. The survey included detailed information on education, retirement preparation, assets and income, and familial and demographic characteristics. The authors were able to survey the respondents at or near retirement to determine if using financial planning software was beneficial to their accumulation of retirement savings. They found that the use of financial planning software decreased significantly with less education. Aggregated, these results suggest that a parsimonious financial planning tool may be the best approach to reach those with less formal education or financial literacy.

Many investors save for retirement with the best of intentions, but it is clear many struggle with retirement preparations. People are often guilty of complacency, overwhelmed by complexity, and suffer from high time preferences or other behavioral distractions. Deemphasizing retirement planning can be especially common among Millennials and Gen Z'ers who view retirement as a distant concern. Given these constraints and the perceived complexity of retirement decisions, many employees use default contribution rates and asset allocations (Choi et al.,2004; Madrian & Shea, 2001). The situation for servicemembers may be even more complex though. Distinctive to military personnel is the further problem of integrating a DB pension. Evidence is that the availability of DB benefits may prompt lower contributions to a supplemental defined contribution (DC) portfolio (Munnell et al., 2000; Bernheim & Garret, 2003).

Evans and Razeed (2020) identify five potential pillars of retirement wealth—government entitlements, savings, housing, self-employed wealth, and inheritance. The authors point out that some countries' citizens might depend too much on government entitlements, suggesting that increased savings could hedge against

reduced entitlements. Therefore, using a retirement planning calculator should include a dynamic approach with changing parameters since risk and uncertainty are continually evolving. This is a key argument for an efficient and accessible financial calculator, with few inputs and simply-interpreted outputs. Ideally, it would also permit dynamic updates.

The economic importance of military retirement benefits—with over two million beneficiaries—means it has entered the mainstream financial planning and wealth management literature. Warner and Pleeter (2001) extrapolate from the post-Cold-War military downsizing to show that the personal discount rate and time preference between financial alternatives are quite high. Jennings and Reichenstein (2002, 2008) demonstrate methods for valuing the military retirement benefit and incorporating it in an *extended portfolio* that includes financial assets and non-portfolio assets. Davis and Fraser (2012) and Jennings et al. (2019) consider military survivor benefits. Payne et al. (2018) infer discount rates for the new hybrid military retirement plan.

Here, in an attempt to enhance financial acumen within the US military retirement system, we augment the military-focused personal finance literature by extending the Skinner (2007) approach and methodology. In designing this analysis and its associated calculator, we extrapolate from Goldin et al. (2020), who find that simplifying retirement plans by a single dimension enhances participation. Deliberately simplifying the dimensions of this analysis, its required calculator inputs, and its output should enhance its utility for military servicemembers. Because the Skinner (2007) results start at age 40, we contend it does not assist military servicemembers effectively because enlisted (officer) servicemembers can begin service around age 18 (22). This population is potentially retiring from service around age 40, so Skinner's prior results begin too late for servicemembers to assess whether they are fully mission capable, FMC, for retirement.

Our approach here enables servicemembers of any age to plan while still serving in the military, starting at age 18 through retirement up to age 42, at which time they can utilize other calculators as appropriate. Our tool also allows servicemembers to review their situations dynamically as their time horizon and conditions change. Finally, we incorporate the recent changes to the military retirement system so that the analysis and associated tools remain timely and relevant.

Model, Methodology, and Assumptions

Calculating retirement needs is situation-dependent, which often diminishes the value of a generalized study such as this one. However, the military's relatively standardized pay and promotion process helps mitigate this concern. And unlike in many private industries, military pay information is public record data. Knowing a servicemember's years of service, rank, and job allows the easy calculation of an individual's military pay using standardized DoD pay tables. Furthermore, promotions occur on a relatively predictable schedule and with relatively predictable probabilities. Outliers are rare.

Table 2 shows the 2022 military pay table. Every military servicemember is familiar with this table, and the vast majority have looked ahead to determine when and how much they can expect for their next pay raise, which occurs with a promotion in rank or increased time in service. The numbers along the x-axis show the years of service for a military servicemember. The letter-number combinations along the y-axis show the rank structure of the military. The letter "O" stands for *Officers* who have earned a commission, have specialized training, and have at least an undergraduate degree. The letter "E" stands for *Enlisted* members, who do not (yet) have the required training, education, or perhaps desire to obtain the officer rank. Because the rank names can differ among the military branches, the letter-number combinations are a way of standardizing across the branches. (For parsimony, we do not address Warrant Officers or previously enlisted Officers.)

There are many components of military pay. It is important to note that this military pay table reflects monthly "Basic Pay," which is federally taxable, state taxable, and subject to Social Security and Medicare withholding. For instance, an O-4 (Major or Lieutenant Commander) with over 10 years of service earned $7,891.80 per month in the calendar year 2022, before federal and state taxes, and before additional entitlements. Meanwhile, an E-6 with over 10 years of service earned $3,987.60 per month in the calendar year 2022, before deductions and entitlements.[3] One of our reasons for showing Table 2 is its unique

familiarity with military servicemembers, who know the layout of the pay table and the meaning of each cell. Ultimately, our goal in this analysis is to replace the relevant monthly pay dollar figures with Retirement Pay Multiples (RPMs) that servicemembers should have saved to be considered FMC for retirement. The RPM is the multiple of annual basic pay that a military servicemember should have invested at a particular rank and years of service to retire with a parallel quality of life at a full retirement age under the general assumptions provided in this analysis. It is analogous to the Skinner (2007) earnings multiple.

The military pay tables are updated annually as part of the defense budget process that involves Congress and the President. Politicians often publicize proposals giving military servicemembers a noteworthy annual raise. For instance, in 2022, the military received a 2.7% pay raise, which means that all numbers in Table 2 represent a 2.7% increase over the same numbers in the 2021 version of the pay table. For many years, the military pay raise exceeds that given to federal civilian employees or Social Security recipients. Assumptions about military pay inflation going forward are very important for servicemembers' financial planning purposes, especially if these pay raises outpace or lag inflation, as this means their pay changes in real terms.

The process for determining a military servicemember's retirement pay multiple (RPM) involves extensive time value of money calculations based on myriad additional assumptions. Figure 1 depicts the timeline and key income and expense building blocks involved in calculating the RPM. Somewhat akin to a balance sheet model, income sources represent the left side of each bar, and use represent the right side for each year. Income sources include active military pay, a military pension (after military retirement occurs), any private salary (after military retirement), and Social Security (after a servicemember fully retires). Uses, or expenses, include savings and investments made during active duty and after military retirement, housing costs, and living expenses.

Figure 1 shows a three-phase timeline to determine the RPM: the active-duty phase, the military retirement (with private sector career) phase, and the full retirement phase. This approach reflects the typical scenario whereby retiring from the military—and starting the military pension—can occur in the servicemember's late thirties for enlisted servicemembers or early forties for officers. This termination of military service is typically followed by a period of civilian work before leaving the labor force and fully retiring. Relatively few military members serve beyond thirty years on active duty.

Although Figure 1 could suggest this analysis is static due to the well-defined shape and size of each building block, none of the values are deterministic. Because they all represent future values, every one of them depends upon various stochastic factors, such as military pay inflation, general inflation, investment returns, the labor market, life expectancy, and personal housing decisions, among others.

However, there are some deterministic aspects of Figure 1. For instance, the military's DB (defined benefit) pension system incorporates 100 percent cliff vesting at 20 years. *Cliff vesting* occurs when an employee becomes fully vested on a specified date—all or none, with no intermediate steps. At 20 years of service, under the legacy military retirement system, the servicemember is entitled to a monthly pension benefit equal to 50 percent of the average of their highest 36 months of basic pay. The 50 percent figure represents a 2.5 percent multiplier times 20 years of service. Recently, the military transitioned to a Blended Retirement System (BRS) whereby the multiplier was reduced to 2.0 percent, meaning that at 20 years of service, a military servicemember's pension payment is 40 percent of the average of their highest 36 months of basic pay. Both systems are considered in the calculator, however, we present the legacy system RPMs in the baseline results. RPMs for the BRS are typically higher because the portfolio must replace the difference in DB benefits. Finally, although the dollar-value blocks in the military retirement and full retirement phases appear level over time in Figure 1, this is because we show relative values in real, inflation-adjusted, terms.

To determine whether an active duty servicemember is fully mission capable, FMC, for full retirement, it is critical to make assumptions about what happens during all three phases in terms of income sources and uses. Because the permutations are limitless, we have developed an online calculator that permits users to tailor inputs to their unique situations. For this study, we show RPMs for a baseline set of assumptions and analyze some common career profiles. Below, we list the relevant variables, initial assumptions, and justifications for them.

- **Gender**: Male. Most military servicemembers are male. This assumption is important because females have longer life expectancies and will have higher RPMs. We use median life expectancy by gender from the Social Security Administration Period Life Table. *Changing this variable to female will increase the Retirement Pay Multiple.*
- **Military Retirement Age & Full Retirement Age**: 42 and 67, respectively. These inputs are based on a military servicemember starting a career at age 22 and serving 20 years, beginning military retirement at age 42 and beginning full retirement at age 67, which coincides with the current Full Retirement Age for Social Security. A *later (earlier) full retirement age will decrease (increase) the Retirement Pay Multiple.*
- **Percent of pay saved before military retirement**: 10%. Under the new BRS, the default contribution level for military servicemembers to the federal Thrift Savings Plan (TSP) is moving to 5%, which means a combined 10% savings rate with the federal government's matching 5% contribution. This value is also a popular heuristic, mentioned as the current savings rate for young professionals and in the prescriptive range of well-known income replacement studies.[4] *Higher savings rates will decrease the Retirement Pay Multiple.*
- **Salary after military retirement (as a percent of final basic pay)**: 100%. This value assumes that a retiring servicemember has a second career that pays the same as the servicemember earned their last year in uniform. Pictorially, this value is shown with the horizontal arrow in Figure 1 going between the final pay level in the active-duty phase to the private salary level in the military retirement phase. We chose 100 percent post-military salary as a reasonable base case for this paper; each servicemember will have better insights about their particular post-military prospects. *Higher post-military salary will increase the Retirement Pay Multiple.*
- **Percent of military pension saved after military retirement**: 30%. Given that a retired military servicemember, with a military pension and follow-on career, now earns 150% of their final year's base pay based on the 100%-replacement previous assumption, saving 30% of their pension keeps them on the path of saving 10% of their overall income. (30% savings on 50% retired pay is 15%, which is 10% of 150%.) This value allows the retired servicemember to increase their standard of living markedly after military retirement. While we do not have data beyond the anecdotal, in our personal experience, many military retirees do upgrade their lifestyles. *Using a higher percentage of pension saved value will decrease the Retirement Pay Multiple.*
- **Housing costs after military retirement (as a percent of total income)**: 10%. Housing costs before military retirement are not considered, because we assume military servicemembers use their Basic Allowance for Housing (BAH) to offset housing costs. However, without BAH after military retirement, the cost of housing can be non-trivial. *Using a higher housing cost value here will decrease the Retirement Pay Multiple*.
- **Housing costs after full retirement as a percent of total income**: 0%. We assume a fully retiring individual pays off their mortgage before doing so. Skinner (2007) also makes this same assumption. Of course, insurance will still be an expense, as will property taxes, unless one lives in a property-tax-free state or receives property tax relief tax as a veteran. *Using a higher housing cost value here will increase the Retirement Pay Multiple*.
- **Federal income tax rate**: 25%. The analysis assumes this rate remains constant throughout the timeline. Users can periodically adjust it as appropriate. Note that this value reflects an average tax rate, not a marginal tax bracket. *Using a higher tax rate value will decrease the Retirement Pay Multiple*.
- **Social Security-Funded Level**: 100%. This assumption can vary immensely from individual to individual, but our baseline assumption is that the federal government will find a way to maintain its current promises to fund this program over time. This assumption is charitable based on forecasts. Pessimists will prefer a lower value, but we caution that completely ignoring Social Security (an implicit 0% assumption) forces much higher Retirement Pay

Multiples or much higher savings rates.[5] *Using a lower Social Security funding value will increase the Retirement Pay Multiple.*

- **Relative Lifespan (percentage of the general population that the military servicemember outlives):** 90%. Routine health exams and mandatory fitness tests put retiring servicemembers among the healthiest members of the general population, at least through their retirement. Changing this variable relates to probable longevity based on the Social Security lifespan tables. *Using a higher percentile will increase the Retirement Pay Multiple.*
- **Risk of Ruin (probability of outliving one's retirement funds)**: 5%. This input relies on the Milevsky and Robinson (2005) study that quantifies the retirement withdrawal annuity conditional on the percentage one desires or outliving their retirement funds. The authors call this percentage the "risk of ruin." We contend the military system trains individuals to behave in an extremely risk-averse manner, leading us to assume they will want a 95% chance of having sufficient retirement funds to last their lifetime.[6] *Using a higher risk of ruin value will decrease the Retirement Pay Multiple*.
- **Nominal return/risk on investments before full retirement**: 4.10% and 15.02%, respectively. We use the 2022 J.P. Morgan *Long-term Capital Market Return Assumptions* for the geometric returns and standard deviation of large U.S. equity investments. These J.P. Morgan capital market forecasts are widely used by financial planners and institutional investors to calibrate return expectations. Using an all-equity return assumption is aggressive, but *extended portfolio thinking* requires treating the asset of a DB pension as a quite valuable fixed-income investment making an equity-heavy financial portfolio more reasonable (see Jennings and Reichenstein 2002, 2008). *Using a lower return value or higher risk value will increase the Retirement Pay Multiple*.
- **Nominal return/risk on investments after full retirement**: 2.60% and 3.48%, respectively. Again, this assumption is based on the J.P. Morgan *Long-term Capital Market Return Assumptions* for the geometric returns and standard deviation of investment-grade US aggregate bonds. Using an all-bond return assumption may seem conservative but reflects plausible recalibration of risk tolerance after retirement. See Fraser and Payne (2018). *Using a higher return value or lower risk value will decrease the Retirement Pay Multiple*.
- **Confidence level about the savings rates of return**: 95%. To generate portfolio returns over long periods, the base case here implements a 5,000-run Monte Carlo simulation to generate the return distribution over the relevant time horizons. To ensure pairwise correlation between stock and bond returns remains realistic, the randomly generated returns are calculated using a Cholesky decomposition approach. The online calculator also permits one to use the Levy and Gunthorpe (1993) straightforward methodology to translate single period return moments (i.e., expected return and standard deviation) to multi-period return moments. Either approach permits us to generate a multi-period return at a specific confidence level, with the Levy and Gunthorpe method resulting in a normal distribution. Methodologically, we want to highlight that we calculated the multi-period return at the very conservative 95% confidence level for each year that a servicemember invests a portion of their base pay or pension. This 95% confidence level is consistent with the 5% risk of ruin assumed earlier. Notably, with this input, the Levy and Gunthorpe return over long horizons result in a complete loss (negative 100%), which increases the RPMs non-trivially relative to the Monte Carlo approach. *Using a lower confidence level value will decrease the Retirement Pay Multiple*.
- **Inflation**: 2%. The Federal Reserve has expressed that it is explicitly targeting this value as the long-term average target. As of the original draft of this paper, the value was also broadly consistent with current levels of breakeven inflation implied by the nominal Treasury and TIPS yield curves as well as average expert opinion in the *Survey of Professional Forecasters* of the Philadelphia Federal Reserve Bank. One could increase this value if they believe the longer-

term will represent more recent times. *Using a higher value will decrease the Retirement Pay Multiple*.

- **Military pay table growth**: 2.09%. This value represents the 10-year rolling average of annual military pay increases ending in 2022. Notably, this is the highest 10-year rolling average value in the last five years. It reached this same value of 2.09% in 2017. This earnings growth is a key difference between this methodology and Skinner (2007), who uses constant earnings over time. *Using a higher value will increase the Retirement Pay Multiple*.
- Although it is not an assumption, per se, we do want to highlight the horizontal arrow between the military retirement phase and the full retirement phase in Figure 1. This arrow shows that the living expenses in the full retirement phase match the living expenses level at the end of the military retirement phase. But in the full retirement phase, these living expenses are met using the military pension, drawing down investments, and Social Security. To the extent that retirement spending declines with age (see Blanchett, 2014), this approach to modeling the RPM is conservative.

These assumptions and some accompanying calculations are shown in Table 3. With these assumptions, it is possible to calculate the amount of savings required today to generate the income levels visualized in Figure 1. Dividing this required savings amount by an annual equivalent of the monthly active-duty base pay values in Table 2 leads to the RPM values shown in Table 4.

DISCUSSION

Table 4 shows the RPM using the same format as the military pay table (see Table 2), where the retirement pay multiple replaces monthly basic pay. Panel A shows the results for the legacy retirement system (50% of the highest 36-month DB payment); Panel B shows the results for the recently implemented BRS system (40% of the highest 36-month DB payment). We obtain the results in Panel B by changing Item 5 in Table 3 to "Yes." Because there are many military years of service and pay grade combinations that are extremely unlikely, we focus on the most common career paths through the officer and enlisted ranks. These are shown in the medium-shaded/standard font blocks in Table 4. Alternatively, an aggressive career path (early promotions) is reflected in the darker shaded/*italicized* font blocks, while a delayed career path is reflected in the dot pattern/bolded font blocks. The two alternative paths reflect plausible deviations from the medium-shaded/normal font base case. They do not deviate, for example, until the O-5 promotion, which currently is the earliest opportunity for accelerated promotion as well as the first promotion with real selectivity.

In the officer portion of Table 4, Panel A, we see that under the above assumptions, the Retirement Pay Multiple ranges from 19.7 for a young O-1 to 6.5 for a conservatively promoted, about to retire, O-4. In the enlisted portion of Table 4, Panel A, the values range from 3.2 to 0.2 for the young E-2 and the retiring E-7, respectively. Panel B shows that the RPM values increase for military members who belong to the BRS, all else equal. At the O-1 and O-4 extremes discussed previously, they increase by 22.5% to 24.8% for the aforementioned officers; these increases are 135.5% and 853.7% for the E-2 and E-7 extremes discussed above.

In the case of the young O-1 officer in Panel A, these results mean that they would need to have 19.7 times their annual base pay saved for retirement to support a lifestyle in full retirement as assumed above. This results in retirement savings of approximately $820,500. The value is higher, at 20.9, or $874,100, for a female O-1. If this individual does not have that much saved, then they have some options and more importantly, they have a lot of time to make adjustments. For instance, they could save more starting now, to reach the appropriate pay multiples shown for higher ranking officers on their career path. Additionally, they could plan to save more of their military pension once they retire, as doing so has two impacts: it creates a higher withdrawal amount in full retirement but also reduces the income level for living expenses needed for replacement in full retirement. This lower income replacement requirement is the reason that the values for a more slowly promoted person are lower than they are for a more aggressively promoted person (see the "Over 18" column), ceteris paribus.

Another, perhaps easier option for this individual is to simply accept a higher risk of ruin than 5% or lower confidence in terms of market returns than 95%. Adjusting these to 10% and 90%, respectively, would lead a male O-1 to have a RPM of 12.9 (14.0 for females), which is a reduction of over one-third.

Relative to the Skinner (2007) values, the RPM values for the (younger) military members shown here are notably higher when we consider both pay and consumption growth. Particularly striking are RPM values of 19.7 and 20.9 for young male and female officers, respectively. However, note these RPMs decrease over time and begin to resemble the Skinner values as military individuals reach 20 years of service. Considering that 20 years of service in the military occurs approximately at age 40, these tables end at the point in time that Skinner (2007) begins (see Table 1). Thus, this military-centric analysis appears to correspond quite well with the general population approach shown in Skinner. These trends enhance the confidence that this military-focused analysis represents an appropriate military extension of Skinner's original efforts.

The RPMs in Table 4 show that achieving retirement readiness can be a daunting proposition for young officers but is perhaps more achievable for young enlisted servicemembers. But for young officers who feel their prospects for saving such large sums are too remote, notice how rapidly the RPM decreases within four short years. The normal promotion path includes two promotions and three length-of-service raises (five total raises) for an officer progressing from being newly commissioned to four years of service. Table 2 shows pay increases from $3,477 to $6,185, which is a 78% increase in a very short period. With these five raises occurring in such a short period, really within in 24 months between two and four years of service, they provide a meaningful opportunity to increase savings rates without significant consumption impact. Meanwhile, the RPM declines by almost one-half (from 19.7 to 11.0) for the four-year O-3. The aggregate amount needed according to this RPM scarcely changes, meaning it is very important to start saving early for retirement security.

To better understand which inputs and assumptions impact the analysis the most and are thus the most important for servicemembers to ensure are accurate, it is possible to create the graphical RPM Profile found in Panel A of Figure 2. This plot, which is a version of a so-called tornado plot, depicts the sensitivity of the RPM to a single-variable change at a constant rate from the baseline value, holding all other variables constant. Table 3 shows the baseline input values, with the exception that we change the first input to "F" for females to induce some variety. More specifically, we consider a female O-3 officer with six years of service. In the base case, she plans to retire from the military at age 42 and fully retire at age 67. All other input variables are as outlined above. In this baseline situation, her RPM is 11.2. By changing inputs ±5% from their baseline values, we see the individual impact of key variables on the RPM in Figure 2.

The comparative slopes of individual variables demonstrate the relative sensitivity of RPM to the various inputs. Some inputs are controllable, such as the Full Retirement Age that a servicemember selects or the percentage saved monthly. Others, such as the Social Security Funding Level and Federal Tax Rate, are beyond the servicemember's span of control. In terms of the important variables to consider, RPMs are relatively sensitive to the salary after military retirement, confidence level of returns, and Social Security funding level. The first two exhibit a positive relationship, while the latter exhibit a negative relationship. In other words, a servicemember can drive down their RPM to maintain their current standard of living by accepting a lower standard of living (i.e., lower paying post-military job) or a less conservative approach to considering their portfolio returns. And as expected, as Social Security benefits decrease, servicemembers—like everyone else—will need to save more to compensate for this loss of retirement benefits. Overall, the information in Exhibits 4 and 5 may help servicemembers and their financial advisors prioritize where to focus their efforts in developing accurate model inputs.[7]

CONCLUSION AND IMPLICATIONS

Through extensive training, education, exercises, and deployments, US military servicemembers maintain a fully mission capable (FMC) readiness through strategic planning in their roles as our country's defenders. However, on the personal finance front, a non-trivial number have not strategically planned for

their retirement. Without such planning, approximately one-half of servicemembers are very worried about running out of money in retirement.

To help address these facts, this analysis leverages the Skinner (2007) retirement multiple construct. It intends to fill a retirement planning gap for these servicemembers in a familiar format. Instead of a military pay chart that reflects a servicemember's monthly pay based on rank and years of service, we create a Retirement Pay Multiple (RPM) chart that shows how much military servicemembers should have saved for retirement at any point in their career to fully retire and maintain their living standard. The RPM is a multiple of annual basic pay that servicemembers should have saved at any point in their career to maintain their living standard once they fully retire. This number is highly relevant given that the DoD estimates that 20 percent of servicemembers serve a full 20 years of active duty (60 percent of officers and 16 percent enlisted).

The results of this study provide evidence that the military's defined benefit (DB) pension system remains a very valuable financial benefit of military service. It also gives further evidence that the military's transition to the partial-DB Blended Retirement System (BRS) did not financially benefit military servicemembers relative to the legacy DB system. Furthermore, it could serve as a recruiting and retention tool for prospective and current military servicemembers who do not yet recognize the financial value of the retirement system.

Although this paper depicts results for some common scenarios, ultimately this analysis is based on myriad assumptions that will vary by individual. Accordingly, we have created a publicly accessible calculator that will allow servicemembers and their financial planners to customize their inputs accordingly. Table 5 shows the dashboard (input and output) interfaces for this calculator. We recommend embedding this calculator into an annual continuous learning requirement on financial matters for military servicemembers.

Our general analysis omits some potential savings goals and costs that servicemembers should consider when evaluating their total financial plan. For instance, perhaps they wish to save for a college education. Fortunately, for longer serving servicemembers, variants of the GI Bill provide a subsidy. Additionally, in retirement one typically non-trivial cost specifically mentioned by Skinner (2007) includes health care. For military servicemember retirees, once again, health care costs are currently bounded by the military's retiree health care system (Tricare). However, recent changes to this system show it is not immune to cost increases. All else equal, it is important to realize that the multiples developed here are understated if individuals have additional savings goals or additional costs that they do not account for in their inputs. However, the RPMs shown here are designed to give *retirement-specific* multiples.

Under reasonable assumptions, RPMs are higher for younger servicemembers than for older ones. For that reason, we advocate that our servicemembers seek to become Fully Mission Capable (FMC) for retirement sooner rather than later. This analysis and its associated customizable tool provide a mechanism for calibrating retirement readiness.

ACKNOWLEDGEMENTS

We would like to acknowledge the helpful comments and suggestions from Dr. Conrad Ciccotello as well as an anonymous reviewer.

ENDNOTES

1. See "Valuation of the Military Retirement System" published in February 2023.
2. Given the Air Force affiliations and pilot licenses on our author team, we think of our retirement savings multiple as "having achieved cruising altitude" to safely reach the retirement destination, whereas the retirement number of the advertisements seems more like "we have arrived at our destination -- it's safe to unbuckle your seatbelt."
3. There are other components of pay, such as a Basic Allowance for Housing (BAH) and a Basic Allowance for Subsistence (BAS). These are non-taxable allowances for housing and food, with housing calibrated to

where a military servicemember is stationed. We assume a servicemember's housing allowance offsets all housing costs while in the service, and we ignore the food allowance, as it is typically quite small relative to Basic Pay. There are other pay components, such as flight pay for pilots and aviators or hazardous duty pay for those serving in harm's way, that are idiosyncratic and not considered in our analysis.

4. See "The Real Deal: 2018 Retirement Income Adequacy Study," a study by Aon (2018). Also see Munnell et al. (2011) and Pfau (2011), respectively, for savings rates of approximately 10% for our assumed retiree age and approximately 16% when not considering Social Security or other income.

5. A resolution of the Social Security funding shortfall may involve lower benefits or later benefits, particularly for those with the economic resources and financial wherewithal to do the planning involved with our approach and our calculator. That is, readers of the present article are at particular risk for reduced benefits. A plausible assumption for Social Security funding might then be in the 70-80 percent range. For instance, a recent analysis by the Committee for a Responsible Federal Budget (a self-described "nonpartisan, non-profit organization committed to educating the public on issues with significant fiscal policy impact"), the status quo will lead to a 23 percent cut in benefits by 2033 (https://www.crfb.org/blogs/retirees-face-17400-cut-if-social-security-isnt-saved). Note that by "funding," we also mean Social Security benefit levels relative to the current promise; 100 percent funding means 100 percent benefits, and 80 percent funding means 80 percent benefits.

6. This parameter is an important tradeoff between current and future consumption and prospective bequests. See, for example, Gu et al. (2017). One co-author of the present study believes 80, 90, and 95 percent risks of ruin provide important financial planning insights. Note that Figure 2 demonstrates this assumption is one of the most important. Also see Guyton (2004), Spitzer (2008), or Finke et al., (2012) on adaptive spending in retirement.

7. We acknowledge that a direct evaluation of sensitivities will offer additional insights. A financial planner or wealth adviser might prefer to examine larger or smaller adjustments than the ±5% deviations shown. For example, we suggest in endnote 4 that evaluating an 80 percent risk of ruin could make sense based on prior research, which is clearly outside the ±5% range.

REFERENCES

Ando, A., & Modigliani, F. (1963). The 'life-cycle' hypothesis of saving: Aggregate implications and tests. *American Economic Review*, *53*(1), 55–84.

Aon. (2018). *The real deal: 2018 retirement income adequacy study*. Retrieved from https://www.aon.com/getmedia/59c14111-6414-46a4-adbb-0dba9e0e8676/Aon-Retirement-Solutions-The-Real-Deal-Full-Report-US-2018.aspx

Asch, B.J., Rennane, S., Trail, T.E., Berdie, L., Ward, J.M., Troyanker, D., Gadwah-Meaden, C., & Kempf, J. (2023). *Food insecurity among members of the armed forces and their dependents*. Santa Monica, CA: RAND Corporation. Retrieved from https://www.rand.org/pubs/research_reports/RRA1230-1.html

Balasuriya, J., Muradoglu, G., & Ayton, P. (2010). Optimism and portfolio choice. In *Behavioral Decision Research in Management*. Pittsburgh, PA.

Bernheim, B.D., & Garrett, D.M. (2003). The effects of financial education in the workplace: Evidence from a survey of households. *Journal of public Economics*, *87*(7–8), 1487–1519.

Bi, Q., Finke, M., & Huston, S.J. (2017). Financial software use and retirement savings. *Journal of Financial Counseling and Planning*, *28*(1), 107–128.

Blanchett, D. (2014). Exploring the retirement consumption puzzle. *Journal of Financial Planning*, *27*(5), 34–42.

Campbell, J.Y. (2006). Household finance. *The Journal of Finance*, *61*(4), 1553–1604.

Choi, J.J., Laibson, D., & Madrian, B.C. (2004). *Plan design and 401 (k) savings outcomes*. National Bureau of Economic Research, no. w10486.

Davis, K.J., & Fraser, S.P. (n.d.). *Financial Services Review*

Department of Defense. (2018). *Demographics Report: Profile of the Military Community*. Retrieved from https://download.militaryonesource.mil/12038/MOS/Reports/2018-demographics-report.pdf

Evans, J.R., & Razeed, A. (2020). *Measuring retirement adequacy in a dynamic society*. Retrieved from SSRN 3665431.
Finke, M.S., Pfau, W.D., & Williams, D. (2012, March). Spending flexibility and safe withdrawal rates. *Journal of Financial Planning*, pp. 44–51.
FINRA. (2018). *The state of U.S. financial capability: The 2018 national financial capability study*. Retrieved from https://www.usfinancialcapability.org/downloads/NFCS_2018_Report_Natl_Findings.pdf
FINRA. (2022). *Financial Capability in the United States: Highlights from the FINRA Foundation National Financial Capability Study* (5th Ed.). Retrieved from https://www.finrafoundation.org/sites/finrafoundation/files/NFCS-Report-Fifth-Edition-July-2022.pdf
Fraser, S.P., & Payne, B.C. (2018). Bond tents. *Journal of Wealth Management*, *21*(2), 27–38.
Glaser, M., & Weber, M. (2007). Why inexperienced investors do not learn: They do not know their past portfolio performance. *Finance Research Letters*, *4*(4), 203–216.
Goldin, J., Homonoff, T., Patterson, R.W., & Skimmyhorn, W.L. (2020). *How much to save? Decision costs and retirement plan participation*. NBER Working Paper No. 27575. Retrieved from https://www.nber.org/papers/w27575
Gu, Y., Kausch, D., Moore, K., & Young, F. (2017). Balancing income and bequest goals in a db/dc hybrid pension plan. *Journal of Retirement*, *4*(3), 51–62.
Guyton, J.T. (2004). Decision rules and portfolio management for retirees: Is the 'safe' initial withdrawal rate too safe? *Journal of Financial Planning*, *17*(10), 54–62.
Jennings, W., & Reichenstein, W. (2002). The value of retirement benefits: The value of military retirement. *Financial Services Review*, *10*(1), 19–35.
Jennings, W., & Reichenstein, W. (2008). The Extended portfolio in private wealth management. *Journal of Wealth Management*, *11*(1), 36–45.
Levy, H., & Gunthorpe, D. (1993). Optimal investment proportions in senior securities and equities under alternative holding periods. *Journal of Portfolio Management*, *19*(4), 30–36.
Madrian, B.C., & Shea, D.F. (2001). The power of suggestion: Inertia in 401 (k) participation and savings behavior. *The Quarterly Journal of Economics*, *116*(4), 1149–1187.
Milevsky, M.A., & Robinson, C. (2005). A sustainable spending rate without simulation. *Financial Analysts Journal*, *61*(6), 89–100.
Munnell, A.H., Sunden, A., & Taylor, C. (2001). What determines 401 (k) participation and contributions. *Soc. Sec. Bull.*, *64*, 64.
Munnell, G.-S., & Webb. (2011). *How much to save for a secure retirement*. Boston College, Center for Retirement Research. Retrieved from http://hdl.handle.net/2345/bc-ir:104194
Payne, B.C., Jennings, W.W., & O'Malley, T.C. (2018). Implied discount rates for the U.S. military blended retirement system. *The Journal of Retirement*, *6*(1), 22–32.
Pfau, W. (2011). Safe savings rates: A new approach to retirement planning over the life cycle. *Journal of Financial Planning*, *24*(5), 42–50.
Puri, M., & Robinson, D.T. (2007). Optimism and economic choice. *Journal of Financial Economics*, *86*(1), 71–99.
Skinner, J. (2007). Are you sure you're saving enough for retirement? *Journal of Economic Perspectives*, *21*(3), 59–80.
Spitzer, J.J. (2008). Retirement withdrawals: An analysis of the benefits of periodic 'midcourse' adjustments. *Financial Services Review*, *17*(1), 17–29.
Warner, J.T., & Pleeter, S. (2001). The personal discount rate: Evidence from military downsizing programs. *American Economic Review*, *91*(1), 33–53.

APPENDIX

TABLE 1
REPRODUCTION OF TABLE 1 FROM SKINNER (2007)

Row	*Model specification*	*Age 40*	*Age 45*	*Age 50*	*Age 55*	*Age 60*	*At retirement*
1	Simple life-cycle benchmark	1.8	2.3	2.9	3.6	4.3	5.1
2	Nonhomeowner	3.7	4.5	5.2	6.0	7.8	8.6
3	Higher saving rate (15%)	-0.5	0.3	1.1	1.9	2.8	3.8
4	Lower saving rate (2.5%)	3.1	3.6	4.1	4.6	5.2	5.8
5	Late retirement age (age 70)	0.9	1.4	1.9	2.5	3.1	4.5
6	Early retirement age (age 60)	2.7	3.3	4.0	4.7	5.5	5.5
7	Early death (age 85)	1.0	1.5	2.0	2.6	3.2	3.9
8	Replacement rate β=0.6, retired at 62, 5% saving rate, nonhomeowner	1.8	2.3	2.7	3.3	3.9	4.2
9	Earnings and consumption growth of 2% until retirement	3.2	3.6	4.0	4.4	4.7	5.1
10	Consumption decline at retirement (by 2%)	0.6	1.1	1.6	2.1	2.7	3.4

Notes: Wealth-to-income ratios necessary to ensure smooth consumption through the household's lifetime. Baseline life-cycle simulation parameters: 3 percent real interest rate: no growth in earnings; retirement planning horizon of 95; retirement age of 65; 7.5 percent saving rate; 20 percent mortgage payment; 20 percent marginal and average tax rate.

TABLE 2
MONTHLY BASIC PAY TABLE FOR US MILITARY SERVICEMEMBERS

FY22 NDAA 2.7% increase

MONTHLY BASIC PAY TABLE

EFFECTIVE 1 JANUARY 2022

PAY GRADE	YEARS OF SERVICE																					
	<2	2	3	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
COMMISSIONED OFFICERS																						
O-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16974.90	16974.90	16974.90	16974.90	16974.90	16974.90	16974.90	16974.90	16974.90	16974.90	16974.90
O-9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16444.80	16682.40	16974.90	16974.90	16974.90	16974.90	16974.90	16974.90	16974.90	16974.90	16974.90
O-8	11635.50	12017.10	12270.00	12340.50	12656.10	13183.20	13306.20	13806.60	13950.90	14382.00	15006.30	15581.40	15965.70	15965.70	15965.70	15965.70	16365.60	16365.60	16774.20	16774.20	16774.20	16774.20
O-7	9668.40	10117.50	10325.40	10490.70	10789.80	11085.30	11427.00	11767.50	12109.50	13183.20	14089.80	14089.80	14089.80	14089.80	14162.10	14162.10	14445.60	14445.60	14445.60	14445.60	14445.60	14445.60
O-6	7332.00	8054.70	8583.30	8583.30	8616.30	8985.30	9034.50	9034.50	9547.80	10455.30	10988.10	11520.60	11823.60	12130.80	12725.40	12725.40	12979.50	12979.50	12979.50	12979.50	12979.50	12979.50
O-5	6112.20	6885.30	7361.70	7451.40	7749.30	7926.90	8318.10	8605.80	8976.90	9543.90	9813.90	10080.90	10384.20	10384.20	10384.20	10384.20	10384.20	10384.20	10384.20	10384.20	10384.20	10384.20
O-4	5273.70	6104.40	6512.40	6602.70	6980.70	7386.30	7891.80	8284.50	8557.50	8714.70	8805.30	8805.30	8805.30	8805.30	8805.30	8805.30	8805.30	8805.30	8805.30	8805.30	8805.30	8805.30
O-3	4636.50	5256.00	5672.40	6185.40	6482.10	6807.30	7017.30	7362.90	7543.50	7543.50	7543.50	7543.50	7543.50	7543.50	7543.50	7543.50	7543.50	7543.50	7543.50	7543.50	7543.50	7543.50
O-2	4006.50	4562.70	5255.10	5432.70	5544.30	5544.30	5544.30	5544.30	5544.30	5544.30	5544.30	5544.30	5544.30	5544.30	5544.30	5544.30	5544.30	5544.30	5544.30	5544.30	5544.30	5544.30
O-1	3477.30	3619.50	4375.50	4375.50	4375.50	4375.50	4375.50	4375.50	4375.50	4375.50	4375.50	4375.50	4375.50	4375.50	4375.50	4375.50	4375.50	4375.50	4375.50	4375.50	4375.50	4375.50
COMMISSIONED OFFICERS WITH OVER 4 YEARS ACTIVE DUTY SERVICE AS AN ENLISTED MEMBER OR WARRANT OFFICER																						
O-3E	0.00	0.00	0.00	6185.40	6482.10	6807.30	7017.30	7362.90	7654.80	7822.80	8050.80	8050.80	8050.80	8050.80	8050.80	8050.80	8050.80	8050.80	8050.80	8050.80	8050.80	8050.80
O-2E	0.00	0.00	0.00	5432.70	5544.30	5720.70	6018.60	6249.30	6420.60	6420.60	6420.60	6420.60	6420.60	6420.60	6420.60	6420.60	6420.60	6420.60	6420.60	6420.60	6420.60	6420.60
O-1E	0.00	0.00	0.00	4375.50	4672.20	4845.00	5021.70	5194.80	5432.70	5432.70	5432.70	5432.70	5432.70	5432.70	5432.70	5432.70	5432.70	5432.70	5432.70	5432.70	5432.70	5432.70
WARRANT OFFICERS																						
W-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8520.30	8952.30	9274.50	9630.30	9630.30	10112.70	10112.70	10617.60	10617.60	11149.50	11149.50
W-4	4791.90	5154.30	5302.20	5447.70	5698.50	5946.60	6198.00	6575.40	6906.60	7221.90	7480.20	7731.90	8101.20	8404.80	8751.00	8751.00	8925.60	8925.60	8925.60	8925.60	8925.60	8925.60
W-3	4376.40	4558.20	4745.70	4806.60	5002.20	5388.00	5789.40	5978.70	6197.70	6422.70	6828.30	7101.60	7265.40	7439.10	7676.40	7676.40	7676.40	7676.40	7676.40	7676.40	7676.40	7676.40
W-2	3872.10	4238.40	4350.90	4428.60	4679.40	5069.70	5263.50	5453.70	5686.50	5868.60	6033.30	6230.70	6360.30	6462.90	6462.90	6462.90	6462.90	6462.90	6462.90	6462.90	6462.90	6462.90
W-1	3398.70	3765.00	3863.10	4071.00	4316.40	4678.80	4847.70	5084.70	5317.20	5500.20	5668.50	5873.10	5873.10	5873.10	5873.10	5873.10	5873.10	5873.10	5873.10	5873.10	5873.10	5873.10
ENLISTED MEMBERS																						
E-9	0.00	0.00	0.00	0.00	0.00	0.00	5789.10	5920.50	6085.80	6279.90	6477.00	6790.50	7056.90	7336.20	7764.30	7764.30	8151.90	8151.90	8559.90	8559.90	8988.90	8988.90
E-8	0.00	0.00	0.00	0.00	0.00	4739.10	4948.80	5078.40	5233.80	5402.40	5706.30	5860.50	6122.70	6268.20	6626.10	6626.10	6759.00	6759.00	6759.00	6759.00	6759.00	6759.00
E-7	3294.30	3595.50	3733.50	3915.30	4058.10	4302.60	4440.60	4685.10	4888.50	5027.40	5175.30	5232.60	5424.90	5528.10	5921.10	5921.10	5921.10	5921.10	5921.10	5921.10	5921.10	5921.10
E-6	2849.40	3135.60	3274.20	3408.60	3548.70	3864.30	3987.60	4225.50	4298.40	4351.20	4413.30	4413.30	4413.30	4413.30	4413.30	4413.30	4413.30	4413.30	4413.30	4413.30	4413.30	4413.30
E-5	2610.30	2786.10	2920.80	3058.50	3273.30	3497.70	3682.20	3704.40	3704.40	3704.40	3704.40	3704.40	3704.40	3704.40	3704.40	3704.40	3704.40	3704.40	3704.40	3704.40	3704.40	3704.40
E-4	2393.40	2515.80	2652.00	2786.70	2905.50	2905.50	2905.50	2905.50	2905.50	2905.50	2905.50	2905.50	2905.50	2905.50	2905.50	2905.50	2905.50	2905.50	2905.50	2905.50	2905.50	2905.50
E-3	2160.60	2296.50	2435.70	2435.70	2435.70	2435.70	2435.70	2435.70	2435.70	2435.70	2435.70	2435.70	2435.70	2435.70	2435.70	2435.70	2435.70	2435.70	2435.70	2435.70	2435.70	2435.70
E-2	2054.70	2054.70	2054.70	2054.70	2054.70	2054.70	2054.70	2054.70	2054.70	2054.70	2054.70	2054.70	2054.70	2054.70	2054.70	2054.70	2054.70	2054.70	2054.70	2054.70	2054.70	2054.70
E-1 >4 Mon	1833.30	1833.30	1833.30	1833.30	1833.30	1833.30	1833.30	1833.30	1833.30	1833.30	1833.30	1833.30	1833.30	1833.30	1833.30	1833.30	1833.30	1833.30	1833.30	1833.30	1833.30	1833.30
E-1 <4 Mon	1695.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

C/S	16974.90	M/S	9355.50
Cadet	1217.10		

NOTE--BASIC PAY FOR O7-O10 IS LIMITED TO LEVEL II OF THE EXECUTIVE SCHEDULE DURING 2022 ($16,974.90)

NOTE--BASIC PAY FOR O6 AND BELOW IS LIMITED TO LEVEL V OF THE EXECUTIVE SCHEDULE IN EFFECT DURING 2022 ($13,775.10)

Table 2 is a replication of the Monthly Basic Pay Table for the calendar year 2022 for U.S. active duty military servicemembers. The vertical axis shows the military pay grade. For example, E-1 is the most junior Enlisted member of a respective military branch (e.g., Army, Air Force, Marines, or Navy), W-1 is the most junior Warrant Officer for those branches that incorporate them, and O-1 is the most junior Officer of a branch. The horizontal axis shows the total years of military service that an individual servicemember has completed. Using these horizontal and vertical combinations, any active duty member can quickly find their monthly basic pay (i.e., salary) based on their pay grade and years of completed service.

FIGURE 1
SOURCES AND USES OF MONTHLY PAY BY CAREER PHASE FOR MILITARY SERVICEMEMBERS

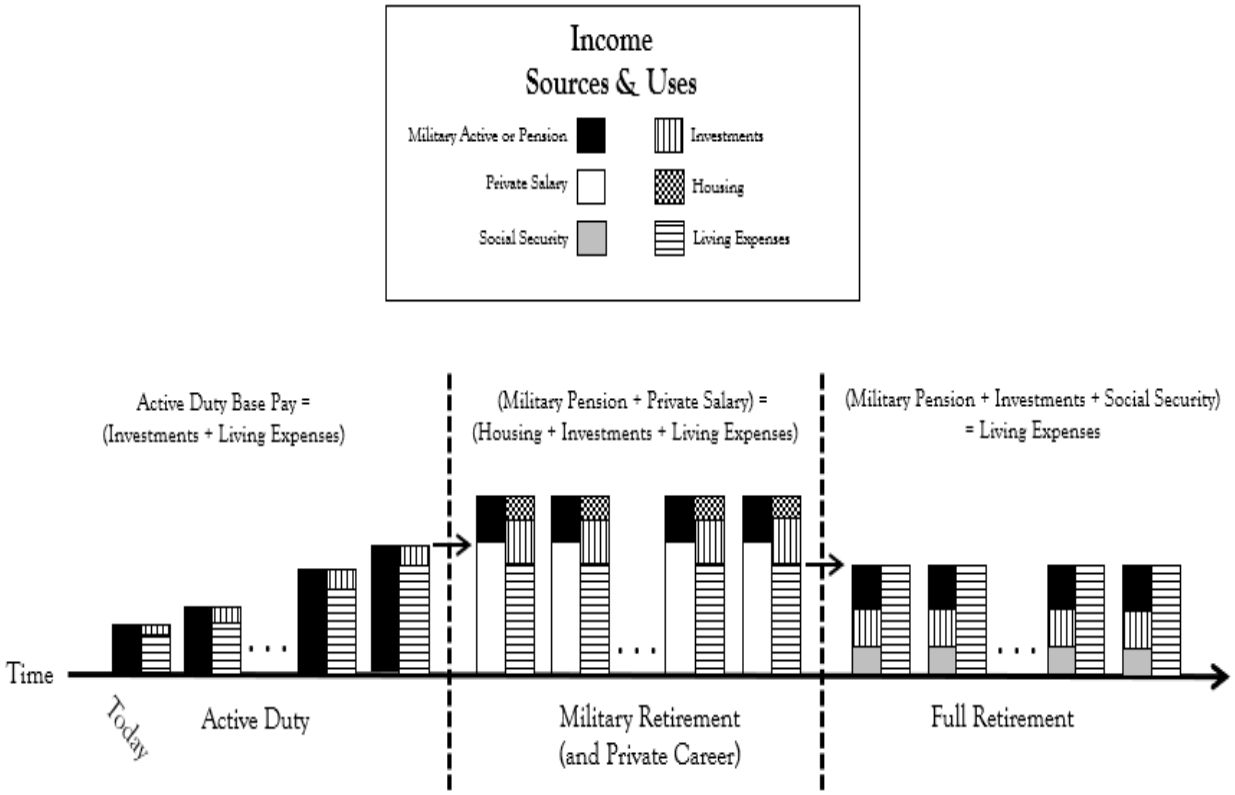

Figure 1 shows career phases for a military servicemember using assumptions described in the paper, along with the corresponding sources and uses of their income during each respective phase. For example, during the Active Duty phase, military servicemembers earn their active duty pay, which they spend on investments and living expenses, while their housing costs are completely offset by a military housing allowance. After 20 years of military service, they retire from the military and begin a private career, which is the Military Retirement (and Private Career) phase. Finally, they transition to the Full Retirement phase. The vertical side of the bar charts represents the relative magnitude of income and expenses assumed in the model presented in this study.

TABLE 3
EXAMPLE INPUT ASSUMPTIONS FOR RETIREMENT PAY MULTIPLE CALCULATOR

	Inputs--change anything in the green cells; yellow cells are calculated (do not change them)		
Item	User input required in the below rows:		Notes:
1	Male or Female (dropdown)	M	Females statistically live longer than males
2	Current Age	22	
3	Military Retirement Age	42	
4	Full Retirement Age	67	
5	Are you participating in the Blended Retirement System?	No	The BRS is the new program with matching in TSP
6	% of monthly pay saved before mil retirement	10.00%	
7	Salary after mil retirement as % of final military salary	100.00%	Enter 100% if you plan to fully replace final military base pay in next job
8	% of military pension saved after mil retirement	30.00%	30% of 50% = 15%, which is 10% of 150%
9	Housing costs after military retirement (% of total income)	10.00%	BAH used toward housing before military retirement
10	Housing costs after full retirement	0.00%	0% if home paid off before full retirement; >0% if renting in retirement
	User input optional in the below rows (default values are entered already):		
11	Federal Income Tax Rate	25.00%	
12	Social Security Funded Level (100% is fully funded)	100.00%	
13	What % of the general population do you outlive?	90.00%	I will live longer than "x"% of the general US population
14	Risk of Ruin (prob of outliving $)	5.00%	I want to have "x"% chance of running out of money in full retirement
15	Nominal Return on Savings, pre full retirement	4.10%	JPM US Large Cap; returns pre-full retirement (2022)
16	Risk (sigma) of Return on Savings, pre full retirement	15.02%	JPM US Large Cap; returns pre-full retirement (2022)
17	Nominal Return on Savings, after full retirement	2.60%	JPM Aggregate Bond; returns post-full retirement (2022)
18	Risk (sigma) of Return on Savings, after full retirement	3.48%	JPM Aggregate Bond; returns post-full retirement (2022)
19	"Confidence" level about savings rate of return (0-100%)	95.00%	I want to be "x"% confident about getting the above returns
20	Inflation	2.00%	Fed long-term target
21	Military pay table growth (nominal)	2.09%	10-year rolling average (as of Jan 1, 2022)
	End of Full Retirement (based on user defined life expectancy)	91.00	From Social Security longevity tables
	Remaining Lifespan (based on user defined life expectancy)	24.00	From Social Security longevity tables
	End of Full Retirement (Median)-not used anymore	83.47	From Social Security longevity tables
	Median Remaining Lifespan-not used anymore	16.47	From Social Security longevity tables
	Savings (Real) Rate of Return	2.06%	Fisher
	Savings (Real) Rate of Return, after full retirement	0.59%	Fisher
	Military pay table growth (real)	0.09%	Fisher

Table 3 shows the input dashboard for the online calculator developed as part of this study. The input values shown are used to generate the outputs shown in Table 4. To keep it tractable to users of varying experience and financial familiarity, the upper section requires straightforward user inputs. The lower section allows users to change the default inputs, which are based on the authors' experience and professional judgment.

TABLE 4
RETIREMENT PAY MULTIPLES FOR BASE CASE INPUT ASSUMPTIONS

Panel A: Legacy Retirement System

Output Dashboard											
Multiple of Current Annual Base Pay You Need to Have Saved at this Point to Make Up the Deficiency											
Officer Ranks											
	2 or less	Over 2	Over 3	Over 4	Over 6	Over 8	Over 10	Over 12	Over 14	Over 16	Over 18
O-10											
O-9											
O-8											
O-7											
O-6											7.8
O-5									9.7	7.3	7.1
O-4							8.7	8.3	8.1	6.5	6.5
O-3				11.1	10.6	10.1					
O-2		15.0	13.0								
O-1	19.7										
Enlisted Ranks											
	2 or less	Over 2	Over 3	Over 4	Over 6	Over 8	Over 10	Over 12	Over 14	Over 16	Over 18
E-9									2.3	2.3	2.3
E-8								2.7		1.3	1.3
E-7						3.2	3.1	1.4	1.4	0.1	0.2
E-6					3.8	1.7	1.7	0.0	0.0		
E-5			4.6	4.4	2.0						
E-4			2.5	2.3							
E-3		2.9									
E-2	3.2										
E-1 > 4mo											

Panel B: Blended Retirement System (BRS)

Output Dashboard											
Multiple of Current Annual Base Pay You Need to Have Saved at this Point to Make Up the Deficiency											
Officer Ranks											
	2 or less	Over 2	Over 3	Over 4	Over 6	Over 8	Over 10	Over 12	Over 14	Over 16	Over 18
O-10											
O-9											
O-8											
O-7											
O-6											9.3
O-5									11.5	8.9	8.6
O-4							10.6	10.2	9.9	8.2	8.1
O-3				13.5	12.9	12.3					
O-2		18.3	15.9								
O-1	24.1										
Enlisted Ranks											
	2 or less	Over 2	Over 3	Over 4	Over 6	Over 8	Over 10	Over 12	Over 14	Over 16	Over 18
E-9									3.9	3.9	3.8
E-8								4.7		2.9	2.9
E-7						5.5	5.3	3.3	3.2	1.7	1.8
E-6					6.6	4.0	3.9	2.0	2.0		
E-5			8.1	7.7	4.7						
E-4			5.8	5.5							
E-3		6.7									
E-2	7.5										
E-1 > 4mo											

Table 4 shows the annual Retirement Pay Multiples (RPM) for a 22-year-old male military servicemember who retires from the military at age 42, begins a private career, and then fully retires at age 67 (see Table 3 for additional inputs and assumptions). These RPMs represent the multiple of annual basic pay that this example servicemember needs to have saved at each stage of his career to maintain a pre-retirement lifestyle once fully retired. Panel A shows RPMs for the legacy high-3 military retirement system. Panel B shows RPMs for the recently initiated Blended Retirement System (BRS).

FIGURE 2
RETIREMENT PAY MULTIPLE SENSITIVITY TO INPUT CHANGES

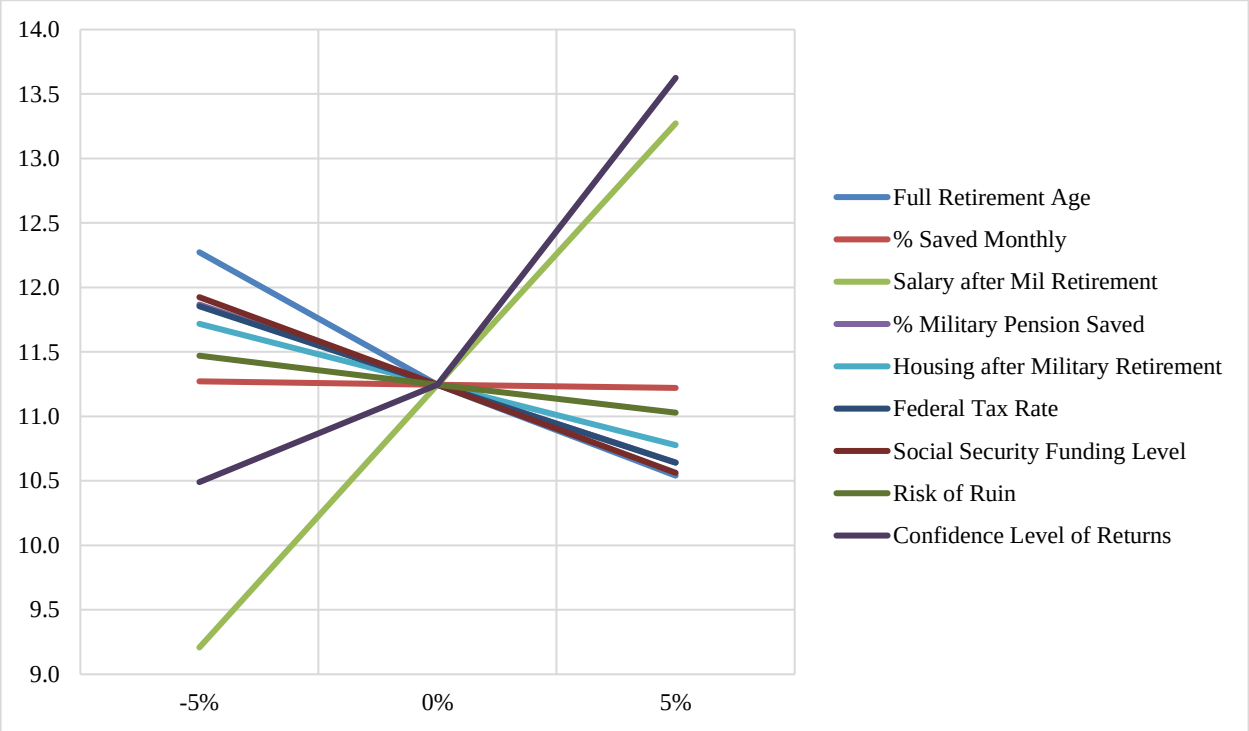

Figure 2 shows the sensitivity of Retirement Pay Multiples (RPM) for a 22-year old male military servicemember who retires from the military at age 42, begins a private career, and then fully retires at age 67 (see Table 3 for additional inputs and assumptions) to changes in various inputs including the age at full retirement, the percentage of income saved monthly, the salary after military retirement, the percent of military pension saved, the housing costs after military retirement, the federal tax rate, the Social Security system funding level, the risk of (financial) ruin, and the individual's desired confidence level in investment returns. The steeper the slope, the more sensitive the RPM is to a given percentage change in the respective input variable.

TABLE 5
INPUT/OUTPUT VIEW OF RETIREMENT PAY MULTIPLE CALCULATOR

	Inputs--change anything in the green cells; yellow cells are calculated (do not change them)		
Item	User input required in the below rows:		Notes:
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5	Are you participating in the Blended Retirement System?	No	The BRS is the new program with matching in TSP
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	User input optional in the below rows (default values are entered already):		
11	Federal Income Tax Rate	25.00%	
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	Savings (Real) Rate of Return	2.06%	Fisher
	Savings (Real) Rate of Return, after full retirement	0.59%	Fisher
	Military pay table growth (real)	0.09%	Fisher

Output Dashboard

Multiple of Current Annual Base Pay You Need to Have Saved at this Point to Make Up the Deficiency

Officer Ranks

	2 or less	Over 2	Over 3	Over 4	Over 6	Over 8	Over 10	Over 12	Over 14	Over 16	Over 18
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O-2		18.1	15.7								
O-1	23.8										

Enlisted Ranks

	2 or less	Over 2	Over 3	Over 4	Over 6	Over 8	Over 10	Over 12	Over 14	Over 16	Over 18
E-9									3.5	3.4	3.4
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E-6					6.2	3.6	3.4	1.5	1.4		
E-5			7.7	7.3	4.3						
E-4			5.4	5.1							
E-3		6.3									
E-2	7.1										
E-1 > 4mo											

Table 5 shows the input dashboard and output format for the online calculator associated with this study. Because of the almost endless permutations of input variables and the time-varying nature of many of them, it is important to have the ability for individuals to have the capacity to customize their inputs.