NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

COST ANALYSIS FOR THE
PROPOSED CONSOLIDATION OF
CARRIER AIRBORNE EARLY WARNING (VAW)
FLEET REPLACEMENT SQUADRONS (FRS)

by

Thomas E. Jarrell

June, 1991

Thesis Advisor: Dr. Shu Sheng Liao

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution is unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION Naval Postgraduate School 6b. OFFICE SYMBOL (*If applicable*) 55	7a. NAME OF MONITORING ORGANIZATION Naval Postgraduate School
6c. ADDRESS (*City, State, and ZIP Code*) Monterey, CA 93943-5000	7b. ADDRESS (*City, State, and ZIP Code*) Monterey, CA 93943-5000
8a. NAME OF FUNDING/SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (*If applicable*)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (*City, State, and ZIP Code*)	10. SOURCE OF FUNDING NUMBERS Program Element No. / Project No. / Task No. / Work Unit Accession Number

11. TITLE (*Include Security Classification*)
COST ANALYSIS FOR THE PROPOSED CONSOLIDATION OF CARRIER AIRBORNE EARLY WARNING (VAW) FLEET REPLACEMENT SQUADRONS (FRS).

12. PERSONAL AUTHOR(S) Jarrell, Thomas Eugene

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (*year, month, day*)	15. PAGE COUNT
Master's Thesis	From To	1991, June	70

16. SUPPLEMENTARY NOTATION
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.

17. COSATI CODES			18. SUBJECT TERMS (*continue on reverse if necessary and identify by block number*)
FIELD	GROUP	SUBGROUP	E-2C FRS CONSOLIDATION

19. ABSTRACT (*continue on reverse if necessary and identify by block number*)

This thesis reviews the proposed consolidation of the two E-2C Hawkeye Fleet Replacement Squadrons (FRS) into a single training site. Expected cost savings areas are evaluated against possible expense areas. Each savings/cost category is discussed and possible impact on training if omitted. Implementation scenarios are presented and evaluatied on a break-even basis. In addition, possible future conditions in which FRS consolidation might be fiscally practical is discussed. Finally, impact of the consolidation on the E-2C aviation community is listed.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION	
[X] UNCLASSIFIED/UNLIMITED [ ] SAME AS REPORT [ ] DTIC USERS	Unclassified	
22a. NAME OF RESPONSIBLE INDIVIDUAL Dr. Shu S. Liao	22b. TELEPHONE (*Include Area code*) (408) 646-2505	22c. OFFICE SYMBOL AS/LC

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted
All other editions are obsolete

SECURITY CLASSIFICATION OF THIS PAGE
UNCLASSIFIED

Approved for public release; distribution is unlimited.

Cost analysis for the proposed consolidation of Carrier Airbone [i.e. Airborne] Early Warning(VAW) Fleet Replacement Squadons [i.e. Squadrons] (FRS)

by

Thomas E. Jarrell
Lieutenant Commander, United States Navy
B.S., University of Maryland, 1990

Submitted in partial fulfillment
of the requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
JUNE 1991

ABSTRACT

This thesis reviews the proposed consolidation of the two E-2C Hawkeye Fleet Replacement Squadrons (FRS) into a single training site. Expected costs savings areas are evaluated against possible expense areas. Each savings/cost category is discussed and possible impact on training if omitted. Implementation scenarios are presented and evaluated on a break-even basis. In addition, possible future conditions in which FRS consolidation might be fiscally practical is discussed. Finally, impact of the consolidation on the E-2C aviation community is listed.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

I. INTRODUCTION

A. GENERAL

The political changes caused by the democratic revolutions of Eastern Europe and the thawing of Russian-American relations as indicated by the nuclear and conventional arms treaties has resulted in the draw down of the military force structure of the United States. Recent events in the Persian Gulf have barely slowed the discharge of manpower and the retirement of major weapon systems.

In May 1990 OP-02 was tasked to submit a plan to reduce the manpower level of naval aviation. Based on historical data from the 1960's it was determined that a one-third savings in manpower could be accomplished if Fleet Replacement Squadrons (FRS) that were currently operating on each coast were consolidated into a single unit in order to conduct single site training. Based on the initial projections by OP-02 training for the A-6E Intruder, S-3A/B Viking, and the E-2C Hawkeye & C-2A Greyhound FRSs were consolidated in the POM '92 budget without further consideration.

Reaction by each community was swift and well organized to point out the weaknesses of such a plan. The communities organized and presented their case through the chain of command up to the Commanders Naval Air Forces Atlantic (AirLant) and Pacific (AirPac) respectively. A joint AirLant/AirPac message to the Chief of Naval Operations advocated for a continuation of dual site FRSs.

Billets that had been canceled in fiscal year 1992 have been reinstated. However, implementation of the consolidation plan has not been rescinded, only delayed.

B. OBJECTIVES OF THE RESEARCH

The purpose of this research project is to analyze costs/savings that would possibly result if the East coast Carrier Airborne Early Warning (VAW[1]) Fleet Replacement Squadron (FRS) is disbanded and the mission associated with this unit is transferred to the West coast FRS, resulting in a single site training in the E-2C Hawkeye and the C-2A Greyhound aircraft.

C. RESEARCH QUESTIONS

1. What impact would consolidation of the two coast E-2C and C-2A FRS training pipeline into a single squadron have on replacement aircrew training and fleet squadron operations?
2. What expenses would be incurred if the status quo student throughput and flight simulator utilization were maintained?
3. What alternatives and related expenses are viable in view of limited funding dollars and manpower reductions?
4. What costs are associated with each alternative in implementing the FRS consolidation?

---

[1] The naval aviation abbreviation for a Carrier Airborne Early Warning Squadron is VAW.

D. SCOPE OF LIMITATIONS

The purpose of this research is to examine if relevant cost items were considered and properly evaluated during the VAW study to keep the current dual FRS system. The objective is not to dispute the premise that a one-third manpower savings could be achieved through consolidation of the FRSs, but rather to explore those relevant costs that could result if such a proposal is implemented.

E. METHODOLOGY

The methodology employed in this research consisted of the following components: (1) Examination of pertinent message traffic, point papers, discussion papers, and studies related to the consolidation proposal, (2) Interview selected individuals directly involved with the consolidation issue, (3) Independent evaluation of cost versus savings data over the short run life of the consolidation.

Conclusions will be based on the break-even period without inflation or the time value of money applied. In addition to the monetary factors discussed, non-monetary issues related to the proposed consolidation will be summarized.

F. ORGANIZATION OF THE THESIS

This thesis is organized into five chapters. The first chapter is an introduction of the thesis. Chapter II provides background information regarding both the E-2C and C-2A aircraft mission and the current FRS system. Chapter III presents areas

where cost savings and added expenses that are probable in maintaining the status quo of aircrew training and fleet readiness. Chapter IV presents an analysis of viable alternatives and the related expenses and saving that would occur if adopted. In addition, where possible the impact on FRS training is included with the alternative cost figures. Chapter V presents the researcher's conclusions and recommendations.

II. AIRCRAFT AND MISSION

Fleet Replacement Squadrons (FRS) have a primary mission to train pilots, naval flight officers (NFO), and enlisted technicians on a specific type of naval aircraft. All naval aircraft (F-14, A-6, S-3, P-3, etc.) have a training squadron on each coast to train personnel in the flying and maintenance of a particular aircraft. The only major exception is the EA-6B community, because of its small size, is single sited at Whidby Island, Washington, with the West coast A-6 squadrons. The subject of this study, the E-2C Hawkeye and C-2A Greyhound FRSs, are Carrier Airborne Early Warning Squadron One Hundred Twenty (VAW-120) at Naval Air Station (NAS) Norfolk in Norfolk, Virginia and One Hundred Ten (VAW-110) at NAS Miramar in San Diego, California.

A. THE E-2C HAWKEYE

The E-2C Hawkeye is the Navy's premier command and control aircraft. Through use of a long range air and surface search radar, on-board computer processing, and radio data-links it can detect, track and relay locating information to surface ships, as well as fighter and attack aircraft. Two pilots and three NFOs make up a normal mission crew.

Responsibility for the safety of the aircraft rests solely with the plane's aircraft commander, who is always a pilot. One NFO will hold the designation of mission commander. The mission commander is responsible for the tactical employment

of the aircraft. Close coordination between the plane commander and the mission commander is critical in achieving mission success.

B. THE C-2A GREYHOUND

The C-2A Greyhound is the Navy's primary fixed wing supply aircraft that can support an aircraft carrier operating beyond the range of helicopters. The aircraft has a minimum crew of four; pilot, co-pilot, load master, and plane captain. The C-2A transports passengers and cargo between land and the underway aircraft carrier.

C. FLEET REPLACEMENT AVIATION MAINTENANCE PROGRAM

Both VAW-110 and VAW-120 train enlisted technicians for the E-2C and the C-2A at a Fleet Replacement Aviation Maintenance Program (FRAMP). Initially both sites taught plane captain and load master courses, but did not duplicate training in the more specialized areas of both aircraft. VAW-110 taught jet engine maintenance, system hydraulics, and airframe maintenance for both coasts. VAW-120 on the other hand taught avionics technicians who support the radar, computer and radios; and aviation electricians who maintain the wiring system of the aircraft.

Beginning in 1989 both FRAMPs began duplicating the courses of instruction. Full duplication will be complete in 1992. Course duplication was initiated when significant cost savings was possible when the cost of an instructor and training equipment was compared to the cost of moving permanent change of station

(PCS) students training en route to their ultimate command, or temporary additional duty (TAD) students cost of training away from their parent command. VAW-120 in calendar year 1990, operating with 25 instructors, trained 169 PCS and 202 TAD students. With the exception of personnel with orders to one of the two overseas C-2 squadrons, per diem and travel costs for each student was not incurred. In addition, squadrons traditionally could neither afford the cost nor the loss of manpower that resulted whenever a student was sent to the other coast for training. Therefore, training for current squadron personnel was rarely provided. Training remained limited to those courses were available locally at no cost. The dual site training has allowed more enlisted personnel to receive specific technical training for their type aircraft. The end result can be found in better aircraft availability and increased enlisted morale in not having to use on-the-job training that was prevalent for some ratings in years past.

Because of the specialized work required, close coordination between the FRAMPs and Naval Manpower Personnel Command (NMPC) is required to meet future fleet squadron manning requirements. Students receive training in order to replace specific personnel who are preparing to complete their sea duty obligations.

D. COLLATERAL ASSIGNMENTS

Besides its duties as an FRS, VAW-120 serves as the model manager for the E-2C and C-2A aircraft, and VAW-110 serves as the model manager for the two

newest versions of the E-2C. Both squadrons manage the Naval Aviation Training Operations Procedures Standardized (NATOPS), tactics manual, and training syllabus for both aircraft.

E. STUDENT CLASSIFICATIONS

The training syllabus that a student undergoes is dependent on the level of experience he arrives with. Pilot and NFO students are divided into three categories; Cat I, Cat II, and Cat III. A Cat I student arrives with no experience in either the E-2C or C-2A. Cat I students have the longest training syllabus because everything presented will be new to them. Cat II students are officers returning for refresher training prior to reporting back to a fleet squadron. Cat II students undergo an abbreviated syllabus since they are there to reacquaint themselves with the aircraft and learn what changes may have occurred since they last flew. Category III students are the most experienced. They have had several tours in either the E-2C or C-2A. Cat III students normally are senior officers en route to becoming the executive officer (XO) of a squadron. Category III students require the least amount of training normally because of their high level of experience. Table I shows the prescribed time a student is expected to be in training.

Table I. STUDENT CATEGORIES AND PRESCRIBED TRAINING TIME.

Category (Cat)	Background	Training Time Allotted
Cat I Pilot	No experience	28 weeks
Cat I NFO	No experience	32 weeks
Cat II Pilot	1 tour	15 weeks
Cat II NFO	1 tour	15 weeks
Cat III Pilot	2+ tours	15 weeks
Cat III NFO	2+ tours	15 weeks

F. PILOT TRAINING

The E-2C and the C-2A are dissimilar in mission, have few common parts; but have similar flight controls and flight characteristics. E-2C and C-2A pilots can transition between either aircraft after minimal training. In addition, the C-2A aircraft is not a warfare specialty, meaning that a pilot cannot expect to be promoted beyond the junior pay grades if he stays in C-2s his entire career. At sometime he must serve a tour as an E-2 pilot to receive a warfare designation. Therefore, VAW-110 and VAW-120 are tasked to train pilots in two different aircraft.

The pilot training syllabus is balanced between class work, simulators, and actual flying. Following initial carrier qualifications and dual engine training at intermediate training squadrons in Texas and Florida, a student pilot arrives at the FRS with no exposure to the E-2C or the C-2A aircraft. Students initially receive classroom lectures on the systems of the aircraft. Systems such as engines, fuel, hydraulics and electrical are taught in exacting detail. The students also

immediately begin training on cockpit familiarization and become proficient in normal and emergency procedures using a static cockpit mockup.

Since the E-2C is a dual piloted - dual controlled aircraft, student pilots serve as co-pilots on NFO training hops. This gives the students a better understanding of the aircraft's mission and his role in it.

1. The 2F110 Flight Simulator

After completing the classroom phase of his training, student pilots enter training on the 2F110 simulator. The 2F110 is a full motion - fully functional cockpit that operates in either a night land or a night carrier environment. The trainer operates normally with one instructor as operator/evaluator.

Training emphasis is on normal cockpit procedures such as engine start, take-off and landing; but more importantly - emergency procedures are practiced relentlessly. Very difficult and judgement critical decisions are forced from students who must contend with multiple emergencies, fly the aircraft and communicate with the crew and air traffic controllers.

It is impossible to determine how many aircraft and crew have been saved because pilots were allowed to face simulated life threatening situations and were able to practice hands on both the procedures and flying skills required to extricate their aircraft from an extremis situation.

2. The 2C20B Simulator

For the C-2A a hybrid between the static E-2C Cockpit Procedures Trainer (CPT) and the 2F110 full motion trainer has been developed. The 2C20B is an interactive training device that gives having many of the capabilities of the 2F110, with the exception of full motion. To simulate motion the 2C20B uses a projection system to give the visual cues of flying. But unlike the CPT, the 2C20B's gages and controls operate like the real aircrafts would.

3. Flight Training

The formal flight training syllabus requires hands on demonstration of skills learned in the 2F110. Standard operating procedures are reenforced, but the emphasis of the flight phase is to build up experience in the flight characteristics of the E-2C or the C-2A. Both aircraft are powered by two T-56 Allison turboprop engines with fiberglass Hamilton Standard propellers. Both engines turn clockwise, thus inducing a significant movement about the aircraft's flight axes. When power is applied the aircraft nose pitches up, and the wings roll right due to the torque of the engines. When power is removed from the aircraft the opposite effect is induced, the plane's nose drops and the wings roll left. It therefore becomes necessary for student pilots to develop a sense of how much stick and rudder needs to be applied in order to preempt the forces of the engines. Such skills are mandatory when the student pilot progresses from normal airfield landings to field carrier landing practices (FCLP) in preparation for actual carrier landings.

FCLPs are conducted on dry land at a specially configured airstrip that has been painted to represent the landing area of a carrier, and has the visual lighting cues to replicate what a student would see when approaching a carrier for landing. FCLPs build the student's confidence in following the procedures dictated in the carrier's landing pattern. The only short-coming of FCLPs are that they cannot simulate the effect of trying to land on a moving surface, and then being shot into the air by a steam catapult. Students must draw on their experiences learned from the 2F110 carrier simulator routine to prepare for those events.

Pilots returning to flight duty or transitioning between the E-2C and C-2A go through an abbreviated syllabus that allows experienced pilots to brush up on their system knowledge and regain their flying skills.

As a result of the loss of one of their E-2C to a mishap, the U.S. Coast Guard will have their pilots go through a 10-12 week training syllabus. This is expected to include both simulator and actual training flights.

G. NAVAL FLIGHT OFFICER TRAINING

Student Naval Flight Officers (SNFO) arrive from Pensacola, Florida, following successful completion of basic and intermediate training where they learned instrument navigation, basic fighter maneuvers and how to fly low altitude bombing missions. None of these areas directly relate to their job as an E-2C NFO, but develops empathy for the aircraft that they will eventually control.

SNFOs go through a lengthy classroom training on each portion of the E-2Cs weapon system. Radar, IFF, navigation, passive detection system (PDS), and communication equipment are taught in detail to allow students to understand how they work, alternative modes of operation, and troubleshooting possible to regain operation if a malfunction occurs during flight. Following successful completion of a course of instruction, each student flies a mission to demonstrate his practical knowledge in operating and trouble shooting the equipment.

1. The 15F8 Trainer

The 15F8 serves as the NFO mission trainer. It does not simulate aircraft motion, but it can replicate operations in areas of the world that E-2s might be expected to be employed. The trainer requires a maximum of four operators to run the mission scenario, and an instructor to evaluate each of the three SNFOs. Therefore, a maximum staff of seven is required to train three SNFOs. The 15F8's computers generate landmass depicting the geographic area of operation, shipping, air traffic, missiles, radio jamming, and radar transmissions associated with the ships, aircraft, or land-based defenses. The four 15F8 operators orchestrate the scenario by controlling the air and surface contacts, mimic radio traffic normally encountered on the eight radios in the aircraft, and respond to student commands to ships and aircraft that are under their control. The student instructors control the pace of the trainer. Through inquiries, recommendations, and when warranted - pausing the simulation for counseling;

students learn the thought processes and tactics necessary to control engagements and report tactical information to the afloat commander.

The 15F8 can closely replicate the real world that E-2s operate in when deployed with a carrier battle group. Students must become proficient in conducting air-to-air intercepts, war-at-sea strikes, overland strikes, and E-2 controlled recovery of aircraft on-board the aircraft carrier. Because the E-2's mission supports, coordinates and controls many other units ranging from admiral staffs to individual ships and aircraft, the 15F8 is critical in training SNFOs in the proper conduct of their mission that cannot be found except in the real world carrier battle group environment, where errors in judgement could have disastrous consequences for those who rely on the E-2's information or control. Without the 15F8 mission trainer the cost to use real ships, aircraft, and staffs would be too expensive to train SNFOs in command and control.

H. FLEET USE OF 2F110 AND 15F8

Fleet and reserve pilots use the 2F110 to maintain their flying skills, especially now that flying dollars are limited. Fleet squadrons use the 2F110 to revive their landing skills on the aircraft carrier in preparation for returning to shipboard operations.

Fleet NFOs also maintain their proficiency by using the 15F8, but in addition have practiced and evaluated new tactics before actual employment by the battle group. In addition, fleet squadrons go through Fleet Air Superiority Training

(FAST) prior to commencing their deployment work-up schedule. FAST is taught by the Navy Fighter Weapons School (TopGun), and uses classroom instruction supported by intense simulator battle problems.

VAW-110's simulators are also used by Carrier Airborne Early Warning Weapon School (CAEWWS), to train E-2C pilots and NFOs how to better employ their aircraft in support of advanced airwing tactics.

Both student and experienced pilots and NFOs fully use their specific trainers to improve their skills, develop and evaluate new tactics without adding to the demand for limited flight time.

I. VERSIONS OF THE E-2C HAWKEYE AND THE C-2A GREYHOUND

Neither the E-2C Hawkeye nor the C-2A Greyhound aircraft are homogeneous. Both have significant variations that directly impact the training provided by both FRSs.

1. Operational Versions of the E-2 Hawkeye

The E-2 family of aircraft are the only aircraft designed from the start to fulfill the requirement for airborne early warning. The exterior of the aircraft has only been slightly modified since its inception, nearly all improvements have occurred within the airframe itself. Each modification has improved and automated detection, tracking, and reporting, thus freeing the three NFOs of routine functions and allowing them to survey effectively an area of over a thousand cubic miles. The E-2A was introduced into fleet service in 1964 with limited success. Beginning

in 1969 the E-2As were modified into E-2Bs. The major modification was the installation of an improved computer, the Litton L-304. Production of the E-2C was initiated in 1971. The E-2C (Figure 1) was a significant improvement in operational capability, with a major upgrading of the principal avionics, entering naval service in 1973. Over the years the E-2C has continued to be modified and currently operates in three distinct variants:

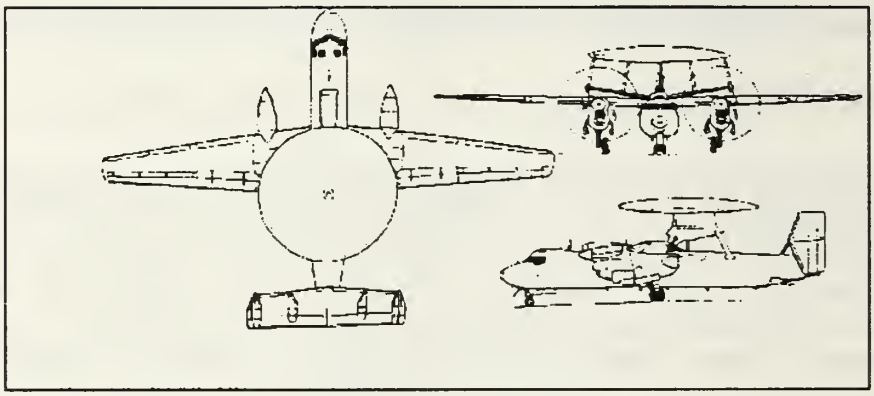


Figure 1. The Grumman E-2C Hawkeye.

a. The APS-138/ALR-73 Configuration

The baseline version of the E-2C is configured with the APS-138 radar and the ALR-73 Passive Detection System (PDS). All earlier versions of the E-2C have been upgraded to this configuration. Structural fatigue has resulted in expensive wing, tail, engine, and rotodome reenforcement. Starting in 1985 portions of the older APS-125 radar system was modified to give the radar additional capability in a jamming environment. This new configuration was designated the APS-138. In addition, the older PDS system (ALR-59) was

significantly improved to automate many functions that had required one NFO to monitor in order to effectively utilize the equipment. This equipment was redesignated the ALR-73. The U.S. Navy has 67 copies of this version operating throughout the fleet.

b. The APS-139/T56-A-427 Configuration

Over the years the operating environment of the E-2 had changed from predominantly open ocean operations to serving as a sentinel off the coast of world trouble spots. Starting in 1988 the E-2C radar was again modified to improve overland detection and tracking. Significant modifications were made to the interior arrangement of the equipment to fit new and future equipment.

From its inception the E-2 had increased significantly in weight. To meet the navy's single engine emergency requirement the newest version of the T-56 engine was accepted - the T56-A-427. The 427 engine, as it is known, increases the thrust by approximately 30% giving the aircraft a greater rate of climb and improved fuel efficiency. Unfortunately this also changed the landing characteristics of the aircraft, thereby increasing the danger of crashing during carrier landings. Carrier approach speeds are a factor of the speed of the aircraft and its weight. The carrier's arresting gear has an upper limit on the amount of inertia (weight times speed) that they can withstand. The E-2C is now the heaviest aircraft capable of landing on the carrier. Unfortunately the aircraft must approach the ship within a narrow safety margin between the maximum engagement speed and the minimum airspeed needed to sustain flight. Because of the added weight

and higher thrust of the 427 engine, pilots must attempt landings at minimum power setting. This slow approach speed makes the aircraft react sluggishly when corrections are initiated in trying to land aboard ship. For this reason, pilots will need to have even greater flying abilities than before if accidents are to be avoided. Production of this variant is expected to be limited to 18 airframes.

c. The APS-145/JTIDS Configuration

Starting in 1990 what is expected to be the final variant of the E-2C began production. Building on the APS-139 radar the APS-145 radar began operations. Major changes include an even greater detection range and additional anti-jam features. Because of the increased number of tracks possible to display on the NFO scopes, color symbology is being introduced to allow the operators to distinguish more easily friend, hostile, and unknown. Provision was made to receive the navy's newest tactical data link - the Joint Tactical Integrated Data System (JTIDS). JTIDS is a spread spectrum high speed data link designed to improve the navy's command and control structure in a heavy jamming environment. Currently 27 copies of this variant are expected to be produced. The APS-139 variant is scheduled to be updated to the APS-145/JTIDS configuration beginning in 1993. In addition, 36 of the APS-138 variant are expected to undergo major modifications to function as APS-145/JTIDS variants. Some time after the turn of the century the navy will operate with a complete E-2C force of 81 APS-145/JTIDS aircraft. The remaining APS-138 aircraft should have met their useful life and been retired.

2. Operational Versions of the C-2 Greyhound

The rapid delivery of high-priority personnel, urgently needed stores and mail to the U.S. carrier fleet at sea was obviously one that could be carried out effectively by aircraft. Thus, carrier on-board delivery (COD) aircraft have for many years been an essential component to U.S. naval aviation.

a. The Initial C-2A

The E-2 with its capacity to lift heavy equipment from the flight deck and fly for up to six hours led the Navy to take a logical step in developing a carrier on-board delivery (COD) version. Using an entirely different fuselage and tail, the C-2 (Figure 2) was introduced into fleet service in 1964. Only 25 of the C-2A aircraft were build, and operated exclusively from squadrons based in Sicily and the Philippines. It has become common for single plane detachments to embark the carriers when they passed these bases and operate with the carriers while in their forward deployed position. This gives aircraft carriers a heavy lift capacity between ship and shore. While embarked the C-2s are hosted by the E-2 squadron on-board. Since most of the C-2's systems are similar to the E-2's, this reduces the manpower requirements for embarking the C-2s.

b. The Reprocured C-2A

In 1988 the navy retired the last of the venerable C-1 Traders. The C-1s had also operated from the same bases as the C-2, and provided short lift capacity for operations near the U.S. coast. The navy recognized that a

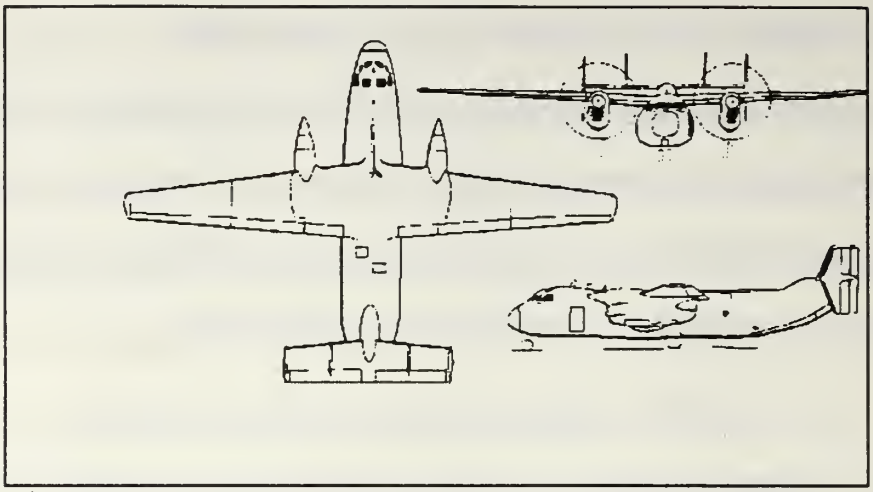


Figure 2. The Grumman C-2A Greyhound.

replacement was needed for the C-1s, it was decided to reopen the successful C-2 line in 1987. This new-production C-2 retained the C-2A designation, but underwent some modifications to its aircraft systems. To differentiate between the two models, the newer aircraft have become known as C-2A(R) to recognize that operating procedures are different in the newer aircraft. The navy purchased 39 of the C-2A(R).

III. THE FRS CONSOLIDATION PROPOSAL

There is no doubt that consolidation of the FRSs into a single unit would reduce the manpower requirements in naval aviation. A reorganization would have a cost savings from the reduction in operating target (OPTAR) funds, and salaries by the dissolution of VAW-120. Of equal importance is the added expense likely to be incurred by the navy, if the facilities at VAW-110 are tasked to assume the additional burden of VAW-120's training requirement. What follows are savings/cost categories directly relevant to the consolidation issue. All figures are in 1990 constant dollars.

A. PROJECTED SAVINGS

The transfer of VAW-120's mission to VAW-110 is estimated to have the following savings [Ref. 1]:

Milcon (P-128)	$3.0 million
OPTAR	1.5 million
Manpower	2.9 million
	$7.4 million

1. Milcon

Military Construction (Milcon) fund provides for the installation and facilities for the Department of the Navy by funding land purchases and construction. Milcon has a five year period in which to be obligated, starting in the fiscal year in which it was appropriated. Milcon contracts are closely scrutinized

by Congress, making it uncertain how or if the funds could be assigned to a different project.

Construction project P-128 is additional classroom and teaching aid facilities that would allow VAW-120 FRAMP to teach all the courses necessary to support the training of enlisted technicians for E-2C squadrons and C-2A units both on the East coast and in the Mediterranean. Construction was held in abeyance for 90 days while the outcome of the consolidation was being staffed. Construction has commenced and is scheduled for completion in fiscal year 1992.[Ref. 2]

2. OPTAR

The closure of VAW-120 would free up its associated operating funds. OPTAR originates from the Operations and Maintenance, Navy account (O&M,N). It has an obligation period limited to the fiscal year in which it was allocated. O&M funds finance the cost of on-going operations (i.e., squadron operations, civilian personnel salaries, flying hours, maintenance of real property, training, etc.).

3. Manpower

Single siting the E-2C and C-2A FRSs is expected to result in a billet savings of 16 officers and 155 enlisted personnel [Ref. 1]. Funding for manpower expenses come from the Military Personnel, Navy (MPN) account. This account funds the cost of active duty navy personnel (i.e., military pay, allowances, clothing, subsistence, GI Bill, PCS, retired pay accrual, etc.). The MPN account is controlled

by NMPC and must be obligated within the fiscal year it is appropriated. NMPC will reallocate these funds to where it has shortfalls or lose the funds entirely in the annual budget procedure.

B. PROJECTED ADDITIONAL EXPENSES

If the FRS consolidation were to go through, VAW-110 would become the sole source provider for all levels of training associated with the E-2C and C-2A aircraft. This includes all US Navy, US Coast Guard, and all FMS training. VAW-110, and VAW-120 for that matter, are functioning at their designed capacity. The sudden influx of students and instructors would immediately require additional funding in order to complete the prescribed training syllabus and graduate students with the allotted time period. The following additional costs were included in the analysis of the consolidation proposal:

1. Milcon

The additional training requirements that VAW-110 would have to meet calls for an almost immediate increase in its training capacity. Needed are more classroom and instructor facilities, buildings for additional simulators, ramp space for more aircraft, and an increased burden on the already short supply of bachelor officer and enlisted quarters. An estimate of $15.69 million would be needed for VAW-110 to have the capacity to meet its pilot and NFO training requirements. The following are estimates on portions of the Milcon requirements [Ref. 3]:

Table II. MILCON REQUIREMENTS FOR SINGLE SITE FRS AT NAS MIRAMAR.

Facility	Area	Cost
Offices/Classroom	16000 sq ft	$ 480,000
15F8/2F110 Building	6100 sq ft	$1,100,000
FRAMP Trainer Building	40000 sq ft	$1,200,000
Hangar/Ramp	25000 sq ft	$5,200,000
BOQ	3800 sq ft	$ 360,000
BEQ	24700 sq ft	$2,200,000
High Pressure Air (Wells)		$ 300,000
Fire Fighting Upgrade		$4,300,000
Utility Upgrades		$ 550,000
TOTAL		$15,690,000

2. Simulators

The single siting of the FRSs does not remove the need for flight/mission simulators (2F110 and 15F8) for the fleet squadrons. How best to handle the influx of students at VAW-110 needs to be resolved.

Presented first is a review of the status quo utilization of the trainers, then an estimation of the demand expected on the single site trainer [Ref. 4].

Table III. VAW-110 CURRENT SIMULATOR REQUIREMENTS.

Student Type	Hours	Per	Year
(Estimated Number/Yr)	2F110	CPT	15F8
E-2C Cat I Pilot (19)	1254	476	38
E-2C Cat II Pilot (6)	276	108	12
C-2A Cat I Pilot (12)	792	300	24
C-2A Cat II Pilot (4)	100	40	8
E-2C Cat I NFO (28)	56	0	1740
E-2C Cat II NFO (12)	24	0	1158
Fleet Squadrons	1250	0	1250
CAEWWS	30	0	300
Reserves	50	0	120
Foreign Military Sales (FMS)	300	0	500
TOTAL	4132	924	5150

Table IV. VAW-120 CURRENT SIMULATOR REQUIREMENTS.

Student Type	Hours	Per	Year
(Estimated Number/Yr)	2F110	CPT	15F8
E-2C Cat I Pilot (21)	1386	546	42
E-2C Cat II Pilot (7)	322	126	14
C-2A Cat I Pilot (21)	1386	546	42
C-2A Cat II Pilot (7)	322	126	14
E-2C Cat I NFO (32)	64	0	2020
E-2C Cat II NFO (14)	28	0	560
Fleet Squadrons	1500	0	1500
FMS & Reserves	550	0	350
TOTAL	5558	1344	4542

Notes:

1. CPT - Cockpit Procedures Trainer. A static mockup of an E-2C cockpit.
2. There are five fleet and one reserve E-2C squadron at NAS Miramar, California. NAS Norfolk, Virginia has six fleet and one reserve E-2C squadron.

3. CAEWWS - Carrier Airborne Early Warning Weapons School is the E-2C tactics school similar to the Navy Fighter Weapon School (TopGun).
4. Japan, Israel, Egypt, and Singapore have purchased the E-2C through Foreign Military Sales (FMS). Trainer facilities are provided when requested by the State Department and approved by the Defense Department.
5. Total annual training hours for U.S. Coast Guard personnel is under development.

Table V provides an estimate of the number of hours per device if VAW-110 were to serve as the single training site for E-2C and C-2A pilots and NFOs. Training device hours are projections based on the VAW-110 training syllabus, which differs from the syllabus used at VAW-120.

Table V. VAW-110 PROJECTED SIMULATOR REQUIREMENTS.

Student Type	Hours	Per	Year
(Estimated Number/Yr)	2F110	CPT	15F8
E-2C Cat I Pilot (46)	2838	1076	86
E-2C Cat II Pilot (12)	552	216	24
C-2A Cat I Pilot (24)	1584	600	48
C-2A Cat II Pilot (11)	276	110	22
E-2C Cat I NFO (65)	130	0	3828
E-2C Cat II NFO (16)	32	0	1544
Fleet Squadrons	1250	0	1250
CAEWWS	30	0	300
Reserves	50	0	120
Foreign Military Sales	300	0	500
TOTAL	7042	2002	7722

Note: Tables III and IV are historical averages, table V is the projected near-term student throughput. This is why tables III and IV do not add up to table V figures.

In order to calculate the number and types of simulators required, the maximum training time available for each device must be determined. This is done by multiplying five work days a week times 52 weeks to get the number of work days/year (260). Table VI presents an estimation of the number of training devices required to meet the projected simulator requirements for single site training (Table V) and the number of hours the trainers are available per day; 8, 10, 14, or 16 hours.

Table VI. SINGLE SITE SIMULATOR REQUIREMENTS.

	Hours/Yr.	Hours Available Per Year				Number Trainers Required			
Device	(Table 4)	8	10	14	16	8	10	14	16
2F110	7042	2080	2600	3640	4160	3.39	2.71	1.93	1.69
CPT	2002	2080	2600	3640	4160	.96	.77	.55	.48
15F8	7722	2080	2600	3640	4160	3.71	2.97	2.12	1.87

Table VI shows that a single static Cockpit Procedures Trainer (CPT) is able to meet the expected demand of an eight hour training day. Both the pilot's 2F110 and the NFO's 15F8 training requires a minimum of two trainers with a 14 hour day. Taken to the extreme of 24 hour utilization (260 days X 24 hours = 6,240 hours) neither current trainer can meet the availability requirement (7042/6240 = 1.13 and 7722/6240 = 1.24) with a single trainer.

The single siting of the FRSs does not remove the requirement for East coast trainer usage. Fleet and reserve squadrons as well as foreign military sales

would keep both the 2F110 and 15F8 fully utilized. The E-2C static cockpit trainer in Norfolk would no longer be needed. For $2.5 million it could be moved to Miramar and modified into a C-2A static cockpit.

The conclusion that can be drawn from Table VI is that a second 15F8 and 2F110 trainer is required to meet the simulator requirements of the training syllabus. A group II (APS-145/JTIDS) 15F8 trainer would cost $43.2 million, and a group I (427 engine) 2F110 would cost $21.5 million. Total cost for both trainers and relocating and modifying the Norfolk CPT is $67.2 million [Ref. 3]. Facilities for these three simulators is included in the Milcon discussion.

At VAW-120 both the 2F110 and the 15F8 use Contractor Supported Instruction (CSI) contracts to operate the trainers. CSI personnel free up the staff officers so that they can make more productive use of their time. Currently VAW-110 has only 80% CSI support for the pilot trainer and 45% for the NFO trainer. The cost to VAW-110 to operate both simulators 14-15 hours per weekday with 100% CSI is $400,000 for the 2F110 and $1 million for the 15F8. In addition, $45,000 would be needed for a civilian trainer manager to keep track of CSI and trainer maintenance paper work. Therefore the annual recurring cost in civilian support of the single site simulators is $1.445 million [Ref. 5].

3. FRAMP

The expense in relocating FRAMP includes both men and equipment. Most of the FRAMP training aids can be easily transported across country with the exception of the Integrated Systems Maintenance Trainer (ISMT). The ISMT is

constructed with teflon coated wiring that would be destroyed in the move. The cost to replace the wiring, parts and labor, is between $3 million and $3.5 million. The cost to move the other 16 FRAMP trainers is $2 million. The cost of setting up the new FRAMP is $972,000.[Ref. 6]

The cost to transfer 20 FRAMP instructors is $6,000 each, or $120,000 total. Annual recurring expenses for the replacement of four instructors (eight moves) is $48,000. The travel and per diem cost for the estimated 390 East coast students is $1.436 million. Total recurring expenses are expected to be $1.484 million.

4. Officer, Enlisted, and Student Expenses

Relocating the VAW-120 enlisted and officers to VAW-110 would give the single site training squadron the wealth of knowledge and experience needed to immediately train students and maintain the additional aircraft allocated to the squadron. Forty-two officers and 100 enlisted would be relocated, costing $6,000 each, totaling $852,000.

Annual expense associated with officer relocation includes those both staff and students. Fourteen staff officers are expected to be replaced by other East coast officers annually. These 28 moves costing $6,000 each would total $168,000 annually. Annual Category I student transfers are projected to be 68 for E-2C pilots/NFOs and C-2A pilots. At a cost of $3,000 each, a total recurring student transfer cost of $340,000 is expected. Category II and III officers would normally complete training in less than four month and would not be eligible to

move their households and families to Miramar. The estimated 34 Category II/III students would be entitled to per diem for the duration of their training at VAW-110. The daily per diem rate differs from a low of $45/day if rooms are provided at the bachelor officer quarters (BOQ), to a high of $101/day if rooms are not provided. Therefore, Category II/III recurring student costs range from $185,000 (w/ BOQ) to $412,000 (w/o BOQ). [Ref. 6]

5. Variable Housing Allowance

The government recognizes that the cost of living varies from location to location across the country. The cost of living is higher in San Diego (Miramar) than it is in Norfolk. Therefore, all PCS staff and students would be entitled to the higher rate of housing allowance. This is estimated to result in an additional $830,000 in annual expenses.

6. Other Expenses

Aircrew ordered to Group I and Group II squadrons cannot be trained in the original E-2C and vice versa. The E-2C Group I and Group II aircraft with their 427 engines have different handling characteristics and performance figures than the original E-2C. In addition, the Group II aircraft contains a new radar system, color displays, JTIDS, as well as numerous other improvements. The configuration differences between the three E-2C variants are significant as discussed in Chapter II. Based on the expected student load, FRAMP training

requirements, and historical aircraft availability; Table VII shows the aircraft needed to fulfill single site training requirements.

Table VII. PROJECTED FRS/FRAMP AIRCRAFT REQUIREMENTS.

Aircraft Type	Allocated	Onboard	Required	Needed
E-2C	8/1	5/0	12/1	7/1
E-2C Group I	2/0	3/0	4/1	1/1
E-2C Group II	0/0	0/0	5/1	5/1
C-2A(R)	2/1	3/0	5/1	2/1
TOTALS	12/2	11/0	26/4	15/4

Note: Left numbers are FRS requirements, right numbers are FRAMP requirements.

The impact of more than doubling the number of aircraft on the VAW-110 flight line was partially addressed in the discussion on Milcon. The additional aircraft will also require an increase in the support and test equipment on-hand at the squadron. Just as important is the additional test benches and spare parts available at the Aviation Intermediate Maintenance Department (AIMD). Additional personnel with the required expertise to operate the test equipment may be available with transfers from VAW-120. The expense of additional spare parts, test equipment, and AIMD test benches has not been quantified. What excess equipment would result in the disbanding of VAW-120, or is needed to support those squadrons remaining, has not been determined. What is determinable is the requirement for AIMD to have additional space to store and operate the required equipment.

C. PROPOSED METHODOLOGY

In the following chapter, savings and expense items listed in this chapter will be grouped and summed as either recurring or non-recurring. Next, the summations will be used to determine the break even, or payback period, for the proposed consolidation would occur. If this results in an unacceptable conclusion, scenarios will be developed that limit expenses and increase savings in an attempt to present a workable solution, within the framework of the proposed consolidation.

IV. ANALYSIS

The consolidation of the E-2C/C-2A fleet replacement squadrons (FRS) can be evaluated from three aspects. The first is the primary goal to reduce the manpower requirements in naval aviation. The second is the financial impact likely to be incurred if single site training were ordered. The third is non-monetary issues that the consolidation would also present.

The expectation of saving a third of the manpower used by VAW-120 is accepted without challenge. The only competent authority to determine if this is valid is the Naval Manpower Evaluation Command (NAVMEC). NAVMEC has not been tasked to perform such an evaluation. Based on historical precedent, a one-third reduction in manpower is not an unreasonable expectation.

The evaluation of the financial aspects of the consolidation are just as important as the reduction in manpower it is expected to produce. Faced with shrinking budgets, decisions made solely based on the measurement of manpower requirements may have significant and disastrous impact on budget outlays far into the future. The fiscal impact will be evaluated in several scenarios. First, an all inclusive break-even evaluation of the expected expenses and savings will be presented. Anticipating that this will result in an impossible situation, further evaluations are presented; including a discussion of the possible impact of the avoidance of large one-time and/or recurring expenses. All figures and scenarios

are presented without consideration of other future decisions that may impact the facilities at NAS Miramar or the E-2 and C-2 communities. For instance, relocation of the fighter squadrons at NAS Miramar or the further reduction in the number of carrier air wings from the current twelve are not considered. Both would make available some additional aircraft, maintenance space, and lower the student training load.

Finally, non-monetary issues and concerns relevant to the consolidation will be presented for consideration. Though both manpower and fiscal impact are easy to use as a measurement tool, the overall impact and repercussions to naval aviation and the E-2/C-2 communities must be considered.

A. FINANCIAL ASPECTS

All financial analysis is done on the break even basis to determine the payback period of the scenario. By doing this, the impact of non-recurring and recurring expenses can be paired with expected savings. Initial evaluations will be conducted without consideration of inflation in order to view the scenario in more simpler terms. If the scenario results in a feasible outcome, the effects of inflation will be added in order to achieve a more realistic appraisal of the scenario.

1. All Inclusive

The first scenario will include all savings and expenses presented in Chapter III with the exception of milcon project P-128. Project P-128 is currently under construction and would most likely be completed or cost more to stop than

to finish. Cat II/III students are optimistically given BOQ rooms. Expenses and savings for this scenario are presented in Table VIII.

Table VIII. EXPECTED EXPENSES AND SAVINGS WITH FULL IMPLEMENTATION.

Non-Recurring:	
Expenses:	
Milcon	$15,690,000
Simulators	67,200,000
FRAMP ISMT trainer repair	3,000,000
FRAMP trainers moving expense	2,000,000
FRAMP set-up expense	972,000
Transfer of 20 FRAMP instructors (@ $6K ea.)	120,000
Transfer of 42 officers (@ $6K ea.)	252,000
Transfer of 100 enlisted (@ $6k ea.)	600,000
Total non-recurring expenses	$89,834,000
Savings:	none
Net non-recurring expenses ($89,834,000 - 0)	$89,834,000
Recurring:	
Expenses:	
Full CSI contract support	$1,445,000
8 FRAMP transfers (@$6K ea.)	48,000
390 FRAMP students per diem & travel exp.	1,436,000
28 staff officer transfers (@ $6K ea.)	168,000
68 Cat I student transfers (@ $3K ea.)	340,000
34 Cat II/III per diem & travel (@ $45/day)	185,000
100 staff enlisted transfers (@ $6K ea.)	600,000
Additional VHA	830,000
Total recurring expenses	$5,052,000
Savings:	
OPTAR	$1,500,000
Manpower	2,900,000
Total recurring savings	$4,400,000
Net recurring expenses ($5,052,000 - 4,400,000)	$652,000

In this scenario additional simulators are procured and VAW-120 personnel, both officer and enlisted, are transferred to VAW-110. Table VIII shows both a large up front outlay and a recurring annual expense. One-time up front funding of $89.834 million is expected. Furthermore, an additional $652,000 in expenses to the Navy can be expected annually, before considering inflation. In purely fiscal terms, this scenario is very unsound and should be rejected.

2. Selective Inclusion

In order to make the consolidation fiscally acceptable, some expense elements of Table VIII must be reduced or eliminated. The following section discusses these options and their possible impact. The objective will be to examine the option of decreasing the non-recurring and recurring expenses, thus generating a positive cash flow and gaining a shorter payback period.

a. West Coast Exclusive

Savings could be induced both long and short term if all the personnel of VAW-120 are redistributed to Norfolk area commands. The additional billets at VAW-110, both officer and enlisted, would be either gleaned from San Diego commands or squeezed from the fleet squadrons. The financial impact of this scenario is shown in Table IX. (Note milcon project P-128 is deleted since it will soon be completed.)

Table IX. EXPENSES AND SAVINGS WITH WEST COAST EXCLUSION SCENARIO.

Non-Recurring:	
Expenses:	
Milcon	$15,690,000
Simulators	67,200,000
FRAMP ISMT trainer repair	3,000,000
FRAMP trainers moving expense	2,000,000
FRAMP set-up expense	972,000
Total non-recurring expenses	$88,862,000
Savings:	none
Net non-recurring expenses ($88,862,000 - 0)	$88,862,000
Recurring:	
Expenses:	
Full CSI contract support	$1,445,000
390 FRAMP students per diem & travel exp.	1,436,000
68 Cat I student transfers (@ $3K ea.)	340,000
34 Cat II/III per diem & travel (@ $45/day)	185,000
Additional VHA	830,000
Total recurring expenses	$4,236,000
Savings:	
OPTAR	$1,500,000
Manpower	2,900,000
Total recurring savings	$4,400,000
Net recurring savings ($4,400,000 - 4,236,000)	$164,000
Break even point ($88,862,000/164,000) = 541.8 years	

In this scenario only West coast personnel would be assigned to VAW-110 to occupy the additional billets created by the E-2C/C-2A FRS consolidation. This would be done without concern for the quality of the instructor, only that the expense of relocating VAW-120 personnel is avoided.

The fiscal data shown in Table IX indicates that the first year non-recurring expense would be $88.862 million in outlays. With an expected recurring savings of $164,000 a year, without inflation, it would take 541.8 years to break-even. The excessive payback period and the dead-end detailing created by excluding East coast experience causes this scenario to be unacceptable.

b. Simulator Shortage

Significant non-recurring expenses could be avoided if additional simulators are not procured. This would have a severe impact on VAW-110's ability to train replacement E-2C and C-2A aircrew. In effect the anticipated time allotted in Table V Chapter III would have to be halved in order to be within the capacity of one 15F8 and 2F110 with a 14 hour training day. In addition, without the additional simulators, related milcon and CSI expenses are reduced accordingly. Because VAW-120's FRAMP equipment has no utility if left in Norfolk, this scenario will continue to provide for it's transfer to VAW-110.

VAW-120 personnel transfer to VAW-110 is retained to improve the quality of instruction in light of the loss of simulator facilities. Table X shows the expected financial effects of this scenario.

Table X. EXPENSES AND SAVINGS WITHOUT ADDITIONAL SIMULATORS.

Non-Recurring:	
Expenses:	
Milcon (less $1.1 million for simulator bldg.)	$14,590,000
FRAMP ISMT trainer repair	3,000,000
FRAMP trainers moving expense	2,000,000
FRAMP set-up expense	972,000
Transfer of 20 FRAMP instructors (@ $6K ea.)	120,000
Transfer of 42 officers (@ $6K ea.)	252,000
Transfer of 100 enlisted (@ $6k ea.)	600,000
Total non-recurring expenses	$21,534,000
Savings:	none
Net non-recurring expenses ($21,534,000 - 0)	$21,534,000
Recurring:	
Expenses:	
Full CSI contract support	$745,000
8 FRAMP transfers (@$6K ea.)	48,000
390 FRAMP students per diem & travel exp.	1,436,000
28 staff officer transfers (@ $6K ea.)	168,000
68 Cat I student transfers (@ $3K ea.)	340,000
34 Cat II/III per diem & travel (@ $45/day)	185,000
100 staff enlisted transfers (@ $6K ea.)	600,000
Additional VHA	830,000
Total recurring expenses	$4,352,000
Savings:	
OPTAR	$1,500,000
Manpower	2,900,000
Total recurring savings	4,400,000
Net recurring savings ($4,400,000 - 4,352,000)	$48,000
Break-even point ($21,534,000/ 48,000) = 448.6 years	

In this scenario it appears that the recurring expenses and savings are off setting, resulting in the non-recurring expense never being recovered. In light of the fact that significant impact on training would occur if forced to use only one 15F8 and 2F110 simulator to conduct all training, this scenario is easily rejected for being both fiscally and operationally infeasible. Simulator downtime caused either by malfunction or system modification would be deeply felt. In addition, it has already been presented that the E-2 and its dissimilar hardware configurations require different trainer suites, else some aircrew will be instructed on equipment not relevant to the aircraft they are being assigned too. The decision to save money on simulators ($67.2 million) is insignificant compared to the cost of one Group II E-2C (approximately $90 million). The risk of loosing an aircraft would be too high and cost more than the simulators.

c. The Worst Case

The final scenario will combine the previous two cases. No personnel will be transferred from the East coast and no additional simulators will be obtained for VAW-110 training. This scenario represents the effect of a forced merger to reduce naval aviation manpower at a minimal financial cost, regardless of the effect on the eduction of E-2C and C-2A aircrew. Table XI presents the possible financial implications of just such a scenario.

Table XI. EXPENSES AND SAVINGS WITH NO ADDITIONAL SIMULATORS AND NO EAST COAST TRANSFERS.

Non-Recurring:			
Expenses:			
Milcon:			
	Classrooms	$480,000	
	FRAMP Bldg.	1,200,000	
	Hanger/Ramp	5,200,000	
	Total milcon		6,880,000
FRAMP ISMT trainer repair			3,000,000
FRAMP trainers moving expense			2,000,000
FRAMP set-up expense			972,000
Total non-recurring expenses			$12,852,000
Savings:			none
Net non-recurring expenses ($12,852,000 - 0)			$12,852,000
Recurring:			
Expenses:			
Full CSI contract support			$745,000
390 FRAMP students per diem & travel exp.			1,436,000
68 Cat I student transfers (@ $3K ea.)			340,000
34 Cat II/III per diem & travel (@ $45/day)			185,000
Additional VHA			830,000
Total recurring expenses			$3,536,000
Savings:			
OPTAR			$1,500,000
Manpower			2,900,000
Total recurring savings			$4,400,000
Net recurring savings ($4,400,000 - 3,536,000)			$864,000
Break-even point ($12,852,000/ 864,000) = 14.9 years			

By far this scenario is the most draconian to be considered. It ignores the mission and responsibility of the fleet replacement squadron. Category I students would be sent to fleet squadrons with only textbook training and very little hands-on experience. In effect junior officers would arrive at their squadrons with only an apprentice's knowledge of what he needs to know in order to effectively fly or use the weapon system. The burden to complete their training would fall on the squadrons in order to make the aircrewman a productive, safe, and competent member of the squadron.

3. Inflation and Discount Rate Influences

A more sophisticated analysis of the scenario would consider the effects of inflation and the time value of money. Inflation would affect the scenario by increasing the amount of annual savings each year by an assumed inflation factor. Each previous years savings would be increased by the inflation factor. The end result would be to further decrease the break-even point because more savings would be projected for each year into the future.

The time value of money, also known as a discount rate, recognizes that money today is worth more than money next year. The time value of money influences the outcome of financial analysis by decreasing the amount of savings each year by a predetermined factor, thereby representing that future savings is worth less than immediate savings. The result of the discount rate is that the break-even period would increase because the value of savings projected for each year into the future would be lower than the previous year.

Any further analysis recognizing the influence of inflation and the time value of money would be very sensitive to the choice of the forecasted inflation and discount rates. For this reason it is easier to forecast that the two factors will cancel each other out, and not allow the conclusion to be manipulated by the influence of either factor.

B. FUTURE FACTORS TO CONSIDER

Given that the U.S. Armed Forces are currently undergoing a reductions in force structure as a result of the lessening of East-West tensions, under what conditions would the consolidation possibly be practical?

The previous scenarios indicated that the largest outlay was for additional simulators. In addition, the simulators were also the bottleneck to student throughput. The demands on the trainer were greater than what a single trainer could provide annually.

1. Changing Constraints and Demand

This scenario will concentrate on maximizing the availability of single site simulators, and estimate under what student throughput single site training might be potentially viable.

a. Simulator Availability

One of the initial assumptions was that the simulator would operate five days a week, and even running 24 hours a day it could not fulfill the training demands put on it if it had to support single site operations. This usage constraint

will be modified to having the simulators available seven days a week, and allowing six hours a day for maintenance, modification, and testing; thus allowing them to be available for eighteen hours a day for training. This would make available the 2F110, CPT, and 15F8 each have a theoretical availability of 6,570 hours (365 days X 18 hours) per year.

b. Student Throughput

Since the Navy is reducing it's forces by one carrier airwing in fiscal year 1991, and is scheduled to disband another in fiscal year 1992; at what point would student throughput be within the theoretical capacity of the single simulator availability?

Using Table V as an annual standard, two factors can be determined. First, the number of pilots and NFOs, by category, sent to each squadron per year. Second, the number of hours required for each student per simulator. This analysis will consider only E-2 aircrew. C-2 aircrew will be held constant since they would not be directly affected by the reductions in the number of carrier airwings.

The first item to be calculated is the number of hours on each simulator required per student category. This is found by taking the total hours per year in Table V and dividing it by the number of students in each category. Table XII shows these values.

Table XII HOURS PER SIMULATOR FOR EACH E-2C STUDENT CATEGORY.

	2F110	CPT	15F8
E-2C Cat I Pilot	61.7	23.4	1.9
E-2C Cat II Pilot	46	18	2
E-2C Cat I NFO	2	0	58.9
E-2C Cat II NFO	2	0	96.5

Again, using the total number of students in Table V and dividing by 12 fleet squadrons, an average number of students, by category, sent to fleet squadrons can be estimated. Multiplying the number of students by Table XII hours/simulator for each student category, we get the annual simulator time to train the average number of replacement aircrew for a single squadron per year (Table XIII).

Table XIII AVERAGE NUMBER OF REPLACEMENT AIRCREW PER SQUADRON, AND THEIR AVERAGE SIMULATOR HOURS.

	Annual # students/ squadron	Number of hours annually		
		2F110	CPT	15F8
E-2C Cat I Pilot	3.8	234	89	7
E-2C Cat II Pilot	1	46	18	2
E-2C Cat I NFO	5.4	11	0	318
E-2C Cat II NFO	1.3	3	0	125
Totals/squadron		294	107	452

Using the total annual simulator time to train one squadrons replacements, the number of squadrons that would need to be disestablished in

order to be within the capacity of a single series of trainers can be determined. First, by subtracting the flight hours not used to train E-2C aircrew from the 6,570 hours that each simulator is possibly available, gives the simulator time available for training E-2C aircrew. Using the figures from Table V, that leaves 3,080 hours for the pilots 2F110 simulator (6570 - 3490), and 4,330 hours for the NFOs 15F8 simulator (6570 - 3490). Table V also shows that the pilots CPT trainer is used only to train student pilots, so the full 6,570 hours remain available for training. Table XIV shows the total trainer time for each simulator for a different number of airwings.

Table XIV. TOTAL SIMULATOR HOURS TO TRAIN REPLACEMENT E-2C AIRECREW FOR A GIVEN NUMBER OF AIRWINGS.

	Number of Airwings			
Trainer hrs/airwing	12	11	10	9
2F110 (294 hrs)	3528	3234	2490*	2640
CPT (107 hrs)	1284	1177	1070	963
15F8 (452 hrs)	5424	4972	4520	4068*

Note: (*) Below pilot maximum of 3,080 hours, NFO maximum of 4,330 hours.

The conclusion indicated by Table XIV is that if the Navy reduces the number of active airwings from 12 to ten, then single site pilot training may be possible. If the number of airwings decreases by three to nine active airwings then both NFO and pilot training may be possible at a single training site. It should be noted that both staff and equipment would be heavily tasked in order to provide the maximum amount of simulator time available.

There are several other points to consider if airwings are reduced in the later part of the 1990's. First, the disestablishment of an East coast airwing removes one E-2C squadron from Norfolk. A West coast airwing, in contrast, removes one E-2 and two F-14 squadrons from Miramar, thus freeing up more hangar space and facilities. Second, depending on how many E-2C squadrons remain on the East coast, it may not be practical to maintain a separate simulator for their use. These simulators would become available for use on the West coast at the expense of relocation and milcon for facilities. This total should be far less than the cost of new simulators. Unresolved is how to train the remaining East coast fleet squadrons.

In summary, a reduction in the number of airwings would eliminate one E-2C squadron per airwing. These reductions would therefore reduce the annual training throughput of the FRS. If the simulators (15F8, 2F110) are tasked at a very high usage rate, and if the number of airwings approach nine, then the single siting issue should be re-evaluated to see if it had become cost effective.

C. NON-FISCAL CONSIDERATIONS

Manpower reductions and financial requirements are more easily quantified and evaluated on paper than abstract issues and concerns. The evaluation of the proposed consolidation would be remiss if it was limited to only manpower and financial considerations. The following are community and career issues that do not lend themselves to be easily placed on a spreadsheet or tallied.

1. East Coast Training Issues

a. Funding constraints placed on detailers precludes West coast training of personnel transferring between East coast commands.

b. Restricted temporary additional duty (TAD) funds impairs fleets' ability to send enlisted personnel from fleet squadrons to utilize West coast training facilities.

c. School house limitations greatly reduces the number of quotas available. Student throughput limitations in E-2/C-2 combined courses further prevent personnel from receiving needed training.

d. Fleet is forced to train personnel via on-the-job-training (OJT) and with the maintenance training improvement program (MTIP). Both have very limited capability to provide significant improvement in technical knowledge of enlisted maintenance personnel.

2. Effects on West Coast Operations

a. Single site FRS would double aircraft carrier tasking for pilot carrier qualification evolutions on the West coast, and would require extensive TAD funding in an effort to utilize East coast aircraft carrier assets.

b. Currently each FRS spends approximately 24 weeks conducting FCLPs and 20 weeks in dedicated air intercept control (AIC) training each year. These evolutions are mutually exclusive and would preclude a single FRS from conducting both 48 weeks of FCLP and 40 weeks of AIC training per year. The allocation of more aircraft and instructors fails to address the saturation

of the airspace in the Southern California area. This is contra to the goal of reducing naval aviation manpower requirements.

c. Construction of facilities and installation of simulator equipment is expected to take at a minimum four years. Training at VAW-110 would be degraded until the new simulators are brought on line.

3. Effect on East Coast Operations

a. VAW-120 gears its tactics training towards operations in the Mediterranean and the North Sea, while VAW-110 trains towards Western Pacific/Sea of Japan operations. Single site training would have to tailor needs for specific replacement aircrew with a corresponding increase in time to train due to increased simulator and classroom requirements.

b. Proximity of fleet squadrons to FRS provides a rapid and open line of communications which ensures training needs and improvements are rapidly and precisely addressed. Single site isolates East Coast squadrons from this source of aircrew and enlisted technicians.

c. VAW-120 provides parts support for fleet squadrons and allows for rapid transfer of aircraft to squadrons on short notice. VAW-120 routinely serves as the source of highly trained personnel for support of fleet E-2's that have diverted back to Norfolk from shipboard operations. VAW-120 also temporarily supplements manning of fleet squadrons experiencing manning shortages in critical positions.

d. VAW-120 provides support to East coast commands in numerous scenarios. Surveillance and data links for both ship and aircraft missile exercises; data link training for fighter and attack FRSs are but a few examples.

e. VAW-120 serves as the resident store house of current tactics and E-2 operations with both Second and Sixth Fleets, not to mention combat operations off Libya and during Desert Storm.

f. VAW-120 has participated in counter narcotic operations from both the East coast and the Gulf of Mexico. These operations could easily be incorporated into flight syllabus training for student naval flight officers.

g. Local FRS provides the forum for aviators and flight officers within the Atlantic fleet to discuss relative issues regarding updated tactics and scenarios.

h. VAW-120 provides the fleet squadrons a ready access to intelligence data.

4. Effect on Careers

a. East coast personnel interested in a FRS tour must determine if they can afford housing for their tour at Miramar. Enlisted personnel who would otherwise be retained in a closed loop detailing (going from E-2 squadron to E-2 squadron) would be lost. These skilled and experienced technicians would be lost to other aviation communities on the East coast. Officers normally do not have the option of flying other aircraft. Thus personnel wishing to fly E-2s for their shore tour must suffer the financial hardship of single tour (normally 2.5 years) in San Diego, while running the risk of being unable to return to the East coast.

b. The VAW community has very few avenues to major command, the decommissioning of VAW-120 would further acerbate the situation.

c. A tour of duty at an FRS is viewed as career enhancing. Therefore officer retention and being competitive for future senior promotion would be limited for those who chose to serve on the East coast.

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

Based on the analysis in Chapter IV the following conclusions to the thesis research questions are provided.

1. **What impact would consolidation of the two coast E-2C and C-2A FRS training pipeline into a single squadron have on replacement aircrew training and fleet squadron operations?**

In order to fulfill the mission of an FRS, and generate the same quality of student output, the training capacity of VAW-110 would have to be increased. The training of aircrew uses classroom lectures, flight/mission simulators, and actual hands-on flying to develop the skills required to perform their mission in the fleet. Limitations placed on training due to the lack of classrooms, simulators, or aircraft will either degrade the quality of the final product, or extend the time required to graduate a student using the prescribed syllabus. In either case consolidation from a dual coast FRS into a single site FRS without the expansion of training facilities, will in all likelihood result in a poorer quality of aviator and maintenance personnel. Expanding the training facilities of the single site to accommodate the larger student load, however, will make the consolidation fiscally undesirable.

2. **What expenses would be incurred if the status quo student throughput and flight simulator utilization were maintained?**

A smooth transition from a dual to a single sited FRS squadron to train E-2C and C-2A aircrew, as well as enlisted technicians, will require both time and money to implement. The initial OP-02 goal was for implementation during fiscal year 1992. Construction alone for the simulators and classrooms will take a minimum of four years to legislate and actually construct.

Up-front an expense of just under $90 million would be required to expand the facilities at VAW-110 and to transfer a cadre of VAW-120 personnel. At a minimum, an additional expense of $652,000 would be required to function as a single site FRS. Besides the increase in the number of aircraft at VAW-110, related facilities improvements in hanger, ramp, power, and air were detailed. The cost of support items such as AIMD and supply were noted but no cost estimate was available.

3. **What alternatives are viable in view of limited funding dollars and manpower reductions?**

The expense and savings of the FRS consolidation proposal were classified as either recurring or non-recurring. Alternatives were evaluated by reducing the non-recurring expense and increasing the recurring savings in order for the alternative to break even during the life of the project. The E-2C is expected to serve at least until the year 2010.

The first scenario was built around the premise of maintaining the status quo of the training provided at the FRS. Facilities and training at VAW-110 were expanded to ensure identical training equal to the current training is maintained.

The next two scenarios were used to examine the effects of trying to reduce life cycle costs of the consolidation. The most significant outlay is the $67.2 million for additional aircrew simulators. Both a recurring and non-recurring expense is incurred in transferring East coast personnel to West coast staff billets. Both scenarios were evaluated independently. Both reduced non-recurring expenses and resulted in a net recurring savings, but both would take over 400 years to break even. This is excessive even before considering the effects of inflation.

The final scenario considered was the most severe. It represented a decision that no additional simulators would be added, and no East coast personnel would ever be transferred to the West coast for instructor duty.

In order to determine under what conditions a consolidation of the two FRSs should be recommended, two critical constrainst were adjusted. First was seven day a week simulator usage. The second was a reduction in student throughput caused by a reduction in the number of active duty carrier airwings.

4. **What costs are associated with each alternative in implementing the FRS consolidation?**

Table XV below summarizes the totals for non-recurring and recurring savings and expenses associated with each scenario mentioned above. In addition, the non-inflation break even period is estimated.

Table XV. SUMMARY OF CONSOLIDATION SCENARIOS.

	Non-recurring savings(expense)	Recurring savings(expense)	Payback period
Full Consolidation	($89,900,000)	(652,000)	Indefinite
No East coast staff	($88,900,000)	164,000	542 years
No additional simulators	($21,500,000)	48,000	449 years
No East coast staff & No additional simulators	($12,900,000)	864,000	15 years

The first scenario produced a situation where the non-recurring costs would never be recovered, because of an additional recurring expense. The next two scenarios produced excessive payback periods, rendering them fiscally impractical. The final scenario resulted in a feasible solution, but at a very high cost in the capability of VAW-110 to fulfill its mission to train the E-2 and C-2 community personnel.

B. RECOMMENDATIONS

Faced with either the large up-front and additional recurring expense or a significant drop in the capabilities of graduates of the FRS, the proposed consolidation of the dual coast E-2C and C-2A fleet replacement training squadrons is strongly recommended not to be accepted.

The consolidation of the East coast FRS into a single site FRS on the West coast is physically possible but at a significant trade off. Either large amounts of funds are required ($90 million) up front to expand VAW-110, and additional funds annually ($652,000) will be needed in order for the squadron to meet the required student throughput as well as graduate the same quality students provided by the current dual FRS system.

The lead time to bring VAW-110 up to the projected student load is driven by an expected four year construction period to expand classroom and simulator facilities. The proposed consolidation is determined to be unaffordable.

Alternatives to not purchasing additional simulators or to not transfer East coast personnel to West coast staff billets had very little impact on the life cycle costs of the consolidation. Loss of the additional simulators would have effected the training of the students. Loss of East coast instructors would have effected the E-2C and C-2A aviation community by removing the best shore duty billets available to junior officers.

The final scenario, no additional simulators or East cost staff, would in effect force VAW-110 to double its student load while being constrained to its present

level of training facilities. It is impractical to expect that this could be done without significant reduction in the quality or quantity of graduates.

If the number of active duty carrier airwings is reduced to approximately nine, the training throughput may be low enough to allow one set of simulators to handle the student demand, all be it at a very high usage rate. Therefore it is recommended that a review of the FRS consolidation proposal be conducted if the number of carrier airwings is reduced to nine or fewer.

C. RECOMMENDATIONS FOR ADDITIONAL RESEARCH

The following alternatives to the proposed FRS consolidation are submitted for evaluation as an alternative to the dual site consolidation.

1. A cut in overall manning at both VAW-110 and VAW-120 equal to half of the overall manning reduction anticipated as a result of the proposed consolidation.

2. Analyze the overall effect if the total naval aviation reduction were applied to all naval aviation communities on a proportional basis of the communities percentage of total naval aviation manpower.

3. Determine the life cycle cost of relocating the entire E-2C and C-2A communities, FRSs and fleet squadrons, to a single site.

4. Determine the effect of having each FRS specialize in training for one configuration of the E-2C. For example; the East coast trains only APS-138/139 NFOs and non-427 engined pilots, while the West coast trains APS-145 NFOs and 427 engined pilots.

LIST OF REFERENCES

1. Commander Naval Air Forces Pacific Unclassified message, date time group 131801Z Nov 90 to Commander Pacific Fleet and Commander Atlantic Fleet, Subject: Single Site FRS Proposal.

2. Interview with FRAMP's leading Chief Petty Officer, ATCS Arndt, April 19, 1991.

3. Commander Fighter Airborne Early Warning Wing Pacific Unclassified message, Date Time Group 281130 Aug 90, to Commander Naval Air Forces Pacific, Subject: Single Site FRS Proposal.

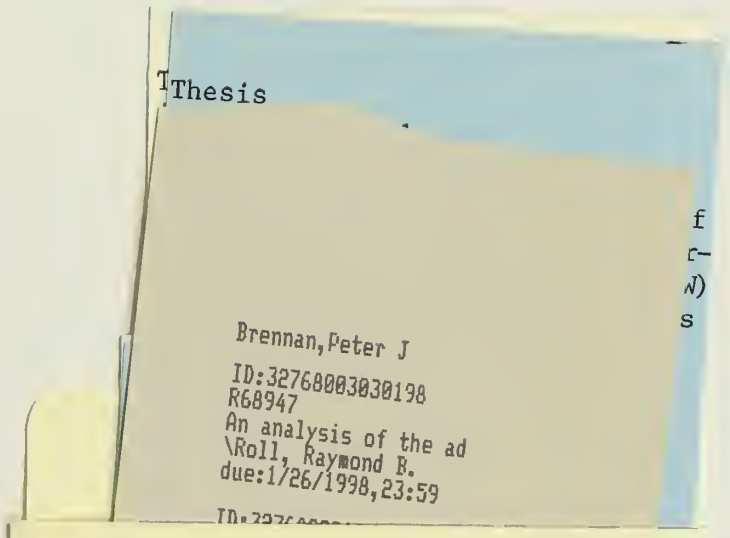
4. Naval Training Systems Center Unclassified study, Subject: Training Device and Training Program Requirements Associated with Single Siting the E-2C Fleet Readiness Squadrons, 17 August 1990.

5. Commander Fighter Medium Attack Early Warning Wing Atlantic, Unclassified letter unserialized to Commander Naval Forces U.S. Naval Atlantic Fleet, Subject: E-2C Single Site Proposal, undated.

6. VAW-120 command brief, unclassified, Subject: Single Site E-2C FRS Proposal.

INITIAL DISTRIBUTION LIST

1.	Defense Technical Information Center Cameron Station Alexandria, Virginia 22304-6145	2
2.	Library, Code 52 Naval Postgraduate School Monterey, California 93943-5002	2
3.	Department of the Navy, Code NOP-501D Pentagon (Room 4D366) Washington D.C. 20350-2000	1
4.	Commanding Officer Carrier Airbone Early Warining Wing Twelve NAS Norfolk Norfolk, VA. 23511	1
5.	Commanding Officer VAW-110 NAS Miramar San Diego, CA. 92415	1
6.	Commanding Officer VAW-120 NAS Norfolk Norfolk, VA. 23511	2



Jarrell

Cost analysis for the proposed consolidation of Carrier Airbone [i.e. Airborne] Early Warning (VAW) Fleet Replacement Squadons [i.e. Squadrons] (FRS).