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MBA PROFESSIONAL REPORT

COMPARING MILITARY RETIREMENT TO THE CALIFORNIA HIGHWAY PATROL PENSION PLAN

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June 2014

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A 2013 Congressional Budget Office report estimates that DOD will need to reduce 2014 to 2021 total costs by $701 billion in order to meet the most stringent limitations set by the Budget Control Act of 2011. It is obvious that DOD must restructure the MRS to achieve the necessary reduction in costs. Too often, however, the department looks to private industry for solutions to DOD problems. While not to be overlooked, private industry is not always the best model by which to develop solutions to military problems. The unique risks to which service members are exposed require a different analogue to ensure a successful comparison and adequate solutions. In this light, a more representative group outside of DOD can be found in law enforcement officers. This study analyzes the retirement systems of DOD service members and the California Highway Patrol in an effort to accurately compare the two.

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COMPARING MILITARY RETIREMENT TO THE CALIFORNIA HIGHWAY PATROL PENSION PLAN

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A 2013 Congressional Budget Office report estimates that DOD will need to reduce 2014 to 2021 total costs by $701 billion in order to meet the most stringent limitations set by the Budget Control Act of 2011. It is obvious that DOD must restructure the MRS to achieve the necessary reduction in costs. Too often, however, the department looks to private industry for solutions to DOD problems. While not to be overlooked, private industry is not always the best model by which to develop solutions to military problems. The unique risks to which service members are exposed require a different analogue to ensure a successful comparison and adequate solutions. In this light, a more representative group outside of DOD can be found in law enforcement officers. This study analyzes the retirement systems of DOD service members and the California Highway Patrol in an effort to accurately compare the two.

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LIST OF ACRONYMS AND ABBREVIATIONS

CHP	California Highway Patrol
CJCS	Chairman of the Joint Chiefs of Staff
CSB	Career Status Bonus
DBB	Defense Business Board
DOD	Department of Defense
DOPMA	Defense Officer Personnel Management Act
MRF	Military Retirement Fund
MRS	Military Retirement System
PEPRA	Public Employees' Pension Reform Act
SPOFF	State Peace Officers and Firefighters
TSP	Thrift Savings Plan
YOS	Years of Service

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I. INTRODUCTION

A. BACKGROUND

In fiscal year (FY) 2011, the Military Retirement Fund (MRF) paid $51 billion in retirement benefits to over 1.9 million military retirees (Allen & Garcia, 2013). The number of retirees receiving retirement pay increased from 1.5 million in 1981, up from approximately 823,000 20 years prior (Office of the Actuary, 2013). In its most recent report, the DOD Office of the Actuary estimated that, by 2036, the required outlay from the MRF will have grown to nearly $116 billion (Allen & Garcia, 2013).

The current budgetary challenges faced by DOD show no signs of easing in the near term. Additionally, steadily increasing life expectancy and the possibility of rising inflation rates in coming years place considerable strain on the current Military Retirement System's (MRS) ability to meet future obligations. Indeed, a 2011 report from the Defense Business Board (DBB) called the current system "unaffordable" (DBB, 2011). Aware of the challenges faced by the MRS, the Office of the Secretary of Defense (OSD) is actively seeking solutions. In March of this year, following a two-year long review of the MRS, the Chairman of the Joint Chiefs of Staff (CJCS) presented to OSD a white paper with accompanying endorsement. The paper, titled Concepts for Modernizing Military Retirement, outlines proposed changes to the MRS and includes recommended fundamental guidelines for any new retirement system. This thesis analyzes the current system along with its proposed changes. It then compares both models against the plans offered to law enforcement officers by the public pension fund that most closely approximates the size of the MRF, the California Public Employees' Retirement System (CalPERS).

B. PURPOSE

DOD often looks to private industry for innovative solutions to defense-related issues. However, private industry solutions do not directly translate to the Armed Forces. This claim holds true when considering a reshaping of military retirement benefits. The uncommon demands expected of service members, along with the risks they face,

necessitate a retirement package designed with these factors taken into account. General Dempsey, CJCS, stated as much in his endorsement of the aforementioned white paper, "The Commission needs to recognize the unique contributions and sacrifices required by military service when considering changes to the retirement system." He goes on to state, "However, we do not support a retirement system consisting of 100 percent defined contribution, which was a recommendation of the Defense Business Board." The DBB is tasked with providing advice to DOD from a private sector perspective. The DBB settled on a defined contribution (DC) plan, a model increasingly favored by the private sector.

One relevant pursuit would be to identify a suitable analogue to the U.S. service member. When considering the unique demands placed upon service members and their exposure to a relatively high risk to life and limb, law enforcement officers are the most representative group available for comparison. If the retirement plan offered to the law enforcement community has taken into consideration the demands and risks unique to their profession, then the law enforcement public pension plan provides a more appropriate model for comparison than those found in the private sector. Indeed, safety workers, a category under which law enforcement officers fall, receive special consideration from the CalPERS plan. The California Public Employees' Pension Reform Act of 2013 provides three separate schedules of multipliers for safety officers by which to calculate retirement compensation. All three schedules grant higher benefits and an younger retirement eligibility age than the single non-safety schedule ("CA Codes," 2012). This study aims to compare, in the most direct way possible, the current MRS and proposed DOD retirement model to the CalPERS system. The findings will provide unique insight on the MRS from a perspective that has not yet been widely considered by the DOD.

C. RESEARCH QUESTIONS

The primary question that this study considers is:

- Does the MRS model proposed in the *Concepts for Modernizing Military Retirement* white paper favorably compare to the CalPERS California Highway Patrol (CHP) plan?

Secondary questions that this study considers include the following:

- Does the current MRS model favorably compare to the CalPERS law enforcement plans?
- What is the Net Present Value (NPV) of the CalPERS plan?
- What is the NPV of the current MRS plan?
- What is the NPV of the proposed MRS model?

D. SCOPE AND LIMITATIONS

This study utilizes only publicly available financial and actuarial data prepared in accordance with generally accepted industry practices and standards. Some of the essential data used is several years old due to delays in reporting. For instance, as of the writing of this thesis, the DOD Office of the Actuary's most recent valuation of the military retirement system utilizes data only current to 2011. Additionally, the model employed by this study to determine the valuation of retirement benefits will only consider active duty service members and selected reservists. Excluded from consideration are the effects of changes specifically applicable to survivors' benefits and disability retirement. The scope is limited to exclude these categories due to the CJCS's choice to reserve opinion on the matters citing the need for additional information.

E. METHODOLOGY

This research uses a NPV model to compare the monetary retirement benefits provided by the current MRS system, the OSD proposal, and the CalPERS CHP plan. NPV modeling offers a single, dollar value for each scenario that can be directly compared to each other. Each scenario was designed to capture the most probable variables for a given calculation, and sensitivity analysis was applied to test changes to thesis variables.

F. ORGANIZATION OF THE RESEARCH

Chapter II provides a history of the MRS and includes a breakdown of the current structure. It details the relevant costs of the current system along with forecasted future costs. The chapter concludes with an overview of the CJCS-endorsed proposal, which will hereby be referred to as the CJCS plan or system. Chapter III covers the public pensions. It describes the historical developments of these plans and continues with their recent trends. Chapter III finishes with a detailed description of the CalPERS plan. Chapter IV describes the methodology used to generate the Net Present Value of each system from the member's perspective. Chapter IV begins with a description of the CHP retirement plan. Chapter V provides a comprehensive summary and analysis of the findings in Chapter IV. Chapter VI presents the conclusions and recommendations of the study based on data and analysis from Chapters IV and V.

II. HISTORY OF THE MRS AND RECENT PROPOSED CHANGES

A. INTRODUCTION

This chapter covers the history of the MRS. It should be noted that Chapter II focuses on officer retirement, as the enlisted force structure was, historically, more easily managed via the approval rate of reenlistment requests. Thus, the majority of legislation throughout the 19th and 20th century focused on the officer ranks. Currently, all the plans offered by the modern MRS are identical for both officers and enlisted.

This chapter traces the retirement system's genesis and evolution to the present-day in order to explain to the reader the function of the MRS and how it has been revised over the years to meet changing needs. The chapter continues by detailing the design of today's system to include a comparison of the three current retirement packages and their purpose. Chapter II finishes with a description of the most recent proposed changes offered by CJCS and the issues these changes aim to resolve.

B. HISTORY OF THE MRS

The current MRS began to take shape over 150 years ago. In its earliest form, MRS legislation was written to deal with issues unique to a specific service, and it focused only on the officer corps. Incremental changes over the next century shaped the MRS into a structure that is applicable to all services and included enlisted service members. The following sections highlight the most important advancements in the MRS throughout the years.

1. 1855–1899

In 1855, a statute passed by the Thirty-Third Congress stipulated that the president, via the Secretary of the Navy, was to assemble a board whose purpose it was to identify any officers "incapable of performing promptly and efficiently" all of their duties (Military Retirement Reform Act of 1986, 1986) Those found at fault for their incapacity

would be “stricken altogether from the rolls,” but those, otherwise, approved by the president could be placed on a “reserve list” (Military Retirement Reform Act of 1986, 1986). Members of this reserve list were entitled to half of their active duty pay (Hix & Taylor, 1997). Although this statute most closely aligned with disability compensation, it laid the foundation for a retirement system. Just six years later, on August 3, 1861, Congress passed a law authorizing, at the discretion of the president, the *voluntary* retirement of officers, across all services, upon reaching 40 years of service (YOS). By July 17, 1862, this authority had expanded to allow for involuntary, non-disability retirement of officers at 45 YOS or the age of 62. However, this act, although granting the services the authority to force retirement upon these individuals it did not mandate their retirement(USD(P&R), 2011). Officers were allowed to continue their career if they received their service’s approval.

The statutes signed into law in 1855 and 1861 were the first legislative attempts at establishing the authority to retire military officers on either a voluntary or compulsory basis. They also indicate the earliest attempts to shape the force with retirement compensation. The need for this authority was described over six decades later by a congressional review of Army retirement:

> The unsatisfactory personnel conditions in the Regular Army which prompted these repeated recommendations of the War Department that Congress provide some form of retirement for the Regular Army were emphasized during the extended field service required over the period 1812–1861. While the law provided a pension of one-half pay for disabled officers, there existed no provision for compulsory separation from active service of old and disabled officers; there was no limit to active service save by dismissal or resignation of the officer. Thus, an officer could remain on active duty until death, despite incapacity due to old age, physical disability, etc. In consequence, many junior officers exercised commands in the field beyond their rank, the old and disabled officers who should have exercised these commands being left behind—often on leave—whenever field service was performed. (U.S. GAO, n.d.)

Following the initial legislation in 1855 and 1861, Congress continued to introduce retirement statutes, many of which contained concepts that serve as the

underpinnings of the modern retirement system. The act of July 27, 1862, set the rate at which Army and Marine Corps officers who were retired due to length of service were compensated. The rate was based on their "pay proper" at retirement plus a cash value of $36 per month (USD(P&R), 2011). The cash value was determined from the value of four daily rations plus "pay proper." The latter can be thought of as modern-day base pay. This act compensated officers for their rank at retirement but gave *all* officers the cash equivalent of four daily rations, even though those with longer terms of service were entitled to more during their active duty tenure. Navy officers, who were compensated via a separate active-duty pay formula, had their involuntary retirement pay established the previous year. Their retirement compensation was determined using a similar formula to Army and Marine Corps officers, but it was set at a slightly higher rate due to their correspondingly higher active-duty pay (USD(P&R), 2011). After the initial military retirement legislation in the early 1860s, the introduction of similar laws paused for nearly a decade until the passing of the Appropriations Acts of 1871 for the Army and Navy (USD(P&R), 2011). These appropriations were established under two separated statutes within the act of July 15, 1870, known as the Navy Appropriation Act of 1871 and the Army Appropriation Act of 1871 (USD(P&R), 2011). Although the Marine Corps is not mentioned in the titles, a special provision tied the treatment of Marine Corps officers pay to that of the Army officers (USD(P&R), 2011). These acts redefined the active-duty pay system and disposed of the commuted rations provisions in the process. Retirement pay, partially based upon the conversion of rations to a cash value, also needed reshaping. The act of July 15, 1871 scheduled retirement pay for Army and Marine Corps officers at 75% of base and longevity pay and at 50% of sea duty pay for Navy officers (USD(P&R), 2011). This rate was later raised to 75% of sea duty pay in 1873 (USD(P&R), 2011). Furthermore, the Army Appropriation Act of 1871 reestablished the president's authority to approve voluntary retirement for Army and Marine Corps officers after 30 years of service (USD(P&R), 2011).

A mandatory retirement age was not established until the act of June 30, 1882, limited the maximum age to 64 but left the previous 45-YOS and 62-years-of-age compulsory retirement authority as an option for the services (USD(P&R), 2011). The act gave officers the *right* to receive retirement benefits upon serving for 40 years. The previous statutes left retirement approval to the discretion of the president (USD(P&R), 2011). This is the first law that guaranteed the benefits of retirement to officers who qualified based on longevity.

Congress concluded their 19th century military retirement reform with a force-shaping law, the basis of which is still used in the modern era. In an effort to allow for better promotion opportunities for junior officers, Congress passed the act of March 3, 1899. This legislation authorized Navy officers from the rank of lieutenant commander to captain to apply for early voluntary retirement. Those officers who had not yet reached the minimum 40 YOS or 62 years of age could request they be added to a list for consideration for retirement. If attrition via death, resignation, retirement, and disability was insufficient in creating the desired vacancies, those added to the early retirement list were granted their request based upon seniority (USD(P&R), 2011).

2. 1900–1937

Overpopulation of the Navy's senior officer ranks remained an issue up until World War I. Consequently, the policy of early retirement, created by the act of March 3, 1899, remained in place until 1915 (USD(P&R), 2011). Meanwhile, to align the Navy with the other services, Congress passed the act of May 13, 1908, also known as the Naval Service Appropriations Act of 1909. Since 1870, Army and Marine Corps officers had been authorized retirement at 30 YOS, but Navy officers were still being held to the 40-YOS or 62-years-of-age metric. The act of May 13, 1908, set the services equal in this respect by allowing Navy officers the option of a 30 YOS voluntary retirement (USD(P&R), 2011).

The act of August 29, 1916, also called the Naval Service Appropriation Act of 1917, introduced two concepts still present in some form in the modern-day retirement system. The act instituted the "up-or-out" promotion principle (USD(P&R), 2011). Second, the act determined the formula by which retirement benefits would be accrued. A retiring officer was entitled to 2.5% of his base pay, up to 30 YOS, so the maximum retirement pay was capped at 75% (USD(P&R), 2011). The "up-or-out" concept allowed the Secretary of the Navy to hold annual selection boards for promotion to the ranks of commander through rear admiral. Those officers not chosen for the next rank by a certain age were involuntarily retired from service. The act of June 22, 1926, later replaced the age restriction with a limit on time-in-service(USD(P&R), 2011). This law set the cut-off for a lieutenant commander not selected for promotion at 21 YOS, commander at 28 YOS, and captain at 35 YOS (USD(P&R), 2011). Laws over the next decade would further define this plan and expand its application to Marine Corps officers and to Navy junior officers.

The end of World War I brought with it a need for force reduction in the Army. The War Department Appropriation Act of 1923, passed as the act of June 30, 1922, allowed for the use of the retirement system to enact an Army draw-down (USD(P&R), 2011). Officers were eligible for retirement at their current rank with as few as 10 years of commissioned service (USD(P&R), 2011). A provision in the act allowed for those not meeting this requirement to retire as a warrant officer, assuming they had accumulated 20 years of total service (USD(P&R), 2011). Although the entitlement formula varied based on years of commissioned service, the maximum benefit was capped at 75% of final month's pay (USD(P&R), 2011).

The officer influx during World War I affected the Army for more than a decade after the passing of the act of 1923. Once again facing a bloated officer corps, the act of July 1, 1935, authorized a 15-year retirement option for Army officers (USD(P&R), 2011). The benefit formula for this program continued with the established standard of 2.5% per year of service and a 75% cap. (USD(P&R), 2011). The 15-year option was offered until 1948, although it was suspended during World War II (USD(P&R), 2011).

3. 1938–1980

Building upon the framework established over the previous 83 years, the act of June 23, 1938, established the model for the modern MRS. The Office of the Undersecretary of Defense for Personnel and Readiness referred to this act as one establishing a "merit system for promotion" (USD(P&R), 2011). Under this legislation, captains, commanders, and lieutenant commanders who were twice passed over for promotion were subjected to mandatory retirement at upon reaching 30, 28, and 26 years of respective commissioned service (USD(P&R), 2011). Additionally, it authorized Navy officers the option to apply for retirement upon completing a minimum of 20 YOS (USD(P&R), 2011). The Army and Air Force Vitalization and Retirement Equalization act of 1948 extended this option to the remaining services, and, for the first time, it aligned voluntary retirement authority across all branches of service (USD(P&R), 2011).

After World War II, the Navy faced the same overpopulation of the officer ranks that the Army had faced following The Great War. To deal with the issue, Congress passed the act of February 21, 1946, thereby, authorizing the Secretary of the Navy to convene boards with the purpose of recommending officers up to the pay grade of Navy captain and Marine Corps colonel for "involuntary retirement or elimination" (USD(P&R), 2011). The law further dropped the age for mandatory retirement for Navy and Marine Corps officers from 64 to 62 (USD(P&R), 2011). The authority of the screening boards ended in 1949, but the additional retirement provisions remained as permanent law (USD(P&R), 2011).

Until the passing of the Defense Officer Personnel Management Act (DOPMA) in 1980, officer involuntary retirement authority followed the framework of the Officer Personnel Act of 1947 and its amendment, the Officer Grade Limitation Act of 1954 (USD(P&R), 2011). For 33 years, involuntary retirement of non-disabled officers adhered to the guidelines set forth in Table 1.

Table 1. Officer Personnel Act of 1947 Grade Limitations (from (USD(P&R), 2011)

Grade	Army and Air Force	Navy and Marine Corps
O-10, O-9	Retired after 5 years in grade or 35 years of service, but retirement could be deferred to age 64.	Retired after 5 years in grade and 35 years of service, unless selected for continuation.
O-8	Retired after 5 years in grade or 35 years of service, but retirement could be deferred to age 60.	Retired after 5 years in grade and 35 years of service, unless selected for continuation.
O-7	Retired after 5 years in grade or 30 years of service, but retirement could be deferred to age 60.	Rear Admiral (lower half)—retired after 5 years in grade and 35 years of service unless selected for continuation; Brigadier General USMC—retired after second failure of selection for promotion.
O-6	Retired after 5 years in grade or 30 years of service.	Retired after 30 years of service if twice failed of selection for promotion or after 31 years if not twice failed.
O-5	Retired after 28 years of service.	Retired after 26 years of service if twice failed of selection for promotion.
O-4, 0–3	When twice passed over for promotion: Retired if with 20 or more years of service; retained to complete 20 years and then retired if within 2 years of 20- year point; eliminated with severance pay if less than 18 years of service.	Retired after 20 years of service if twice failed of selection for promotion; other grades eliminated with severance pay if twice failed of selection for promotion.

On December 12, 1980, Congress passed the DOPMA in an effort to align all services under a common mandatory retirement authority. Its enactment resulted in the involuntary officer retirement framework outlined in Table 2 (USD(P&R), 2011).

Table 2. DOPMA Involuntary Retirement Framework

Grade	Retirement Provisions
O-10, O-9	Retired at age 62 unless selected by the president for continuation on active duty, in which case retirement could be deferred, but not past age 64.
O-8	Unless specially selected for continuation, retired after five years in grade or upon completion of 35 years of active commissioned service, whichever was later.
O-7	Unless specially selected for continuation or upon a list of officers recommended for promotion, retired after five years in grade or upon completion of 30 years of active commissioned service, whichever was later.
O-6	Unless specially selected for continuation or upon a list of officers recommended for promotion, retired after 30 years of active commissioned service.
O-5	Unless specially selected for continuation or upon a list of officers recommended for promotion, retired after 28 years of active commissioned service.
O-4, 0–3	If eligible for retirement, retired after having twice failed of selection for promotion to the next higher grade, unless specially selected for continuation on active duty. If not eligible for retirement, continued on active duty if within two years of becoming eligible for retirement and retired when eligible; otherwise, discharged with entitlement to separation pay if eligible therefore, unless specially selected for continuation on active duty. An officer in pay grade O-4 who was selected for continuation could not be continued on active duty beyond completion of 24 years of active commissioned service unless promoted to the next higher grade; a similar officer in pay grade O-3 could not be continued beyond completion of 20 years of active commissioned service unless promoted to the next higher grade.
0–2	If eligible for retirement, retired after having twice failed of selection for promotion to the next higher pay grade; if not eligible for retirement, continued on active duty if within two years of becoming eligible for retirement and retired when eligible, otherwise discharged with entitlement to separation pay if eligible therefore.
0–1	Could at any time be discharged if less than five years of active commissioned service or if found not qualified for promotion to the next higher pay grade.

4. 1981–Present

On September 8, 1980, Congress enacted the Defense Authorization Act of 1981, which created the High-3 retirement plan for all service members joining after its enactment (USD(P&R), 2011). The High-3 is one of the plans offered under the current MRS and is discussed in more detail below.

In an effort to reign in growing MRS costs, the Department of Defense Authorization Act of 1984, also called Public Law (P.L.) 98–84, instituted an accrual-based funding approach (USD(P&R), 2011). Prior to the 1984 legislation, DOD operated the MRS on a "pay-as-you-go" approach. Under this system, DOD requested enough funding within the annual budget to meet that budget year's retirement outlays. In this case, an outlay is the actual retirement pay received by retirees. P.L. 98–94 created the Military Retirement Fund (MRF). The MRF is funded by DOD and maintained by the U.S. Treasury. Under accrual funding, DOD pays into the MRF at a rate required to finance the coverage of future liabilities. The financing is accomplished through the purchase of special-issue securities from the U.S. Treasury. These securities are required by P.L. 98–94 to bear "interest at rates determined by the Secretary of the Treasury, taking into consideration current market yields on outstanding marketable obligations of the United States of comparable maturities" (*Defense Authorization Act, 1984*). The interest earned off of these investments allows DOD to fund the MRS at a lower annual rate than under the "pay-as-you-go" system.

The creation of the MRF also incurred an initial unfunded liability. P.L. 98–94 established a Board of Actuaries, in part, to determine the size of the liability and the structure by which it would be amortized (*Defense Authorization Act, 1984*). The amount of the initial unfunded liability was determined to be $528.7 billion, as of September 30, 1984 The Board of Actuaries decided that the liability should be amortized with payments of 33% of the DOD basic payroll over the following 60 years (Office of the Actuary, 2013). The structure of this amortization has since been adjusted multiple times.

In 1985, Congress took steps to reduce the fiscal year (FY) 1986 budget by $2.9 billion (USD(P&R), 2011). The resulting legislation, titled the Military Retirement Reform Act of 1986, created the Redux plan and introduced changes to the retirement benefits. The Redux plan is still in place under the current MRS and is further discussed in the next section.

The early 1990s saw the need for an "active force drawdown period" and the return of a voluntary early retirement option (USD(P&R), 2011). The National Defense Authorization Act for Fiscal Year 1993 provided the service Secretaries authorization to consider applications for early retirement from service members who had reached 15 YOS but with less than 20 YOS (USD(P&R), 2011). The initial drawdown period was listed as October 23, 1992 to October 1, 1995, but the Defense Authorization Act for Fiscal Year 1994 extended the period to October 1, 1999 (USD(P&R), 2011). The formula used to determine early retirement benefits was similar to previous formulas, allowing for a 2.5% of base pay credit for each year served. It also gave a 1/12th credit for any additional months (USD(P&R), 2011). The formula then subtracted 1/12th of 1% for each full month required to reach 240 months of service (USD(P&R), 2011). For example, a qualifying member serving 18 years (216 months) would receive 43% of base pay, as calculated below:

$$216 * 2.5\% * \frac{1}{12} - (240 - 216) * 1\% * \frac{1}{12}$$

In the late 1990s, Congress determined that the Redux program established in FY 1986 was detrimental to recruiting efforts. Consequently, the National Defense Authorization Act of 2000 offered affected service members the option to remain on the Redux plan, with a one-time Career Status Bonus (CSB), or to revert to the High-3 formula (USD(P&R), 2011).

C. CURRENT SYSTEM

A March 2014 CJCS report describes the current MRS as "a non-contributory, cliff-vested, defined-benefit plan" (Dempsey, 2014). This brief description captures the plan's basics. Service members do not directly contribute to their retirement. Members are entitled to full benefits upon reaching 20 YOS but are entitled to none before the 20-year point. Upon retirement, members receive an inflation-protected, lifetime annuity. The MRS is comprised of three separate plans commonly referred to as Final Pay, CSB/REDUX (or Redux), and High-3. The details of each are explored in the following sections.

1. Final Pay

The Final Pay plan applies to military members in service before September 8, 1980. It applies the historical convention of determining retirement pay from base pay at the time of retirement. Members vest at 20 YOS and earn a credit equal to 2.5% of final month base pay for each year served up to a maximum of 75%. At the time of this writing, the most junior service member eligible for this plan has, theoretically, over 33 YOS The latest published DOD actuarial data shows this demographic makes up less than .5% of all service members (Garcia, 2012)

2. High-3

The Department of Defense Authorization Act of 1981 established the "high-three-year average" policy, or High-3, in order to slow the rapidly growing military retirement cost liabilities (USD(P&R), 2011). The formula is exactly the same as the Final Pay plan but with one exception. Instead of members receiving retirement pay determined by a multiplier and their final base pay, the average of the final three years of base pay is used along with the multiplier.

Using the 2014 Basic Pay charts, an officer of the 0–5 pay grade will retire at 20 YOS with a High-3 retirement benefit pay of $4062 per month. The same officer under the Final Pay plan will receive $4099 per month.

3. CSB/Redux

Seeking a $2.9 billion cut in the FY 1986 budget, Congress passed the 1986 Department of Defense Authorization Act. The legislation required DOD to render a report offering two separate sets of changes, the implementation of which would achieve the desired budgetary cuts (USD(P&R), 2011). After a review of DOD's proposal, Congress passed the Military Retirement Reform Act of 1986. A Congressional committee studying the matter stated:

> The uniformed services retirement system has existed essentially unchanged for the last 50 years, and its basic form was established over a century ago. During the past two decades, the uniformed services retirement system has come under increasing scrutiny and attack. By recommending the [current] changes ..., the conferees are attempting to put the issue of structural reform of the uniformed services retirement system to rest for the foreseeable future. The conferees believe that, as a result of these changes, the criticism of the uniformed services retirement system will subside and the concerns of service members regarding the uncertainty of retirement benefits can be assuaged. (USD(P&R), 2011)

The Act of 1986 introduced two changes to the MRS. First, members retiring with less than 30 YOS will have the 2.5% multiplier reduced by 1% for each year under 30 YOS until reaching age 62, at which time the reduction is eliminated (USD(P&R), 2011). Members retiring with 30 YOS or more will receive immediate benefits equal to 75% of base pay (USD(P&R), 2011). For example, a member retiring after 20 YOS will receive base pay times a 40% multiplier in order to reflect the 10% reduction for the 10 years served under 30 YOS. Second, the cost of living adjustment was reduced to Consumer Price Index (CPI) minus 1%. This adjustment restores to a rate equal to CPI at age 62 (USD(P&R), 2011).

As mentioned earlier, Congress concluded that the Redux plan hindered recruiting efforts. To correct the issue, the National Defense Authorization Act for Fiscal Year 2000 offers a one-time CSB of $30,000 for those choosing to remain on the Redux plan (USD(P&R), 2011). All others will default to the High-3 plan. The CSB/Redux option is available to all members who entered service after August 1, 1986 (USD(P&R), 2011).

Qualifying members are eligible within 180 days of reaching 15 YOS (USD(P&R), 2011). Members choosing this lump sum bonus must agree to serve until the 20-year mark, or they must repay a prorated portion of the bonus (USD(P&R), 2011).

D. OFFICE OF THE SECRETARY OF DEFENSE PROPOSAL

In March 2014, CJCS submitted a report to Congress via the Office of the Secretary of Defense (OSD) detailing two proposed models by which DOD can modernize the MRS (Dempsey, 2014). The report follows a two-year long DOD review of the current MRS. The report contradicts a 2011 report by the Defense Business Board (DBB) which recommended a switch to a 100% DC system (Spencer, 2011). The report describes DOD research that used a model developed by the Rand Corporation to simulate the DBB proposal and determined that a pure DC system would have a "devastating effect on retention" (Dempsey, 2014).

The CJCS report set forth three main objectives that a new MRS must meet. These objectives are "to provide the members who faithfully serve their country a robust retirement; to provide force managers with the tools to maintain and shape the force structure; and to provide the American taxpayers an effective force at a reasonable and affordable cost" (Dempsey, 2014). Furthermore, the report lists two "overarching considerations" when considering MRS modernization; (1) the protection of current service members through a "grandfathering" provision and (2) no negative effects to the "existing force structure and capability of the All-Volunteer Force" (Dempsey, 2014).

The proposal cites the need to develop a retirement system that meets the needs of DOD and is also competitive with plans offered by outside organizations. In a stated effort to offer an attractive and affordable retirement incentive package, while meeting the three main objectives mentioned earlier, OSD proposes two variations of hybrid retirement systems. Table 3 outlines the two concepts.

Table 3. OSD Retirement Reform Concepts (from Dempsey, 2014)

	Concept 1	Concept 2
DB	**Two-tier retirement benefit** for both active and reserve components • Partial benefit during member's second career years* (for both active and reserve) • Full benefit in old age • Vests at 20 years of service	**Single-tier retirement benefit** with lower multiplier • Active: full benefit during second career years* and in old age • Reserve: benefit starts at age 60 • Vests at 20 years of service
Supplemental Pay	**Continuation pay** to sustain the force (multiplier varies by officer/enlisted/ Service with a range from 0–16 months basic pay) Active component **transition pay** upon retirement to ease transition and encourage separation	**Continuation pay** to sustain the force (multiplier varies by officer/enlisted/ Service with a range from 0–19 months basic pay) Active component **transition pay** (with lower multiplier) upon retirement to ease transition and encourage separation
DC	**Thrift savings plan**: Automatic DOD contributions, early vesting (e.g., after six years of service) with payout available at age 59 ½	

* Members can establish a second career in the civilian sector after leaving military service.

1. Defined Benefit

Under both concepts in this model, the DBs vest at 20 YOS and offers some form of immediate payout calculated via the High-3 methodology (Dempsey, 2014) Both concepts also deliver a lower retirement annuity than the current system, offset by a DC element and supplemental pay. Concept 1 presents a two-tier model. The first tier is a partial benefit paid to both active and reserve retirees during "second career years" (Dempsey, 2014). This model assumes that many military retirees embark on a second career after leaving military service. The second tier of this model pays a full benefit when the member reaches "old age" (Dempsey, 2014). The report does not recommend a

specific age for the beginning of the second tier, but models run by the DOD study assume both 62 and 65 years of age (Dempsey, 2014).

A difference between the current MRS and the DB portion of Concept 1 is the immediate benefit offered to reserve retirees. Under the current system, reservists generally do not collect retirement pay until reaching age 60. The stated goal of the proposed change is to align the active and reserve retirement plans (Dempsey, 2014).

Concept 2 offers a single-tier of DBs to both active and reserve components. This is consistent with the current system in design, but Concept 2 offers a multiplier lower than 2.5% in order to offset the supplemental pays and DC elements. Although no concrete multiplier is suggested in the report, the DOD models used both 2% and 1.75% to conduct their research (Dempsey, 2014).

2. Supplemental Pays

Concept 1 and Concept 2 both provide a supplemental pay provision in addition to DBs and contributions. The supplemental pays consist of transition pay and continuation pay. Both of these types of pay are designed to provide the system with the flexibility to actively shape the force. The lump sum transition pay is set at a multiple of final base pay and delivered upon retirement to active duty members with at least 20 YOS (Dempsey, 2014). The report claims that current compensation has proven to be considered more valuable to service members than deferred compensation. The transition payment is then a way to increase the value of the retirement package by pulling deferred retirement payments forward. The multiplier used to determine the lump sum is lower under Concept 2.

Continuation pay is designed to be a more focused and flexible tool by which to manipulate force structure. It can vary across services, active and reserve components, officer and enlisted, and by occupational area (Dempsey, 2014). The size of the payment will be set as a multiple of monthly basic pay. Under Concept 2, this payment could be slightly larger than Concept 1 (Dempsey, 2014).

3. Defined Contribution

Both plans employ identical DC elements by utilizing the Thrift Savings Plan. The Thrift Savings Plan (TSP) closely resembles civilian 401(k) plan and is, currently, available to service members on a voluntary basis. Authorization already exists allowing for DOD contributions to members' accounts, but no service has exercised this option, to date. Under both concepts, members vest upon serving over six years, with payouts deferred until age 59½ (Dempsey, 2014). Service contributions to the TSP will cease upon the member reaching 20 YOS, although the member can continue personal contributions (Dempsey, 2014). CJCS states that this option will help DOD recruiting efforts by offering a retirement component comparable to those in the civilian workforce (Dempsey, 2014). Although the proposal does not recommend a specific rate of contribution, DOD analysis performed during concept modeling assumed 5% of base pay (Dempsey, 2014).

III. OVERVIEW OF PUBLIC PENSION PLANS

A. INTRODUCTION

The first retirement plans for public sector state and local employees can be traced back to an almost identical timeframe as military retirement (NCPERS, 2008). State and local municipalities first offered pension plans to their workers, in part, to make compensation package more competitive with private sector jobs that offered higher salaries. Government employers intended to offset their relatively low wages with the added security that retirement benefits provide later in life.

B. HISTORY OF PUBLIC PENSIONS

In 1857, the state of New York passed the first law establishing retirement benefits for its workers (NCPERS, 2008). The law provided a lump sum payment for police officers injured in the line of duty. New York overhauled the legislation in 1876, proving a lifetime retirement benefit for any officers serving for 21 years on the force or reaching age 55 (NCPERS, 2008). The plan was extended to include firefighters in 1866. (NCPERS, 2008).

Over the next 60 years, public pension plans were slow to spread. Only 12% of the large state plans in existence today were functioning in 1930 (NCPERS, 2008).That history of slow growth quickly changed after the Social Security Act passed in 1935. Due to federal government concerns over the taxation of the states, the Social Security Act excluded state and local workers. States and municipalities were forced to develop plans by which to provide their employees with similar protection in old age to that the average American citizen would now receive. Consequently, the years between 1935 and 1950 saw the establishment of approximately half of today's largest state pension plans (NCPERS, 2008).

In the earliest plans, most public pensions provided a defined benefit in two forms. First, they paid an employer-funded lifetime pension based on the worker's years of service and salary. Second, they granted an annuity, the value of which was determined by the employee's total contributions (NCPERS, 2008). By the 1970s, this

model proved too complex to easily administer, and many public plans opted for a simplified formula comprised of age, salary, and years of service (NCPERS, 2008). Both plans required employee contributions, however, the newer design fixed the retirement benefit at a value independent of the worker's total contributions (NCPERS, 2008).

The Employee Retirement Income and Security Act (ERISA) of 1974 indirectly loosened restrictions on public pension fund investments. While the legislation did not mandate that private sector employers establish pension plans, ERISA did set rules that plans were obligated to follow once established (NCPERS, 2008). Before the guidelines for private pensions were codified, many plans, both public and private, structured fund investment portfolios in a relatively conservative fashion. ERISA, however, codified the term "prudent man" when referring to the fiduciary responsibility of pension fund management (NCPERS, 2008). The term gave tacit approval for fund managers to pursue a riskier investment strategy so long as the investments were "prudent and diversified" (NCPERS, 2008). Although ERISA had never applied to public pensions, public fund managers began to follow the private sectors lead in the 1980s and pursued riskier investment strategies, mainly in the form of common stock purchases (NCPERS, 2008).

Pension fund portfolios that were heavily weighted with equities were rewarded for the additional risk in the stock market boom of the 1990s. Funds grew at a higher rate than anticipated. Instead of holding the additional assets as a hedge against below-average returns in the future, many plans were restructured. The revised plans required lower employee contributions, provided increased benefits, and some granted both enhancements.

C. PUBLIC PLANS TODAY

The latest U.S. Census Bureau survey reports 3,998 active public pension systems serving over 19.5 million members (U.S. Census Bureau, 2014). The majority of active members belong to state pension systems as Table 4 shows, below (U.S. Census Bureau, 2014) Interestingly, of the almost 4000 public systems, only 227 belong exclusively to states. [Census membership] This data can be a bit misleading, however. Many local governments buy into the state system and contribute to that system on behalf of their

employees. These local government payments, consequently, make up the majority of all public pension contributions as shown in Table 5.

Table 4. U.S. Public Pension Membership (from (U.S. Census Bureau, 2014)

Type of Government	Number of Systems	Membership			Number of Beneficiaries
		Total	Active	Inactive	
United States	**3,998**	**19,587,970**	**14,374,391**	**5,213,579**	**9,012,347**
State	227	17,544,912	12,643,450	4,901,462	7,622,748
Local	3,771	2,043,058	1,730,941	312,117	1,389,599
California	**63**	**2,296,468**	**1,679,222**	**617,246**	**1,136,296**
State	5	1,891,699	1,334,760	556,939	874,734
Local	58	404,769	344,462	60,307	261,562

Table 5. U.S. Public Pension Contributions (from (U.S. Census Bureau, 2014)

Contribuitions	Amount (in thousands of $)	Distribution Ratio (%)
Total Contributions	144,565,774	100
Employee Contributions	43,521,424	30.10
Government Contributions	101,044,350	69.90
State Government Contributions	42,745,898	29.57
Local Government Contributions	58,298,452	40.33

In the last decade, the pension plans revised in the late-1990s have taken a toll on their associated fund investments. Increased volatility in investment returns coupled with increased benefits and declining contributions have rendered many plans dangerously underfunded. In 2011, the Congressional Budget Office (CBO) released a report on the condition of public pension funding. After studying 85% of all state and local funds, it concluded that, in 2009, they were underfunded by $700 billion, or 20% (Rusek, 2011). This was the lowest rate in the previous 20 years (Rusek, 2011). A similar survey to the one used by the CBO pegged the unfunded rate at 25% in 2011 (Munnell, Aubry, Hurwitz, Medenica, & Quinby, 2012)

The public sector has not adapted its plans as quickly as the private sector to deal with the current economic reality. Where private funds are decreasing their reliance on

corporate equities, public pensions are moving in the opposite direction. From 2000 through 2006, the ratio of total fund assets invested in equities for both public and private funds steadily increased to roughly 70% [CRR BC Funding]. Over the next few years this ratio dropped sharply to a little under 50% for private plans but only fell to 60% for public funds (Munnell et al., 2012). In the last few years, however, the private sector's ratio moved sideways, while the public sector increased sharply. In 2012, the ratio was 48% for the private sector and 66% for the public (Munnell et al., 2012). The fundamental structure of public and private pension plans has diverged in recent years, as well. Private firms increasingly offer DC plans, whereas almost all public plans retain some DB aspect. As of 2010, only Alaska and Michigan had systems requiring new employees to join a DC plan, and only the Alaska plan applied to peace officers (Munnell et al., 2012). Conversely, the private sector participation in DB plans decreased from 35% to 18% from 1991 to 2011 (Wiatrowski, 2013). The most recent trend among state and local pensions is the move to hybrid plans. Hybrids consist of both DB and DC components. They split the investment risk amongst employer and employee. Conversely, DC plans place all of the risk with the employee, and DB plans place it with the employer. Today, at least 12 states offer some form of hybrid plan (Munnell et al., 2012).

D. DEFINED BENEFIT, DEFINED CONTRIBUTION, AND HYBRID PLANS

Retirement plans are categorized by what within the plan is defined. DB plans offer a specific, established benefit upon retirement. This benefit can be paid to the member as either a lump sum or as an annuity. DC plans set the payments that will fund the retirement benefits. The employer, the employee, or a combination of both makes the payments. Contributions shared by the employer and employee split the risk of funding the retirement benefit. Hybrid plans combine characteristics of each plan. An example of a hybrid plan is one in which the employee makes defined contributions but is guaranteed a specific benefit at retirement.

E. CALPERS

The California Public Employees Retirement System (CalPERS) was established in 1931 and became operational in 1932 (CalPERS, 2013). It originally provided retirement benefits to only State employees. However, State legislation in 1939 opened the program to public agency and select school employees (CalPERS, 2013). The plan began providing health care benefits to State employees in 1962 (CalPERS, 2013).

Today, CalPERS is the largest public pension fund in the nation. Its net position as of June 30, 2013 was valued at $262 billion (CalPERS, 2013). CalPERS consists of 13 separate funds that provide benefits to over 1.6 million members within 3089 school and public employer systems (CalPERS, 2013). In its most recent Comprehensive Annual Financial Report, CalPERS' was listed as a DB retirement plan (CalPERS, 2013). Nonetheless, it administers four supplemental DC plans, one of which is the State Peace Officers' and Firefighters' Defined Contribution Plan Fund (SPOFF) (CalPERS, 2013). SPOFF controlled assets worth $491.3 million as of June 30, 2013 (CalPERS, 2013). Following an agreement with the California Correctional Peace Officers Association, California passed legislation in 2013 that allows for the termination of SPOFF and the distribution of its assets. The measure is on hold pending IRS approval.

California Governor Jerry Brown signed into law the Public Employees' Pension Reform Act (PEPRA) of 2013 on September 12, 2012. The law went into effect on January 1, 2013 with the purpose of reigning in rising pension plan costs. PEPRA introduced several cost-cutting measures including reduced benefits and increased retirement age, caps on "pensionable salary" used to calculate benefits, sharing of normal costs between employer and employee, and a three-year-final-compensation standard. The last measure is identical to the way High-3 determines final compensation for military retirement.

The DB portion of CalPERS splits contributions between employer and employee. The rate of contributions varies by employer, but all Contributions are invested in one of the State-administered funds. Upon retirement, the member receives a monthly benefit payment calculated as the final 36-month's average monthly salary times

an age-dependent multiplier and years of service. The multipliers are set by PEPRA and differ for safety and non-safety employees with the former receiving a more generous multiplier schedule. Safety employers can offer their workers one of three plans, all with separate multiplier schedules. Safety workers vest after five years and may retire as early as age 50. For employees in non-safety positions, the earliest retirement age is 52. Furthermore, safety workers reach their maximum multiplier rate at age 57½ with a 2.7% multiplier under PEPRA's Safety Option Plan 2. The maximum multiplier for non-safety employees is 2.5% at age 67.

IV. METHODOLOGY

A. INTRODUCTION

One of the objectives of this thesis is to compare the current MRS and the Office of the Secretary of Defense (OSD) proposal to a representative group under the CalPERS system. This chapter details how the analogue was chosen and the methods used to compare it to the DOD systems. Chapter IV also explains the assumptions used in the evaluation.

B. CALIFORNIA HIGHWAY PATROL PLAN

The California Highway Patrol (CHP) is the group within the CalPERS system to which the MRS and OSD proposal are compared in this thesis. CHP met four criteria required of the selected representative group. First, CHP officers may face risk to life and limb in the performance of their regular duties. Second, CHP officers fall under the Safety Members category within the CalPERS system. As noted in Chapter II, this member category is offered a more generous retirement compensation package than the General category of beneficiaries. The complete multiplier schedule for General and Safety Member categories is available in Appendix A. As previously discussed in Chapter I, DOD shares this concept of providing a more valuable retirement package to those placed in harm's way. Third, CHP provides the most homogenous group of law enforcement officers within CalPERS. While the SPOFF and State Safety plans are larger, they include members outside of the law enforcement profession. Fourth, available data on the CHP retirement plan is sufficient to conduct a fair comparison with the DOD plans.

When PEPRA went into effect in on January 1, 2013, it brought changes to the CHP plan. However, current CHP employees were allowed to remain on their current plans, a concept referred to as "grandfathering." Similarly, DOD grandfathered current members when it made the switch from Final Pay to High-3. CJCS also recommends the same option should be offered to current service members if the MRS is again overhauled. The relatively recent implementation of PEPRA means that the majority of

CHP employees are still members of grandfathered plans. Nonetheless, those plans are no longer offered to new CHP employees, so they are not a part of this study. New employees join the State Safety Option Plan Two. This plan offers a 2% multiplier at age 50, increasing quarterly until the 2.7% maximum at age 57 is reached.

As part of the CalPERS system under the state's Safety plan, CHP officers participate in a hybrid pension plan. High-three-year salary and the age-dependent multiplier schedule determine the defined benefit element. PEPRA mandates the normal cost of funding the plan be shared equally between employer and employee. This means that the defined contribution rate for employees can change depending on the funding requirement. The current rate is 11.5% of the member's base salary (CalPERS, 2013). Base salary does not include special pay such as overtime, flight officer pay, or bilingual pay, and it is analogous to military basic pay.

The CHP plan provides two types of adjustments to protect retirement pay from inflationary pressure. First, the CHP plan offers a 2% cost-of-living (COLA) adjustment, 1% below the DOD standard (CalPERS, 2013). However, the CHP plan also provides an additional adjustment known as the Purchasing Power Protection Allowance (PPPA) (CalPERS, 2013). PPPA is capped at 1.1% of member contributions (CalPERS, 2013). It is meant to keep the retirement allowance at 75% of the initial allowance at the time of retirement (CalPERS, 2013). For the purpose of this study, PPPA is set at 1% in order to set the total CHP adjustment equal to DOD COLA. When added to COLA, the 1% PPPA sets the total inflation adjustment equal to the 3% annual salary increase cited in the city of Oakland's February 2014 CalPERS contribution rate study

CHP base pay is determined by years of service. Newly designated officers receive and annual salary of $67,764 ("CHP-Recruiting," n.d.). The amount increases by 5%, annually, until reaching the top base salary of $84,036 ("CHP-Recruiting," n.d.). For the purpose of this thesis the terms "base salary" and "pensionable salary" are interchangeable. Upon retiring, CHP members receive a lifetime annuity with monthly payments capped at 90% of their active duty base pay. Table 6 summarizes the CHP plan's characteristics discussed above.

Table 6. CHP Pension Plan Summary (from "CHP-Recruiting," n.d.)

Annual Base Salary	$67,764 - $84,036
Annual Salary Increase	5% per year[1]
Vesting	5 YOS
Multiplier	2% - 2.7%
COLA Adjustment	2% per year
PPPA	1.1% per year[2] max
Retirement Annuity Cap	90% of base salary
DC Contribution Rate	11.25% of base salary
Employer/Employee DC Ratio	50/50
Earliest Retirement Age	Age 50
Maximum Retirement Reached	Age 57

[1] Capped at $84,036
[2] 1% assumed for this analysis

C. NET PRESENT VALUE

In order to directly compare different retirement plans, a single value must be generated for selected scenarios within each plan. This study makes financial comparisons between each retirement plan from the perspective of a member at the moment of retirement. However, from this perspective, cash flows used in the valuation may occur in the past, present, or future (i.e., continuation pay, transition pay, and retirement pay, respectively). In accordance with the time value of money principle, cash flows that occurred in the past grow by applying an interest rate. Compounding occurs when the interest rate is reapplied to the principle and interest earned over more than one period. Conversely, future cash flows are discounted (e.g., compounding in reverse) back to the present. The sum of these cash flows at the present time is the NPV. For this study, the present time is always considered the moment of transition into retirement (i.e., year-zero). Calculating the net present value (NPV) of each scenario provides the desired single dollar value. From the perspective of the service member, the highest value is the most desirable option.

NPV corrects for the time value of money, or the financial principle that a dollar in the future is worth less than a dollar today. This discounting of future funds is a function of time (**t**) and a discount rate (**d**). Figure 1 and Figure 2 show the NPV equations used in this thesis. In these formulas time is a function of years (**n**) and periods per year, or months (**m**).

$$NPV_{Annuity} = C(\frac{1-(1+\frac{d}{m})^{-mn}}{\frac{d}{m}})$$

Figure 1. Net Present Value of an Annuity

$$NPV_{LumpSum} = \frac{C_t}{(1+\frac{d}{m})^{mn}}$$

Figure 2. Net Present Value of a Lump Sum

$$NPV_{Annuity\ w/growth} = \frac{C}{d-g}\left[1-\left(\frac{1+g}{1+d}\right)^{n}\right]$$

Figure 3. Net Present Value of an Annuity with Growth

Figure 1 is used to discount future retirement pay to the time of retirement transition. **C** represents the monthly DB payouts to members in retirement. The number of years members will receive the payouts is represented by **n.** This is determined by the member's age at the time of retirement and life expectancy. The average age at retirement for each rank is taken from the 2012 Statistical Report on the Military Retirement System (Allen & Garcia, 2013).

Figure 2 is used to discount a lump sum in the future back to the present time. In this formula, $\mathbf{C_t}$ represents the lump sum at time **t**, and **d** is the discount rate. Again**, m** times **n** is the total number of periods the lump sum will be discounted (i.e., months times number of years).

Figure 3 is the formula for the present value of an annuity with growth. This equation calculates the present value of a regular payment that grows at a fixed rate. The net present value of an annuity with growth is applicable to the CHP retirement plan

where all retirees have reached the maximum annual pensionable salary. In this case, **g** is COLA (2%) plus PPPA (1%), **d** is the discount rate, and **n** represents the number of years of retirement pay until the life expectancy age.

D. LIFE EXPECTANCY

Life expectancies differ between the officer and enlisted ranks as well as between males and females. The weighted average of each demographic is used to develop a life expectancy schedule applicable to both males and females. Weights for males and females are consistent with demographic information published in the Office of the Deputy Assistant Secretary of Defense (Military Community and Family Policy's) 2012 Demographics report. According to this study, males account for 83.9% of the Armed Services (Office of the Deputy Assistant Secreatary of Defense (Military Community and Family Policy), 2012). A 2010 experience study from the CalPERS Actuarial Office shows average life expectancies for retired CHP officers only 1% less those of DOD members (*CalPERS Experience Study*, 2010). The similarity of CHP and DOD life expectancy combined with a margin of error inherent to the prediction of mortality rates allows for both life expectancies to be set equal. Due to a lack of data regarding CHP demographics, the male-to-female ratio is assumed to be the same as DOD, as well. This assumption is not unrealistic, however. Los Angeles Police Department demographics data from October 2013 reports that female officers comprise 18% of the total force, whereas the percentage of female DOD officers is 16.1% (*Report PR91*, 2013).

Life expectancy rates are not single numbers for men and women but dependent upon age. For example, the life expectancy for a 35-year-old male officer is 83 years, but it is 86 years for a retired officer at age 70 (Allen & Garcia, 2013). The improvement in life expectancy as age progresses is called the mortality improvement rate. Conveniently, the mortality improvement rate among service members is less than 1%, so life expectancy is relatively stable across the range of retirement ages considered in this study (Allen & Garcia, 2013). The average life expectancy for retirement-age officers is 83–84 years and 79–80 years for enlisted (Allen & Garcia, 2013).

E. DISCOUNT RATE

In the broadest terms, a discount rate is the value used to account for the time of a future amount. *Principles of Corporate Finance* defines the discount rate as the "rate used to calculate the present value of future cash flows" (Brealey, Myers, & Allen, 2011). This thesis considers the discount rate from the perspective of the service member. These personal discount rates are different from the classic financial definition, although the underlying principle is the same. In this study a personal discount rate is the rate at which an individual will trade future payment for current payment. In a February 2014 study performed by Dr. Menichini and Dr. Cunha of the Naval Postgraduate School, the individual discount rates among the enlisted and officer corps averaged 6.5% and 10%, respectively (Menichini & Cunha, 2014). Without a similar study of CHP officers, it is impossible to determine their average discount rate. For direct comparisons between DOD and CHP plans, this analysis uses the respective officer and enlisted rates determined by Menichini and Cunha. However, for informational purposes, valuation data for discounts rates from 2.5% to 15% for each plan is included in Chapter V.

F. FUTURE VALUE

The future value of a sum of money is the amount it will be worth at a future point based on a specified rate of return. Figure 3 and Figure 4 show the future value formula used in this thesis, where **r** is the interest rate. The rate of return is synonymous with interest rate for this purpose. The future value of a sum is applicable to two elements of the military retirement plans. Considering that year-zero for all valuations is the moment of retirement, the CSB and proposed Continuation Pay occur in the past and must be adjusted to present day to account for the time value of money. The interest rate for each of these payments is set equal to the discount rate for the given scenario. The CSB is paid at the beginning of the 15th YOS, so it is compounded for the number of years remaining until retirement for the given scenario. For example, a Redux service member retiring at after 20 YOS will have the CSB compounded for five years. A member retiring after 25 YOS will benefit from 10 years of compounding interest. The same principle is

applied to Continuation Pay only the payment is set at 12 YOS for enlisted and 16 YOS for officers, consistent with the CJCS report (Dempsey, 2014).

The future value of money concept is also applied to the defined contribution portion of the proposed OSD system. Since contributions are invested in the Thrift Savings Program (TSP), penalty free withdrawal is not available until age 59½. The percentage of members taking early withdrawals is difficult to predict, therefore it is assumed that all members refrain from accessing their TSP fund until reaching the penalty-free age. Consequently, the future value of the contributions at age 59½ must be calculated before the present value at year-zero can be determined. A 5% interest rate is applied to all DC contributions to align with the TSP assumed return used in the CJCS DOD study (Dempsey, 2014).

$$FV_{Annuity} = C\left(\frac{(1+\frac{d}{m})^{mn}}{\frac{d}{m}}\right)$$

Figure 4. Future Value of an Annuity

$$FV_{LumpSum} = C(1+\frac{d}{m})^{mn}$$

Figure 5. Future Value of a Lump Sum

G. INFLATION

The intent for this thesis is to draw direct comparisons between the DOD and CalPERS CHP retirement systems. Therefore, any variables that are equal among all the plans may be removed from the testing. Although inflation may vary slightly across the United States, standard actuarial practice utilizes the national Consumer Price Index (CPI). Additionally, due to the inherent difficulty in predicting future inflation rates, the Society of Actuaries recommends avoiding inflation assumptions when possible. Because of this recommendation and the equality of the CPI variable across all plans, inflation is not included in this thesis.

H. AGE AT ENTRY AND PROMOTIONS

The age at entry into the Armed Services used in this thesis comes from the DOD Office of the Actuary. Consistent with their findings, the average age of entry for all officers in this study is assumed to be 23 years, while the average age for enlisted members is 19 years (Allen & Garcia, 2013). The average age for members at the start of a CHP career is 27 years, and is taken from the 2012 Actuarial Cost Analysis performed by CalPERS (Glazier, 2012) .

DOD promotion estimates are based on the professional experience of the author and checked for relevance with information available on the Navy Personnel Command website. CHP rank is not a factor in determining retirement pay.

I. YEARS OF SERVICE ASSUMPTIONS AND SCOPE

The model used to determine the NPV of retirement pay utilizes data from 20 to 25 YOS for the ranks of 0–4 and E-6 and 20 to 30 YOS for all other ranks. However, the analysis in the next chapter covers only retirement at 20 YOS and the most common remaining retirement rank and YOS combination. Analysis of E-6 and 0–4 ranks is limited to 20 YOS due to the high-year tenure restrictions for enlisted members and statutory retirement limits for officers. Additionally, it is assumed assumes the majority of CHP officers retire from service before or upon reaching the maximum multiplier limit at age 57.

In order to conduct the best analysis within the timetable afforded for this thesis, the scope is confined to data applicable to the majority of DOD and CHP employees. The analyzed data consists of only that from the most heavily populated retirement ranks of E-6 through E-8 and O-4 through O-6. The analysis in Chapter V is further limited to active duty service members and CHP officers. Consequently, DOD Selected Reservists and CHP reserve officers are excluded from this study. Survivor benefits are, also, not considered in this thesis.

V. ANALYSIS RESULTS

A. INTRODUCTION

This chapter presents the results of the NPV calculations for each of the retirement categories summarized in the previous chapter. For the DOD, HI-3, Redux and the OSD proposals are included in the analysis. Only the most recent CalPERS plan offered to new CHP employees is analyzed. By using several different discount rates, the results capture the value of each plan to individuals across a range of personal preferences. Lower discount rates yield higher NPV's. Generally speaking, a lower rate represents a member with a more patient financial demeanor. By comparing results with identical discount rates, each plan is ranked in terms of monetary value against the others. The results begin with the CHP analysis and continue in ascending order of military rank. In the section where the first military rank is analyzed (E-6), each retirement model is explained in order to provide a brief recap and explain terminology used in the rest of the chapter. Results for the remaining ranks are summarized in the narrative. Tables providing the complete data for each rank are included in each section (Tables 7–16). A comparison to the CHP plan is also included in each DOD section.

B. CHP

The valuation of the CalPERS plan for CHP in this thesis ranges from a NPV of $308,688 for a 50-year-old officer with 23 YOS and a 15% discount rate to a maximum of $1,951,127 for 30-year officer at age 57 with a 2.5% discount rate. For comparative purposes, the 10% rate bracket, that equals the chosen enlisted discount rate, ranges from $484,239 to $802,343. The analogous officer discount rate bracket of 6.5% starts at $740,670 and continues to $1,159,471. Figure 6 shows the difference in NPV for 6.5% and 10% discounts rate across all CHP multiplier ages. In all CHP officer abbreviations below, the number immediately following the acronym "CHP" refers to YOS for the scenario (e.g., CHP-20 and CHP-23). CHP-20 is assumed to have an entry age of 30 in order to show the comparison between DOD members and service members at 20 YOS. All other scenarios assume service entry age of 27.

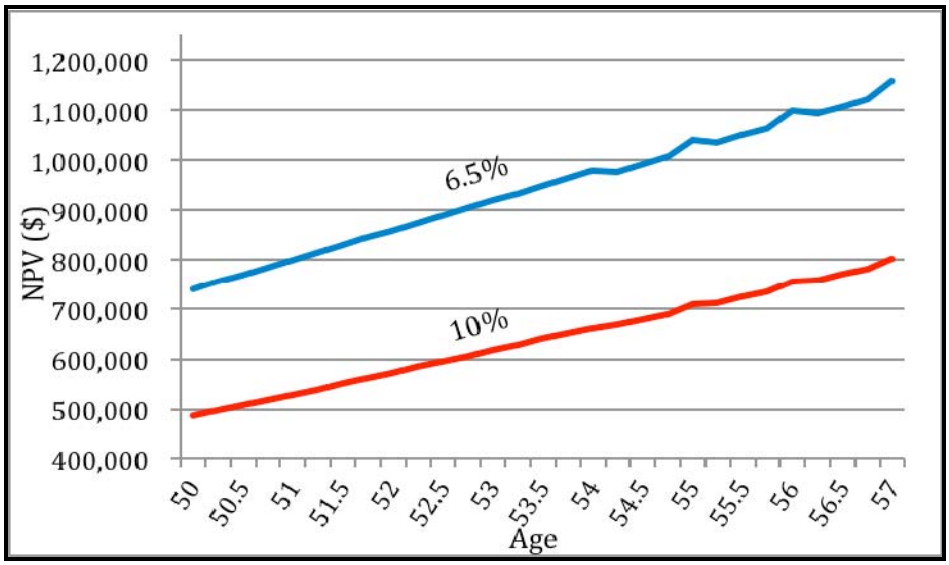

Figure 6. California Highway Patrol Retirement NPV, 6.5% vs 10%

C. E-6

The limitations of high-year tenure significantly affect the ability of an enlisted member to exceed 20 years YOS. DOD Office of the Actuary data from 2012 shows that 75% of non-disability E-6 retirees entered retirement at 20 YOS (Allen & Garcia, 2013). Therefore, only data for an E-6 retiring at 20 YOS is included in this section. NPV's for all E-6 discount rates are listed in Table 9.

1. HI-3

The valuation of the HI-3 plan for an E-6 retiring at 20 YOS of service is $962,008 for a 2.5% discount rate and $179,550 for a 15% rate. At the assumed enlisted discount rate of 10%, the value is $290,194.

A CHP member entering service at age 27 and serving for 20 years (CHP-23) is still three years short of retirement eligibility. At 23 YOS, the CHP officer's retirement payments are valued at $485,239. A CHP officer who enters service at age 30 and retires at 50 with 20 YOS (CHP-20) earns a retirement valued at $421,947, NPV. Table 10 summarizes the above comparison along with addition of E-6 Redux and OSD Concept 1 and Concept 2.

2. Redux

The CSB/Redux option for an E-6 retiring at 20 YOS yields a NPV of $268,256. For all Redux valuations, the future value (FV) of the CSB is determined by compounding the payment at the discount rate from 15 YOS until the moment of retirement. The result is a 10% rate of return on a six-year investment for enlisted an enlisted member retiring at 20 YOS. Although the return may seem optimistic by modern standards, the rate is within .5% of the historical return of the Standard and Poor's 500 index.

3. Concept 1

Concept 1 refers to the OSD's two-tiered DB proposal. Concept 1 introduces a cap on multipliers past 20 YOS. Under the two-tiered concept, retirement pay is capped at 25% of base pay for the 2.5% multiplier and 16% of base pay for the 2.0% multiplier. The cap is removed and the full multiplier applied once the retiree reaches age 65 for the 2.5% option and 62 for the 2.0%. The CJCS report outlining the proposals contains scenarios with DB multipliers of 2.5% and 2.0%. An E-6 under Concept 1 with a multiplier of 2.5% earns a NPV of $314,601. The 2.0% multiplier model returns an NPV of $283,198. In the table at the end of this section, the Concept 1 models are listed as **C1–2.5** and **C1–2.0** for the 2.5% and 2.0% multipliers, respectively.

4. Concept 2

Concept 2 is the second option in OSD's proposal. It is also a hybrid plan, but it offers a full DB element immediately upon retirement. Concept 2 with a 2.0% multiplier yields an NPV of $285,661. It is abbreviated as **C2–2.0**. The 1.75% multiplier gives an NPV is $279,458. It is abbreviated as **C2–1.75**.

Table 7. E-6 NPV at 20 YOS, All Discount Rates

	Discount Rate					
Plan	**2.5**	**5.0**	**7.5**	**10**	**12.5**	**15**
HI-3	$962,008	$594,115	$400,233	**$290,194**	$223,144	$179,551
Redux	$733,589	$474,423	$340,837	**$268,256**	$227,412	$204,343
C1–2.5	$940,185	$588,631	$410,377	**$314,601**	$260,351	$228,252
C1–2.0	$779,886	$499,378	$358,175	**$283,198**	$241,490	$217,468
C2–2.0	$895,889	$567,067	$388,592	**$285,661**	$222,907	$182,732
C2–1.75	$819,402	$527,260	$369,406	**$279,458**	$225,963	$193,269
CHP 23	$1,384,920	$918,579	$649,351	**$485,239**	$379,814	$308,688
CHP 20	$1,204,278	$798,764	$564,653	**$421,947**	$330,273	$268,424

5. Summary

The most valuable option for the E-6 service member after 20 YOS is the C1–2.5 that returns an NPV of $314,601. This value is 8% greater than the closest MRS plan, the current HI-3 option. However, C1–2.5 needs to increase in value by 54% in order to equal the NPV for CHP's initial retirement offering for a member who joined at age 27. Setting the YOS for the E-6 and CHP officer equal requires the latter to enter service at age 30 and retire at age 53. This scenario yields an NPV of $421,947, 34% greater than C1–2.5.

D. E-7

In 2012, roughly 39% of all DOD members retiring at the rank of E-7 did so at 20 YOS (Allen & Garcia, 2013). By 24 YOS, 94% of E-7 members had retired (Allen & Garcia, 2013). Therefore, this analysis of the E-7 retirement plans applies data for 20 and 24 YOS, allowing for extrapolation of the intermediate years.

A CHP officer joining at age 27 must serve 23 years to reach the minimum retirement eligibility, so only one additional YOS is required to equal the E-7 at 24 YOS. However, the E-7 will retire at age 43, while the CHP officer (CHP-24) retires at age 51. Also, in this thesis compares the E-7 with 20 YOS is compared to a CHP officer with 20 YOS by shifting the latter's entry to age 30 (CHP-20). The same technique is used to set the YOS equal in the E-6 section above. In this scenario, the NPV for the CHP-20 officer is, again, $421,947.

As with E-6 retirement, C1–2.5 is the most valuable option for an E-7 retiring at 20 YOS. Redux carries the lowest NPV in that category. At 24 YOS, HI-3 is the most valuable and C2–1.75 the least valuable. At 24 YOS, the HI-3 NPV is 12% less than a typical CHP officer with 24 YOS.

Table 8. E-7 NPV at 20 YOS, All Discount Rate

	Discount Rate					
Plan	**2.5**	**5.0**	**7.5**	**10**	**12.5**	**15**
HI-3	$1,127,980	$696,616	$469,284	**$340,260**	$261,642	$210,528
Redux	$854,151	$549,337	$391,653	**$305,368**	$256,154	$227,626
C1–2.5	$1,087,397	$680,582	$474,699	**$364,166**	$301,493	$264,260
C1–2.0	$899,443	$575,931	$413,490	**$327,345**	$279,377	$251,616
C2–2.0	$1,045,501	$659,375	$451,099	**$331,458**	$258,636	$211,988
C2–1.75	$953,531	$610,909	$426,777	**$322,083**	$259,704	$221,299
CHP 23	$1,384,920	$918,579	$649,351	**$485,239**	$379,814	$308,688
CHP 20	$1,204,278	$798,764	$564,653	**$421,947**	$330,273	$268,424

Table 9. E-7 NPV at 24 YOS, All Discount Rates

	Discount Rate					
Plan	**2.5**	**5.0**	**7.5**	**10**	**12.5**	**15**
HI-3	$1,388,658	$884,167	$605,738	**$442,375**	$340,660	$273,713
Redux	$1,044,880	$708,049	$525,426	**$424,250**	$369,410	$343,405
C1–2.5	$1,186,539	$767,637	$543,372	**$417,840**	$345,056	$302,122
C1–2.0	$990,907	$655,422	$476,557	**$377,246**	$320,523	$287,994
C2–2.0	$1,174,752	$775,782	$548,208	**$411,374**	$325,211	$268,914
C2–1.75	$1,069,757	$717,412	$517,918	**$400,249**	$329,219	$286,744
CHP 23	$1,384,920	$918,579	$649,351	**$485,239**	$379,814	$308,688
CHP 24	$1,407,255	$935,761	$662,674	**$495,775**	$388,344	$315,759

E. E-8

In 2012, 4833 service members across DOD retired at the rank of E-8. Of these, 89% left their Service between 20 and 26 YOS (Allen & Garcia, 2013). The largest number of retirements occurred at year-26 and the second most common was at 20 YOS (Allen & Garcia, 2013). Therefore, analysis of the E-8 retirement options is focused on these specific YOS. Correspondingly, the CHP comparison is expanded to include a CHP member who retires at 26 YOS (CHP-26). This officer is assumed to have entered service at age 27 and retired at age 53.

Apart from varying YOS due to retirement tendencies among various ranks, no new concepts are introduced for the remainder of this chapter. The 0–4 ranks are similar to E-6 in that both are limited to 20 YOS, E-6 due to high-year tenure and 0–4 due to statutory restrictions.

At 20 YOS, C1–2.5 gives the highest NPV $398,334. This value is 6% below CHP-20 and 22% below CHP-23. At 26 YOS, HI-3 is the most valuable option with an NPV of $545,310, but 11% less valuable than CHP-26. The lowest NPV's come from Redux at 20 YOS and C1–2.0 at 26 YOS.

HI-3 becomes the more valuable option after 20 YOS for both E-7 and E-8 due to the C1–2.5 plan's multiplier cap. With this cap in place, service members' retirement valuations are not rewarded for more than 20 YOS until the cap expires in "old age." The discounted value of the additional retirement pay after the cap is insufficient to catch the HI-3 plan's years of higher payments during the C1–2.5 plan's second career years.

Table 10. E-8 NPV at 20 YOS, All Discount Rates

	Discount Rate					
Plan	**2.5**	**5.0**	**7.5**	**10**	**12.5**	**15**
HI-3	$1,243,799	$768,143	$517,469	**$375,197**	$288,571	$232,144
Redux	$938,281	$601,614	$427,113	**$331,266**	$276,211	$243,873
C1–2.5	$1,188,338	$743,657	$518,910	**$398,334**	$329,937	$289,219
C1–2.0	$981,085	$628,261	$451,417	**$357,732**	$305,550	$275,276
C2–2.0	$1,142,354	$720,538	$493,216	**$362,670**	$283,173	$232,180
C2–1.75	$1,040,300	$666,300	$465,412	**$351,123**	$282,870	$240,643
CHP-23	$1,384,920	$918,579	$649,351	**$485,239**	$379,814	$308,688
CHP-20	$1,204,278	$798,764	$564,653	**$421,947**	$330,273	$268,424

Table 11. E-8 NPV at 26 YOS, All Discount Rates

	Discount Rate					
Plan	**2.5**	**5.0**	**7.5**	**10**	**12.5**	**15**
HI-3	$1,627,443	$1,060,763	$738,736	**$545,310**	$422,701	$340,948
Redux	$1,266,086	$876,282	$659,734	**$538,710**	$474,777	$448,654
C1–2.5	$1,380,434	$910,394	$651,394	**$503,082**	$415,841	$364,372
C1–2.0	$1,155,366	$778,830	$572,020	**$454,413**	$386,209	$347,153
C2–2.0	$1,374,526	$927,875	$666,653	**$506,268**	$403,625	$335,892
C2–1.75	$1,248,877	$855,650	$627,727	**$490,990**	$407,966	$359,229
CHP-26	$1,641,815	$1,123,552	$812,110	**$615,994**	$486,785	$397,957

F. O-4

As previously discussed, the rank of O-4 is subject to a statutory retirement limit at 20 YOS. Therefore, this section only presents data for retirement at the 20-year point. Additionally, research conducted by Menichini and Cunha (2014) found the discount rate for military officers averaged 6.5%. As a result, analysis of the officer ranks utilizes a 6.5% rate in lieu of the 7.5% discount rate shown in the enlisted results.

An 0–4 retiring at 20 YOS receives the highest value from the C2–2.0 model. The NPV for this model is $1,140,331, 54% larger than CHP-23 and 77% larger than CHP-20. The least valuable option is Redux with an NPV of $744,594. Although returning the least valuable NPV, Redux is more valuable than both CHP-20 and CHP-23 models.

Table 12. 0–4 NPV at 20 YOS, All Discount Rates

	Discount Rate					
Plan	**2.5**	**5.0**	**6.5**	**10**	**12.5**	**15**
HI-3	$1,919,199	$1,185,256	**$926,168**	$798,463	$578,935	$445,170
Redux	$1,475,141	$934,724	**$744,594**	$651,392	$493,254	$400,129
C1–2.5	$1,920,741	$1,236,716	**$1,002,379**	$889,590	$703,188	$598,263
C1–2.0	$1,707,745	$1,144,318	**$952,642**	$861,221	$713,225	$634,498
C2–2.0	$2,027,967	$1,374,472	**$1,140,331**	$1,024,288	$824,750	$705,119
C2–1.75	$1,879,505	$1,299,405	**$1,091,173**	$987,900	$810,315	$704,060
CHP 23	$1,384,920	$918,579	**$740,670**	$485,239	$379,814	$308,688
CHP 20	$1,204,278	$798,764	**$644,061**	$421,947	$330,273	$268,424

G. O-5

In 2012, 3058 military officers retired from the rank of O-5 (Allen & Garcia, 2013). Of these, 32% left upon competing 20 YOS and 95% retired before their 27th YOS (Allen & Garcia, 2013). Consequently, the data in this section is limited to members retiring from the 0–5 ranks at 20 and 26 YOS.

The most valuable retirement plan for an 0–5 retiring at 20 YOS is the C2–2.0 plan. C2–2.0 was the most valuable plan for 0–4 retirees, as well. This is to be expected, since there is little difference in HI-3 pay between an 0–4 and 0–5 at 20 YOS. In fact, according to the 2014 pay scale, the difference at the Over 18 step is $830 per month. What difference there is adds $161,612 to the 0–4 C2–2.0 for an 0–5 NPV of $1,301,943. This equates to a valuation 75% higher than CHP-23 and double CHP-20. The lowest NPV, again, is Redux at $824,885.

At 26 YOS, C2–2.0 still holds the highest NPV at $1,634,085. A 53-year-old CHP officer with 26 YOS (CHP-26) earns retirement pay with an NPV of $919,017. While CHP-26 has a multiplier of 2.3%, the 0–5 benefits from a 24% higher base pay, past retention bonus, transition pay, and four additional years until reaching life expectancy.

Table 13. 0–5 NPV at 20 YOS, All Discount Rates

	Discount Rate					
Plan	**2.5**	**5.0**	**6.5**	**10**	**12.5**	**15**
HI-3	$2,139,077	$1,321,048	**$1,032,277**	$889,940	$645,262	$496,172
Redux	$1,640,158	$1,037,208	**$824,885**	$720,716	$543,676	$439,003
C1–2.5	$2,114,901	$1,358,257	**$1,099,359**	$974,808	$768,979	$652,933
C1–2.0	$1,872,869	$1,250,045	**$1,038,312**	$937,310	$773,569	$685,938
C2–2.0	$2,284,760	$1,560,934	**$1,301,943**	$1,173,641	$953,007	$820,508
C2–1.75	$2,070,613	$1,428,742	**$1,198,666**	$1,084,614	$888,468	$770,886
CHP-23	$1,384,920	$918,579	**$740,670**	$485,239	$379,814	$308,688
CHP 20	$1,204,278	$798,764	**$644,061**	$421,947	$330,273	$268,424

Table 14. 0–5 NPV at 26 YOS, All Discount Rates

	Discount Rate					
Plan	**2.5**	**5.0**	**6.5**	**10**	**12.5**	**15**
HI-3	$2,696,288	$1,757,432	**$1,403,951**	$1,223,911	$903,451	$700,317
Redux	$2,093,574	$1,432,269	**$1,183,298**	$1,057,403	$838,816	$711,524
C1–2.5	$2,392,404	$1,630,359	**$1,353,778**	$1,217,526	$990,377	$868,673
C1–2.0	$2,177,723	$1,551,220	**$1,327,636**	$1,219,933	$1,050,587	$977,984
C2–2.0	$2,637,982	$1,908,876	**$1,634,085**	$1,495,027	$1,253,531	$1,113,353
C2–1.75	$2,387,403	$1,744,347	**$1,502,026**	$1,379,537	$1,167,626	$1,046,303
CHP-26	$1,641,815	$1,123,552	**$919,017**	$615,994	$486,785	$397,957

H. O-6

The DOD Officer of the Actuary reports 2105 service members retired from the rank of 0–6 in 2012 (Allen & Garcia, 2013). Unlike the 0–4 and 0–5 ranks, 0–6 retirements were more evenly distributed among YOS. The largest number of 0–6 officers retired at 30 YOS, so this section will report on the 20th and 30th YOS (Allen & Garcia, 2013).

C2–2.0 has the highest NPV for an 0–6 with 30 YOS. Redux remains the lowest. The C2–2.0 NPV is $1,435,592, or nearly twice the $740,670 of CHP-23. Redux returns an NPV of $918,360, only 64% of C2–2.0's value.

Table 15. 0–6 NPV at 20 YOS, All Discount Rates

	Discount Rate					
Plan	**2.5**	**5.0**	**6.5**	**10**	**12.5**	**15**
HI-3	$2,395,056	$1,479,135	**$1,155,808**	$996,438	$722,479	$555,548
Redux	$1,832,270	$1,156,518	**$918,360**	$801,422	$602,376	$484,259
C1–2.5	$2,334,365	$1,495,335	**$1,208,766**	$1,071,022	$843,521	$715,163
C1–2.0	$2,058,529	$1,368,713	**$1,134,552**	$1,022,895	$841,770	$744,409
C2–2.0	$2,524,550	$1,722,267	**$1,435,592**	$1,293,649	$1,049,572	$902,792
C2–1.75	$2,284,777	$1,574,255	**$1,319,957**	$1,193,968	$977,309	$847,231
CHP-23	$1,384,920	$918,579	**$740,670**	$485,239	$379,814	$308,688
CHP-20	$1,204,278	$798,764	**$644,061**	$421,947	$330,273	$268,424

Table 16. 0–6 NPV at 30 YOS, All Discount Rates

	Discount Rate					
Plan	**2.5**	**5.0**	**6.5**	**10**	**12.5**	**15**
HI-3	$3,374,531	$2,305,265	**$1,882,160**	$1,660,811	$1,254,608	$987,187
Redux	$2,747,807	$1,964,497	**$1,657,496**	$1,499,588	$1,223,392	$1,068,778
C1–2.5	$3,038,779	$2,164,477	**$1,834,248**	$1,669,074	$1,393,722	$1,257,360
C1–2.0	$2,794,448	$2,083,442	**$1,822,323**	$1,696,502	$1,508,038	$1,456,676
C2–2.0	$3,334,648	$2,497,440	**$2,174,351**	$2,009,918	$1,727,513	$1,577,087
C2–1.75	$3,010,821	$2,276,629	**$1,994,037**	$1,850,728	$1,606,979	$1,481,947
CHP-30	$1,951,127	$1,390,624	**$1,159,471**	$802,343	$643,140	$530,699

I. SUMMARY

This chapter contains analysis of the NPV of the current MRS options and the models proposed by OSD using a range of discount rates and YOS. The NPV of each of these retirement plans was compared to an analogous CHP retirement formula. The analysis is done from the point of the member. Therefore, the highest NPV each scenario represents the most valuable retirement plan.

The data in this chapter shows the effect of discount rates and the time-value-of-money within each scenario. For an 0–6 retiring at 30 YOS, changing the discount rate from 5% to 2.5% increases the NPV by $1,069,266. A similar effect is seen on payments made over different timelines. Redux delivers a payment sooner than HI-3 because of the CSB at 15 YOS. For an E-7 retiring at 20 YOS, the Redux NPV is 90% of HI-3. If the E-7 retires at 24 YOS, the Redux NPV grows 96% of HI-3 due to the value of receiving payment sooner.

The most valuable plan varies between the officer and enlisted ranks. For enlisted service members, C1–2.5 is the most valuable when retiring at 20 YOS. Beyond 20 YOS, HI-3 is the most valuable. The most valuable option for officers is C2–2.0, regardless of YOS. Redux is, generally, the least valuable plan. Redux returns the lowest NPV in seven of the ten scenarios chosen for analysis. In the E-7 at 24 YOS, E-8 at 26 YOS, and 0–4 scenarios, C1–2.0 is the least valuable option.

Tables 17 and 18 list the most valuable and least valuable plan for each scenario and also show that plan's NPV as a percentage of it CHP analogue.

Table 17. Most Valuable Plan as Percentage of CHP

Rank	Plan	NPV	% of CHP
E-6(20)	C1–2.5	$328,456	78%
E-7(20)	C1–2.5	$364,166	86%
E-7(24)	HI-3	$442,375	84%
E-8(20)	C1–2.5	$398,334	94%
E-8(26)	HI-3	$545,311	89%
0–4(20)	C2–2.0	$1,140,331	177%
0–5(20)	C2–2.0	$1,301,943	202%
0–5(26)	C2–2.0	$1,634,085	178%
0–6(20)	C2–2.0	$1,435,592	223%
0–6(30)	C2–2.0	$2,174,351	188%

Table 18. Least Valuable Plan as Percentage of CHP

Rank	Plan	NPV	% of CHP
E-6(20)	Redux	$268,256	64%
E-7(20)	Redux	$305,368	72%
E-7(24)	C1–2.0	$377,246	84%
E-8(20)	Redux	$331,266	94%
E-8(26)	C1–2.0	$454,413	89%
0–4(20)	C1–2.0	$744,594	177%
0–5(20)	Redux	$824,886	202%
0–5(26)	Redux	$1,183,298	178%
0–6(20)	Redux	$918,360	223%
0–6(30)	Redux	$1,657,496	188%

VI. SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Given the renewed interest in retirement reform, this thesis attempted to determine how the current military retirement options and the proposed OSD plan compare to the pensions of an analogous group outside of the federal government. Scope was limited to active duty officer and enlisted service members only. The study began with a review of the history of military retirement. It then detailed the current MRS and the recently released OSD proposal. The next chapter gave brief history of public pensions and ended with an overview of CalPERS. The CHP pension plan was chosen as the DOD analogue due to the common risks shared with service members in the performance of their duties. Finally, NPV calculations were presented for each chosen scenario. The largest NPV is the most valuable plan from a beneficiary's perspective.

The results of the comparison between the OSD proposal and CHP pension plan vary between officers and enlisted. No plan provided to an enlisted service member from the rank of E-6 to E-8, nor did any of the OSD proposed options, match a CHP member who retires after a comparable tenure. The results are reversed among DOD officers. The least valuable plan for officers in this study, Redux for an 0–4 at 20 YOS, still outperforms the CHP analogue (CHP-23) who has three more years of service.

A goal of the OSD proposal was to provide a system with equity for those serving less than 20 years. In this respect, none of the proposed models compare favorably with CHP. The DC portion of the proposal begins at after 2 YOS with vesting at 6 YOS. An enlisted service member who departs after six years earns TSP contributions with an NPV of $35,396. An officer departing at the same point has contributions worth $62,660. By comparison, a CHP member who joined at age 44 and retired six years later, leaves with a DB pension with an NPV of $126,584 at the enlisted discount rate and $193,218 at the DOD officer rate.

The plans within the OSD proposal offer different valuations under different circumstances. For officers in this study, at least one option in the proposal offered a higher NPV than the current MRS. Conversely, for enlisted members retiring beyond 20

YOS, HI-3 gave the highest NPV. In either case, the OSD proposal provides a more flexible alternative to service members, since members with 6 YOS are allowed to leave active duty with their accumulated defined contributions. Additionally, DOD estimates that implementing the proposal will yield annual cost savings of $0.5 to $2.7 billion (Dempsey, 2014).

This thesis provides an NPV-based, initial comparison between the current and proposed MRS plans and the CHP retirement plan. However, the financial analysis in this thesis addresses just one aspect of the comparison between the retirement plans of DOD members and non-federal analogues. Therefore, it is recommended that DOD considers the following guidance in order to provide a comprehensive comparison:

1. Identify and perform comparative valuations of the retirement systems of other analogue groups outside of CHP.
2. Perform comparative valuations of each plan taking into account survivor benefits.
3. Perform comparative valuations of each plan taking into account Selected Reservists.
4. Perform comparative valuations of the total lifetime compensation between the DOD plans and analogue groups.

APPENDIX. CHP PLAN VS. GENERAL PLAN MULTIPLERS

CHP Plan	
Age	Multiplier
50	2.000%
50 1/4	2.025%
50 1/2	2.050%
50 3/4	2.075%
51	2.100%
51 1/4	2.125%
51 1/2	2.150%
51 3/4	2.175%
52	2.200%
52 1/4	2.225%
52 1/2	2.250%
52 3/4	2.275%
53	2.300%
53 1/4	2.325%
53 1/2	2.350%
53 3/4	2.375%
54	2.400%
54 1/4	2.425%
54 1/2	2.450%
54 3/4	2.475%
55	2.500%
55 1/4	2.525%
55 1/2	2.550%
55 3/4	2.575%
56	2.600%
56 1/4	2.625%
56 1/2	2.650%
56 3/4	2.675%
57 and over	2.700%

General Plan			
Age	Multiplier	Age	Multiplier
52	1.000%	59 3/4	1.775%
52 1/4	1.025%	60	1.800%
52 1/2	1.050%	60 1/4	1.825%
52 3/4	1.075%	60 1/2	1.850%
53	1.100%	60 3/4	1.875%
53 1/4	1.125%	61	1.900%
53 1/2	1.150%	61 1/4	1.925%
53 3/4	1.175%	61 1/2	1.950%
54	1.200%	61 3/4	1.975%
54 1/4	1.225%	62	2.000%
54 1/2	1.250%	62 1/4	2.025%
54 3/4	1.275%	62 1/2	2.050%
55	1.300%	62 3/4	2.075%
55 1/4	1.325%	63	2.100%
55 1/2	1.350%	63 1/4	2.125%
55 3/4	1.375%	63 1/2	2.150%
56	1.400%	63 3/4	2.175%
56 1/4	1.425%	64	2.200%
56 1/2	1.450%	64 1/4	2.225%
56 3/4	1.475%	64 1/2	2.250%
57	1.500%	64 3/4	2.275%
57 1/4	1.525%	65	2.300%
57 1/2	1.550%	65 1/4	2.325%
57 3/4	1.575%	65 1/2	2.350%
58	1.600%	65 3/4	2.375%
58 1/4	1.625%	66 0	2.400%
58 1/2	1.650%	66 1/4	2.425%
58 3/4	1.675%	66 1/2	2.450%
59	1.700%	66 3/4	2.475%
59 1/4	1.725%	67	2.500%
59 1/2	1.750%		

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