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THESIS

A COST COMPARISON OF AVIATION PERSONNEL:
ACTIVE VS. RESERVE

by

Michael Paul Rishel

December 1985

Thesis Advisor:

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A Cost Comparison of Aviation Personnel:
Active vs. Reserve

by

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Commander, United States Naval Reserve
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Submitted in partial fulfillment of the
requirements for the degree of

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ABSTRACT

This thesis addresses aviation personnel cost differences between Active and Reserve Aviation Units. Current costing methods and figures developed by the Center for Naval Analysis provide the basis for developing the cost comparisons. The study provides a contrast to past personnel cost comparisons by analyzing the cost differentials between Active and Reserve Units whose annual operating tempos are approximately equal. During the cost comparison, significant cost differentials are identified and factors affecting the realization of any cost savings are discussed. Costing methods that conflict with information developed during the research phase are analyzed and discussed. The cost comparison does not attempt to validate the Center for Naval Analysis' costing approach, but it does provide actual data that will contribute to future validation efforts.

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I. INTRODUCTION

A. BACKGROUND

Congress is attempting to curb defense spending while the United States Navy is increasing in size to support a projected 600 ship fleet. These two initiatives, which appear to be in direct opposition to each other, may find a common source for insuring each success. To accomplish this difficult task, both have turned to the United States Naval Reserve for assistance.

Beginning in 1983, Congress directed that each service provide for greater Reserve participation in the Active duty mission. Past efforts to integrate Reserve forces had proven very successful. Reserve logistics squadrons have provided the majority of all logistic transport service for many years. Active duty surface and airborne units are becoming increasingly dependent on air support services provided by two Reserve Fleet Composite Squadrons. Major Naval surface ship exercises now utilize Reserve forces for planning, support and coordination. [1]

Augmenting Active forces with Reserve manpower and material has allowed the Active Navy to retain established missions and shift its critical Active manpower assets to new roles and responsibilities. While the ability to expand the scope of the U.S. Navy through the use of Reserve forces

remains an important incentive for pursuing this policy, a new incentive is rapidly gaining significance.

It has long been recognized that some cost savings have been realized when Reserve forces assume Active duty missions. Only recently under the dark cloud of increasing defense spending and its contribution to very large deficits has the significance of these savings received much attention.

B. PRIMARY RESEARCH QUESTION

In the past, cost savings resulting from the transfer of Active units to Reserve status had been attributed to a corresponding reduction in operating tempo. While the mission may have remained the same, the part time status of Reserve personnel could not allow for the same level of output. Many cost studies have been conducted to verify the extent of these cost reductions. Most have compared units which have had significant differences in workload and productivity levels. [2]

The idea of identifying, for cost comparison, an Active and Reserve unit with identical workloads appeared to contrast with past studies. While identifying two units that are mirror images of each other would prove extremely difficult, identifying two units that are close in size and function seemed within reasonable limits. In developing the cost comparison, several qualifying assumptions were required. First, there could be no degradation in quality of work performed between the two units. While some controversy exists

over this issue, recent studies have indicated that Reserve forces perform extremely well when measured against their Active counterparts. [3] The second assumption is that if units could be identified that were close in size, function, location, and material assets, then significant cost variations would be restricted to differences in personnel costs. [4] Given these conditions, the primary research question is, "What are the personnel cost differences between an Active and Reserve aircraft squadron who operate within the same environment, at the same level of intensity, and with the same mission?"

C. APPROACH

The methodology for this cost analysis will be to use current costing methods as developed by the Center for Naval Analysis together with inputs from other professional organizations. After establishing a theoretical basis for cost comparison, as many actual costs as are practicable to measure, will be identified for additional evaluation. This cost comparison will not attempt to validate the Center for Naval Analysis' costing approach, but it will provide evidence that will contribute to future validation efforts. Cost differences that show significant variations or methods that conflict with information developed during the research phase will be analyzed and discussed.

II. ORGANIZATIONAL RELATIONSHIPS

A. NAVAL RESERVE

The Naval Reserve was established on March 3, 1915. From World War I to the present the Naval Reserve has played a key role in both peacetime and periods of conflict. "In World War II, approximately seventy-five percent of the Officers and Enlisted men who served on Active duty with the Navy were Reservists." [1:2-1] Today, the Naval Reserve has grown to more than 384,000 men and women.

The Reserve Force structure is comprised of two major groups. The largest of these is the Ready Reserve, while the second group consists of those individuals who are Retired or Standby Reservists. The Ready Reserve can be further broken down into Active Duty Reservists and Inactive Duty Reservists. Active Duty Reservists are those individuals who are serving full time with regular Naval forces or as TAR's (Training and Administration of Reserves). TAR's are full-time career officers who are assigned the responsibility of administering the Reserve program on a daily basis. The Inactive duty segment of the Ready Reserve is comprised of three key groups: drilling Selected Reserve (SELRES) personnel, students in the training pipelines for NROTC, and those in the Individual Ready Reserve. [1]

From the TAR and Selected Reserve categories come the personnel who comprise the cost factors for the Reserve half of the cost analysis. The Selected Reserve personnel are the heart of the entire reserve program. These individuals are the so-called "weekend warriors". They are required to perform four drills (four hour work period) per month and at least two weeks of Active Duty for Training (ACDUTRA) per year. "Most of the SELRES are Navy Veterans who continue their affiliation with the Navy while, at the same time, pursuing their civilian careers." [1:2-4]

Many reservists serve much more time than the minimums describe. Drills, in addition to the minimum four per month requirement, are authorized for those who require more time to maintain proficiency in high skill areas. Reserve pilots often perform up to 72 additional drills per year. Special Active Duty, which is active duty performed in excess of the two week requirement, is often used by these same individuals.

The fact that most SELRES are veterans will be a significant factor affecting the Indirect costs of Reservists as opposed to those of Active personnel.

During the periods when the SELRES are active in their civilian careers, TAR personnel keep the programs and machinery operating. They are analagous to a highly trained skeleton crew who provide continuity and expert skills to the Reserve Program. They are the administrators and custodians of the Reserve Navy.

Important to note is the planned expansion of these two groups. SELRES personnel strengths are planned to grow from 110,000 in October 1985 to 132,600 by the end of 1990. TAR personnel are programmed to grow from approximately 15,000 in FY84 to approximately 25,000 in FY90. This planned expansion coincides with the increasing pressure from Congress to transfer more missions to the Reserve Forces. [1]

B. RESERVE FORCE INTEGRATION

"The Conference Report on the FY84 Defense Authorization Bill asked the Services to provide the Armed Services Committees of the Senate and House of Representatives with an annual report outlining changes that will be accomplished to provide the Guard and the Reserves with: new missions, more modern equipment, and greater integration with the active forces." [5] In this statement, Secretary John Lehman refers to Congress' increasing interest in reducing costs through greater use of a 'perceived' less costly Reserve Armed Forces. Perceived is used to qualify Congress' view because there is presently numerous discussions and debates about whether transferring missions to the Reserves actually does save money. A case in point is that the cost to operate a Reserve ship from a forward deployed site has proven to be more costly than operating an Active ship under the same conditions. [5] Concern has been expressed that, although initial cost studies show a substantial savings when Reserve forces assume an active

duty mission, further analysis has shown that the degree of participation by the Reserves will affect the amount of savings. "This cost differential however, should be considered valid only for marginal changes. . . . Large substitutions of Reserve for Active squadrons would reduce the cost differential for several reasons." [2:3]

C. OPERATIONAL UNITS FOR COST STUDY

VC-13 is a Reserve Aviation Squadron located at Naval Air Station, Miramar, San Diego, California. The squadron's mission is to provide a variety of air services within two major categories. The first category, Dissimilar Air Combat Training (DACT), provides aircraft to oppose the Active and Reserve fighters in simulated air battles. These battles can include major encounters between an entire aircraft carrier's fighter aircraft assets to single plane encounters such as initial pilot training missions. The second category is airborne target towing for both ships and aircraft. Targets are towed for fighter aircraft to practice air to air gunnery. Certain specialized targets are towed so that ships can certify weapon stations and qualify gun and missile crews.

To provide these services VC-13 flies approximately 4000 hours per year. [6] The squadron does this with an authorized squadron manning level of 21 Officers and 187 Enlisted. [7] In addition to this manning, VC-13 is supplemented with 10 Officers and 39 Enlisted who are provided by a Squadron Augment Unit (SAU) called VC-885.

VC-885 is unique in that it maintains an administrative identity of its own; while on a practical basis it functions as an integral part of VC-13. For the purpose of this cost comparison, VC-13 and VC-885 will be considered as one unit.

The Active duty unit being evaluated within this cost study is VF-126, a fighter squadron located at Naval Air Station, Miramar, San Diego, California. VF-126 provides Dissimilar Air Combat Training in the same manner as described in the discussion of VC-13. Additionally, VF-126 provides spin training to both Reserve and Active pilots.

In providing these services VF-126 flies approximately 4600 hours per year. [8] The squadron performs this mission with an authorized squadron manning of 27 Officers and 217 Enlisted personnel. [7]

VC-13 and VF-126 were chosen for this cost comparison for several reasons. The writer's intimate knowledge of both organizations prompted the initial question of "Could the Navy save money or alleviate manpower shortages through a similar use of Reserve forces within the organizational framework of VF-126?" What was intriguing about this question was the possibility of extending any identified cost/manpower savings to units of like nature throughout the Naval Air community. The closeness in unit structure, location, mission, and operating tempo also made these two units ideally suited to this type of analysis. Although the air service missions do vary, the pilot skill requirements for

each squadron are identical. Both squadrons recruit the majority of their pilots from the fighter community. Many of VC-13's Reserve pilots acquired their skill while serving as Active duty pilots with VF-126. Essentially, these pilots require little or no additional training prior to becoming productive members of VC-13. These pilots also adapt quickly to the few entirely new missions.

The Enlisted personnel are closely aligned in both professional experience and training background due to the commonality of working on the same basic aircraft. The one exception are the personnel assigned to VF-126's T-2 aircraft spin training program. [7] For this cost comparison the 42 people specifically trained for maintenance on the T-2 aircraft will be discounted. Coinciding with the removal of the 42 Enlisted personnel we must disregard 600 hours of VF-126's flight time which is devoted to spin training in the T-2 aircraft. With 27 assigned pilots flying approximately 4600 hours per year, the average flight time per pilot is approximately 200 hours per year. Eliminating further costs associated with the T-2 program requires that 3 VF-126 pilots be removed from the cost consideration. The elimination of personnel associated with the T-2 program now establishes two units who have the same location, essentially the same mission, the same maintenance environment, and approximately the same operating tempo.

At this point, we should review the ground work that has transpired. First, there may be some concern over the elimination of the T-2 program from the cost analysis. This was done in an effort to match the two units as closely as possible. The identification of personnel associated with the T-2 program was not forced since the squadrons manpower document clearly identifies those personnel assigned specifically for the T-2 program. The 3 pilots were removed based on the average amount of flying each pilot performs in one year and applying this average to the 6000 hour T-2 flight program.

We now have a Reserve and Active unit who fly approximately 4000 hours, maintain the same number and type of aircraft, and perform approximately the same mission.

A secondary reason for selecting these two units is that units with support missions who are based within the continental United States (CONUS) should be primary targets for Reserve force integration. Although the Fiscal Year 1985 report to Congress on proposals deemed inappropriate for transfer to the Reserves, identified VC squadrons as not being practical for further integration because of the overseas location of the remaining Active VC squadrons, it appeared to ignore the closeness in structure and mission of Active adversary squadrons to the current VC operations. [1]

III. COST MODEL

A. METHODOLOGY

The Center for Naval Analysis (CNA), located in Alexandria, Virginia, is an organization which employs analysts and researchers to do various studies for the United States Navy. Since 1983, it has published numerous documents relating to many of the cost differences between Active and Reserve forces. In May 1985, CNA published a memorandum that established both a methodology and specific cost factors for evaluating personnel cost differentials between Active and Reserve forces. [9]

The Center for Naval Analysis separated personnel costs into two major categories of direct and indirect costs. CNA then established per capital cost factors in the following manner:

Aggregate cost factors are developed for Officers and Enlisted personnel rather than for individual pay grades. Aggregating this way simplifies the analytical task without sacrificing accuracy. (Several test cases were tried in which personnel costs were estimated first using the aggregate factors and then by individual pay grades. The differences were no greater than 8 percent, justifying the use of aggregate factors.) In general, the aggregate cost factors are developed by dividing the costs displayed in the budget justifications found in (1) and (2) by the appropriate average personnel strengths for the specific categories, also displayed in (1) and (2). [9:2]

(1) and (2) refer to Department of the Navy Budget justification documents on both Active and Reserve manpower costs.

Although CNA had qualified its use of aggregate figures, there remained some question as to the validity of this statement. In a telephone conversation with one of the CNA analysts, it was learned that additional actual data on Reserve personnel costs would be beneficial to refining future cost factors. Consequently, this cost comparison will include any actual cost data that are available.

While studying the Center for Naval Analysis documents on costing methodology, several references to similar Rand studies were noted. To broaden the possible perspective on estimating costs, a Rand study comparing costs between Reserve and Active C-141 squadrons was reviewed. [3] Based on this study and several other Rand Notes, there appeared to be no major differences between the costing approach of either organization. One area that showed the same methodology but significantly different cost factors was the replacement training cost category. This issue is addressed later in this cost study. The similarity of all cost studies reviewed plus the general acceptance of the CNA methodology and standards by the Department of the Navy, made CNA the logical choice to model this cost study after.

B. DIRECT COSTS

Direct Costs include the following:

- 1) Pay and Allowances
- 2) Flight Pay

3) Other Direct Personnel Costs

4) Retirement Costs

A brief description of each cost subcategory including tables depicting per annum cost totals follows:

1. Pay and Allowances

This is an accumulation of all annual costs associated with the basic performance of an individual's duties. By basic we mean extraneous of incentives, bonuses, and indirect costs. It is analagous to the basic wage rate of a factory worker or salary of a sales manager without sales incentives or bonuses. The average figures for each cost factor are:

TABLE 1

PAY AND ALLOWANCES [9]

	<u>Officer</u>	<u>Enlisted</u>
Active	\$37,506	\$17,150
TAR	47,098	17,999
SELRES	5,874	2,133

2. Flight Pay

This allowance is regarded as an incentive or special pay for those individuals who are aviation qualified and who have met specific physical and performance criteria. The average figures for this cost factor are:

TABLE 2
FLIGHT PAY [9]

	<u>Officer</u>	<u>Enlisted</u>
Active	\$3,639	\$1,279
TAR	N/A	N/A
SELRES	822	207

3. Other Direct Costs

These costs include travel costs associated with permanent change of duty station for Active and TAR personnel. For SELRES the costs are associated with travel in performance of Active Duty for Training (ACDUTRA), clothing, and subsistence allowances. These costs are summarized in Table 3.

TABLE 3
OTHER DIRECT COSTS [9]

	<u>Officer</u>	<u>Enlisted</u>
Active	\$2,315	\$ 907
TAR	2,117	2,657
SELRES	871	661

4. Retirement

This cost is the annual cash accrual required to make the retirement system fully funded. Appropriate actuarial tables were used and the rates for Active and TAR personnel were calculated at 52% of basic pay. Projections for SELRES personnel were calculated at 7.8% of pay and allowances. The lower rate for SELRES was attributed to the delay between

completing the minimum retirement requirements and the time when Reservists can start drawing their pay.

"Military personnel on active duty can retire after 20 years of service with pensions that begin immediately, whereas the pensions of reservists do not begin until they reach age 60. During this interim period between retirement and age 60, the implied Reservist annuity fund would increase in value because of cumulative interest, thereby reducing the required annual per capita contribution during the years of military service." [3:13]

Table 4 illustrates the cost figures for this factor.

TABLE 4
RETIREMENT [9]

	<u>Officer</u>	<u>Enlisted</u>
Active	\$13,942	\$5,826
TAR	12,669	4,680
SELRES	458	164

C. INDIRECT COSTS

The second major cost category is Indirect Costs and the following costs are included in this category:

- 1) Medical and Welfare
- 2) Base Operations
- 3) Replacement Training

While direct costs are relatively easy to identify and assign dollar values, Indirect Costs become more intangible and more open for variances between costing models. This can be attributed to the fact that most direct costs accrue due to individual services performed. This is not so for the Indirect Costs.

These costs require the analyst to attempt an estimate of benefits such as "how much does one individual benefit from the medical, dental, or general base services?" To simplify the Center for Naval Analysis calculated per annum costs by taking the aggregate budgets in each benefit area and dividing them by the force strength. Since some budgets did not distinguish between Officer and Enlisted, a single figure for average cost per person was calculated for Medical and Welfare costs for Active and TAR personnel. It amounted to \$954 per person. SELRES costs for Death Gratuities and Hospitalization were calculated at \$17 for Officers and \$9 for Enlisted.

Base Operating Support Costs include costs of all general support functions that contribute to the welfare of the unit and its personnel. Examples are laundry facilities, cafeteria, transportation, and administrative and acquisition costs. Table 5 shows the resulting Center for Naval Analysis per capita costs.

TABLE 5
BASE OPERATING SUPPORT COSTS [9]

Active	\$8,923
TAR	8,923
SELRES	1,233

Replacement cost is the last subcategory addressed under indirect costs. This cost represents the cost of initial acquisition and training. Pilot training is a good example

of this cost. A summary of replacement training costs is provided in Table 6.

TABLE 6

REPLACEMENT TRAINING [9]

<u>Active and TAR</u>	<u>Officer</u>	<u>Enlisted</u>
Pilot	\$77,080	\$ -
Naval Flight Officer	22,550	-
Other Aviation	5,740	6,029
Non Aviation	6,560	6,029
<u>SELRES</u>		
Pilots	\$49,820	\$ -
Naval Flight Officer	14,575	-
Other Aviation	3,710	1,920
Non Aviation	4,240	1,920

IV. DATA PRESENTATION AND ANALYSIS

A. INTRODUCTION

Chapter IV will describe the basis for collecting the personnel manning figures. Once establishing a data base, the average cost figures from Chapter III will be applied and costing information will be depicted in table format. Each cost subcategory will be discussed as they are presented, with emphasis on cost differentials. When results conflict with information obtaining during the research phase, these conflicts will be analyzed and alternative measures will be presented.

B. DATA COLLECTION

1. VF-126

The average cost figures identified in Chapter III requires personnel manning totals to complete the cost assignment process. The Navy's Squadron Manpower Requirements Program documents manpower requirements for aviation squadrons. These requirements are then promulgated through instructions called Squadron Manpower Documents (SQMD). Manpower totals within the SQMD are for full funding conditions and represent a unit's required manning levels during wartime conditions. Since full funding levels are seldom provided a second document called Manpower Authorization Instruction (OPNAV 100 / 2) is published. The Manpower Authorization Instructions provides the basis for manning levels of less than full funding through

a Billets Authorized column. This column identifies authorized manning levels by billet type. [10]

VF-126's Manpower Authorization Instruction was obtained from the Commander Fighter Airborne Early Warning Wing Pacific (COMFITAEPAC) manpower shop. Staff personnel indicated that although at any specific point in time there would likely be some variance between actual squadron manning levels and the Manpower Authorization Instruction, the Billets Authorized column would best approximate the actual manning levels over extended periods. Consequently, the billets authorized totals were used as the basis for computing VF-126's costs.

2. VC-13

Since all aviation squadrons have a Manpower Authorization Instruction, a visit to VC-13 provided the needed document. During this visit, two additional computerized forms which document actual costs were obtained. The first form is called the Naval Reserve Drill Pay Statement and it is produced by the Naval Finance Center in Cleveland, Ohio. [11] The Drill Pay Statement lists the total number of Drills, both Regular and Additional, that each individual performs each month. Cumulative totals by fiscal year are also shown and these totals provided the basis for calculating the Actual drill costs. The second form, titled the Unit Profile Report, provided cumulative totals of the Active Duty for Training that each Reservist performed during the fiscal year. [12]

C. PAY AND ALLOWANCES

Costs for the Pay and Allowance category utilize the average costs figures developed in Chapter III and the manpower figures taken from both squadron's Manpower Authorization Instructions. In this section, and all future sections, the category column will refer to Active and SELRES. Again, Active refers to personnel who work fulltime at their military duties and SELRES refers to the part time (Reservist) personnel. Table 7 and 8 provide the basic numbers and cost totals for this cost category.

TABLE 7

VF-126 PAY AND ALLOWANCES

<u>Category</u>	<u>No.</u>	<u>Avg. Cost (\$)</u>	<u>Total (\$)</u>
Officer	24	37,506	900,144
Enlisted	175	17,150	3,001,250
		Total	\$3,901,394

TABLE 8

VC-13 PAY AND ALLOWANCES

<u>Category</u>	<u>No.</u>	<u>Avg. Cost (\$)</u>	<u>Total (\$)</u>
TAR Officer	6	47,098	282,588
SELRES Officer	25	5,874	146,850
TAR Enlisted	97	17,999	1,745,903
SELRES Enlisted	126	2,133	268,758
		Total	\$2,444,099

The cost differential between VF-126 and VC-13 amounts to \$1,457,295 and represents a 37% cost savings. The cost savings

is partially inflated because there is an extra cost that has yet to be included. VC-13 is required to provide services equivalent to an Active duty squadron's output. The squadron meets this demand through increased SELRES participation. While not addressed in the Center for Naval Analysis description of personnel costs, the cost category labeled Additional Drills is delineated in a follow on costing analysis. [2]

In the Additional Drill cost category there is a difference between the VC-13 SELRES Officers and the VC-885 SELRES Officers. Since VC-13 Officers are authorized 72 Additional Drills while VC-885 Officers are only authorized 42 Additional Drills, separate cost computations are required. The Enlisted SELRES from both units are authorized 12 Additional Drills thus eliminating the need to compute costs separately. [13]

Additional Drill costs are computed as a percentage of the average base pay and allowance figure. The average base pay and allowance rate is calculated using 48 Regular Drills plus 14 days active duty as a base. To calculate the rate for Additional Drills a simple ratio of the number of Additional Drills to Regular Drills plus active duty days is used (ie. $72/[48 + 14]$). For VC-13 Officers this ratio is 1.16 and for the VC-885 Officers the ratio is .68. The ratio for all Enlisted is .2. Cost for Additional Drills are listed in Table 9. [2]

TABLE 9

ADDITIONAL DRILLS

<u>Category</u>	<u>No.</u>	<u>Factor</u>	<u>Base (\$)</u>	<u>Total (\$)</u>
VC-13 Rated Officer	12	1.16	70,488	81,766
VC-885 Rated Officer	10	.68	58,740	39,943
Officer (Nonrated)	3	.2	17,622	3,524
Enlisted (Nonrated)	126	.2	268,758	53,751

D. FLIGHT PAY

Active and Reserve pilots who are required to perform duties involving flying are awarded special pay for their services. Table 10 depicts these costs. Since Reserve pilots draw flight pay during all duty, the Additional Drill factors used previously must again be added to the calculations. This results in factors of 2.16 and 1.68 for VC-13 and VC-885 SELRES pilots.

TABLE 10

FLIGHT PAY

<u>VF-126</u>	<u>No.</u>	<u>Rate (\$)</u>	<u>Factor</u>	<u>Total (\$)</u>
Pilots	24	3639		87,336
<u>VC-13</u>				
TAR Pilots	6	3639		21,834
VC-13 SELRES Pilots	12	822	2.16	21,306
VC-885 SELRES Pilots	10	822	1.68	13,809
			Total	\$56,949

The initial cost comparison shows a cost differential of \$30,387 or approximately a 35% cost savings.

The use of average costs can distort results when the assumption of nearly uniform cost distribution is not justified. Active duty flight pay costs fall into this category. Beginning in 1981, Congress authorized an additional special pay for aviators called the pilot bonus. Congress, along with the Navy, was responding to a severe drain on the pilot supply by the civilian airline industry. The greatest drain was in the group of aviators who had completed their initial obligation for service but had not yet had the time invested towards retirement that would deter them from leaving the Navy. Pilot bonuses are limited to aviators who fall within this group. The bonus amounts to \$6000 per year for up to six years. The net increase to aviators accepting the bonus amounts to \$4872 because the normal flight pay is reduced by \$94 per month when the bonus is awarded. [14] Each pilot who accepts the bonus incurs an obligation to perform additional years of service. When civilian airline positions are available or projected to be available, this obligation causes many pilots to reject or delay accepting the bonus. Information provided by OP-130 indicates that approximately 39 percent of those eligible accept the bonus. [15] SELRES pilots are not eligible for the bonus.

Based on the above information, the \$3639 average flight pay cost used in Table 10 should be adjusted by a factor of .39 times \$4872 or \$1900.

Substituting the adjusted flight pay cost of \$5539 into Table 10, the cost differential between VF-126 and VC-13 becomes \$75,387 or a 87% cost savings.

E. RETIREMENT/OTHER DIRECT COSTS

Retirement costs are presently being reviewed in the Federal Government. In the past, the same retirement factors have been used to establish both Active and Reserve costs. The present factors do recognize actuarial differences in assigning these costs. One point that still remains unanswered is whether the retirement factors are attempting to account for current retirement costs or whether they are also recouping past unfunded retirement costs. Due to unfunded past costs, any retirement cost factors developed to provide for a fully funded retirement system would have to be higher than those that represent only current retirement costs. Since there is a considerable cost differential between Active and Reserve retirement costs, it is important to consider only present costs when evaluating savings that occur from a shift in Active and Reserve force mix. The presently accepted retirement factors produce costs shown in Table 11.

TABLE 11

RETIREMENT

<u>VF-126</u>	<u>No.</u>	<u>Avg. Cost (\$)</u>	<u>Total (\$)</u>
Officer	24	13,942	334,608
Enlisted	175	5,826	1,019,550

<u>VC-13</u>	<u>No.</u>	<u>Avg. Cost(\$)</u>	<u>Total(\$)</u>
TAR Officer	6	12,669	76,014
TAR Enlisted	97	4,680	453,960
SELRES Officer	25	458	11,450
SELRES Enlisted	126	164	20,664

Other Direct Costs - Table 12 illustrated these costs.

TABLE 12
OTHER DIRECT COSTS

<u>VF-126</u>	<u>No.</u>	<u>Avg. Cost(\$)</u>	<u>Total(\$)</u>
Officer	24	2,315	55,560
Enlisted	175	907	158,725

<u>VC-13</u>	<u>No.</u>	<u>Avg. Cost(\$)</u>	<u>Total(\$)</u>
TAR Officer	6	2,117	12,702
TAR Enlisted	97	2,657	257,729
SELRES Officer	25	871	21,775
SELRES Enlisted	126	661	83,286

F. REPLACEMENT COSTS

Replacement costs make up a large proportion of the total costs differential. What may appear to be small variations in costing methods, can ultimately result in significantly high changes in cost differentials. A comparison of the Center for Naval Analysis costing method with a cost study conducted on Air Force C-141 squadrons revealed significant differences in the assignment of pilot training costs. The Center for Naval Analysis costing method assigns Reserve pilot training costs, equal to 65 percent of Active duty pilot training cost, while the Rand Corporation Study assigns Reserve Pilot training

costs equal to 33 percent of Active costs. [3] This difference prompted further investigation into the replacement cost estimates.

The Center for Naval Analysis costing method utilizes the following formulas for determining replacement costs.

$$RC = TOR [NPS (AC_{nps} + TC) + (1-NPS)AC_{ps}] \text{ where: } [8]$$

RC = replacement costs

TOR = turnover rate

AC = acquisition or recruiting factor

NPS = percent of replacement with no prior service

TC = training cost factor

The acquisition and training cost factors used by CNA were obtained from Reference [16]. This cost was \$940,000 per pilot and represents the cost of (AC_{nps}+TC). Personnel turnover rates were obtained by CNA from Reference [17]. Turnover rates for Active and SELRES were 8.2% and 25.2% respectfully. The percent NPS was 100 percent for Active and 20.9 percent for SELRES. At this point, CNA applied the numbers to the formula in the following manner:

$$\text{Active Pilots: } RC = .082 [1(940,000) + (1-1)0] = 77,080$$

$$\text{SELRES Pilots: } RC = .252 [.209(940,000) + (1-.701)0] = 49,820$$

Based on the writer's close association with the Active and Reserve pilot communities, the turnover ratios and NPS figures seemed questionable.

Several sections of the Chief of Naval Operations staff were interviewed concerning pilot turnover rates. Trying to obtain a turnover rate that could be related to replacement

costs proved to be extremely complicated. Each section tracked a different aspect of pilot turnover. Even within the same section there was discussion as to what was the best method for determining this figure. The Chief of Naval Operations Retention section provided data that showed pilot turnover rates ranged from a high of 12.6 percent in FY78 to a low of 5.8 percent in FY84. [18] These rates reflected the turnover rates from the entire aviator population regardless of years of service.

A review of VF-126' Manpower Authorization document showed that out of the 23 pilots being evaluated, approximately 20 of these pilots are designated to be of the grade of Lieutenant. The normal time in service for this grade ranges between three and 10 years. As mentioned in the previous section on flight pay, this is the same group that has historically shown the highest turnover rate. The use of an average turnover rate for an entire population seems inappropriate if that rate is applied to a smaller population who historically exhibits a much higher rate.

OP-130 provided additional data that appears to resolve this dilemma. Although the data were qualified as being only close approximations, it seemed more in line with the historical trend. By tracking a group of 100 Naval aviators from the completion of pilot training to year nine of service, and approximate turnover rate of 13 percent was calculated. [15]

The percentage of NPS SELRES who are aviators was estimated at 20.9 percent which is the average for the Reserve Officer Corp. In a telephone conversation with CNAVRES, it was learned that there are no NPS pilots serving in the Reserves. This is one instance when utilizing average figures results in a significant variation from more specific cost estimates. A revised cost estimate utilizing the new turnover and NPS factors follows:

$$\text{Active Pilots: RC} = .13[1(940,000) + (1-1)0] = 122,200$$

$$\text{SELRES Pilots: RC} = .252[0(940,000) + (1-0)0] = 0$$

The new ratio of Active to SELRES pilot replacement costs shows SELRES costs equal to 0 percent (0/122,200) of Active costs. While this too differs from the Rand estimate of 33 percent, we find that the Air Force does train pilots for direct entry into their Reserve forces structure. [3] This factor accounts for higher replacement costs assigned to Reserve pilots in the Air Force.

Replacement training cost tables utilizing both CNA figures and revised figures are provided in Table 13 and 14.

TABLE 13 (VF-126 REPLACEMENT COSTS)

<u>Category</u>	<u>No.</u>	<u>Avg. Cost(\$)</u>	<u>Total(\$)</u>
Rated Officer	24	77,080	1,849,920
Officer	1	5,740	5,740
Enlisted	175	6,029	1,055,075
		Total	\$2,910,735

(REVISED)

<u>Category</u>	<u>No.</u>	<u>Avg. Cost(\$)</u>	<u>Total(\$)</u>
Rated Officer	24	122,200	2,932,800
Officer	1	5,740	5,740
Enlisted	175	6,029	1,055,075
		Total	\$3,993,616

TABLE 14 (VC-13 REPLACEMENT COSTS)

<u>Category</u>	<u>No.</u>	<u>Avg. Cost(\$)</u>	<u>Total(\$)</u>
Rated TAR Officer	6	77,080	462,480
TAR Enlisted	97	5,740	556,780
Rated SELRES Officer	24	49,820	1,195,680
SELRES Officer	1	3,710	3,710
SELRES Enlisted	126	3,710	467,460
		Total	\$2,686,110

(REVISED)

Rated TAR Officer	6	77,080	462,480
TAR Enlisted	97	5,740	556,780
Rated SELRES Officer	24	0	0
SELRES Officer	1	3,710	3,710
SELRES Enlisted	126	3,710	467,460
		Total	\$1,490,430

G. MEDICAL AND WELFARE/BASE OPERATING COSTS

These two costs subcategories complete the cost model developed by the Center for Naval Analysis. Table 15 provides a summary of VF-126's costs and Table 16 shows VC-13's costs.

TABLE 15

<u>VF-126</u>	<u>MEDICAL AND WELFARE</u>		
<u>Category</u>	<u>No.</u>	<u>Avg. Cost(\$)</u>	<u>Total(\$)</u>
Officer	24	954	22,896
Enlisted	175	954	166,950
		Total	\$189,846

BASE OPERATING SUPPORT COSTS

Officer	24	8,923	214,152
Enlisted	175	8,923	1,561,525
		Total	\$1,775,677

TABLE 16

<u>VC-13</u>	<u>MEDICAL AND WELFARE</u>		
<u>Category</u>	<u>No.</u>	<u>Avg. Cost(\$)</u>	<u>Total(\$)</u>
TAR Officer	6	954	5,724
TAR Enlisted	97	954	92,538
SELRES Officer	25	17	425
SELRES Enlisted	126	17	2,142
		Total	\$100,829

BASE OPERATING SUPPORT COSTS

TAR Officer	6	8,923	53,538
TAR Enlisted	97	8,923	865,531
SELRES Officer	25	1,278	31,950
SELRES Enlisted	126	1,278	161,028
		Total	\$1,112,047

H. TOTAL COST DIFFERENTIAL

The combined cost differentials of Section B through G total 4.1 million dollars. This implies a 39 percent cost savings should VF-126 be converted to a Reserve Unit. The identification of a potential cost savings is but one step in the actual chain of events that lead to the realization of that savings. Evaluating all the steps and considerations that must precede such a change is beyond the scope of this thesis. However, to merely identify the cost differential does not do justice to the collected data.

Before reviewing the additional data, a familiarity with the relative magnitudes of various segments of the potential cost savings must be acquired. To begin, we will isolate the cost differentials according to Enlisted and Officer categories. Table 17 itemizes these costs and provides cost differentials.

TABLE 17

	OFFICER (TOTAL COST)		
	<u>VF-126</u>	<u>VC-13</u>	<u>Differential</u>
Active Officer	\$3,470,356	\$914,880	
SELRES Officer		376,508	
Total	\$3,470,356	\$1,291,388	\$2,178,968

	ENLISTED (TOTAL COST)		
	<u>VF-126</u>	<u>VC-13</u>	Differential
Active Enlisted	\$6,963,075	\$3,972,441	
SELRES Enlisted		1,057,089	
Total	\$6,963,075	\$5,029,530	\$1,933,545
	Total Cost Savings		\$4,112,513

As we can see from Table 17, the largest cost differential belongs to the Officer category. What makes this important from an economic viewpoint is the small number of personnel changes required to realize this savings. The Enlisted population involves many more people and results in a smaller, though still significant, cost savings.

The next step to evaluating the significance of these numbers was to obtain information relevant to the availability of Reserve personnel in the San Diego area. The large per capita cost savings associated with the substitution of Reserve pilots for Active pilots merited special emphasis. Several visits to the Naval Air Reserve Center provided the following facts. San Diego's recruiting program is one of the most successful programs within the Reserve Navy. However, there is also a high turnover rate within the Reserve Enlisted population. Consequently, many aviation units are manned at less than 100 percent of their authorized levels. Without large improvements in retention, any plan to supplement VF-126 with Reserve Enlisted personnel would adversely affect Reserve manning in already established units. [19]

Reserve pilot resources proved similar to the Reserve Enlisted situation with one noticeable exception. Data did indicate that several aviation units were undermanned in the pilot category. However, there was a large pool of aviators who were no longer flying, in any capacity, assigned to the Naval Air Reserve Center. Most of these pilots had served at one time or another in the very same units that now showed pilot vacancies. The pool of pilots was the direct result of a pay grade restriction which prohibits pilots who reach the pay grade of Ø-5 from serving in Reserve Units unless they are assigned to an Ø-5 billet. Since there are usually only two such billets per unit, many pilots find their flying careers ending around the 15 years of service time frame. Lacking the 2Ø years of service required for retirement, these pilots complete their remaining five years by drilling at various Reserve centers. Presently, there are 18 pilots who meet all the requirements to fly VC-13 or VF-126 aircraft but, because of this policy, are prohibited from doing so.

[19]

The relationship that this information has with the previously identified cost differentials can best be shown by answering the question, "What price are we paying by not utilizing these pilots?". To illustrate the significance of this question a theoretical cost comparison has been constructed. Suppose that we elect to use the pooled Reserve pilots to replace 1Ø VF-126 pilots. Since Reserve pilots

fly less hours per year than Active pilots, a greater than one to one trade-off must be made. Dividing VF-126's per capita flight time average (2000 hours) by the average per Reserve pilot (1300 hours) we get a trade-off ratio of approximately 1.5. Thus, it will take 15 Reserve pilots to replace the 10 Active duty pilots. Utilizing the Center for Naval Analysis costing method the cost of 10 Active pilots is \$1,443,590 and the cost for 15 Reserve pilots is \$256,310. The cost savings is \$1,187,280. Utilizing the alternative replacement cost figures resulting from a higher Active pilot turnover rate, the Active pilot cost is \$1,894,790. The answer to the theoretical question is that we are losing somewhere between \$1,187,280 and \$1,638,480 by not using these Reserve pilots.

I. ACTUAL COSTS VERSUS COMPUTED COSTS

After calculating the total cost differential, one question still cast an air of uneasiness over the results. One of the major reasons VC-13 was chosen for this cost comparison was that it was not a typical Reserve unit. Unlike most Reserve units whose activity levels are well below their Active counterparts, VC-13 activity level matches those of most Active squadrons. There is even consideration being given to increasing VC-13 flight hour program to 5000 hours per year. [19]

During the data collection phase, it became apparent that Reserve personnel within VC-13 were serving more time than

the Center for Naval Analysis costing method had used as a norm. Since the average cost figures were derived using force budget totals and normal Reserve participation requirements, there remained some doubt as to the accuracy of this costing approach. To resolve this issue, all available actual cost data was obtained from VC-13.

Section A described the documents that provided the source for pay and allowance plus flight pay actual costs. Efforts to recover actual cost data on the remaining cost categories proved to be fruitless. These costs are analagous to intangible costs in that there is no billing procedures or direct cost link between services rendered and cost assignment. Consideration was given to using specific budget totals like those for a medical facility or a base transportation department. However, the determination of a basis for cost assignment required too many assumptions.

In the areas where costs are not accumulated like pay and allowances, the Center for Naval Analysis' approach using aggregate budgets appears to limit cost basis assumptions to a single basic one. The basic assumption is that all individuals receive approximately an equal proportion of these services. Given that this investigation produced no local source documents, no cost accounting codes, or any local procedures that would enable one to determine actual costs on the individual level, the Center for Naval Analysis' approach seems reasonable. The actual cost comparison reduces down

to a comparison of pay and allowances and flight pay. Rates for individual drill pay, flight pay per drill, and ACDUTRA pay by the day were obtained from NOP-09R32. The first step was to calculate the costs for all drills performed by VC-13 personnel. Using drill data from the Naval Reserve Drill Pay Statement, SELRES Officers performed 2,490 drills and the cost total amounted to \$199,827. SELRES Enlisted performed 4,838 drills and their total cost was \$172,184. The next step was to calculate the Active duty cost for SELRES Officers and SELRES Enlisted. SELRES Officers performed 686 days of Active duty for a cost of \$74,787. The SELRES Enlisted performed 2,600 days of Active duty for a cost of \$127,426. The last actual cost was flight pay. Based on 3,080 total days of duty, SELRES pilots flight costs were \$40,625. For ease of comparison, Table 18 illustrates the actual cost totals versus the Center for Naval Analysis costing approach totals.

TABLE 18

SELRES ACTUAL VERSUS STANDARD COSTS

	<u>VC-13 Std. Formula</u>	<u>VC-13 Actual</u>
Officer	\$307,198	\$315,239
Enlisted	322,509	299,610

The rows marked Officer and Enlisted show actual costs versus the Center for Naval Analysis' computed costs. The

cost differentials result in a seven percent variation between the Enlisted costs and less than a three percent variation in the Officer costs. While only one example, this result reflects well on the accuracy of the Center for Naval Analysis method.

V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY

Chapter I stated that the objective of this research was to identify the cost differences between an Active duty support squadron and a similar Reserve support squadron. The interest in this cost area was generated by a growing public concern over increased defense spending and Congressional directives stressing the need to reduce costs through more efficient use of available Reserve Forces. Support units were chosen for this study because mobilization requirements, operational environment, and unit personnel structure were viewed as less restrictive to any full or partial implementation considerations.

Chapter II provided a brief introduction to the Reserve Forces with emphasis on defining the key personnel terms and Reserve participation requirements. Building on these new concepts, two aircraft squadrons with similar missions, size and operational environment were described. Chapter III laid the groundwork for the costing approach. Recent cost criteria and methods were reviewed and a framework for assessing the personnel costs of each organization was developed.

Chapter IV applied the costing methods and criteria from Chapter III to data obtained from several research trips. When individual results appeared to conflict with information

acquired during the research phase, explanations and alternative measures were introduced. Finally, an evaluation of the costing approach and an identification of high concentrations of cost savings were discussed.

B. CONCLUSION

Substantial cost savings that occur within mobilization type units (ie. Reserve fighter squadrons) are also present within Reserve aviation support units. This cost comparison identified a cost differential between VC-13 and VF-126 of approximately 4.1 million dollars per year. The cost differentials were almost equally divided between the Officer and Enlisted personnel groups. Information obtained during the research phase indicated that due to the current availability of personnel, the 2.1 million dollar cost differential in the Officer category appears to be the most likely area to achieve cost savings.

Unlike many units that obtain a cost savings through reduced operating tempo, aviation support units realize a cost savings while still providing the same basic service as their active counterpart.

When large training investments are recoverable through Reserve service, the cost savings increase dramatically. From a strictly monetary viewpoint, present policy regarding senior reserve Naval aviators precludes any recovery of these training costs.

Current costing methods overstate the replacement costs of Reserve Aviation Rated personnel while understating the replacement costs of Active Aviation personnel. The method identified in this cost comparison results in approximately a \$95,000 difference per pilot over the previous costing method.

C. SUMMARY OF RECOMMENDATIONS

1. Recommendation 1

CNA needs to review its cost factors in the area of flight pay and replacement costs. Attention to high concentrations of aviators who are drawing bonuses can cause the present CNA flight pay factor to almost double. General population turnover factors should not be used if more specific rates can be obtained. This is especially critical when computing costs which involve unusually high replacement costs. Until the Navy specifically trains pilots for SELRES billets, the Non Prior Service factor should remain 0 and SELRES pilot replacement costs should be treated as sunk costs.

2. Recommendation 2

An in-depth study to determine the feasibility of augmenting aviation support units with senior Reserve pilots should be conducted. Without abandoning the existing policy to seek the youngest, most experienced aviators, it seems plausible to incorporate a policy that is flexible enough to ensure full use of this valuable resource. Presently, the

only utilization of senior pilots is through a limited waiver policy. Policy goals should seek to recoup this extensive investment by continuing to fly Reserve pilots up to their retirement date or a point where they are no longer physically qualified to fly.

3. Recommendation 3

A study to identify other aviation organizations similar to the VC-13/VF-126 model should be conducted. Initially, all Active adversary support squadrons could be reviewed for possible augmentation by Reserve pilots.

GLOSSARY

ACTIVE- Military personnel who are employed full time by the United States Armed Forces.

TAR- Active Reserve personnel assigned to administer the Reserve program.

RATED- Personnel who qualify for aviation incentive pay.

SELRES- Selected Reservist - a member of the Ready Reserve in a drill pay status, works only part time for the Armed Forces.

VC-13- Fleet Composit Squadron 13, a Reserve Force Aviation Unit.

VC-126- Fighter Squadron 126, an Active Force Aviation Unit.

ACDUTRA- Active Duty for Training, also termed Annual Active Duty.

DRILL- One period of training.

SPECIAL ACDUTRA- ACDUTRA performed in excess of Annual ACDUTRA, usually granted to provide additional training.

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