NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

A PROFICIENCY-BASED COST ESTIMATE OF SURFACE WARFARE OFFICER ON-THE-JOB TRAINING

by

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December 2011

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REPORT DOCUMENTATION PAGE		Form Approved OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	December 2011	Master's Thesis

4. TITLE AND SUBTITLE A Proficiency-Based Cost Estimate of Surface Warfare Officer On-the-Job Training	5. FUNDING NUMBERS
6. AUTHOR(S) Anthony D. Macaluso	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) Deputy Assistant Secretary of the Navy for Budget (FMB)	10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government. IRB Protocol number _____N/A_____.

12a. DISTRIBUTION / AVAILABILITY STATEMENT	12b. DISTRIBUTION CODE
Approved for public release; distribution is unlimited	A

13. ABSTRACT (maximum 200 words)

Since 2003, the Surface Warfare Officer (SWO) community has changed initial training on two occasions. In 2003, they replaced schoolhouse training (SWOS) with an OJT intensive shipboard computer-based-training in response to criticism that SWOS was a wasteful use of six months. Yet, SWOs considered "SWOS-at-Sea" inadequate fleet preparation, prompting the reestablishment of one month of "SWO Intro." A 2010 Government Accountability Office report concluded the Navy must evaluate how changes to training impact job performance, not just budgetary costs. Analysis of SWO training costs should consider how training changes impact officer proficiencies and qualification time. This thesis calculates the SWO OJT investment assuming the Navy subsidizes officer development until officers achieve SWO qualification. The research proposes first-tour officer proficiency is a function of commissioning source and initial training professional development. After arrival at the ship, proficiency is measured by SWO Personnel Qualification Standards (PQS) progress and, ultimately, SWO qualification. The analysis finds that decreases to initial training increase shipboard training costs, and that changes to initial training have not been accommodated by appropriate shifts in qualification time requirements. Recommendations include adopting SWOS's proposal for two months of initial training in San Diego and Norfolk, ensuring SWOS learning outcomes are based on SWO PQS, and adjusting SWO qualification time requirements to reflect level of initial training.

14. SUBJECT TERMS Surface Warfare Officer, Formal SWO Training, Cost Estimate, SWO Qualification Process, Personnel Qualification Standards, On-the-Job Training	15. NUMBER OF PAGES 86
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UU

NSN 7540-01-280-5500 Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF BUSINESS ADMINISTRATION

from the

NAVAL POSTGRADUATE SCHOOL
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LIST OF ACRONYMS AND ABBREVIATIONS

3M	Maintenance and Material Management
ADOC	Advanced Division Officer Course
ASAT	Advanced Shiphandling and Tactics Course
ATG	Afloat Training Group
BDOC	Basic Division Officer Course
BST	Billet Specialty Training
CBT	Computer Based Training
CinCLantFlt	Commander in Chief Atlantic Fleet
CinCPacFlt	Commander in Chief Pacific Fleet
CIVLANT	Civilian Atlantic Fleet
CNO	Chief of Naval Operations
CO	Commanding Officer
COLREGS	International Regulations for Avoiding Collisions at Sea
COMNAVSURFOR	Commander Naval Surface Forces
COMNAVSURFORINST	Commander Naval Surface Forces Instruction
CONUS	Continental United States
CORTRAMID	Career Orientation and Training for Midshipmen
CPPD	Center for Personal and Professional Development
DC	Damage Control
DIVO	Division Officer
DIVOLC	Division Officer Leadership Course
FCA	Fleet Concentration Area
GAO	Government Accountability Office
GMS	General Managerial Skills
IDTC	Inter-deployment Training Cycle
IOP	Initial Officer Proficiency
MC	Monthly Cost

MPN	Military Personnel, Navy
MV	Monthly Value
OMN	Operations and Maintenance, Navy
PERS-41	Naval Personnel Command Surface Warfare Directorate
NETC (NAVEDTRA)	Naval Education and Training Command
NF	Navy Familiarization
NPS	Naval Postgraduate School
NROTC	Naval Reserve Officer Training Corps
NSI	Naval Science Institute
NSTC	Naval Service Training Command
NSTCINST	Naval Service Training Command Instruction
NSW	Navy Standard Workweek
OCS	Officer Candidate School
OJT	On-the-job Training
OOD UW	Officer of the Deck Underway
OPNAV	Office of the Chief of Naval Operations
OPNAVINST	Office of the Chief of Naval Operations Instruction
OPTEMPO	Operating Tempo
PQS	Personnel Qualification Standards
SURFORTRAMAN	Surface Forces Training Manual
SWDOC	Surface Warfare Division Officer Course
SWO	Surface Warfare Officer
SWOFOTS	Surface Warfare Officer Flag Officer Training Symposium
SWONET	Surface Warfare Officer Network
SWOS	Surface Warfare Officer School
SWOSCOLCOM	Surface Warfare Officer School Command
SWOSDOC	Surface Warfare Officer School Division Officer Course

TDY	Temporary Duty en Route
USNA	United States Naval Academy
XO	Executive Officer
YP	Yard Patrol Craft

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ACKNOWLEDGMENTS

I am greatly indebted to my thesis advisors Alice Crawford, Dr. Raymond Franck, and Bill Hatch, whose collective expertise was instrumental in keeping the project moving. I would also like to thank Conrad Chair Captain John Mutty for his advice and support.

Lastly, I would like to thank my wife, Mariana, for being there for me to see this project to completion.

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I. INTRODUCTION

A. BACKGROUND

1. The Road to Surface Warfare Officer Division Officer Course

Prior to the advent of the Naval Aviation and Nuclear Power communities, the Navy's only path to command at sea was through service on surface combatant ships. Malcolm Muir wrote in *Black Shoes and Black Water*,

> World War II represented the great divide for the surface navy. Until that conflict, the lion's share of the U.S. Navy's budget went to the battleships, cruisers, and destroyers whose top officers made up the so-called Gun Club. These black-shoe officers dominated the Navy's principal decision-making body, the General Board, and such significant bureaus as the Bureau of Ships and the Bureau of Ordnance. But during the Pacific War, naval aviation seized the reins. The aircraft carrier with its longer reach supplanted the battleship as the arbiter of fleet actions; the aviators moved into dominant positions within the Navy's command structure. (Muir, 1996)

According to Muir, once the aviation and submarine communities proved their value to the nation, Navy budgets quickly accommodated them, naturally at the expense of the surface warfare community. Various *U.S. Naval Institute: Proceedings* articles indicated that the submarine and aviation communities offered better promotion opportunities, and generally attracted competitive individuals to their ranks (Robinson, 2008). One particular article written by Commander Rahill in 1952 championed destroyer duty as a means of preparation for duty in the aviation and submarine communities, a stepping stone of sorts (Rahill, 1952).

During this same time, the Navy's historically surface warfare centric education system began to change. The United States Naval Academy offered the only path to a commission in the U.S. Navy prior to 1926, and was the Navy's sole training school for unrestricted line officers (basically SWOs). But as midshipmen's service selection options grew, so did the Academy's training curriculum. What was once a technical school that trained officers for service on ships now had to accommodate the emerging communities' accession needs as well. SWO training for midshipmen became further

marginalized when the Naval Academy transitioned from a trade school to a hard science and liberal arts institution (Muir, 1996). Additionally, in 1926 Naval Reserve Officer Training Corps (NROTC) was developed to offer an alternate path to receive a commission in the Navy. The combined effect of less surface warfare training from the Naval Academy and the introduction of new commissioning programs offered by civilian institutions provided the need to establish a technical school for Surface Warfare Officers.

The Surface Warfare community struggled to recruit and retain officers post-WWII. The nuclear and aviation communities were increasingly attractive to newly commissioned officers who could anticipate higher pay, superior technical training, and a faster promotion rate. In 1949, a submariner wrote in U.S. Naval Institute Proceedings, "the idea that the only roads to success are submarines and aviation is bad for the Navy" (Muir, 1996). This officer's point is further exemplified by the aviation community's near monopoly on the attainment of Chief of Naval Operations (CNO) position from 1961 to 1982. The only SWO to become CNO during that period was Admiral Elmo Zumwalt Jr. Given that the SWOs had little opportunity to influence the Navy from its highest post in recent years, Admiral Zumwalt took full advantage as CNO to overhaul his community's image.

In 1970, Zumwalt commissioned a SWO Retention Study Group to analyze the factors contributing to his community's retention problems. Among the myriad of recommendations were calls for "better schooling, and a surface warfare pin equivalent to the dolphins worn by submariners or the wings by the aviators" (Robinson, 2008). Within the year, the Navy established a Surface Warfare designation in the personnel system, made qualifications for the community more selective, prohibited dropouts from Nuclear Power School and Flight School from joining the Surface Warfare Community, and established what would later be called the Surface Warfare Officer Division Officer Course (SWOSDOC) (Robinson, 2008).

2. SWO Basic and SWOSDOC

By establishing SWO Basic in 1970, the Navy provided all SWOs with baseline training prior to their arrival to the fleet for the first time. In order to have a properly functioning training command, the surface community first needed to establish training objectives that met the needs of the fleet. During this same period, Admiral Zumwalt oversaw the merger of all surface type commands into just two, one for each coast. By consolidating a dispersed group of surface combatants into one administrative command, the surface community could more effectively establish requirements to which all SWO training would adhere. These Personnel Qualification Standards (PQS) formed the basis for the SWO Basic curriculum.

Upon reporting to SWO Basic, officers were provided PQS booklets which were to be completed to the extent possible during training. SWO Basic was designed to teach SWOs the "fundamentals" and "systems" sections of PQS, leaving the "watchstanding" section to be completed upon arrival to the fleet. In 1980, Captain John Parker, Director of Surface Warfare Manpower and Training Requirements said,

> It is the application of theory and system knowledge to watch performance that is important to the command. Knowledge of theory and system knowledge is important to the SWO candidate, of course, since he will not be able to cope with watchstation qualifications without a solid and complete understanding of theory and systems, and that's what we are requiring now at SWOS Basic. (Navy, 1980)

This "train to qualify" method would form the backbone of SWO training.

In 1986, SWO Basic was renamed Surface Warfare Division Officer Course (SWDOC) to avoid the reputation of being overly fundamental. At the same time, the Navy decoupled the PQS from the objectives of the curriculum. (Navy, 2002) By placing a heavier emphasis on watchstanding and decision making, SWDOC went beyond its initial charter of providing the fundamentals and systems PQS knowledge. The following year, the USS Stark was hit by an Iraqi Exocet missile, sparking widespread criticism of the Navy's state of readiness, and consequently its training methods. SWDOC (later renamed SWOSDOC) began receiving criticism from the fleet that it was not properly preparing its junior officers for service onboard ship. Some complained that their junior

officers were showing up at the fleet without fundamental knowledge of how to do their jobs. In a 1998 Proceedings article, LTJG Poole posited that, "Student aviators fly planes, and student submariners operate nuclear plants, but student warriors [SWOs] sit in a classroom" (Poole, 1998). In the following years, the fleet began offering proposals on how to correct SWO training.

3. SWOS-at-Sea

After over a decade of debate within the surface community, Commander Naval Surface Forces (COMNAVSURFOR) VADM Timothy LaFleur ended Newport's control of SWO training in 2002, transferring responsibility to the waterfront via a curriculum of shipboard computer-based training (CBT). He justified the move, stating "This will result in higher professional satisfaction, increase the return on investment during the first division officer (DIVO) tour, and free up more career time downstream" (Navy, 2002, p. 32). In other words, by eliminating six months of formal training, SWOS-at-Sea would allow junior officers to attain SWO qualification sooner in their careers, and have more time onboard ship to hone skills as mariners and leaders.

While there was always a certain degree of on-the-job training (OJT) inherent in SWO training, SWOS-at-Sea took it to a new level. Aside from exposure to professional topics at their commissioning sources (which varied widely across the fleet), and temporary duty en route (TDY) billet specialty training, junior officers were expected to learn their entire job aboard ship.

While some officers excelled in this fast-paced immersion program, there were many officers for whom SWOS-at-Sea was poorly designed. A 2009 Naval Postgraduate School (NPS) study surveyed students attending the Advanced Shiphandling and Tactics Course (ASAT) in Newport, RI (Bowman & Crawford, 2009). Survey responses indicated that the SWO CBT method of instruction was ineffective. A common criticism of SWOS-at-Sea was that it placed the responsibility for training junior officers squarely on the Commanding Officer's (CO) shoulders, thus making it highly dependent on factors unique to a ship's command climate, manpower and operational tempo. When asked what they would change in the training to make it more effective, one DIVO

responded “It would be good not to feel clueless and useless on day-one on your ship” (Bowman & Crawford, p. 37). Other responses indicated that DIVOs rarely had time to complete their CBT modules amidst the many requirements such as divisional work, PQS qualification, and watchstanding. One officer indicated that when they found time to work on CBT, they were criticized for “hiding in the stateroom” (Bowman & Crawford, p. 35). This particular response demonstrated a significant disconnect between the SWO training objectives and actual shipboard culture. By 2007, it seemed inevitable the surface community would have to address the growing criticism that SWOS-at-Sea provided too little in the way of initial training, and was too dependent on shipboard factors to establish a reliable baseline of SWO knowledge.

4. SWO Introduction

In a 2008 interview with the Department of the Navy website Surface Warfare Officer’s Network (SWONET), COMNAVSURFOR VADM Derwood Curtis rejected the SWOS-at-Sea training model, and spoke of re-establishing formal training in what would be called SWO Intro. Admiral Curtis stated, “Some SWOs were coming to our ships not ready to perform” (Robinson, 2008, p. 77). SWO Intro was modeled after a three week leveling course taught in Newport, RI for graduates of Officer Candidate School (OCS). The Navy would provide SWO Intro training to graduates of the Naval Academy and NROTC programs, in conjunction with Newport’s course for OCS graduates. The Navy tasked the Afloat Training Groups (ATG) of each fleet concentration area (FCA) to administer this introductory course that would provide a baseline of professional knowledge to newly commissioned officers heading to the fleet (COMNAVSURFOR, 2010).

After delivery to the fleet, ATGs began to leverage waterfront assets and incorporate hands on training in the form of “school ship” visits. To accommodate the extra hands-on instruction, the three-week SWO Intro course was subsequently expanded to four weeks of classroom instruction, accompanied by an additional week of the Division Officer Leadership Course (DIVOLC) (Crawford, 2010). As evidence that the Navy was taking SWO training more seriously, VADM Curtis released an

ALNAVSURFOR message prohibiting shipboard interference with students enrolled at SWO Intro: "While students are enrolled in the SWO Intro class, they are TAD to ATG for the duration of the class and are accordingly exempt from any shipboard duties to include watches or assignment to a duty section. Assigning a student to duty will result in disenrollment" (COMNAVSURFOR, 2010).

Over the past decade, the SWO community has been tirelessly searching for the appropriate balance of classroom and shipboard training. Attempts to reduce initial classroom training were met with resistance by those who envisioned a Navy with technically proficient DIVOs who report ready to lead. However, later efforts to enhance classroom training met resistance from those who believed that the "death by Power Point" instruction method was ineffective. The SWO community's decade-long progression through three separate training methods has shown many that inadequate formal training does future DIVOs a disservice, while too much formal training might be wasteful and ineffective.

B. RESEARCH QUESTIONS

The purpose of this study is to answer the following questions:

1) How is a first-tour DIVO's value to the Navy determined?
2) What is the Navy's investment in first-tour DIVO OJT in terms of actual and desired officer proficiencies?
3) How does the OJT investment under SWO Intro compare to previous versions of SWOS?
4) What are the hidden costs of OJT?

C. SCOPE, METHODOLOGY AND ASSUMPTIONS

1. Scope

The scope of this thesis is to estimate what the Navy invests in developing first-tour DIVOs into SWOs. This investment has changed over the past decade consequent to changes in initial SWO training. The OJT investment will be calculated for SWO Intro,

and compared to the investment incurred during SWOSDOC and SWOS-at-Sea. The monthly difference between the value of a fully qualified officer and an officer in training will be called the SWO OJT investment. Officer proficiencies are a function of professional development prior to arrival to the ship (at the commissioning source and initial training command), incremental completion of SWO PQS, and final attainment of the SWO qualification.

2. Methodology

This investment estimation model will combine both quantitative and qualitative inputs. The model will posit a monthly progress from initial baseline proficiency (one for each of the three training methods over the past decade). The individual weight of each officer value category will depend on how much time a typical officer spends standing watch and doing administrative work. Each month, as DIVOs accomplish more PQS (arguably becoming more effective at their jobs) their value to the Navy will increase. The rate at which this value increases is highly individual to each officer. To correct for this, a standard learning curve will be estimated based on the nominal time to achieve OOD Underway (UW) qualification, as prescribed in current SURFOR guidance. After estimating the time it takes to qualify as an OOD UW, the time to achieve SWO qualification can be approximated. The officers' derived value will be compared to their monthly cost to the Navy (measured by the Navy Ensign Composite Rate). This thesis will then compute the average annual OJT investment per officer by multiplying the average monthly investment by the number of months to qualify SWO.

3. Assumptions

This thesis assumes that the Navy invests in first-tour DIVO development until the officer attains his/her SWO Qualification. After qualification, the DIVO will still be learning, but is also contributing significantly to shipboard operations and mission. It is reasonable to assume that the first-tour investment ends after SWO qualification. Additionally, as SWO qualification times are affected by a variety of factors that change from year to year, assumptions were made to predict how the qualification timelines of previous versions of SWOS would look today.

D. BENEFITS OF THE STUDY

The SWO community's continued search for the most effective combination of formal classroom and shipboard OJT was the impetus for this research. A 2010 Governmental Accountability Officer (GAO) report to Congress stated, "The Navy has evaluated the impact that its changes to training programs have had on the length and cost of training, but it lacks a broader range of performance measures needed to evaluate the impact on other key aspects, such as the trainees' job performance" (GAO, 2010). In support of the GAO's observation, this thesis estimates shipboard training costs in terms of officer non-proficiency over the shipboard qualification period.

E. ORGANIZATION

Chapter II surveys and synthesizes relevant literature in order to determine officer value upon arrival to the fleet. Chapter III provides the methodology for arriving at initial officer values, establishes a timeline that serves as a basis for increasing officer values over time, determines the investment per officer, and compares the OJT investment associated with each version of SWOS. Chapter IV integrates Chapters I through III, recommends changes to initial training to reduce the SWO OJT investment, and provides recommendations for future study.

II. LITERATURE REVIEW

The literature presented in this chapter will provide a theoretical underpinning for the investment calculation in Chapter III. The SWO OJT investment calculation is based on officer proficiency levels, which in turn determine officer value. An officer's value after the attainment of the SWO qualification (full proficiency) is assumed equal to the Navy Ensign Composite Pay Rate. Proficiency levels at an officer's report date are less straightforward, as they depend on varying levels of commissioning source preparation and professional development during formal training. This chapter explains the different commissioning sources and the three iterations of initial SWO training, and discusses relevant training studies that preface the calculations performed in this research.

A. COMMISSIONING SOURCE PROFESSIONAL DEVELOPMENT

Each commissioning source prepares midshipmen or officer candidates differently for service in the Navy. This thesis will approximate the professional development that occurs at each of the four commissioning sources, and how it affects first-tour DIVO proficiency levels.

1. United States Naval Academy

Established in 1845, the United States Naval Academy (USNA) was the Navy's only commissioning source for naval officers until 1926. Of all the commissioning sources, the Naval Academy offers the most robust preparation for service in the fleet in terms of dedicated professional training. In addition to the core curriculum of engineering, science, mathematics, humanities and social science, midshipmen take a variety of professional military courses to prepare them for leadership in the fleet. Many of the core engineering courses such as Principles of Propulsion, Principles of Ship Performance and Naval Weapons Systems are tailored toward the Navy, giving future SWOs a firm understanding of the topics that will require their understanding upon arrival to the fleet. This research divides USNA professional development into four categories: general naval curriculum, SWO specific curriculum, Character Development and Training, and summer training.

a. General Naval Curriculum

As part of midshipmen's professional military education, they are expected to complete a foundation of general naval courses that will support them throughout their careers. While the course offerings may change slightly throughout the years, they ultimately aim to provide a broad understanding of the challenges that await in the fleet. These courses include Leadership and Human Behavior, Ethics and Moral Reasoning for the Naval Leader, Strategy and Tactics, Leadership Theory and Application, and Law for the Junior Officer (USNA, 2011). This general naval curriculum provides all graduates (particularly SWOs, who have the shortest training pipeline and must put to practice these skills the earliest) with an understanding of leadership, and the context in which it is used. While dominance of these topics is not required to attain a SWO qualification, it ensures a solid foundation from which to approach a career of naval service.

b. SWO Specific Curriculum

While the general naval curriculum provides midshipmen with a foundation of leadership education, the SWO specific curriculum imbues them with the skills required of a mariner. All midshipmen are required to take courses in Basic Seamanship, Introduction to Navigation, and Advanced Navigation to learn the principles of safe ship handling. Topics covered in these courses include International Regulations for Preventing Collisions at Sea (COLREGS) Rules of the Road, nautical chart preparation, underway training on yard patrol craft (YPs), bridge simulator training, and maneuvering boards (USNA, 2011). In addition to these required courses, midshipmen who "service select" SWO prior to graduation must complete a Surface Warfare Practicum in their final semester at the Academy. The Academy designed the practicum to familiarize future SWOs with surface platforms, DIVO administration, zone inspections, basic damage control, maneuvering boards, Officer of the Deck fundamentals, and the SWO career path.

c. Character Development and Training

In addition to formal classroom instruction, midshipmen are immersed in a 20-week Navy professional knowledge study program that provides a working knowledge of the Navy and Marine Corps' missions, organization and capabilities. The Character Development and Training program is designed to teach first-year students (Plebes) about the Navy they are inheriting. Each subsequent rank of midshipmen has a responsibility to train Plebes during regular review periods throughout the year. While the focus of the pro-knowledge review is on the Plebes, all midshipmen (regardless of rank) must stay current on these topics to maintain and foster an effective learning environment. Over the course of four years, this program ensures nearly constant exposure to Navy pro-knowledge that provides graduates with a "working knowledge of the Navy and Marine Corps' missions, organization and capabilities" (USNA, 2011).

d. Summer Training

Summer training is another opportunity for future SWOs to develop professionally prior to arrival at their first ship. According to the USNA website, "Eight weeks of annual summer training introduces midshipmen to operational units of the Navy and Marine Corps, life at sea and the responsibilities of a junior officer" (USNA, 2011). Academy summer training places midshipmen in various parts of the world to experience real fleet operations, and ensure they have the right information on which to base service selection. For midshipmen who have already decided on a career path, it provides them a head start in learning about their community. However, summer training experiences vary widely throughout the Academy, making it difficult to determine to what extent summer training is SWO-related (USNA, 2011).

2. Naval Reserve Officer Training Corps

According to its website, "the Naval Reserve Officer Training Corps (NROTC) was established in 1926 to provide a broad base of citizens knowledgeable in the arts and sciences of Naval Warfare" (NETC, 2011). NROTC works in partnership with civilian universities to commission naval officers for service in the Navy and Marine Corps. While NROTC serves as a valuable means to produce future leaders of the Navy, it is not

designed to prepare them professionally to the extent that the Academy does. LCDR James Robinson highlighted the primary differences between the Academy and NROTC, stating

> The Academy midshipmen attended an institution devoted solely to producing naval officers… Contrasting sharply with this, midshipmen attending NROTC were only partially immersed in a naval culture. (Robinson, 2008, p. 24)

NROTC units, while often outstanding institutions, generally do not have the same resources as the Academy to train midshipmen, as evidenced by its use of consortia. NROTC units in larger metropolitan areas often form consortia to pool the resources of larger units to train smaller "cross town" units. Additionally, NROTC midshipmen are free to live off campus when they are not in class or training with the unit. The Academy requires midshipmen to reside in the dormitory, an environment characterized by constant professional development and military indoctrination.

a. Naval Science Curriculum and Summer Training

The intent of NROTC's Naval Science Curriculum is to provide midshipmen with the professional education needed for successful careers in the Navy. The Naval Service Training Command Instruction (NSTCINST) 1533.2A dictates the courses required of a typical NROTC graduate (NSTC, 2011). There are other course offerings in addition to the following, which are not discussed as they are not mandatory for "Navy option" midshipmen. In their freshman year, midshipmen take courses in Naval Science and Seapower and Maritime Affairs. As sophomores, midshipmen take a Leadership and Management course, along with an introduction to Navigation. Junior year course offerings include Weapons and Engineering. Seniors take courses in Naval Operations and Seamanship, and Leadership and Ethics. Additionally, midshipmen are required to take an annual Naval Science Laboratory that covers miscellaneous topics not covered in formal Naval Science Courses, but of relative importance to the Navy. A review of Naval Science Curriculum revealed that Navigation, Weapons, Engineering, and Naval Operations and Seamanship courses provide some level of SWO-specific training.

NROTC summer training provides a brief introduction to fleet operations. During the summer following their freshman year, midshipmen participate in Career Orientation and Training for Midshipmen (CORTRAMID) to provide introductions to the submarine, surface, aviation and Marine Corps warfare areas. According to NSTCINST 1533.2A, second class summer training on surface ships and submarines, "furnishes midshipmen with basic shipboard orientation and an introduction to enlisted life and the roles of the work center supervisor" (NSTC, 2011). The following summer prior to graduation, midshipmen gain exposure to the officer and wardroom environment onboard ships, submarines, or in an aviation squadron. A comparison of USNA and NROTC summer training cruise lengths indicate that NROTC summer training is half the length of USNA's summer training (Academy, 2011; NSTC, 2011).

3. Officer Candidate School

Officer Candidate School (OCS) is another commissioning source available to college graduates who want to pursue careers as naval officers. Located in Newport, Rhode Island, OCS is the Navy's only commissioning source that requires candidates to already have undergraduate degrees. Thus, OCS can provide 12 weeks of continuous officer indoctrination without interruption from academic instruction. During the 12 week course, officer candidates complete ten units of professional instruction covering the following topics: engineering, military indoctrination, navigation, seamanship, damage control, naval leadership, basic/fleet officer curriculum, military law, naval warfare, and special programs (OTC, 2011).

Upon receiving their officer commission, graduates then undergo further technical training specific to their warfare community. Those who have selected the SWO community proceed directly to Surface Warfare Officer School Command's (SWOSCOLCOM) "SWO Intro" course, also located in Newport (COMNAVSURFOR, 2010).

4. Seaman to Admiral-21 and Lateral Transfers

According to the Seaman to Admiral-21 website, "The STA-21 Commissioning Program is designed to meet the goals of the Navy in the 21st Century, while at the same time creating a fair and equitable system for outstanding active duty Sailors to receive a top-notch college education and become commissioned officers" (Navy, 2011). Active duty Sailors who are accepted into STA-21 must complete an 8-week Naval Science Institute (NSI) course designed to teach them the fundamental concepts of being a Naval Officer. After NSI, STA-21 officer candidates must complete their bachelor's degree within 36 months. While at school, STA-21 candidates must participate in NROTC unit functions, but are exempt from summer training and Naval Science courses covered by the NSI curriculum. Following commissioning, officer candidates undergo the initial training required by their community (Navy, 2011).

The Navy allows a small percentage of officers each year to transfer out of their current communities into a new one of their choosing. Although accounting for a relatively small percentage of SWO accessions, this program is valuable in that it retains officers that meet the Navy's core values. Additionally, the arduous application process suggests that the gaining warfare community is receiving a highly motivated officer into their corps. By definition, all lateral transfers have prior Navy experience, suggesting further benefit to the SWO community.

B. SWO PERSONNEL QUALIFICATION STANDARDS (PQS)

One result of the merger of surface type commands by Admiral Zumwalt in the mid-1970s was the improvement of surface training standards. In 1973, the combined Atlantic and Pacific Fleets promulgated the CinCPacFlt/CinCLantFlt Instruction 1412.1, which for the first time since the establishment of the Navy defined the professional qualification requirements of a SWO (Vion, 1978). By 1980, the combined surface type commanders had fully developed SWO PQS, and integrated them into the SWO Basic Course (Robinson, 2008). The introduction of PQS to SWO training ensured uniformity in the qualification process, and clearly set forth the professional expectations of a SWO.

The PQS program manager Naval Education and Training Command (NETC, or NAVEDTRA) defines it as,

> A qualification system for officers and enlisted personnel where certification of a minimum level of competency is required prior to qualifying to perform specific duties. A PQS is a compilation of the minimum knowledge and skills that an individual must demonstrate in order to qualify to stand watches or perform other specific routine duties necessary for the safety, security or proper operation of a ship, aircraft or support system. (NETC, 2004)

This would suggest that PQS progress provides a good measure of first-tour DIVO proficiency, and consequently value. While PQS progress may not be a measurement of watchstanding prowess, by NETC definition a DIVO's placement on the watchbill indicates they have met the minimum requirements to be trusted with the watch. Additional watchstanders add value by creating extra time in the watch rotation or shortening existing watches, which eases the burden on shipboard personnel.

However, an officer can provide value without attaining a full PQS qualification. Watchstanders still in training can serve as mentors to new watchstanders. The Conning Officer (an OOD UW in training who issues orders to the helmsman) does not require PQS qualification, yet is the watchstander directly responsible for the safe maneuvering of the ship. An experienced Conning Officer can manage the operation of a bridge watchsection, allowing the OOD to concentrate on navigational safety or operational planning. For this reason, a watchstander who has completed some of the requirements necessary for qualification can still demonstrate incremental proficiency, and adds value to the ship as a result. In short, incremental progress towards PQS completion is included in the proficiency calculation.

1. Fundamentals, Systems, and Watchstations

The changes to initial SWO training over the past decade had implications for the intended use of PQS. NAVEDTRA PQS documents explain how the qualification process is organized,

> PQS is divided into three sections. The 100 Section (Fundamentals) contains the fundamental knowledge from technical manuals and other

> texts necessary to satisfactorily understand the watchstation/workstation duties. The 200 Section (Systems) is designed to acquaint you with the systems you will be required to operate at your watchstation/workstation. The 300 Section (Watchstations) lists the tasks you will be required to satisfactorily perform in order to achieve final PQS qualification for a particular watchstation/workstation. (NETC, 2004)

At SWOSDOC, the Fundamentals and Systems sections of PQS formed the curriculum backbone (Navy, 1980). During SWOS-at-Sea, the Fundamentals and Systems sections of PQS were validated by completing shipboard CBT modules (COMNAVSURFOR, 2011). The SWO Intro curriculum reincorporated some of the 100- and 200-level PQS items, but SURFOR guidance states that completion of shipboard CBT modules eliminates the requirement to complete them (COMNAVSURFOR, 2011).

The core SWO PQS requirements have generally stayed the same since their establishment in the mid-1970s, but may change to accommodate the changing operational environment. One such example is the Antiterrorism Tactical Watch Officer (ATWO) watchstation, which was added as a PQS requirement in 2011 in response to continued overseas contingency operations. The addition is reflected in the most recent requirements defined in the Commander Naval Surface Force Instruction (COMNAVSURFORINST) 1412.1C, outlined in Table 1. Note that some of the PQS watchstations have pre-requisite PQS that must be completed prior to qualification.

PQS	NAVEDTRA Series	Watchstations	Type
Basic Damage Control	43119	301-306	Admin
Maintenance and Material Management System	43241	304	Admin
Division Officer Afloat	43463		Admin
SWO Engineering	43101-3		Watch
Inport Officer of the Deck	43397		Watch
M9 Service Pistol	43466-D		Pre-requisite
Small Boat Officer	43152		Watch
Combat Information Center Watch Officer	43101		Watch
CMS User	43462-B	301	Pre-requisite
Mk 164 Control Panel Operator	43341-F	303	Pre-requisite
Antiterrorism Tactical Watch Officer	43385-9		Watch
Underway Officer of the Deck	43101		Watch
Helm/Aftersteering Safety Officer	43492-2D	306	Pre-requisite

Table 1. Minimum SWO Qualification PQS Requirements (From: COMNAVSURFOR, 2011)

2. PQS Categories: Watch and Admin

First-tour DIVOs' primary responsibilities are to become fully qualified watchstanders, and to ensure that the administration of their divisions is sound. Based on analysis of the Navy Manpower Manual OPNAVINST 1000.16K, it seems reasonable to classify DIVO requirements into two general categories: Watches and Admin. This thesis considers PQS a "Watch" if it requires DIVOs to be placed on a watchbill, and "Admin" if it assists them in the execution of their administrative duties, but precludes placement on a watchbill.

The OPNAVINST 1000.16K divides a standard Navy workweek (NSW) into time devoted to "watchstanding" and time devoted to "work in addition to watchstanding" (OPNAV, 2007). A SWO's value to the Navy depends greatly on how they spend their day (on watch, or handling division administration), and the proficiency with which they complete such tasks. While it is impossible to know with what proficiency individual officers accomplish required tasks, PQS progress provides a good estimation of a DIVO's training level. It is important to note that the NSW was not meant to apply to officers. However, it still provides a good estimation of the general work expected of shipboard personnel.

C. SURFACE WARFARE OFFICER TRAINING

A 2007 study of Air Force training concluded that as initial training was reduced, productivity during OJT decreased (Manacapilli, Bailey, Beighley, Bennett, & Bower, 2007). This suggests that similar changes to initial SWO training would be correlated to changes in initial DIVO proficiency levels. Heavy front-end, PQS-based training implies a head start in the qualification process for young officers, which raises initial proficiency levels. Less initial training implies that DIVOs arrive to the ship with less formal preparation and, consequently, lower initial proficiencies. This section illustrates the changes to initial SWO training over the past decade, and serves as the foundation for the investment calculation in Chapter III.

1. SWOSDOC

SWOSDOC (initially called SWO Basic, and then SWDOC) was the first iteration of fleet-wide initial SWO training. The Navy implemented SWOSDOC in 1970 to provide prospective DIVOs with the standardized training that would prepare them for duty aboard ship. SWOSDOC instruction was designed to teach SWO PQS required of first-tour DIVOs. Utilizing the "train to qualify" concept, SWOSDOC taught the 100– and 200–level PQS items, leaving responsibility for the 300–level training and qualification to the ship's CO. In this way, each officer graduated from SWOSDOC with the majority of their prerequisite work completed, ready to begin watchstanding duties on their ship. LCDR Robinson summarized the purpose of SWO Basic, "to produce SWO candidates who possessed a firm grasp of the theory and principles of the SWO profession so they could more quickly qualify once they arrived onboard their ships" (Robinson, 2008, p. 54).

2. SWOS-at-Sea

In 2003, the Navy implemented a new training program that combined shipboard CBT and OJT, called SWOS-at-Sea. The SWOSDOC curriculum, condensed into a CBT format called SWOS-at-Sea 2.0, was provided to all DIVOs upon arrival at the ship (Rocci, 2003). The Navy designed SWOS-at-Sea 2.0 to serve as a lesson plan that, when supplemented by OJT, would guide DIVOs toward their SWO qualification. SWOS-at-

Sea was intended to give officers more time onboard ship by eliminating the long initial training pipeline (Navy, 2002). After achieving an Officer of the Deck Underway qualification, DIVOs were sent to the three-week Advanced Shiphandling and Tactics Course (ASAT), a leveling school that provided all DIVOs with the tactical knowledge and shiphandling skills required of a fully qualified SWO. For the first time in over 30 years DIVOs were sent to their ships without formal training, or introduction to SWO PQS (Navy, 2002).

Criticisms of SWOS-at-Sea are varied. Surveys of DIVOs at ASAT have indicated that SWO CBT was easily "gamed," indicating that there were ways of cutting corners for the sake of quick completion (Crawford, 2010). SWOS-at-Sea virtually eliminated formalized SWO training, leaving behind hopeful optimism that first-tour DIVOs would take their CBT program seriously amongst the already-stringent demands of shipboard life. DIVOs reporting to their ships during this period were completely green, and often sought training from anyone who would provide it. Some officers criticized ASAT for offering shiphandling practice via simulator after she had already learned how to drive onboard ship (Shovlin, 2008).

3. SWO Intro

In 2008, the surface community reestablished initial DIVO training across the fleet to deliver the formal training the waterfront was requesting. SWO Intro, an adaptation of a course already being provided for OCS graduates in Newport, is a four week course taught on the waterfront by ATG. Following SWO Intro, prospective DIVOs complete a week-long leadership course taught by the Center for Personal and Professional Development (CPPD). Naval Academy and NROTC graduates attend the ATG courses, while OCS graduates complete the same course in Newport, RI. A 2008 naval message from Vice Admiral Curtis explained SWO Intro's purpose, "to provide our new accession USNA and NROTC officers the basic building fundamentals and skills required to excel in their billets and build professional relationships with peers and waterfront experts at ATG and other organizations" (COMNAVSURFOR, 2008).

One benefit of SWO Intro's proximity to fleet assets is that it facilitates incorporation of "hands on" shipboard training to its formalized classroom curriculum. In fact, the San Diego course taught by ATG Pacific dedicates a significant amount of time to practical training, touring ships, practicing zone inspections, riding in rigid hull inflatable boats, and earning their 9 mm Pistol and 2nd Class Swim qualifications. SWO Intro aims to provide a general understanding of shipboard life, DIVO expectations, the qualification process, and other useful skills that SWOS-at-Sea did not offer. Additionally, SWO Intro sends a PQS validation letter to the DIVO's commanding officers, recommending the Fundamentals and Systems-level PQS that can be "signed off" upon their arrival. A sample PQS validation table can be found in Appendix A. While a four-week course precludes thorough instruction on all relevant surface warfare topics, SWO Intro aims to prepare DIVOs for at least the basics of shipboard life.

In spite of SWO Intro's numerous advantages over SWOS-at-Sea, it is still not functioning as anticipated. In her study *Process Evaluation of SWOS Division Officer Training,* Alice Crawford interviewed over 100 SWOs to gain an understanding of the current state of SWO training. Crawford recommended that SWO Intro be taught by officers with instructor specialty codes. Currently, ATG considers SWO Intro instruction a collateral duty. SURFOR guidance requires that all DIVOs attend the course within three months of arriving onboard ship, unless prohibited by the ship's operational schedule (COMNAVSURFOR, 2010). Several officers said they reported to training after completing deployments, which at that point made the course too basic relative to their shipboard experience. Crawford recommends that officers take SWO Intro training prior to reporting onboard ship, as it would relieve the training burden on the ships and provide them with a more "standard ensign" (Crawford, 2010).

4. On-the-Job Training

If commissioning source preparation and initial SWO training determine initial officer proficiency levels, and attainment of a SWO qualification equates to full proficiency, then OJT determines the learning curve that connects both points. The last

section discussed determinants of initial and final first–tour DIVO proficiencies. The next section will present relevant literature on OJT.

To a certain extent, nearly all jobs require OJT. Regardless of the thoroughness of initial job training, there are certain aspects of a job that must be learned through actual experience. Captain Steven Davis cautioned that there is no substitution for shiphandling other than actually driving a warship (Davis, 2007, p. 42). Captain Davis voiced what many SWOs have come to realize, that no amount of classroom or simulator training can prepare you for the stresses of a pier landing, or refueling at sea.

Literature classifies OJT as either structured or unstructured. Structured OJT was originally defined by Dr. Ronald Jacobs of Ohio State University as "a planned process of developing competence… by having an experienced employee train a novice employee at the work setting or a location that closely resembles the work setting" (Jacobs, 2003). Dr. Robert Ketchum defines unstructured OJT as "follow Joe or Jenny around" where the person is expected to "sink or swim" (Group, 2011).

Survey results from a 2009 study of SWO CBT suggest that SWO OJT is unstructured. Surveyed officers said as newly arriving DIVOs they were typically given mentors who had no training qualifications other than their own shipboard experience (Bowman & Crawford, 2009, p. 29). When asked if given the proper support in completing SWO CBT, one officer responded, "Everyone was just too busy, and we were just sort of left to figure things out by ourselves" (Bowman & Crawford, 2009, p. 37). Another officer indicated that his Training Officer was not even involved in the process. Interviews with post-command Captains from the NPS show that DIVO mentors often have little experience themselves. Bowman et al. caution that SWO OJT can become a low priority for the mentors who are already overworked as it is. The study revealed that SWOS-at-Sea was not emphasized by shipboard leadership and required structure before it could be a successful training program.

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III. METHODOLOGY AND RESULTS

This chapter calculates the OJT investment during SWO Intro, and compares it to the OJT investment associated with SWOSDOC and SWOS-at-Sea. To be an accurate comparison, SWOSDOC and SWOS-at-Sea investment calculations utilize current Operating Tempo (OPTEMPO), manpower levels, and training culture. First, the model determines first-tour DIVO proficiencies resulting from commissioning source preparation and initial officer training. Then, it establishes a learning curve that brings DIVOs from initial to full proficiency (measured by SWO qualification). Finally, it calculates the OJT investment by converting officer proficiencies into monetary value and subtracting them from the Navy Composite Rate. The investment is calculated monthly, decreases as DIVOs move up the learning curve, and ends after attainment of SWO qualification.

A. ESTABLISHING INITIAL PROFICIENCIES

Initial first-tour DIVO proficiency is a function of how well commissioning source preparation and initial officer training has prepared them for shipboard duties. Initial officer training provides the most objective measure of proficiency, as its learning objectives mirror SWO PQS. Commissioning source effects are harder to approximate as learning objectives are not based on SWO PQS, and are divided amongst the other warfare areas as well. Expected workload is based on the NSW and ship deployment schedules. Finally, the work required of first-tour DIVOs will be compared to their PQS progress in this area to estimate initial proficiency levels.

1. Navy Standard Workweek

This research classifies PQS consistent with Appendix C of the Manual of Navy Total Force Manpower Policies and Procedures, which classifies the work comprising the NSW (OPNAV, 2007). As mentioned before, the NSW, while not intended to apply to officers, still provides a good estimation of the general work expected of shipboard personnel. According to Appendix C, the NSW is devoted to either “watchstanding” (watch) or “work in addition to watchstanding” (admin). When deployed, officers devote

more time to watchstanding and less time to administrative work. When in port, the administrative workload increases as there are fewer watches to stand while moored. Thus, the average deployment cycles and the standard workweek must be considered when approximating the average workload balance between Watch and Admin. Once it is established how officers spend their time, the weighted importance of Watch and Admin PQS progress can be determined.

a. Ships Underway

Appendix C assumes that deployed warships operate in Condition III (Wartime/Deployed Cruising Readiness) on a three-section watch basis while underway. The deployed NSW allows for 70 hours of productive work. Of those 70 hours, 56 hours are allocated to watchstanding, and 14 are allocated to administrative work. This time allocation was used to approximate the work schedule for non-deployed ships underway as well.

b. Ships in Port

Appendix C does not calculate a NSW for shipboard personnel in port, but does provide a calculation for ashore military personnel in the Continental United States (CONUS). Ashore military personnel are allowed 33.38 hours of productive work, once service diversion such as inspections and quarters is factored out. To make this applicable to shipboard personnel, this calculation must account for additional time spent standing watch while on duty. In his thesis, *Training Costs for Junior Surface Warfare Officers,* Michael Makee determined that shipboard duty adds 10 hours to an in port workweek while in CONUS (assuming six section duty), and 20 hours to an in port workweek while outside of CONUS (assuming three section duty) (Makee, 1999, p. 29).

2. Ship Deployment Cycle

Ships operate according to a notional 24 month deployment cycle. According to the Surface Force Training Manual (SURFORTRAMAN) 3502.1D, the deployment cycle is typically comprised of an 18-month Inter-deployment Training Cycle (IDTC) followed by a six-month deployment (COMNAVSURFOR, 2007). While emerging operational

requirements may supersede this schedule for individual ships, the Navy defaults to this timeline for typical ship maintenance and training purposes. Figure 1, taken from the SURFORTRAMAN, provides an illustration of the typical deployment cycle.

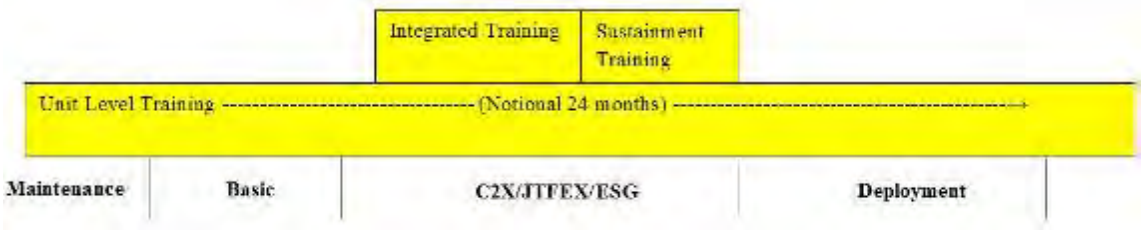

Figure 1. Notional 24 Month Deployment Cycle (From: COMNAVSURFOR, 2007)

3. Determining Workload

DIVO workload estimations are based on the NSW and a typical ship deployment cycle. The 24 month deployment cycle constitutes eight quarters. The first six quarters are devoted to training, the last two quarters to deployment. As each quarter has 13 weeks (91.25 days), the typical ship spends 78 weeks in the IDTC and 26 weeks on deployment. In 2011, the Navy budgeted for enough fuel to support an OPTEMPO of 45 underway days per quarter for deployed forces, and 20 underway days per quarter for non-deployed forces (Comptroller, 2010). Thus, budgets support a total of 90 underway days and 92.5 in port days during a typical deployment, and support 120 underway days and 427.5 in port days for ships during the IDTC. A simple conversion yields 12.8 weeks underway and 13.2 weeks in port while deployed, and 17.0 weeks underway and 61.0 weeks in port during IDTC. By multiplying the average ship schedule by the standard workweek calculations in the previous section, the average percent time devoted to Watch and Admin was determined (Table 2). In short, these time allocation percentages determine the relative weight of the Watch and Admin value categories. For example, the Admin value category discussed in the next section will account for 53.2 percent of an officer's total value, while the Watch category will account for 46.8 percent.

WATCH			
Deployed Ships	**Weeks Deployed**	**Watch Hours Per Week**	**Total Hours**
Underway	12.8	56	716.8
In Port	13.2	20	264
Non-Deployed Ships	**Weeks of IDTC**	**Watch Hours Per Week**	**Total Hours**
Underway	17	56	952
In Port	61	10	610
TOTAL HOURS WATCH			2542.8
% TIME DEVOTED TO WATCH			**46.8%**

ADMIN			
Deployed Ships	**Weeks Deployed**	**Admin Hours Per Week**	**Total Hours**
Underway	12.8	14	179.2
In Port	13.2	33.38	440.62
Non-Deployed Ships	**Weeks of IDTC**	**Admin Hours Per Week**	**Total Hours**
Underway	17	14	238
In Port	61	33.38	2036.2
TOTAL HOURS ADMIN			2894
% TIME DEVOTED TO ADMIN			**53.2%**

Table 2. SWO Time Allocation (After: Gavino, 2002)

4. Value Categories

First-tour DIVOs are expected to become fully qualified watchstanders and manage the administration duties of their division. While Navy PQS progress can approximate proficiency at these skills, it is not the only component of the value calculation. The model breaks down the Watch and Admin value categories into subcategories to account for commissioning source effects, and the general skills that college graduates should possess.

a. Admin Value Category

This research assumes similarities between shipboard administrative work and administrative work conducted in other workplaces. Standard DIVO tasks include routing naval correspondence, representing the division at meetings, and handling divisional personnel issues. These responsibilities approximate what most low-level managers should be expected to demonstrate after graduation, and with little formal training. This thesis argues that college equips all first-tour DIVOs with general managerial skills, a component in the Admin value category.

However, first-tour DIVOs are not just "paper pushers." SWO administrative work that requires formal or shipboard training can be found in the following PQS: Damage Control (DC), Maintenance and Material Management (3M), and ship-specific systems and programs of DIVO Afloat. Thus, certain aspects of DIVO

administration require skills that most college graduates should possess, while other aspects require formal PQS training on Navy specific systems and programs.

b. Watch Value Category

Unlike Admin work, shipboard watches require very specific skill sets that, most likely, have not been cultivated in prior employment or undergraduate experience. Nowhere in the private sector can one recreate the highly unique experience of standing watch on a warship. As a result, this thesis assumes that DIVOs arrive onboard with no other Watch skill set in addition to what the Navy has provided them in formal SWO training.

3. Initial Officer Proficiency Determination

Initial officer proficiencies (IOP) are determined by adding the proficiency gained at the commissioning source to the proficiency gained during initial training.

a. Proficiency Gained at Commissioning Source

Commissioning source effects must be accounted for when calculating IOPs. Based on a work in progress by Crawford and Bowman (2011) that conducted focus groups and interviews of officers on 15 ships and three ATGs (including 145 junior officers, 117 senior enlisted, 53 department heads, 12 COs and 12 XOs), graduates of the Naval Academy are widely considered better prepared upon reporting to the ship than those from NROTC, who are better prepared than cadets from OCS (Crawford & Bowman, 2011). This is consistent with the literature review, which indicates that graduates of the Naval Academy, relative to NROTC and OCS, are provided the most professional development instruction prior to commissioning. Similarly, NROTC midshipmen have more undergraduate professional development than OCS cadets, whose commissioning source professional development is limited to 12 weeks of military indoctrination training. This thesis considers SWO officer accessions via STA-21 or Lateral Transfer Program equally prepared for shipboard duty as Academy graduates because of their previous naval service. For simplicity, the values applied in this section

are generally assumed as an in-depth qualitative analysis for each commissioning source with respect to relevant SWO training was outside the scope of this thesis.

Proficiency gained at the commissioning source is classified as either Navy Familiarization (NF) or General Managerial Skills (GMS). The different degrees of commissioning source professional development are accounted for by applying corresponding NF values. In other words, SWO accessions from the Naval Academy, STA-21 and Lateral Transfer Programs are expected to be initially more proficient at their jobs than NROTC graduates, who are expected to be more proficient than OCS graduates (Crawford & Bowman, 2011). The research assumed that the NF should not exceed 10 percent of the overall officer proficiency. This 10 percent is divided further into NF Watch and Admin components, 4.68 and 5.32 percent, respectively (proportionate to the SWO time allocation from Table 2).

Commissioning source differences are only apparent when initial SWO training is limited. Prior to 2003, graduates went to six months of formal training prior to arrival at their ship. It is reasonable to assume that any initial advantages provided by commissioning source would be indiscernible after graduation from SWOSDOC. Conversely, during the SWOS-at-Sea initiative commissioning source effects were apparent as graduates received no formal training (other than a couple of weeks at billet specialty training) prior to reporting onboard. Lastly, one might argue that one month of SWO Intro training would be insufficient to completely "level out" commissioning source affects. However, SWO Intro provides considerably more training than did SWOS-at-Sea.

The research assumes that SWOSDOC completely leveled commissioning source differences, and gave its graduates an advantage over those who graduated from later versions of SWOS. Consequently, SWOSDOC graduates receive an NF value of 10 percent. For simplicity, the following NF values were assumed for SWOS-at-Sea accessions in accordance with their commissioning sources: 10 percent for USNA, STA-21 and Lateral Transfers, 5 percent for NROTC, and 2 percent for OCS. Finally, NF values of 10, 7.5 and 5 percent were assumed for SWO Intro to show that some leveling occurred. These adjustments are displayed in Table 3.

SWOSDOC	USNA	NROTC	OCS	STA-21	Lateral Transfer
Initial Proficiency Weights	1	1	1	1	1
Added Value to Watch	0.047	0.047	0.047	0.047	0.047
Added Value to Admin	0.053	0.053	0.053	0.053	0.053
Navy Familiarization Value	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**

SWOS-AT-SEA	USNA	NROTC	OCS	STA-21	Lateral Transfer
Initial Proficiency Weights	1	0.5	0.2	1	1
Added Value to Watch	0.047	0.023	0.009	0.047	0.047
Added Value to Admin	0.053	0.027	0.011	0.053	0.053
Navy Familiarization Value	**0.10**	**0.05**	**0.02**	**0.10**	**0.10**

SWO Intro	USNA	NROTC	OCS	STA-21	Lateral Transfer
Initial Proficiency Weights	1	0.75	0.5	1	1
Added Value to Watch	0.047	0.035	0.023	0.047	0.047
Added Value to Admin	0.053	0.040	0.027	0.053	0.053
Navy Familiarization Value	**0.10**	**0.075**	**0.05**	**0.10**	**0.10**

Table 3. Commissioning Source Contribution to Officer Value

As officers are trained aboard ship this initial advantage becomes less apparent. After officers attain their SWO qualification, it is assumed there is no perceived proficiency difference generated from commissioning source.

Second, all college graduates are expected to read, write, and think critically, which this research classifies as General Managerial Skills (GMS). For this reason, no officer shows up at the fleet with a proficiency of zero. Arguably, they should be able attend meetings, route naval correspondence, and generally serve as an information conduit up and down the chain of command. GMS, an important component of the officer proficiency calculation, is particularly administrative in nature. Thus, unlike Navy Familiarization skills, it is not split between Watch and Admin categories. GMS values will be established later in the chapter.

b. Proficiency Gained at Initial Training

Formal training learning outcomes contribute the most to the initial proficiency calculation. As mentioned in the literature review, initial SWO training teaches the Fundamental and Systems-level PQS requirements, leaving the Watchstation PQS to be taught on the ship. An analysis of SWO PQS documents found that NETC allocates a completion percentage value to each section of PQS completed, which makes the proficiency calculation quite objective. Table 4 uses the Basic Damage Control PQS (Watchstation 306) to show the conversion of initial training outcomes to officer proficiencies. The Fundamentals and Systems-level PQS line items each account for 5 percent of the watchstation, leaving 90 percent of the PQS to be learned while standing the watch. Officers were taught all 100– and 200–level PQS at SWOSDOC. They received no formal training during SWOS-at-Sea. They received training on some, but not all, of the 100– and 200–level PQS during SWO Intro. Thus, SWOSDOC and SWO Intro delivered officers with 10 percent and 4 percent of their Basic DC PQS already complete.

BASIC DC (306) PQS		**TAUGHT IN INITIAL TRAINING**			**% OF PQS COMPLETED**		
PQS Line	% of Watchstation	SWOSDOC	At-Sea	Intro	SWOSDOC	At-Sea	Intro
104	1	1	-	1	1	0	1
107	1	1	-	1	1	0	1
110	1	1	-	1	1	0	1
111	1	1	-	0	1	0	0
113	1	1	-	0	1	0	0
202	1	1	-	1	1	0	1
214	1	1	-	0	1	0	0
216	1	1	-	0	1	0	0
217	1	1	-	0	1	0	0
224	1	1	-	0	1	0	0
306.2	50	0	-	0	0	0	0
306.3	12	0	-	0	0	0	0
306.4	4	0	-	0	0	0	0
306.5	12	0	-	0	0	0	0
306.6	12	0	-	0	0	0	0
Totals	**100**	**1= Yes: 0= No**			**10**	**0**	**4**

Table 4. Basic Damage Control PQS Completion Percentages

This research weights progress on individual PQS consistent with its size. All NAVEDTRA PQS documents provide a recommended "time to completion" for each watchstation, an indication of level of undertaking. Thus, Basic DC Watchstation 306 (four weeks) is given a smaller weight relative to larger PQS like OOD UW (26 weeks). In this case, aggregating all SWO PQS times to completion equals 139.33 weeks. It is important to note that, as various PQS can be completed simultaneously, this time does not determine time to reach SWO qualification. The recommended time to complete Basic DC Watchstation 306 equates to 2.9 percent of all PQS as indicated in the "PQS Weight" column in Table 5. Multiplying the "PQS weight" with initial training "Progress" yields the "Weighted Progress" in the right column. The weighted progress is aggregated for each training method to determine PQS completion percentages resulting from initial training.

Category	Required SWO PQS	Expected Time to Qualify (in weeks)	PQS Weight (function of time to complete)	SWOSDOC Progress	At Sea Progress	Intro Progress	SWOSDOC Weighted Progress	At Sea Weighted Progress	Intro Weighted Progress
WATCH	Small Boat Officer	8	0.057	27.0%	0.0%	3.0%	1.6%	0.0%	0.2%
WATCH	OOD Inport	6	0.043	17.0%	0.0%	5.0%	0.7%	0.0%	0.2%
WATCH	M9 Service Pistol	4	0.029	0.0%	0.0%	100.0%	0.0%	0.0%	2.9%
WATCH	SWO Engineering	12	0.086	52.0%	0.0%	6.0%	4.5%	0.0%	0.5%
WATCH	CIC Watch Officer	26	0.187	25.0%	0.0%	5.5%	4.7%	0.0%	1.0%
WATCH	CMS User 301	6	0.043	58.0%	0.0%	0.0%	2.5%	0.0%	0.0%
WATCH	Mk 164 Control Panel Operator	6	0.043	73.0%	0.0%	0.0%	3.1%	0.0%	0.0%
WATCH	OOD Underway	26	0.187	29.0%	0.0%	12.0%	5.4%	0.0%	2.2%
WATCH	Helm/Aftersteering Safety Officer	4	0.029	21.0%	0.0%	3.0%	0.6%	0.0%	0.1%
WATCH TOTALS							**23.1%**	**0.0%**	**7.1%**
ADMIN	Basic DC 301	2	0.014	15.0%	0.0%	15.0%	0.2%	0.0%	0.2%
ADMIN	Basic DC 302	2	0.014	5.0%	0.0%	0.0%	0.1%	0.0%	0.0%
ADMIN	Basic DC 303	4	0.029	11.0%	0.0%	2.0%	0.3%	0.0%	0.1%
ADMIN	Basic DC 304	2	0.014	7.0%	0.0%	7.0%	0.1%	0.0%	0.1%
ADMIN	Basic DC 305	2	0.014	25.0%	0.0%	5.0%	0.4%	0.0%	0.1%
ADMIN	Basic DC 306	4	0.029	10.0%	0.0%	4.0%	0.3%	0.0%	0.1%
ADMIN	3M 304	8	0.057	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
ADMIN	DIVO Afloat	17.33	0.124	58.0%	0.0%	48.0%	7.2%	0.0%	6.0%
ADMIN TOTALS							**8.6%**	**0.0%**	**6.5%**
OVERALL TOTAL		139.33	1				**31.6%**	**0.0%**	**13.7%**

Table 5. PQS Progress by Initial Training Source

This research excluded Billet Specialty Training's (BST) contribution to officer value as different billets call for different levels of training. Additionally, BST learning outcomes are not necessarily based on SWO PQS, and therefore BST does not fit methodologically with this model. Also, the ATWO PQS was excluded from the comparison as it is a new requirement, and not common to the previous versions of

SWOS. Furthermore, the SWO Intro validation table (Appendix A) indicates ATWO has not yet been incorporated into the curriculum.

c. Initial Officer Proficiency

Overall Watch and Admin PQS progress is an approximation of how well initial training prepares officers for work in these areas. While this is a measure of officer preparation, it does not indicate initial proficiency. Such a determination needs to incorporate a SWO's time allocation between Watch and Admin. Table 6 derives initial officer proficiencies. The Watch and Admin PQS progress totals from Table 5 are inputs into the "PQS Progress" rows in Table 6.

		SWOSDOC	**SWOS-at-Sea**					**SWO Intro**				
Value Categories	Weights	All SWO Accessions	USNA (264)	ROTC (253)	OCS (159)	STA-21 (55)	LAT XFER (58)	USNA (264)	ROTC (253)	OCS (159)	STA-21 (55)	LAT XFER (58)
Watch PQS Progress	0.421	0.231	0	0	0	0	0	0.071	0.071	0.071	0.071	0.071
NF Watch Component	0.047	1	1	0.5	0.2	1	1	1	0.75	0.6	1	1
Total Watch	**0.468**											
Admin PQS Progress	0.319	0.086	0	0	0	0	0	0.065	0.065	0.065	0.065	0.065
General Managerial Skills	0.160	1	1	1	1	1	1	1	1	1	1	1
NF Admin Component	0.053	1	1	0.5	0.2	1	1	1	0.75	0.6	1	1
Total Admin	**0.532**											
		OOD UW Factor = 0.95										
Initial Officer Proficiency		**36.5%**	**21.6%**					**28.0%**				

Table 6. Initial Officer Proficiency

Table 6 organizes all indicators of initial value (PQS progress from initial training, Navy Familiarization and General Managerial Skills from the commissioning source) into Watch and Admin categories. The weight column shows the factor each value is given. Recall that the Watch and Admin categories are weighted relative to the time officers are expected to devote to these types of work (46.8 and 53.2 percent, respectively). Also recall that the maximum NF value is 10 percent of overall proficiency (4.68 for watch, and 5.32 for admin).

The Watch value category is only comprised of the NF and Watch PQS Progress Components. Subtracting the NF Component yields a Watch PQS Progress weight of 42.1 percent. The Admin value category is comprised of three components. After subtracting the NF Component, Admin PQS Progress and General Managerial Skills account for the rest of Admin value category. This research weights Admin PQS progress twice as heavily as GMS, because much of the administrative work requires intimate knowledge of Navy regulations and procedures.

SWOSDOC, SWOS-at-Sea, and SWO Intro IOP calculations are largely similar, with the exception of how they incorporate the NF component. IOPs for each training method were calculated by summing the products of the "weight" and "initial training" columns. The SWOSDOC calculation is straightforward, as professional development differences across commissioning sources should have disappeared after six months of formal SWO training. Thus, all SWOSDOC accessions receive the same NF component factor of "1." However, commissioning source differences are assumed unleveled under SWOS-at-Sea and SWO Intro, which explains their subdivision into commissioning source columns. To determine a community-wide proficiency for each training method, the appropriate NF factor must be applied to each DIVO accession point. This accounts for commissioning source effects on overall officer proficiency under each SWO training method.

A final adjustment needs to be made to the IOP to account for the value gained between the Underway OOD and SWO qualifications. The last required SWO PQS is the Underway OOD qualification. Naturally, as the IOP is heavily based on PQS progress, proficiency demonstrated by gains in PQS ends at the OOD qualification. This research assumes that progress towards OOD Underway accounts for 95 percent of a DIVO's total value, leaving 5 percent for the progress towards SWO qualification. An average preparation time between OOD and SWO qualifications of four weeks is assumed. Under SWOS-at-Sea and SWO Intro, three weeks of ASAT training bring the total to seven weeks.

The calculations in Table 6 indicate that officers reporting from SWOSDOC had the highest IOPs (36.5 percent) as a result of the six months of formal SWO training. Under SWOS-at-Sea, first-tour DIVOs reported to their ships with only the preparation afforded by their respective commissioning sources, which yielded the lowest IOPs (21.6 percent). DIVOs that graduate from SWO Intro have IOPs of 26.8 percent. With the IOPs established, the learning curve that brings first-tour DIVOs to full proficiency can be approximated.

B. ESTABLISHING THE LEARNING CURVE

The SWO OJT learning curve is equivalent to the time it takes an average DIVO to reach SWO qualification after arrival to the ship. The lack of dependable quantitative data within the SWO community necessitated that a few assumptions be made. Although, even if the annual average time to reach SWO qualification was known, to make a current comparison it would have to correct for environmental factors unique to the time period in which it was collected. A discussion of these factors precedes the SWO qualification timeline calculation.

1. Qualification Timeline Factors

Before explaining the learning curve calculations, it is necessary to discuss the factors that can affect SWO qualification times. There exist a variety of environmental factors that can alter the time to reach SWO qualification. These factors include (but are not limited to) OPTEMPO, shipboard manning, and shipboard qualification climate influenced by SWO training policy.

As indicated in Chapter II, SWOs are groomed to be professional mariners and leaders at sea. The reductions in OPTEMPO in recent history make it increasingly difficult for ship COs to test their DIVOs at sea, which could have the effect of either delaying qualification, or qualifying officers prematurely to not impede their career progression. Ship manning levels also influence qualification times. Larger officer wardrooms negatively impact individual officer “stick time”, which could significantly slow qualification. But perhaps changes to training policies have the largest impact on qualification rates, as explained in the following paragraph.

The introduction of ASAT (the three-week leveling course that precedes SWO qualification under SWOS-at-Sea and SWO Intro) shortened the time CO's had to qualify their officers as Underway OODs. Prior to ASAT, the SWO qualification requirement was 18 months (OPNAV, 2002). This meant that an officer could qualify as Underway OOD, and then as a SWO, as late as 18 months without violating SURFOR guidance. Once ASAT was added to the qualification process, there was no accompanying shift in qualification timeline, which effectively gave officers less time to qualify onboard. Even after adding the five weeks of SWO Intro training in 2008, SURFOR maintained an 18 month qualification requirement (COMNAVSURFOR, 2010). In short, the Navy crammed two months of additional off-ship training into the same shipboard qualification timeline. Furthermore, ships might have sent DIVOs to ASAT ahead of deployments to either avoid losing them during operationally demanding periods or to beat the ASAT deadline that would occur while deployed, suggesting the potential for premature qualification. Perhaps as a direct result of this, SURFOR removed the OOD UW requirement prior to ASAT attendance (COMNAVSURFOR, 2010).

The numerous factors that affect SWO qualification rates make it difficult to draw a meaningful comparison based on initial SWO training method. As a result of the factors stated above, if previous versions of SWOS existed today it would not necessarily cause SWO qualification rates to revert to those of the past. So even if qualification timeline data were available, it would not translate well to the current training environment. This section explained how environmental factors influence the qualification process. It is important to note that personal factors insert variability as well.

SWO qualification is a process that differs according to the individual. The "Deck" Division Officer might qualify quickly as a Small Boat Officer, while the "Auxiliaries" Division Officer might complete the SWO Engineering PQS first. Even though the ship's Senior Watch Officer is in charge of tracking DIVO qualifications, it does not provide enough structure to suggest that there is a predictable path to qualification. As suggested by previous research, much of the process depends on

variables such as DIVO intelligence, motivation, and even their relationships with senior officers (Bradley, 2011; Bowman & Crawford, 2009).

2. Reconstructing SWO Qualification Timelines

To approximate how older versions of SWOS might be run in today's Navy, it is necessary to understand how qualification was driven in the past. Figure 2 illustrates SWO qualification timeline changes over the past few decades (Operations, 1987 & 2002; Forces, 2010 & 2011).

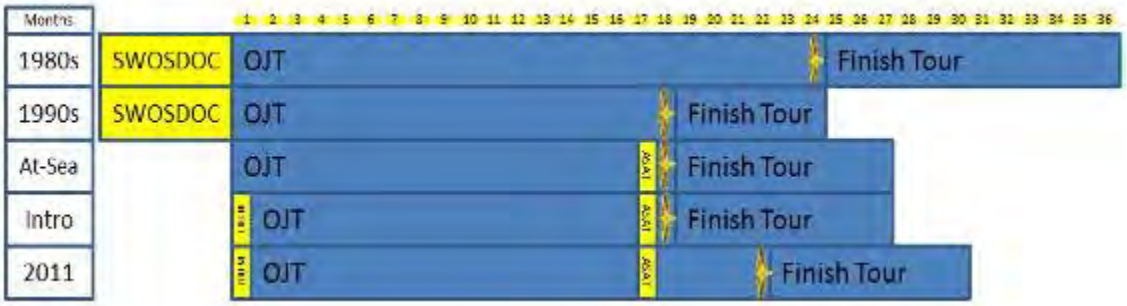

Figure 2. Nominal SWO Qualification Requirements (in months) by Period

During the 1980s, first-tour DIVOs were given the 24 months to qualify as SWOs over a 36 month tour. In the 1990s, the Navy accelerated the qualification requirement to 18 months over a 24 month tour. Once SWOSDOC gave way to SWOS-at-Sea, DIVOs were still expected to earn their qualification in 18 months with far less initial training. The introduction of ASAT into the training pipeline without lengthening the qualification requirement accelerated the qualification process even more. The 18 month requirement remained constant throughout SWOSDOC, SWOS-at-Sea, and SWO Intro until 2011, when SURFOR increased the onboard qualification time to 22 months (COMNAVSURFOR, 2011). Some might argue that the increase to 22 months was an admission the qualification process has been rushed in recent years. Regardless, the change supports the assumption of this research that the SWO qualification requirement should be increased during periods of less initial training, and decreased during periods of more initial training. Figure 3 displays the real shipboard qualification (OJT) period after factoring out initial training and ASAT.

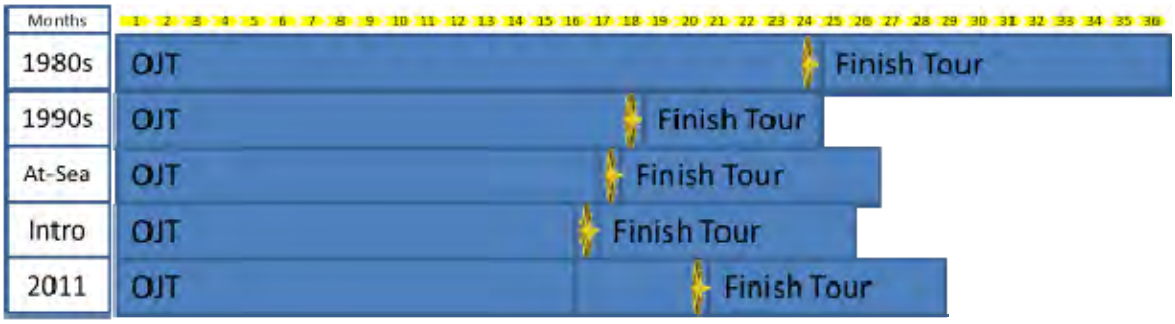

Figure 3. Real SWO Qualification Requirements (in months) By Period

To project the SWO qualification timelines of previous versions of SWOS in today's environment, it is assumed the standard qualification time onboard would be consistent with the training method. Simply put, heavier initial training should yield quicker qualification times.

Attainment of the Underway OOD qualification signals the completion of SWO PQS, which this research equates to 95 percent of the total officer value (SWO attainment is the final 5 percent). Subtracting Initial Officer Proficiency from the OOD Underway proficiency yields the "Proficiency Gained Onboard" (Table 7). SURFOR's most recent guidance of "14 to 17 months" is a good indication of how long it should take to qualify Underway OOD in today's surface fleet (COMNAVSURFOR, 2011). An average of this OOD qualification range indicates that generally graduates of SWO Intro can be expected to qualify OOD Underway within 15.5 months of reporting onboard. It should be noted that in practice, the timing of SWO Intro is anything but predictable, as indicated by ongoing research from Crawford and Bowman. However, the 15.5 months is a reasonable approximation based on current SURFOR guidance.

	Initial Officer Proficiency	OOD UW Proficiency	Proficiency Gained Onboard	Proficiency Gained Onboard	Months to OOD UW	Months to OOD UW	OOD to SWO	Months to SWO
SWOSDOC	0.36	0.95	0.59	0.59	13.5	13.5	1.00	**14.5**
SWOS-at-Sea	0.22	0.95	0.73	0.73	17.0	17.0	1.75	**18.7**
SWO Intro	0.28	0.95	0.67	0.67	15.5	15.5	1.75	**17.3**

Table 7. Predicting SWO Qualification Timelines by Initial Training Method

To approximate "Months to OOD UW" for SWOSDOC and SWOS-at-Sea, it is assumed that once onboard, officers have the capacity to learn at a rate independent of initial training method. Equation 1 uses the "Proficiency Gained Onboard" and average months to qualify OOD UW under SWO Intro to approximate the rate at which DIVOs learn their profession.

SWO Proficiency Gain Rate = 67% / 15.5 months = 4.3% per month (1)

Again, assuming that monthly proficiency gains do not change with respect to initial training method, this learning rate applies for all versions of SWOS. A rate of 4.3 percent proficiency gain per month applied to the "Proficiency Gained Onboard" for SWOSDOC and SWOS-at-Sea yields 17 and 13.5 months, respectively. Thus, suggested OOD UW qualification times during SWO Intro of 15.5 months were utilized to project current qualification times under previous versions of SWOS.

After earning the OOD UW qualification, DIVOs must prepare for their SWO qualification board. Under SWOSDOC, a standard preparation time of four weeks is assumed. Under SWOS-at-Sea and SWO Intro, DIVOs are required to attend three weeks of ASAT upon earning OOD UW. The time spent away from the ship brings their total preparation time to 7 weeks (1.75 months). Adding this preparation time to the OOD UW timeline yields "Months to SWO" (Table 7).

According to calculations, DIVOs who graduated from SWOSDOC should qualify faster than those who were trained under the two subsequent training methods. This research estimates that graduates of SWOSDOC would earn their SWO pins in 14.5 months, while those who accessed under SWO Intro and SWOS-at-Sea attain SWO qualification in 17.3 and 18.7 months, respectively (Figure 4). The length of the SWO OJT learning curve (shipboard qualification process) serves as the basis for the SWO OJT investment calculation.

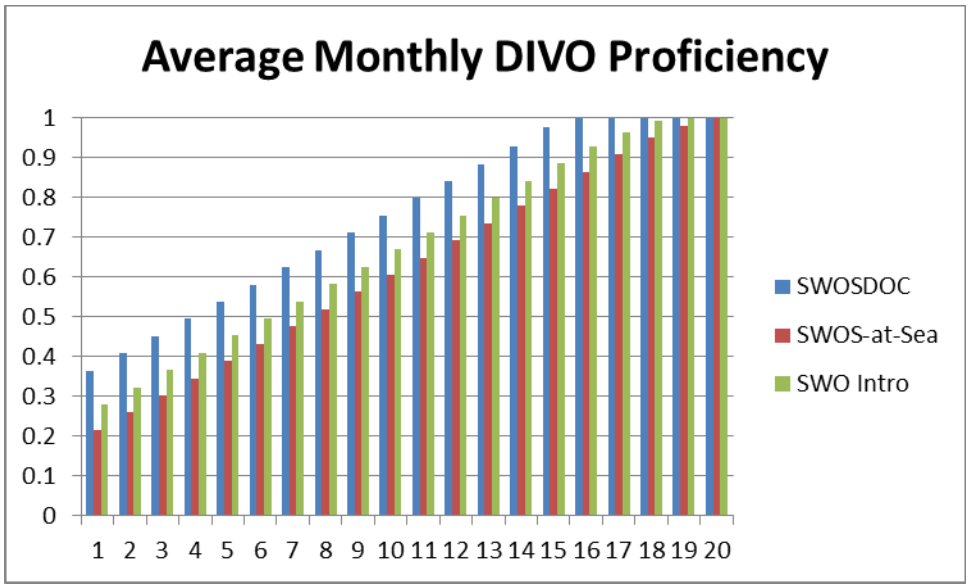

Figure 4. First-tour DIVO Proficiency Progression per Initial Training Method

C. DETERMINING THE INVESTMENT

This section explains how DIVO proficiencies are converted to values. The research assumes that if officers demonstrate 50 percent proficiency, then they earn 50 percent of their paycheck (salary plus benefits). In other words, officer monetary value is derived by multiplying the monthly DIVO proficiency by the monthly cost to the Navy (Ensign Composite Pay Rate). The portion of their compensation that is not earned is considered subsidized, a cost that decreases as SWOs progress towards their SWO qualification. The OJT investment is the difference between a DIVO's average monthly value (MV) and the monthly cost (MC) to the Navy, as defined in Equation 2. The term M_n represents the average number of months to achieve SWO qualification for each initial officer training method.

$$\text{OJT Investment} = \sum [(MC_1 - MV_1)*M_1 + (MC_2 - MV_2)*M_2 + \ldots (MC_n - MV_n)*M_n] \quad (2)$$

Months	SWOSDOC Proficiency	Months	SWOS-at-Sea Proficiency	Months	SWO Intro Proficiency	Monthly DIVO Cost (MC)	SWOSDOC AVG MV	SWOSDOC Investment	SWOS-at-Sea AVG MV	SWOS-at-Sea Investment	SWO Intro AVG MV	SWO Intro Investment
-7	Leave	-1	Leave	-2	Leave	$ 7,575.08						
-6	SWOSDOC	BST/Report	21.6%	-1	BST							
-5	SWOSDOC	1	26%	Intro/ Report	28%				1801.20	5773.89		
-4	SWOSDOC	2	30%	1	32%				2128.76	5446.32	2282.87	5292.22
-3	SWOSDOC	3	35%	2	37%				2456.33	5118.76	2610.43	4964.65
-2	SWOSDOC	4	39%	3	41%				2783.89	4791.19	2938.00	4637.09
-1	SWOSDOC	5	43%	4	45%				3111.45	4463.63	3265.56	4309.52
BST/Report	36%	6	48%	5	50%				3439.02	4136.07	3593.12	3981.96
1	41%	7	52%	6	54%		2928.60	4646.48	3766.58	3808.50	3920.69	3654.40
2	45%	8	56%	7	58%		3256.16	4318.92	4094.15	3480.94	4248.25	3326.83
3	49%	9	61%	8	63%		3583.73	3991.36	4421.71	3153.37	4575.82	2999.27
4	54%	10	65%	9	67%		3911.29	3663.79	4749.27	2825.81	4903.38	2671.70
5	58%	11	69%	10	71%		4238.85	3336.23	5076.84	2498.24	5230.94	2344.14
6	62%	12	74%	11	76%		4566.42	3008.66	5404.40	2170.68	5558.51	2016.57
7	67%	13	78%	12	80%		4893.98	2681.10	5731.97	1843.12	5886.07	1689.01
8	71%	14	82%	13	84%		5221.55	2353.54	6059.53	1515.55	6213.64	1361.45
9	75%	15	86%	14	89%		5549.11	2025.97	6387.09	1187.99	6541.20	1033.88
10	80%	16	91%	15	93%		5876.68	1698.41	6714.66	860.42	6868.77	706.32
11	84%	OOD Qual 17	95%	15.25	94%		6204.24	1370.84	7037.39	537.70		
12	88%	ASAT 17.25	96%	OOD Qual 15.5	95%		6531.80	1043.28				
13	93%	ASAT 17.5	96%	ASAT 15.75	96%		6859.37	715.72				
13.25	94%	ASAT 17.75	97%	ASAT 16.0	96%						7168.55	406.54
OOD Qual 13.5	95%	18	98%	ASAT 16.25	97%				7304.54	270.54		
13.75	96%	18.25	99%	16.5	98%							
14	98%	18.5	99%	16.75	99%		7204.43	370.66				
14.25	99%	SWO Qual 18.75	100%	17	99%				5620.44	60.87	7412.76	162.32
SWO Qual 14.5	100%			SWO Qual 17.25	100%		3740.20	47.34			1887.01	6.76
						Total OJT Investment per officer		**$35,272.30**		**$ 53,943.59**		**$45,564.63**

Table 8. OJT Investment per Officer by Initial Officer Training Method

The left side of Table 8 shows the estimated proficiency gains of a first-tour DIVO. "Report" indicates their start of OJT and corresponding IOP. The months are tallied on the left side of each column to show the time spent in initial training and OJT. After "OOD Qual" the timeline shifts from months to weeks to show a DIVO's weekly progress between OOD UW and SWO qualifications. The average investment is calculated monthly, and then again for the remainder of weeks until SWO qualification. The total OJT investment per first-tour DIVO is calculated by adding the average monthly investments until SWO qualification.

According to the calculations, as a result of completing the 100– and 200– level PQS during initial training, graduates of SWOSDOC require the lowest OJT investment of the three initial training methods ($35,272 per officer). Graduates of SWOS-at-Sea are required to learn their entire jobs onboard ship, which is reflected in their particularly high OJT investment of $53,944 per officer. Naturally, as SWO Intro provides a moderate level of training, the current OJT investment ($45,565 per officer) is less than that associated with SWOS-at-Sea, but is still more expensive than that of SWOSDOC.

D. INCORPORATING PREVIOUS INITIAL TRAINING COST ESTIMATES

After the determination of the SWO OJT investment, a natural question at this point would be, "So what did SWOSDOC, SWOS-at-Sea, and SWO Intro cost the Navy?" It does little good to discuss the shipboard costs associated with previous versions of SWOS without an understanding of what they cost to implement. Lieutenant Christopher Gavino's 2002 thesis, *Cost Effectiveness Analysis of the "Sea to SWOS" Training Initiative on the Surface Warfare Officer Qualification Process,* provides the framework for this answer. A brief exploration of Gavino's cost estimates provides initial training costs per officer for SWOSDOC and SWOS-at-Sea, and assists in determining SWO Intro costs as well.

Gavino's thesis estimated the costs incurred from officer commissioning through SWO qualification (whereas this thesis was limited in scope to the shipboard component). For simplicity, all post-commissioning costs are referred to as "formal training" costs. His shipboard cost estimate for SWOS-at-Sea CBT, based on time devoted to CBT completion, needs to be adjusted to reflect the reality that DIVOs devoted very little time to CBT (Crawford, 2010). A proficiency-based cost estimation corrects for this.

Unlike this thesis, Gavino's work focused on costs associated with initial training such as Permanent Change of Station (PCS) moves, temporary duty en route (TDY) travel, and Billet Special Training (BST). With a few adjustments, his cost estimates can be used to determine what each method should cost the Navy today. Furthermore, even though his estimate preceded the establishment of SWO Intro, many of his cost figures still pertain to the current version of SWOS.

Adjustments to Gavino's cost estimates (detailed in Appendix B) yield initial training costs per officer of $65,605 for SWOSDOC, $37,211 for SWOS-at-Sea and $43,283 for SWO Intro. Adding these costs to the OJT investment shows the Navy's total post-commissioning investment for SWO qualification (Table 9).

	SWOSDOC Costs	SWOS-at-Sea Costs	SWO Intro Costs
Formal Training	$ 65,604.84	$ 37,210.84	$ 43,282.51
OJT	$ 35,272.30	$ 53,943.59	$ 45,564.63
Total	**$ 100,877.14**	**$ 91,154.44**	**$ 88,847.14**

Table 9. Training Costs Per Officer from Commissioning to SWO Qualification

E. RESULTS

By combining the OJT investment with Gavino's initial training cost estimate, one can see the tradeoff between formal and on-the-job training costs. As the Navy increases its investment in formal training, it effectively relieves the ship from training officers on the basic knowledge required of them. As the Navy decreases investment in formal training, the ship's burden of training first-tour DIVOs increases. A current comparison of the three versions of SWOS over the past few years demonstrates that SWOSDOC is the most expensive in terms of formal training costs, but produces officers with the highest initial proficiencies. Conversely, the SWOS-at-Sea program is the least costly formal training to implement, but produces officers with the lowest initial proficiencies. SWO Intro performs in the middle in terms of initial training cost and initial officer proficiency, but costs the least from commissioning to SWO qualification, as illustrated in Figure 5.

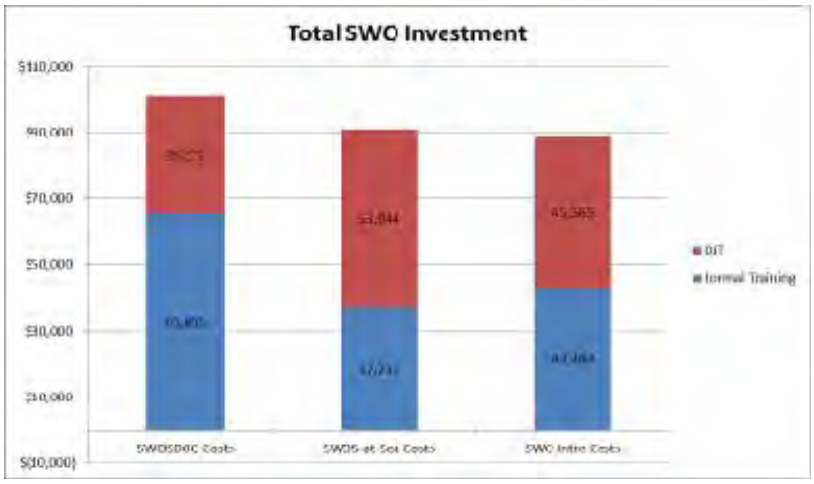

Figure 5. Total SWO Investment by Initial Training Method

Figures 6–8 display formal and on-the-job training costs as a percentage of the overall SWO investment for each version of SWOS.

Figure 6. FY 11 SWOSDOC Investment Allocation

SWOSDOC formal training accounts for 65 percent of the total investment in first-tour DIVO development.

Figure 7. FY 11 SWOS-at-Sea Investment Allocation

During SWOS-at-Sea, the Navy nearly eliminated formal SWO training (except for BST and DIVOLC), representing only 41 percent of the total first-tour DIVO investment.

Figure 8. FY 11 SWO Intro Investment Allocation

Under SWOS-at-Sea, the Navy achieved relative balance between formal and on-the-job training, at 49 and 51 percent of the total investment, respectively.

IV. SUMMARY, CONCLUSIONS, EPILOGUE, AND RECOMMENDATIONS

A. SUMMARY

The persistent changes to initial SWO training over the past decade hinted at the need for analysis of their impact on officer quality. This research developed a proficiency-based cost estimate of the Navy's investment in first-tour OJT, and applied it to the past three versions of formal SWO training. This estimate called for an analysis of SWO qualification requirements, and to what extent incoming DIVOs were prepared to meet them. Commissioning source preparation, formal SWO training, and SWO PQS progress were considered the three contributors to officer proficiency. The value of a first-tour DIVO was calculated by multiplying officer proficiency (represented as a percentage of full proficiency) by the Navy Ensign Composite Pay Rate. The first-tour OJT investment was calculated by summing the monthly differences between officer values and officer costs over the shipboard qualification period.

An accurate estimation of shipboard OJT costs required an analysis of SWO qualification timelines. Consideration was given to using past qualification timelines to approximate OJT costs of older SWOS versions, but the results would have made for a poor comparison as environmental factors significantly altered the qualification process and timeline over the years. Instead, the OJT costs for each version of SWOS were calculated in terms of today's shipboard qualification experience (where varying OPTEMPO, manning levels, and training policies could not influence the results). Furthermore, if future training decisions were to be based on this comparison, policymakers would have to consider current, not past, operational factors.

Finally, once the shipboard OJT investment was calculated, it was combined with initial training cost estimates from Gavino to provide the Navy's total investment in SWO training from commissioning to SWO qualification.

B. CONCLUSIONS

1. SWO Training Investment

The model calculated the OJT investment under SWOSDOC to be the least expensive at $35,272 per officer. Shipboard OJT during SWOS-at-Sea was determined the most expensive at $53,944 per officer. SWO Intro OJT costs per officer were $45,565. Gavino calculated initial training costs for SWOSDOC and SWOS-at-Sea at $65,605 and $37,211 per officer, respectively. Elements of his cost estimate were applicable to SWO Intro as well, the cost of which this thesis estimated at $43,283 per officer. This yields a total SWO investment of $100,877 for SWOSDOC, $91,154 for SWOS-at-Sea, and $88,847 for SWO Intro.

Comparing SWOS-at-Sea and SWO Intro costs indicates that modest increases to investment in initial training resulted in greater reductions to shipboard OJT costs. However, SWOSDOC's relatively high total investment cost suggests there is a point at which tradeoffs between initial and shipboard training become inefficient.

The research concludes that reductions to formal SWO training did not result in direct savings, as the budgetary cost savings were offset by increases to the proficiency-based shipboard training costs. In other words, much of the budgetary costs were effectively transferred to ships in terms of undertrained first-tour officers, as explained in the next section.

2. Hidden Costs of OJT

While it is common to view costs in terms of tangible budget line items, there are other important costs to be considered, which can be difficult to perceive. This thesis concludes that while the elimination of SWOSDOC reduced the budgetary cost of SWO training, it passed many of these costs onto the ship in the form of lower officer proficiencies. It is difficult to measure the true cost of low officer proficiencies however, as they may cause second- and third-order effects that are not felt for some time.

When officers arrive at their ship without the proper training, the ship bears the burden of either training them, or doing their work until they are capable of doing it

themselves. During SWOS-at-Sea, the officer wardroom bore increased responsibility of DIVO development and mentoring, which added to its shipboard responsibilities. Department Heads and SWO qualified officers needed to devote more time to training inexperienced officers on how to perform their duties. The time DIVOs were dedicating to CBT was time they were not managing their divisions. If DIVOs were not around to manage, or did not know how to manage, the Chief bore increased responsibility for division management. By filling in for inexperienced division officers on matters like divisional administration, Chiefs were essentially doing two jobs. In this way, untrained DIVOs negatively impact shipboard readiness.

As originally designed, formal SWO training was meant to prepare officers for all aspects of duty at sea, which included watchstanding. While difficult to measure, reductions in formal SWO training have the potential to negatively impact watchstanding. Less initial training implies a reduction in officer quality, which could translate to an increase in operational mishaps. As the $78 million price tag of the 2009 USS Port Royal grounding suggests, watchstanding mishaps are costly (Kakesako, 2011). On a per capita basis in terms of 789 annual SWO accessions in 2011 that cost would amount to $98,859.

Poor officer retention is another hidden cost that may increase as initial training decreases. In 1970, when the SWO retention rate was 14 percent, the SWO Retention Study Group recommended "better schooling" to Admiral Zumwalt as a means to improve the professionalism of the surface navy, which lead to the establishment of SWOSDOC in 1975. (Muir, 1996) Increasingly, officers criticize the surface navy for making their first DIVO tour "trial by fire" under the SWOS-at-Sea initiative, and suggest more initial training to increase professional satisfaction (Shovlin, 2008). Conceivably, the cost savings achieved by ending SWOSDOC might come back in greater magnitudes as officer recruiting expenses, or increased retention bonuses.

As explained above, periods of limited initial officer training can increase shipboard training costs to a much larger extent than what this thesis indicates. When the Navy bases wide-reaching training policy on budgetary savings (as the 2010 GAO report suggests) it is potentially missing the larger picture.

C. EPILOGUE

1. Latest Proposal for SWO Training

In June of 2011, SWOSCOLCOM CO Captain Neil Parrott outlined the latest proposed changes to initial SWO training (named the Training Project Plan, or TPP) in a speech at the Surface Navy Association West Coast Symposium in San Diego. He stated, "We're making a pitch to the SWO Flags for bringing SWOSDOC back!" (SWOSCOLCOM, 2011) Prior to the speech, CAPT Parrott secured support for the TPP at the Surface Warfare Officer Flag Officer Training Symposium (SWOFOTS). Since, SURFOR has approved the plan, which now awaits final approval and funding from NETC. As proposed, prior to arrival at the fleet, ensigns would report to SWOS satellite commands in either San Diego or Norfolk for two months of formal training called Basic Division Officer Course (BDOC). Training responsibility would shift back to SWOS, allowing ATGs to return to the business of training ships. The proposal (illustrated in Appendix C) calls for lengthening the first DIVO tour from 27 to 30 months. After their first tour, DIVOs would report to four weeks of Advanced Division Officer Course (ADOC) to receive training in navigation, advanced shiphandling, and maintenance via the proposed Junior Officer Ship Material Readiness Course. Following ADOC, DIVOs would complete BST for their next assignment of 18 months.

2. Implications for SWO OJT Investment

This plan could reduce the shipboard OJT costs for a few reasons. First, the second month of formal SWO training would double current SWO training, suggesting an increase to initial officer proficiencies as long as learning objectives continue to follow SWO PQS. Concerning formal SWO training for DIVOs, Parrott simply stated, "More is better." Second, SWOSDOC would be conducted in the two largest FCAs where access to fleet assets could provide valuable hands on training that relates to classroom instruction. BDOC would place the ensigns in a shipboard environment without the added pressure of shipboard duties. This could greatly enhance training, increase shipboard familiarization and initial officer proficiencies. Third, SWOS is removing the ASAT requirement (renamed ADOC) until the end of the first tour, which

eliminates the logistical challenge of sending officers off the ship for nearly a month during the qualification process. Without knowing BDOC learning outcomes, it is difficult to quantify proficiency-based OJT cost reductions. However, it is certain that there will be reductions, the benefits of which must be weighed against the associated increase in initial training costs.

3. Preliminary Cost Estimate

Based on a very preliminary cost estimate, the change would represent a minimum annual cost increase over SWO Intro of $2,880 per officer. This figure considers MPN for the ten instructors (O3) and Officer in Charge (O4), the additional four weeks of MPN for each student (O1), and the removal of ASAT from the qualification period. Yet, the benefits might outweigh the added budgetary costs. BDOC would disincorporate ATG personnel from instruction, enabling them to refocus on their primary responsibilities of shipboard training. From the outset, it might bolster the SWO community's commitment to professionalism, which could positively impact recruiting and retention. Provided its curriculum design incorporates more Fundamental and Systems-level PQS, it would produce officers with an increased understanding of critical SWO knowledge, relative to the past two versions of SWOS. Two months might even be the appropriate course length to introduce DIVOs to what lies ahead without negatively impacting knowledge retention. While imprecise, the benefits of increasing training could lower mishap rates and the cost of officer retention.

D. RECOMMENDATIONS

Based on the results of this research, it is possible for the Navy to further reduce the shipboard OJT investment.

1. Ensure SWO PQS remain the basis for initial training curriculum design. To the extent possible, it is recommended SWOSCOLCOM use Fundamental and Systems-level PQS as the basis for future curriculum design efforts. As PQS is the Navy's measuring stick for SWO proficiency and qualification, it must be the basis for curriculum design.

2. NETC should fully approve and fund the Training Project Plan. Approval of the proposed BDOC and ADOC training changes would be a step in the right direction towards reducing some of the training burden on the ships and ATGs. This research shows that periods of increased initial training reduce OJT costs by more fully preparing officers for the work of a SWO. BDOC would double the length of current training at SWO Intro, and ensure that all SWO accessions (not just USNA and NROTC) are trained on the waterfront with exposure to fleet assets.

3. Naval Personnel Command (NAVPERS-41) and SWOSCOLCOM should cooperate to maintain high screening standards for instructor billets. Some instructors would jokingly refer to SWOSDOC as "CIVLANT" as they anticipated leaving the Navy after their tour in Newport, and would commonly breeze through teaching lessons in half the time required (Robinson, 2008). When initial training was reintroduced after SWOS-at-Sea, instruction responsibility was handed to officer and enlisted ATG personnel as a collateral duty, a direction change from their intended focus on shipboard training. Officers have voiced disapproval of ATG's involvement in the process (Crawford, 2010). This is not to demean the quality or motivation of ATG instructors. Rather, negative comments were offered in the context of a desire for more direct SWO involvement. Naturally, due to limited manpower, ships rely on all qualified SWOs to participate in mentoring and training. But that does not mean initial training commands should also view a SWO pin as a teaching qualification. To teach young and impressionable officers at initial training should be a privilege rewarded to the highest performing, career-minded officers. CAPT Parrott spoke of the BDOC instructor selection process, "By the way, we won't take just anybody" (SWOSCOLCOM, 2011). It is recommended that SWOSCOLCOM and NAVPERS-41 coordinate to ensure first-tour DIVOs continue to be taught and welcomed to the SWO community by its best and brightest.

E. FUTURE RESEARCH

Conduct further research to determine the appropriate SWO qualification timelines. When attempting to find the average qualification time associated with each version of SWOS, one discovers that it depends on too many other changing factors to

isolate the effect initial training plays. In the early 1980s officers were given 24 months to attain SWO qualification after six months of formal training. The requirement over the past decade has been 18 months (until recently changed in 2011). After the elimination of initial training under SWOS-at-Sea, there was no accompanying increase in the SWO qualification requirement. In fact, after the introduction of ASAT and SWO Intro (nearly two months of additional training) the qualification requirement remained 18 months until 2011. So was the SWO community forcing too much training into an 18 month period, or were qualification times artificially long in the past? Would SWO qualification times increase if ASAT was removed from the qualification process?

Determine the appropriate length for initial SWO training. How long should initial training be? LCDR Robinson wrote of a common saying in Newport that SWOSDOC was "Two months of school crammed into six months" (Robinson, 2008, p. 60). Is it coincidence that the proposed length of BDOC is two months? At what length does learning retention degrade? Does learning retention improve when classroom discussion is supplemented with ship visits and hands-on training?

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APPENDIX A: SWO INTRO PQS VALIDATION TABLE

Lesson	PQS Reference
COURSE ADMINISTRATION	
ADMIN-1 Student Check-in	None
ADMIN-2 Comprehensive Final	None
ADMIN-3 Student Critiques, Graduation, and Check-out	None
DIVO FUNDAMENTALS	
DF-1 Enlisted Ratings	43463-1B: 107
DF-2 DH Mentoring Session	None (Professional development)
DF-3 Introduction to Admin / SORM	43463-1B: 102
DF-4 A Day in the Life of a DIVO	None (Professional development)
DF-5 Enlisted Service Record / DIVO Notebook / RADM	43463-1B: 104
DF-6 Career Counseling	43463-1B: 107; 112
DF-7 Manning : AMD / SMD / EDVR and Schools	43463-1B: 103; 108
DF-8 FITREPS / EVALS and Homework	43463-1B: 105-106
DF-8A FITREP Homework Debrief	43463-1B: 105-106
DF-9 Legal Perspective for the DIVO	43463-1B: 111
DF-11 Fleet and Family Resources	43463-1B: 110
DF-13 Financial Management	None (Professional development)
DF-14 Introduction to Navy Message Writing	43463-1B: 109; 116
DF-15 Message Writing - OPREPS	43101-4F: 103
	43463-1B: 109
DF-17 Message Writing - CASREPS	43463-1B: 109
DF-18 Message Writing Practical - OPREPS	43463-1B: 109
DF-19 Message Writing Practical - CASREPS	43463-1B: 109
ENGINEERING	
EN-1 DC Organization	43119-J: 102; 107; 201
EN-2 Fires and Extinguishing Agents	43119-J: 101-104; 107-108; 110; 114; 207
EN-3 Flood Management	43119-J: 104; 110; 114
EN-4 Basic Gas Free	43119-J: 103-104
EN-5 Personal Protective Equipment	43119-J: 103-104; 201-202
EN-6 ORM / Safety	43119-J: 101
	43101-3F: 101
	43101-4F: 101
	43341-F: 101
	43397-D: 101
	43463-1B: 101
	43492-2G: 101

Lesson	PQS Reference
ENGINEERING (cont)	
EN-7 Tagout Program and Practical	43119-J: 101
	43241-H: 101-102
EN-8 Electrical Safety Program	43101-3F: 101
EN-9 DC Exam	43119-J: 101-104; 107-108; 110; 114; 201-202; 204; 207
EN-10 DIVO Supply	43241-H: 112
	43463-1B: 115
EN-11 DC Exam Debrief	None
EN-12 Zone Inspection / Self Assessment Practical	None (Professional Development)
EN-13 3M Spotcheck, Program and Walkthrough	43241-H: 101-104
EN-14 Propulsion Overview	43101-3F: 113; 116; 117
EN-15 EOSS / CSOSS	43101-3F: 102
	43101-4F: 161
School Ship (SSHIP) - Zone Inspection, Spot Check, MLOCS, Tagout, Messing and Berthing	43241-H: 101; 103-104
	43119-J: 101
MARITIME WARFARE	
MW-1 Introduction to Surface Combatants	43101-4F: 115
MW-2 Introduction to Other Navy Platforms	43101-4F: 115
MW-3 Shipboard Evolutions	43101-4F: 141
MW-4 CWC Overview	43101-4F: 102
MW-5 Navy Missions Seminar	43101-4F: 102; 135
MW-6 Strike Group Operations Brief	43101-4F: 102; 135
MW-6A Strike Group Operations Seminar	43101-4F: 102; 135
MW-7 Student Platform Briefs	43101-4F: 115
NAVY FAMILIARIZATION	
NF-1 SWO Career Path	None (Professional development)
NF-2 Meet the CO	None (Professional development)
NF-3 Customs, Courtesies, Honors, and Traditions	43397-D: 106-107
NF-4 Meet the Chief	None (Professional development)
NF-5 DoD / Ship ORG	43463-1B: 102
NF-6 Introduction to CIC	43101-4F: 104-106
NF-7 R/T Procedures	43101-4F: 111
NF-8 Introduction to Navy Operations	43101-4F: 115

Lesson	PQS Reference
NSS AND WATCHSTANDING	
NS-1 Navigation Case Study - ROOSEVELT/LEYTE GULF	None (Professional development)
NS-1A Navigation Case Study - RADFORD	None (Professional development)
NS-1B Navigation Case Study - GONZALES	None (Professional development)
NS-1C Navigation Case Study - DENVER / YUKON	None (Professional development)
NS-1D Navigation Case Study - OAK HILL	None (Professional development)
NS-2 Standard Commands	43101-4F: 143
	43492-2G: 116
NS-3 Basic Shiphandling	43101-4F: 149; 214
NS-4 Intro to Shipboard Watchstanding	43397-D: 102
	43463-1B: 102
	43101-4F: 141
	43492-2G: 103
NS-6 Rules of the Road 1	43101-4F: 157
	43152-F: 104
	43397-D: 114
NS-7 Emergency Actions	43101-4F: 150
	43492-2G: 116
NS-8 Underway Replenishment	43101-4F: 146; 150; 213
NS-9 Rules of the Road 2	43101-4F: 157
	43152-F: 104
	43397-D: 114
NS-10 Man Overboard Procedures	43101-4F: 150
NS-11 Rules of the Road 3	43101-4F: 157
	43152-F: 104
	43397-D: 114
NS-12 Charts and Pubs, Tides and Currents	43101-4F: 153-154
	43152-F: 105
NS-13 Rules of the Road 4	43101-4F: 157
	43152-F: 104
	43397-D: 114
NS-14 Compass and Time	43101-4F: 155-156
	43152-F: 105
NS-15 GPS and Electronic Navigation	43101-4F: 156
NS-16 Rules of the Road 5	43101-4F: 157
	43152-F: 104
	43397-D: 114
NS-17 Moboards - Tracking / CPA	43101-4F: 112
NS-18 Moboards - Change of Station	43101-4F: 112
NS-19 Rules of the Road Exam	43101-4F: 157
	43152-F: 104
	43397-D: 114
NS-20 MoBoard Review 1	43101-4F: 112
NS-21 MoBoard Formations	43101-4F: 112
NS-22 Rules of the Road Exam Debrief	None
NS-23 Introduction to Navigation Brief	None (Professional development)
NS-24 MoBoard - Wind	43101-4F: 112
NS-25 MoBoard Review 2	43101-4F: 112
NS-26 Underway Watchstanding	43463-1B: 102
	43101-4F: 141
	43492-2G: 103
NS-27 BRM / RMD and Navigation Brief Practical	None (Professional development)
Navigation Seamanship Shiphandling Trainer (NSST)	43101-4F: 143; 146; 150

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APPENDIX B: METHOD FOR CALCULATING INITIAL TRAINING COSTS, ADAPTED FROM GAVINO

The following is an excerpt from Gavino's thesis that summarizes his cost estimation for SWOSDOC and SWOS-at-Sea:

> **I. SUMMARY**
>
> Equation (1) illustrates the cost for an 116X to qualify as an 111X based on the current DOSP.
>
> (1) $111X_1 = PCS_1 + SWOSDOC + BST_1 + PCS_2 + POST\text{-}SWOS$
>
> Based on the methodology used in this chapter, the two 'PCS' moves an Ensign makes equals $7,758. The cost of 'SWOSDOC' is $31,720 per equivalent graduate and 'BST_1' is $11,640 per equivalent graduate. 'POST-SWOS' costs incurred are $48,025 per 116X. The total cost to qualify an 111X under the current DOSP is $99,143 in FY 2003 dollars.
>
> Equation (2) describes the cost for an 116X to qualify as an 111X under the "Sea to SWOS" training initiative.
>
> (2) $111X_2 = PCS + BST_2 + BOLTC + CBT + PRE\text{-}OOD\ TRAINING + TDY + T\text{-}SWOS + POST\text{-}OOD\ TRAINING$
>
> Based on the methodology used in this chapter, 'PCS' costs for an Ensign equals $3,879. '$BST_2$' costs are $11,640 per equivalent graduate, while 'BOLTC' costs are $3,432 per equivalent graduate. 'CBT' costs per participant are $17,276. 'PRE-OOD TRAINING' costs incurred are $42,382 per 116X, while the 'POST-OOD TRAINING' cost incurred is $5,662 per 116X. The 'TDY' cost for an 116X to go to Newport, RI and back to their ship is $4,719. The projected 'T-SWOS' cost per equivalent graduate is $13,675. The total cost to qualify an 111X under the proposed "Sea to SWOS" training initiative will be $102,665 in FY 2003 dollars, $3,522 per officer more than under the current DOSP.

ADJUSTMENTS TO GAVINO'S SWOSDOC COST ESTIMATE:

1. Eliminate "POST-SWOS", the shipboard training cost component.
2. To arrive at FY 2011 costs, multiply FY 2003 costs by a factor of 1.2834 in accordance with the Naval Center for Cost Analysis' Joint Inflation Calculator.

ADJUSTMENTS TO GAVINO'S SWOS-AT-SEA COST ESTIMATE:

1. Eliminate the following shipboard training cost components: "PRE- and POST-OOD TRAINING", and "CBT".
2. His cost estimate for ASAT (T-SWOS) was based on a five week curriculum, but the program was shortened to three weeks. Multiply his estimate by a factor of 0.6.
3. Substitute actual budget numbers where practical (specifically for ASAT).
4. To arrive at FY 2011 costs, multiply FY 2003 costs by a factor of 1.2834 in accordance with the Naval Center for Cost Analysis' Joint Inflation Calculator.

SWO INTRO COST ESTIMATE:

1. Utilized Gavino's cost estimates for Permanent Change of Station (PCS) moves, Billet Specialty Training (BST), and temporary duty en route (TDY) at ASAT.
2. The rest comes from Operations and Maintenance (OMN) and Military Personnel (MPN) costs associated with SWO Intro, the Division Officer Leadership Course (DIVOLC), and ASAT.
    a. SWO Intro cost estimates provided by ATG Pacific, San Diego, were used as a proxy for SWO Intro courses run throughout the fleet. OMN costs of $220 per officer account for a variety of learning materials and books provided the students upon arrival. MPN costs per officer converted the Navy Ensign Annual Composite Rate of $90,901 into a monthly cost of $7,575 (consistent with the four-week SWO Intro curriculum). There were no instructor costs as SWO Intro instruction at the ATG is considered a collateral duty.
    b. DIVOLC is a one week course taught at Centers for Personal and Professional Development (CPPD) across the fleet. Again, San Diego Naval Station's CPPD was used as a proxy for the other FCAs. As costs were not available, they needed to be approximated. DIVOLC OMN costs of $55 were approximated by multiplying SWO Intro OMN costs ($220) by a factor of 0.25, as DIVOLC is a quarter the duration of SWO Intro. One week's worth of pay per officer ($7,575* 0.25) yielded an MPN of $1,894. The two DIVOLC instructors (pay grades O3 and O5) cost $144,700 and $187,883, an annual total of $332,583. This divided by last year's student throughput of 454 yields $732 per officer.

Note: Further detail on BST costs are not within the scope of this thesis. For simplicity, this thesis will maintain Gavino's BST cost estimates.

INITIAL TRAINING COSTS BY TRAINING METHOD

SWOSDOC Costs	FY 2003	FY 2011
PCS 1 and 2	7758	9957
SWOSDOC OMN/MPN	31720	40709
BST	11640	14939
Total		**$ 65,604.84**

SWOS-at-Sea Costs	FY 2003	FY 2011
PCS	3879	4978
BST	11640	14939
BOLTC	3432	4405
ASAT TDY	2831.4	3634
ASAT OMN		3574
ASAT MPN		5681
Total		**$ 37,210.84**

SWO Intro Costs	FY 2003	FY 2011
PCS	3879	4978
BST	11640	14939
SWO Intro OMN		220
SWO Intro MPN		7575
DIVOLC OMN		55
DIVOLC MPN		1894
DIVOLC Instructors		732
ASAT TDY	2831	3634
ASAT OMN		3574
ASAT MPN		5681
Total		**$ 43,282.51**

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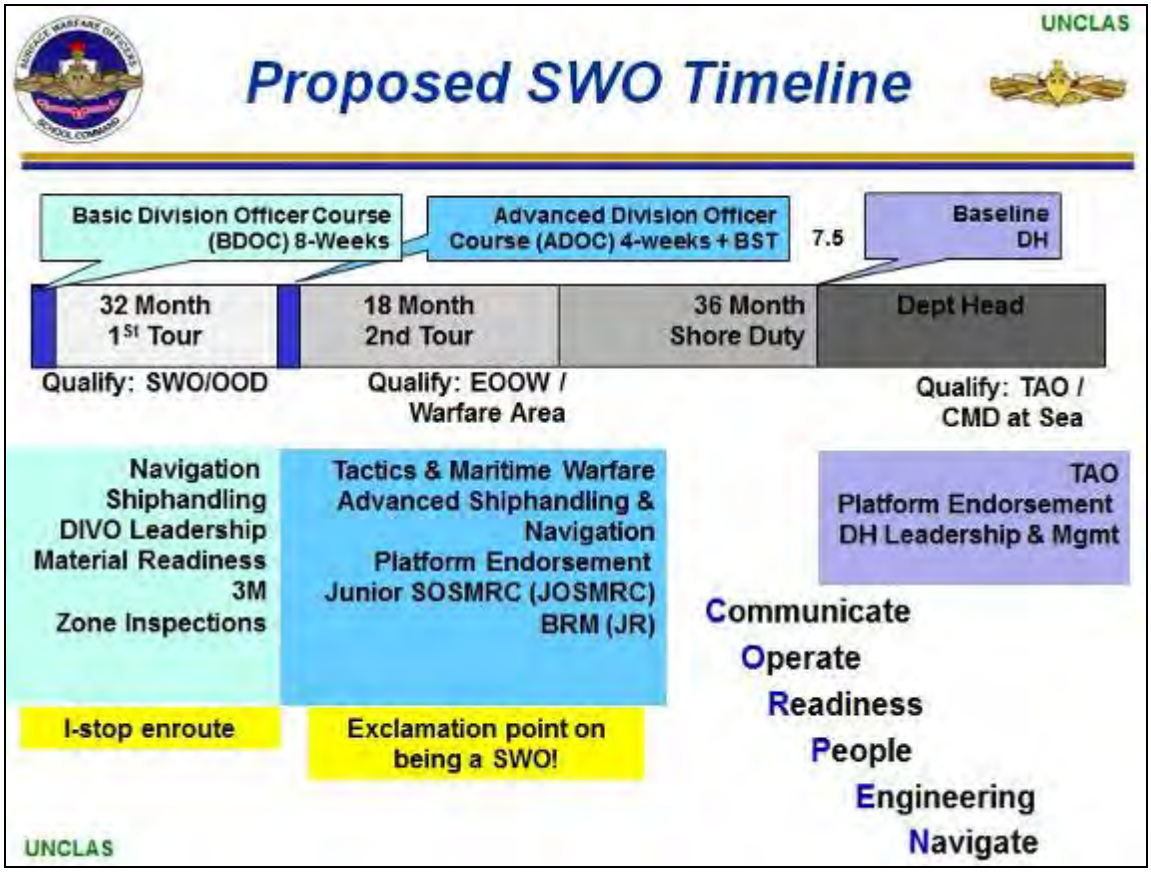
APPENDIX C: PROPOSED DIVISION OFFICER SEQUENCING PLAN



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