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THESIS

**A METHODOLOGY TO IDENTIFY
AN IDEAL FORCE STRUCTURE
FOR NAVY PILOTS**

by

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March, 1995

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A METHODOLOGY TO IDENTIFY AN IDEAL FORCE STRUCTURE FOR NAVY PILOTS

by

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ABSTRACT

The purpose of this thesis was to develop a methodology that could assist manpower managers identify an "ideal" force structure for Navy pilots. This methodology uses billet authorizations for the pilot community and the pilots' "fair share" of general billet authorizations obtained from an officer programmed authorizations (OPA) summary document. A set of pilot requirements was determined by aggregating the various billet authorizations to be filled by pilots. Using historical pilot community continuation rates, a sustainable pilot distribution for each individual grade was determined. DOPMA-based promotion rates and promotion zones were then used to link the grades into a sustainable force structure. Finally, the "ideal" force structure was selected by choosing a force structure that best matched those requirements with total inventory for each grade, as well as in the aggregate. The "ideal" force structure can be used to identify overages and underages in current and future pilot inventory and assist manpower managers in working toward a balanced force structure.

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I. INTRODUCTION

With the end of the Cold War, the military has undergone not only a significant downsizing, but also a significant reorganization in an attempt to face the new challenges of the future. The result has been profound changes in not only the number of personnel in the military, but also in the skill "mix" required in the force. The manpower requirements for this future force are estimated during the manpower determination process. However, when the military downsized in the past, temporary personnel imbalances, both skill and grade, were created because some paygrades received a disproportionate share of the total personnel cuts. The same pattern held true for an expanding military. These imbalances can cause various problems that lead to an inefficient military, e.g. too many senior personnel result in higher personnel costs. This thesis focuses on designing a target force structure that allows manpower planners to program cuts so the force structure approaches a target force, while avoiding the personnel imbalances. Of course, whether the military is growing or shrinking, the manpower requirements used to describe the military's future manpower needs eventually will be reflected in the future force structure.

A. "IDEAL" FORCE STRUCTURE

Manpower requirements in the Navy Officer Corps are broken down into billet[1] requirements. These billets are aggregated by grade and billet designator. This thesis will identify the pilot manpower requirements by grade, by calculating the pilot communities' share of these billets.

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[1] A billet is a specific military manpower space which is assigned qualifiers that define the duties, tasks, and functions to be preformed and the specific skills and skill level required to perform them. Billet connotes military requirement; just as position connotes civilian requirement.

The pilot requirements in each grade are then distributed by years of service (YOS).

This thesis attempts to identify an "ideal" force structure for Navy pilots. This "ideal" force structure is a description of a pilot force structure which fulfills certain objectives. For the purpose of this thesis, these objectives are 1) the force structure must be achievable, 2) the force structure must satisfy the manpower billet requirements for both quality and quantity of personnel, 3) the force structure must be sustainable over time based on community continuation behavior, and 4) it must conform to the Defense Officer Personnel Management Act (DOPMA) guidelines for officer force structure.

The "ideal" force is a target force structure for a specific community. An "ideal" force structure would need to be constructed for each separate officer community, because of differences in continuation rates, billet requirements, career paths and specific Navy policies among communities. This thesis develops methodology to construct an "ideal" force structure for Navy pilots. While this force structure is applicable only to Navy pilots, the methodology should be transferable to other URL officer communities.

Because the "ideal" force structure incorporates historical continuation behavior, current force structure as well as future inventory projected based on historical behavior can both be compared to the "ideal" force. This way overages and underages may be computed in the current or future inventories. The "ideal" force structure will change as billet requirements, continuation behavior, and policies change. It can, however, be used as a target force and predictor.

It is highly unlikely the "ideal" force will ever be achieved because of the difficulty in changing a force structure that involves 30 years of personnel and 30 years of personnel decisions. For example, it may be impossible to increase the number of pilots with 15 YOS substantially in a matter of a few years. However, it might be possible to use policy to compensate for projected overages or underages. For example, offering bonus plans to induce higher continuation rates for projected shortages of personnel may be a way to affect such changes in a number of years.

B. THE PILOT COMMUNITY

The Navy's pilot community is comprised of three main sub-communities, namely jet, propeller, and helicopter. These sub-communities are further divided by aircraft type, e.g. EA-6B Prowler pilots. This thesis, however, considers the pilot community as a whole. While acknowledging that continuation behavior and policy may differ slightly among the different communities, these differences will be ignored for the purpose of this thesis. Because of this the different "mix" of pilots within the pilot community, e.g. the number of F-14 pilots in an "ideal" force, is not considered. Instead, the pilot community is considered homogenous and all pilots are considered interchangeable. The distribution of pilots among the various sub-communities is beyond the scope of this thesis, but might be an area for follow-on research.

1. Aviation Career Path

All Navy pilots share a common professional development path, as shown in Figure 1.1. It is important to stress that the career pattern depicted represents only a general aviation career progression. While it is true that the successful aviator will have completed most of these steps by the termination of a career, the order and timing is not universal.

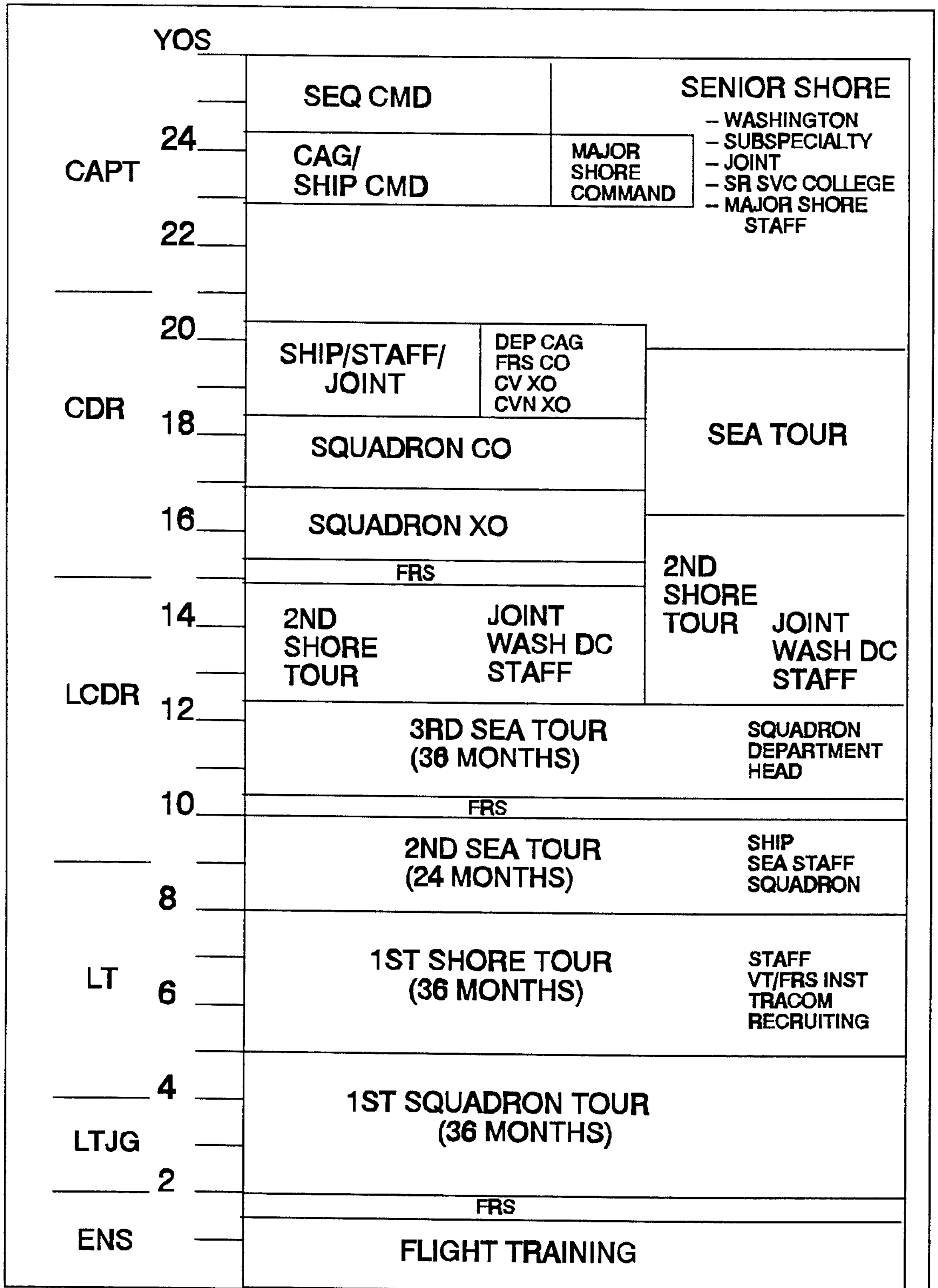

Figure 1.1 Aviation Officer (Typical) Professional Development Path

2. Minimum Service Requirement (MSR)

MSR is the period of time a pilot must remain on active duty before voluntarily leaving the service. All Navy pilots undergo a long required training period, lasting from one year to 18 months. On completion of training, all pilots incur an Active Duty Service Obligation (ADSO). The ADSO is a set period of time that pilots must remain on active duty after completing training. The initial training time plus the ADSO is the MSR. During the years when the data used in this thesis were collected all pilot leavers were under a five year ADSO, however current ADSO is seven years for helicopter pilots and eight years for the rest. A long MSR for pilots is evident in the high continuation rates up to six YOS.

3. Mid-Grade Retention Problems

The pilot community has been characterized by poor retention because pilots possess skills that are easily transferable and in demand in the civilian market. The pilot mid-grade shortfall was about 1100 in paygrades O-3/O-4 in FY1990 (House Armed Services Committee 1991, p 211). These pilot shortfalls must be compensated for by personnel from other officer communities or junior pilots. Because other communities are required to fill billets that should be filled by pilots, these other communities are being overmanned. Of course, the billets that can only be filled by pilots take first priority, so the shortfall is felt in general billets, a certain portion of which should be filled by pilots.

To correct the shortfall of mid-grade pilots, pilots are offered an Aviation Continuation Pay (ACP) bonus at the end of their MSR. The effect of the ACP bonus on pilot continuation behavior is beyond the scope of this thesis.

C. THESIS OBJECTIVE

The purpose of this thesis is to develop a methodology to identify an "ideal" force structure for the Navy pilot community. Based upon:

- Community-specific billet requirements
- The communities' "fair share" of general billets
- Community historical continuation behavior
- DOPMA force structure and promotion guidelines

A future force structure is then projected from the current force. Both of these force structures may be compared to the "ideal" force and predictions of future inventory overages and underages can be made. It is hoped that the methodology will be transferable to other officer communities.

II. BACKGROUND

In identifying an Ideal Force Structure (IFS) for Navy pilots we will need to determine exactly how many pilots the Navy requires to fulfill its mission. Thankfully, these requirements are already identified during the Navy manpower processes. The Navy manpower processes are a part of the Planning, Programming, and Budgeting System (PPBS), a twenty month cycle supporting the President's Budget submission to Congress. In delineating the IFS we will add other dimensions to these requirements in order to develop a viable force structure, but first it is important to understand how these requirements are determined.

Manpower requirements are determined for activities within the Navy based on a variety of required operational capabilities and the activities' projected operational environment. Manning levels vary with conditions. During peacetime manpower requirements will be lower than during wartime. It would be impractical to have excess manpower to fulfill capabilities that are not necessary for current conditions, reserves can be mobilized to augment activities when conditions warrant that action.

Throughout the PPBS cycle, manpower requirements face two major constraints, fiscal and end strength limits. The end result of these manpower processes are Manpower Authorizations (MPA), which are the requirements that have resources committed to them. Navy manpower managers use MPA for current and future military manpower planning in strength planning, personnel distribution, recruiting, promotions, etc.(OPNAVINST 1000.16H 1994)

Manpower Authorizations will play a key role in the development of an IFS for Navy pilots. Any discussion of this IFS would be incomplete without some understanding of the manpower authorization system and some explanation of its relevance to the Navy and its manpower managers.

The following sections provide an overview of the manpower determination processes, focusing on aviation manpower determination. For a more detailed discussion of the Navy's manpower processes, the reader should consult OPNAVINST 1000.16H.

A. AVIATION MANPOWER DETERMINATION PROCESS

Pilot manpower requirements evolve from a lengthy planning process that starts with a National Military Strategy developed by the Joint Chiefs of Staff (JCS), which describes the threat facing the United States and the forces necessary to counter that threat. With guidance from the Department of Defense (DoD), the Navy determines the resources necessary to carry out the Navy's mission. Through in-depth analysis and assessments, the adequacy of these resources is evaluated. The Secretary of the Navy (SECNAV) and Chief of Naval Operations (CNO) provide guidance to the resource sponsors[2] directing the allocation and utilization of their resources. ACNO for Air Warfare (N88) is the resource sponsor for Naval Aviation.

To determine the pilot requirements, Assistant Chief of Naval Operations (ACNO) for Air Warfare must determine the manpower requirements for aviation squadrons, afloat Aircraft Intermediate Maintenance Departments (AIMD), and Sea Operational Detachments (SEAOPDET). Manpower requirements are the minimum manpower resources necessary for an effective and efficient force capable of performing the missions assigned. These requirements are based upon conditions and readiness levels specified in each Naval activity's Required Operational

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[2]Resource Sponsor-OPNAV Principal official responsible for an identifiable aggregation of resources which constitute inputs to warfare and supporting tasks. The span of responsibility includes interrelated programs or parts of programs located in several mission areas.

Capability (ROC) and Projected Operational Environment (POE) statements. Staffing standards guidance provided by the Navy Manpower Analysis Center (NAVMAC) are used to determine the quantity and quality of personnel needed to perform the tasks required at a specified level of workload volume. The end result is a credible (or justifiable) cost-effective requirements baseline to support the Planning, Programming and Budgeting System (PPBS).

ACNO for Air Warfare (N88) issues aviation ROC/POE statements. These documents provide manpower planners with a precise set of guidelines regarding mission and operational environment. For aviation squadrons, this includes types of missions, number and type of aircraft, utilization rates, length of flying and maintenance day, and other factors.

Shore based activities have a document called the Performance Work Statement (PWS) which identifies the work required to be accomplished and standards of performance required. Shore activities have greater flexibility in fulfilling requirements; they can substitute for military manpower with civilian and contractor personnel.

To determine aviation manpower requirements we must determine the quantity and quality of personnel necessary to man all facilities, both at sea and ashore that require aviation personnel. These requirements are identified in Squadron Manpower Documents (SQMDs) and Shore Manpower Documents (SHMDs). Additionally, some aviation personnel are required onboard ships in various assignments. These requirements are identified in Ship Manpower Documents (SMDs). The SQMDs, SHMDs, and SMDs specify the manpower resources necessary to satisfy the activities' ROC/POE statements. The following sections examine how manpower is determined for SQMDs, SHMDs, and SMDs, and how these requirements are aggregated into manpower authorizations (MPA).

1. Squadron Manpower Documents

Squadron manpower documents are prepared for all aviation squadrons based upon their ROC/POE. The Navy Manpower Analysis Center (NAVMAC) develops SQMDs using industrial engineering survey techniques, published staffing standards and models that translate workload volume into manpower needs. Identically equipped squadrons' SQMDs are published as "class documents," e.g. all five plane EA-6B squadrons have the same SQMD. Unique fleet squadrons, training squadrons and fleet readiness squadrons have individual SQMDs tailored to fit their ROC/POE statements. (OPNAVINST 1000.16H 1994)

Draft SQMDs prepared by NAVMAC are reviewed at various levels for accuracy and completeness. Squadron commanders, wing and type commanders and fleet commanders-in-chief review the SQMDs and monitor changes in the ROC and POE to assess the impact on manning requirements. ACNO for Air Warfare reviews the documents and passes them on to Deputy CNO (Manpower, Personnel and Training) for final review and approval. The approved SQMDs are published and are used to substantiate aviation manpower needs during the PPBS. These documents are reviewed tri-annually for changes that may affect requirements.

2. Shore Manning Documents

Manpower resources required for shore establishments are determined through the Efficiency Review (ER) process. Using industrial engineering and management analysis techniques, as well as prevailing management concepts, i.e., Total Quality Leadership, the ER process reviews and assesses workload in terms of an activity's mission and function. The activity's mission and standards of performance required are stated in a Performance Work Statement. (OPNAVINST 1000.16H 1994)

The ER process defines the minimum quantity, quality, and mix (military, civilian, or contractor) of manpower required to satisfy an activity's PWS. ER-based staffing standards, developed by NAVMAC, are used to relate manpower requirements to workload. Specific skills necessary to complete various workloads are identified. In this way the ER process ascertains the Most Efficient Organization (MEO) which utilizes the minimum quality and quantity of manpower resources for the work to be performed.

3. Other Aviation Requirements

Not all aviation manpower requirements can be accounted for in SQMDs and SHMDs. Aviation-specific billets are included in some ship's manning documents (SMDs). Aviation requirements for Aircraft Intermediate Maintenance Departments (AIMDs) and Sea Operational Detachments (SEAOPDETs) are also included in some SMDs.

Some aviation personnel may be required to fill billets not specifically designated for any warfare specialist, for example recruiting billets. Aviation personnel should reasonably fill their fair share of these general billets. This will be discussed in more detail in Chapter III.

4. Manpower Authorizations

Manpower requirements represent the total manpower required to fully satisfy the missions and functions of each Naval ship, squadron, and shore facility based upon their respective ROC/POE. However, not all requirements can be filled due to budgetary constraints imposed during the PPBS cycle, as shown in Figure 2.1. When required, Naval Reserve forces fill the shortfalls between manpower requirements and authorizations.

During the programming phase of the PPBS cycle, resource sponsors, such as ACNO Air Warfare, program their limited resources to best satisfy their manpower requirements. In addition, resource sponsors outline the quality of manpower required, i.e., officer or enlisted and rank or rate. DCNO, CNO, and SECNAV review the proposals from the resource sponsors and make changes. The end product of the programming

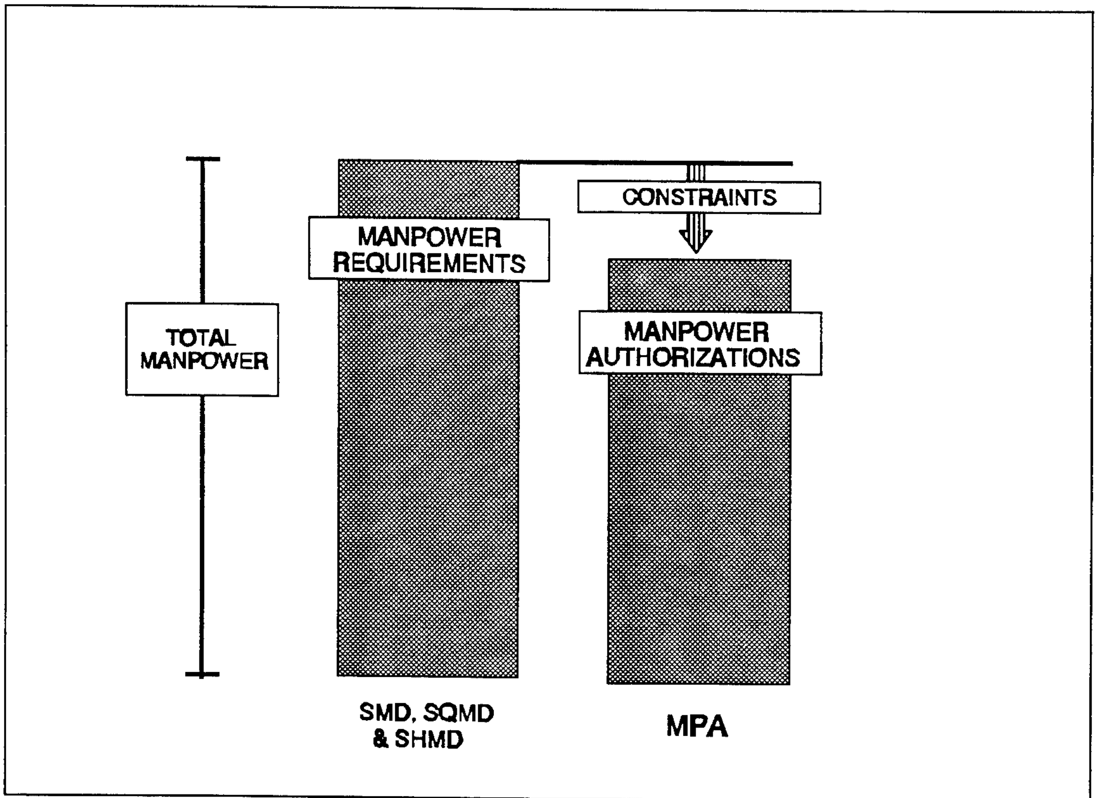

Figure 2.1 Manpower Requirements versus Manpower Authorizations

phase is the approved manpower end strength, Manpower authorizations (MPA).

Manpower authorizations are also reviewed for their impact on force structure during the programming phase of PPBS. Manpower managers assess a variety of force issues, including sea/shore rotation and manning levels, and make changes as necessary.

Manpower authorizations fluctuate periodically as the Navy Program Objectives Memorandum (POM) proceeds through the PPBS. Changes may come from within the Navy, from the DoD, or Congress. Changes occur for a variety of reasons such as a change in priority, budgetary reasons, changes in policy, etc. As changes occur that effect the Navy POM, MPA are revised accordingly.

The objective of maintaining an authorization system is the effective and efficient management of manpower, including strength planning and distribution of personnel. Manpower authorizations support the personnel management for the budget year and the six years beyond the budget year, as part of the Future Years Defense Program (FYDP). Military MPA are the basis for planning future military inventory and the placement of personnel inventory for the execution, or budget, year.

5. Total Force Manpower Management System

The Total Force Manpower Management System (TFMMS) is the central, authoritative data base for maintaining manpower authorizations both in quantitative and qualitative form (OPNAVINST 1000.16H 1994). TFMMS supports the PPBS by maintaining and updating authorization data.

The billet subsystem of TFMMS tracks billet authorizations, which are military end strength that is authorized, programmed, and budgeted. These billet authorizations include qualitative data, such as designator and paygrade. In fact, the billet subsystem of TFMMS is the only authoritative source for aggregations that include qualitative factors. (OPNAVINST 1000.16H 1994)

Manpower managers use the billet subsystem of TFMMS for personnel strength planning. By aggregating the programmed authorizations by designators and paygrades, skill and grade templates can be identified. For officers these summaries are called Officer Programmed Authorization (OPA) documents.

a. Officer Programmed Authorizations

Three times a year after each FYDP update, programmed authorizations are summarized by primary occupation (designator) and paygrades within that occupation. The officer programmed authorization is an aggregation of officer billet authorizations. The OPA provides a skill and grade template for strength planners. By selecting designators for the pilot community, we can examine the programmed authorizations for each paygrade within the pilot community. Table 2.1 shows an OPA prepared for designator 131X, Navy pilot. Appendix E contains the various OPA documents used in this analysis. Aggregations of authorizations for specific skills with a primary occupation, such as F-14 pilots, are also possible, but beyond the scope of this thesis.

GRADE	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97
CDR	488	465	444	437	436	435
LCDR	1324	1281	1225	1214	1213	1213
LT	3631	3546	3442	3418	3424	3412
LTJG	2024	1917	1799	1766	1769	1765
ENS	218	220	189	189	189	189
TOTAL	7685	7429	7099	7024	7031	7014

Table 2.1 Designator 131X Authorizations, Navy Pilot

The OPA serves as the benchmark inventory for the current year and future years to come. Strength planners use the OPA to plan accessions, promotions, losses, and training plans. Because the OPA incorporates six years of estimated manpower authorizations, it is the "best guess" for future manpower needs.

B. OPA AND THE IDEAL FORCE STRUCTURE

The OPA for Navy pilots will be used as a benchmark for the IFS. In describing an IFS for Navy pilots, it makes sense to use a tool that is readily available to manpower managers and that accurately reflects the emergent priorities of the Navy.

Because manpower requirements are not subject to fiscal and end strength constraints, they would not provide a practical baseline for the IFS. The OPA aggregates validated manpower requirements that are budgeted for and approved by the Department of the Navy and the DoD. Also, the authorizations that make up the OPA are continuously reviewed, updated and adjusted to reflect changes in policy and priorities.

III. METHODOLOGY

A. DETERMINING PILOT REQUIREMENTS BY GRADE

Officer programmed authorizations (OPA) are aggregations of officer requirements which describe manpower needs by designator, grade, and other specialties. These authorizations represent the funded billets for the execution (current) year and the "best guess" for future years. Authorizations are not identical to end strength, however. To calculate end strength, these billet authorizations must be divided among the various officer communities that can fill them.

1. Billet Authorizations available to Pilots

Some billet authorizations can only be filled by an officer with a specific designator, others by any officer within a range of several designators. The billet authorizations that may be filled by Navy pilots are described in the following sections.

a. Designator 139X Authorizations

The 139X authorizations are reserved for pilots in a training status. The minimum grade requirements are O-1 (Ensign). All entries into the pilot community must first enter into 139X billets.

b. Designator 131X Authorizations

Upon completion of pilot training, Navy pilots are designated 131X. Designator 131X authorizations are exclusive billets, only 131X designated personnel may fill these billets.

c. Designator 130X Authorizations

These authorizations require a qualified aviation warfare officer, either pilot (131X), NFO (132X), or aviation generalist (130X). All 130X authorizations are in grades O-3 (Lieutenant) and above. Also, all billet authorizations in grades O-6 and above requiring aviation qualified personnel must have the 130X designator.

d. Designator 1000 Authorizations

Designator 1000 authorizations do not require any specific warfare specialty, any unrestricted line (URL) officer may fill these billets. These billets allow manpower managers maximum flexibility in matching inventory with billets requirements. However, general URL (GenURL) officers[3] (1100 designated) are restricted to filling 1000 billet authorizations, and no others.

e. Designator 1050 Authorizations

Designator 1050 authorizations are billets, in grades O-3 and above, which require a qualified warfare specialist, but can be filled by any warfare specialty. These billets may be filled by aviators, surface warfare officers, or submariners.

2. Determining Pilot "Fair Share" of General Billets Authorized

In determining the pilots' "fair share" of these general billets a measure of the proportion of pilots to other officer communities is usually used (Terkhorn, 1993). This thesis calls these proportions **pilot factors**. These pilot factors measure the proportion of pilots of each group of officers eligible to fill a billet type. These pilot factors are used to determine the pilot community's "fair share" of the general billets. For pilots, the 1000, 1050, and 130X billets are general billets. The process for dividing these billets is different for each billet type and is described in the following sections. The data used to calculated these pilot factors can be seen in Appendix F.

[3] As of 01 January 1995, the GenURL community has been transitioned to the Restricted Line, Fleet Support (1700 Designator). However, the billet base has not yet been changed to reflect this action.

a. *Allocating 1000 Billet Authorizations*

(1) Billets below Grade O-3. Because pilots have a lengthy training period, it is assumed that pilots will be unavailable to fill any 1000 billets below the grade of O-3 due to the lengthy training time and the first sea tour requirements. So, the pilot's fair share of 1000 billets below grade O-3 is assumed to be zero.

(2) General Unrestricted Line Officers. GenURL officers are restricted to filling 1000 billets. Subtracting the GenURL inventory in a grade from the total 1000 billets in that grade yields the number of 1000 billets available to be filled by the three warfare officer communities.

(3) The Pilot-URL Factor. The Pilot-URL factor represents the pilot proportion of the URL community, not including GenURL officers. It is calculated for each grade, O-3 and above, using the following formula:

$$\underset{\textit{in PG}}{\textit{PILOT-URL FACTOR}} = \frac{131X \ \underset{\textit{in PG}}{\textit{Inventory}}}{\underset{\textit{in PG}}{\textit{URL Inventory}} - \underset{\textit{in PG}}{\textit{GenURL Inventory}}}$$

where PG = paygrade O-3 through paygrade O-6 **(3.1)**

The Pilot-URL factor is calculated using OPIS inventory data from 1975 to 1991. The factors are calculated for individual grades O-3 and above.

(4) Calculating "Fair Share" of 1000 Billet Authorizations. The following formula is used to calculate the pilots' "fair share" of 1000 billet authorizations in paygrade PG (O-3 through O-6):

$$\text{Pilot "Fair share" of 1000 Billets in PG} = \text{1000 Billets in PG} - \text{GenURL Inventory in PG} \times \text{Pilot-URL Factor for PG}$$

where PG = paygrade O-3 through paygrade O-6 **(3.2)**

b. Allocating 1050 Billet Authorizations

Designated 1050 billets can only be filled by qualified warfare specialists, not GenURLs. The Pilot-URL factor, since it excludes GenURLs, can be applied directly to the 1050 billets to calculate "fair share," by the following formula:

$$\text{Pilot "Fair share" of 1050 Billets in PG} = \text{1050 Billets in PG} \times \text{Pilot-URL Factor for PG}$$

where PG = paygrade O-3 through paygrade O-6 **(3.3)**

c. Allocating 130X Billet Authorizations

Any qualified aviation warfare officer can fill a 130X billet. "Fair share" is calculated by measuring the pilot proportion of the aviation warfare community, this proportion is called the Pilot-Aviation factor.

(1) The Pilot-Aviation Factor. The Pilot-Aviation factor is calculated from OPIS inventory data from 1975 through 1991. It is calculated for each grade, O-3 and above (there are no 130X billets below O-3) using the formula:

$$\text{Pilot-Aviation Factor for PG} = \frac{\text{Pilot Inventory for PG}}{\text{Total Aviation Inventory for PG}}$$

where PG = paygrade O-1 through paygrade O-6 **(3.4)**

(2) Pilot "Fair Share" of 130X Billets. Multiplying the number of 130X billets in grade PG by the Pilot-Aviation factor for grade PG yields the number of 130X billets that should be filled by pilots.

$$\begin{matrix}\textit{Pilot "Fairshare"} \\ \textit{of } 130X \textit{ Billets} \\ \textit{in PG}\end{matrix} = \begin{matrix}130X \textit{ Billets} \\ \textit{in PG}\end{matrix} \times \begin{matrix}\textit{Pilot-Aviation} \\ \textit{Factor for PG}\end{matrix}$$

where PG = paygrade O-3 through paygrade O-6 **(3.5)**

3. Determining Total Billets to be Filled by Pilots

The total billets to be filled by pilots is simply a summation of billets exclusive to pilots and the pilots' "fair share" of the various general billets. All these billets of different types are summed up by grade. For example, billets to be filled by pilots in grade O-3 are the sum of all 139X and 131X billets in grade O-3, plus the "fair share" of 130X, 1000, and 1050 billets. The results are shown in Figure 3.1 and Table 3.1.

GRADE/ BILLET	ENS O-1	LTJG O-2	LT O-3	LCDR O-4	CDR O-5	CAPT O-6	TOTAL
139X	1428	0	0	0	0	0	1428
131X	189	1799	3422	1225	444	0	7099
130X	0	0	567	455	617	260	1898
1050	0	0	75	89	117	194	387
1000	0	0	444	122	224	105	984
TOTAL	1617	1799	4528	1891	1402	558	11795

Table 3.1 Pilot Billets by Grade and Billet Type

B. DISTRIBUTION OF PILOTS IN THE "IDEAL" FORCE STRUCTURE

Once pilot billet requirements are determined by grade, the issue of how to fill these billets with pilots arises. Pilots of each grade come with various years of service as their time in grade increases since their last promotion. Since billet requirements do not specify how much experience

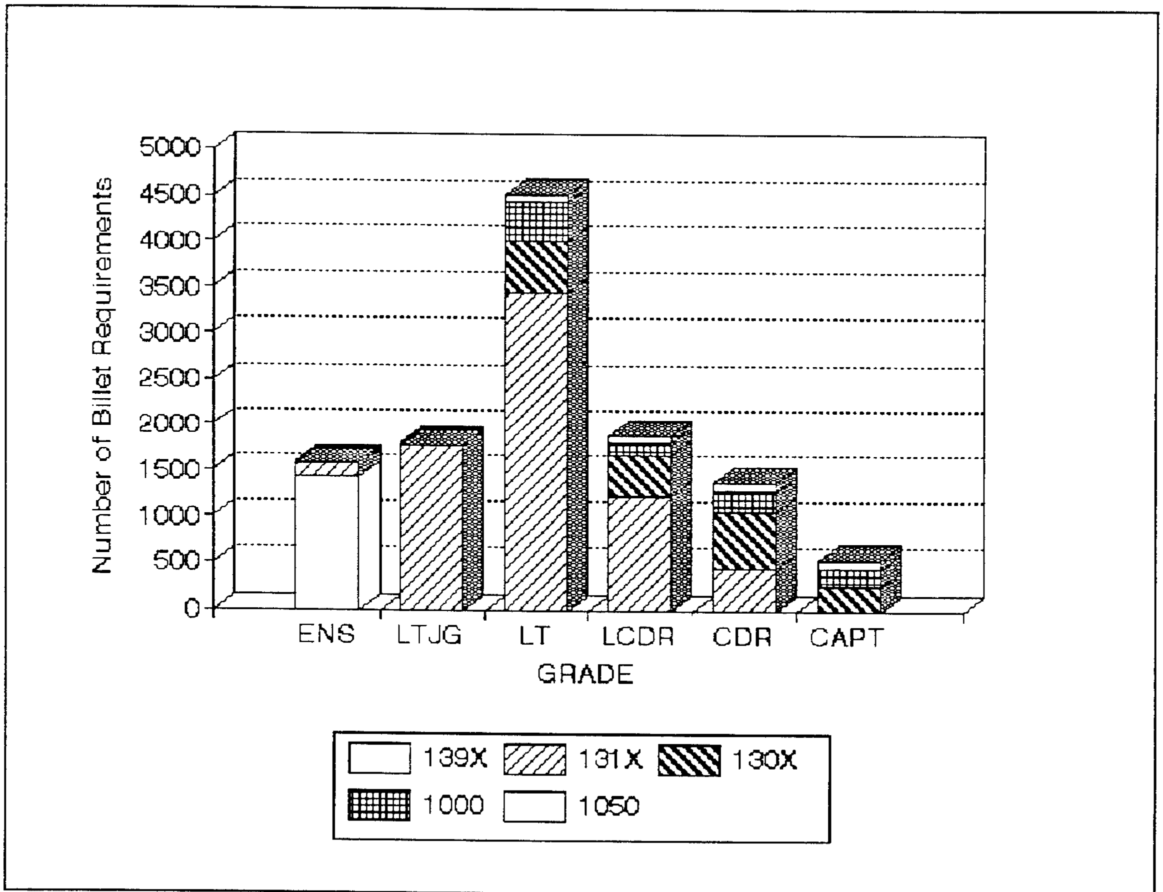

Figure 3.1 Pilot Requirements by Grade

the officer must have in his/her grade, an allocation of officers to billets in their grade should be made in a fashion that is sustainable over the years. This will be done using historical continuation rates.

The first item to observe in this respect is that in each grade there is a range of YOS's over which officers in that grade are distributed.

1. Defining a Range of YOS for Each Grade

Table 3.2 shows a sample pilot force structure by grade and YOS, the force structure was derived from an average of pilot inventory from 1985 through 1991. The inventory has been somewhat manipulated, to delete outliers in order to more clearly illustrate the unique range of YOSs relevant for each

YOS/PG	O-1	O-2	O-3	O-4	O-5	O-6	TOTAL
0	1070						1070
1	950						950
2		884					884
3		870					870
4			855				855
5			818				818
6			663				663
7			529				529
8			463				463
9			407				407
10			22	334			356
11			3	323			325
12				310			310
13				296			296
14				285			285
15				285			285
16				77	219		296
17				77	225		302
18				72	225		297
19				57	214		271
20				11	200		211
21					191		191
22					55	116	171
23					43	113	156
24					35	103	138
25					25	92	117
26					4	79	83
27						64	64
28						49	49
29						36	36
30						7	7
	1999	1888	3495	2155	1562	745	11844

Table 3.2 Sample Pilot Inventory

grade. For example, pilots in paygrade O-3 are found between 4 YOS and 11 YOS and nowhere else. In reality there are often some pilots outside this typical range of YOS, but it is reasonable to assume that in an "ideal" force these will not occur.

Table 3.3 shows the YOS range by grade over which personnel in each grade must be distributed. These ranges of YOS's were determined somewhat differently for each grade because of policy differences among grades. For all grades, the initial YOS of the grade's range of YOS is defined as the DOPMA promotion point into that grade (0 YOS for grade O-1, etc.). These DOPMA promotion points are also listed in Table 3.3.

For grades O-1 and O-2, the YOS range comprises two years, which corresponds to the DOPMA promotion points to the next higher grade. This results in the YOS ranges given for O-1 and O-2 shown in Table 3.3.

The range for grade O-3 is the period from promotion into grade O-3 (i.e. 4 YOS) to 11 YOS, which is one more than the DOPMA promotion point to O-4. The reason for the one YOS extension is that O-3s are allowed two opportunities (or looks) for promotion to O-4. If they fail to select for promotion twice they are involuntarily separated from the service.

Unlike O-3s, officers in grades O-4 and above may be allowed to continue on active duty after failing to select for promotion twice. To determine the range of YOS for grades O-4 and above, the time from promotion into the grade to the high year tenure (HYT) point for that grade is used. High year tenure for a grade is defined as the maximum YOS personnel within that grade may remain on active duty. For example, the O-4 range of YOS extends from 10 YOS to 20 YOS, the latter being the HYT for O-4s. These definitions in ranges for grades O-3 and above lead to YOS overlaps in these grades.

GRADE	DOPMA PROMOTION POINTS	YOS RANGE
0-1 ENS	0 YOS	0-1 YOS
O-2 LTJG	2 YOS	2-3 YOS
O-3 LT	4 YOS	4-11 YOS
O-4 LCDR	10 +/-1 YOS	9-20 YOS
O-5 CDR	16 +/-1 YOS	15-26 YOS
O-6 CAPT	22 +/-1 YOS	21-30 YOS

Table 3.3 Grade Range of YOS for the "Ideal" Force

2. Distribution of Officers within Each Grade

The next step is to find the best method of distributing pilots in each grade over the range of YOS given in Table 3.3. One possible way to distribute pilots would be to distribute them equally among the grade's range of YOS. Figure 3.2 shows a sample distribution of O-3 pilots using this method. The 4528 (from Table 3.1) pilot billets in grade O-3 are filled by pilots equally distributed over the eight YOS's in the O-3 range. This pilot distribution, however, would not be "ideal" because, while it satisfies billet requirements, the force structure created by this distribution would not be sustainable. Nor does it reflect the historical continuation behavior of the pilot community.

a. The Effect of Promotion on Pilot Continuation Rates

Historical pilot community continuation rates will be used to determine a sustainable distribution of personnel that satisfies the pilot billet requirements for each grade. Continuation rates usually measure the percentage of all personnel in a community at the beginning of a fiscal year who

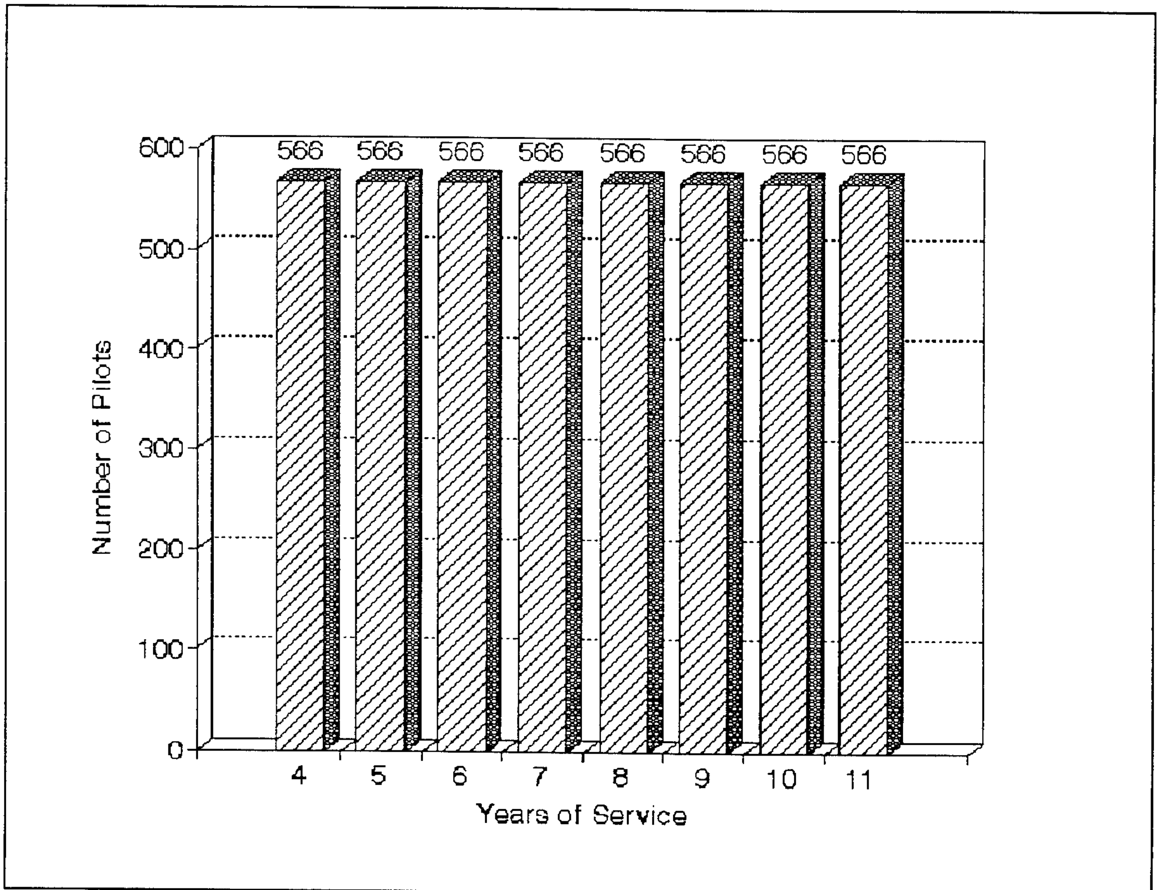

Figure 3.2 Sample Distribution of O-3 Pilots

are still in the community at the end of the fiscal year. Because the distribution of billet requirements is accomplished by grade it is preferable here to have continuation rates calculated by grade. Calculating continuation rates by grade is straightforward until we encounter grades with overlapping YOS ranges as in grades O-3 and above. These problems arise at points where some personnel (but not all who stay in the community) are promoted to the next higher grade.

For example, when computing continuation rates for personnel with 10 YOS one must do so separately for grade O-3 and grade O-4. If at 10 YOS, pilot inventory consists of 22 O-3 pilots and 334 O-4 pilots and the next year's inventory is three (3) O-3 pilots and 323 O-4 pilots of whom six have just been promoted to O-4, the continuation rate for 10 YOS and PG O-3 is calculated, as (3+6)/22 (.4091) and the continuation rate for 10 YOS and PG O-4 pilots is computed as (323-6)/334 (.9491). By including promotion data in the calculation of continuation rates, separate grade continuation rates can be calculated and personnel movement among grades can be distinguished from attrition.

b. The Effect of Lateral Transfers on Pilot Continuation Rates

Lateral transfers into and out of the pilot community affect continuation rates in a similar manner to promotion. Because this thesis is concerned solely with the pilot community, lateral transfers out of the pilot community are treated as losses. Lateral transfers from other officer communities into the pilot community can skew continuation rates higher, sometimes resulting in continuation rates which exceed 1.0, because laterals are not included in initial inventory, but are part of the ending inventory. In the pilot community lateral transfers generally occur from 0 YOS to 4 YOS. The number of lateral transfers is, however, generally small relative to inventory, so for the purpose of this thesis the effects of lateral transfers on continuation rates are assumed to be negligible and will be generally ignored except as explained in section c. below.

c. Calculating Pilot Continuation Rates

Pilot continuation rates are calculated using OPIS inventory and promotion data. Although OPIS data is available from FY1975, only data from FY1990 through FY1993 were used. Inventory data are presented in Appendix A. It was considered inappropriate to make use of older data when estimating continuation of current and future pilot personnel. The inventory data were aggregated by YOS and grade into two 31x6 matrices for FY1990 through FY1992, and for FY1991 through FY1993, respectively. Promotion data were also aggregated by

YOS and grade into two 31x6 matrices. Appendix B contains promotion data from these years. One matrix contained the aggregate number of promotees from O-1 through O-5 with a sixth column of zeros attached to represent promotions from O-6. In our system the real O-6 promotions to O-7 must be included with other losses, because O-7s are not part of our system. The second promotion matrix contained aggregate promotions to grades O-2 through O-6, with a column of zeros for grade O-1, representing "promotions" to O-1, attached.

Before continuation rates were calculated using these matrices, the matrices were somewhat manipulated to reflect each grade's relevant range of YOS and some outliers were shifted into an appropriate grade, or where necessary some inventory were deleted. For example, when O-5 inventory at 14 YOS was found to be 19 (as in FY 91), these 19 O-5s were added to the O-4 inventory with 14 YOS, since the O-5 range of YOS is 15 to 26. The promotion matrix was adjusted in a similar manner, except promotion data were shifted vertically at the DOPMA promotion points.

Some inventory data within the matrices were deleted. For example, the FY1991 through FY1993 aggregate inventory matrix had three YOS cells where the YOS cell inventory in a grade was greater than the previous YOS cell inventory in that grade in the aggregate inventory matrix FY1990 through FY1992, after accounting for promotions. In one instance, this may have been caused by lateral transfers into the pilot community. This was one instance where laterals were not ignored. For example, if some officers with 4 YOS laterally transfer to the pilot community in 1991, they were not included as part of the 1990 pilot inventory, and thereby the continuation rate for the pilot cohort with 3 YOS is skewed higher. Where these continuation rates exceeded 1.0, excess inventory, assumed to be the result of lateral transfers, was deleted to constrain the continuation rate to be 1.0. In this manner, the effect of lateral transfers is largely nullified. It is not possible to sustain a force structure where inventory in successive YOS increases resulting in continuation rates greater than 1.0. It is assumed that in an "ideal" force, the YOS inventory in a grade cannot be greater than the sum of the previous YOS inventory in that grade and promotions into that grade, minus promotions to the next higher grade.

Continuation rates were then calculated from the adjusted matrices using the following formula:

$$C(PG)_i = \frac{Inv_{i+1}(PG) - Pt_i(PG) + Pf_i(PG)}{Inv_i(PG)}$$

where,
$C(PG)_i$ = continuation rate in grade PG and i YOS
$Inv_i(PG)$ = inventory in grade PG and i YOS and
$Pt_i(PG)$ = promotion to grade PG in i YOS
$Pf_i(PG)$ = promotion from grade PG in i YOS
$i = 0,\ldots,n$
n = maximum YOS - minimum YOS for grade PG **(3.6)**

These continuation rates were computed for each grade O-1 to O-6 and YOS 0-30. The result is a 31x6 matrix of continuation rates shown in Appendix C.

3. Identifying Links between Grades

Using the historical continuation rates, we can develop a method of distributing pilots that is sustainable and which fulfills the billet requirements for each grade. The aim is that in the "ideal" force, the sum of each grade's YOS inventories should equal that grade's pilot billet requirements.

If we can compute the inventory in the initial YOS of a particular grade, we can construct the "ideal" force structure by applying each successive continuation rate to the previous YOS inventory. For example, if 1010 O-3s start a fiscal year at 4 YOS and the continuation rate for O-3s with 4 YOS is

0.9783, then the inventory at 5 YOS should be 985 (1010*0.9783). This process is repeated for each successive YOS until reaching the last YOS in a grade's relevant range of YOS. By setting the sum of the inventories for each YOS in a grade's YOS range equal to the grade's pilot billet requirements the following equation is valid:

$$PBR(PG) = N(PG) + N(PG)C_i + N(PG)C_iC_{i+1} + \ldots + N(PG)C_iC_{i+1}\ldots C_n$$

where,
PBR(PG)=Pilot Billet Requirements for grade PG
N(PG)=inventory of the initial YOS for PG
$C_i = C(PG)_i$ = grade specific continuation rate in YOS interval i for i = 0,..,n
n = max YOS - min YOS in PG **(3.7)**

Solving the equation for a grade's initial YOS inventory, N(PG), we get the following formula:

$$N(PG) = \frac{PBR(PG)}{1 + C_i + C_iC_{i+1} + \ldots + C_iC_{i+1}\ldots C_n}$$

(3.8)

In grades with large ranges of YOS the denominator of this formula is cumbersome to work with. Substituting a grade survivor function (G) in place of products of continuation rates allows us to simplify the equation:

Let $G_0 = 1$

$G_1 = C_1$

and $G_i = C_1 \ldots C_i$ for $2 \le i \le n$

where $C_i = C_i(PG)$ = grade specific continuation rate and

n = maximum YOS - minimum YOS in grade PG, so

$$N(PG) = \frac{PBR(PG)}{G_0 + G_1 + \ldots + G_n}$$

where,
PBR(PG)=Pilot billet requirements for grade PG
N(PG)=inventory of the initial YOS for grade PG
G_n=grade specific survivor rate to n YOS interval
n=maximum YOS - minimum YOS in grade PG **(3.9)**

This formula allows us to calculate the required initial pilot inventory in grade PG that will, based on historical pilot continuation behavior, satisfy the pilot billet requirements for grade PG.

Formula 3.9 is valid for grades O-1 and O-2 whose YOS ranges do not overlap with those of other grades. However, if a grade's YOS range overlaps with another, as for grades O-3, O-4, O-5 and O-6, this formula must be adjusted to account for promotion effects. At promotion flow points, continuation rates are computed including both personnel who are promoted and those not promoted. To calculate the personnel distribution at these flow points we must account for personnel who are promoted (i.e. leave the grade, but continue in the community). DOPMA promotion rates are shown in Table 3.4. For example, with 441 O-3s with 9 YOS, if their

GRADE	DOPMA PROMOTION OPPORTUNITY
O-1 (ENS)	-
O-2 (LTJG)	100%
O-3 (LT)	95%
O-4 (LCDR)	80%
O-5 (CDR)	70%
O-6 (CAPT)	50%

Table 3.4 DOPMA Promotion Opportunity by Grade

continuation rate is 0.8103, the number of pilots promoted to O-4 who continue should be 441*(0.8103*0.80) = **286**, using a 0.80 DOPMA promotion opportunity to O-4 from Table 3.4. Conversely, the number who are not promoted and continue should be 441*(0.8103*(1 - 0.80) = **71.** Applying promotion rates in this manner allows us to calculate the personnel distribution in grades with overlapping YOS ranges, using the formula:

$$N(PG) = \frac{PBR(PG)}{G_0 + G_1 + G_2 + \ldots + G_p(1-PR) + \ldots + G_n(1-PR)}$$

where p = promotion flow point YOS for grade PG+1
PR = the promotion rate to grade PG+1
n = maximum YOS - minimum YOS in grade PG **(3.10)**

a. *Calculating N(PG) for each Grade*

The range of YOS and promotion flow points vary among the grades in our system, so the formula that is used to calculate the initial YOS inventory for each grade, N(PG), will need to be modified somewhat from grade to grade.

(1) Grades O-1 and O-2. Because grades O-1 and O-2 both have two YOS in their respective ranges of YOS, and do not have overlapping YOS ranges with other paygrades, the same basic formula applies to both:

$$N(PG) = \frac{PBR(PG)}{G_0 + G_1}$$

where PG = O-1 or O-2 **(3.11)**

(2) Grade O-3. Figure 3.3 shows the result of this methodology applied to O-3 pilots, with 4528 O-3 pilot billet requirements, and an O-4 promotion rate of 0.80 at 10 YOS.

$$N(O\text{-}3) = \frac{PBR(PG)}{G_0 + G_1 + G_2 + G_3 + G_4 + G_5 + G_6(1-PR) + G_7(1-PR)}$$

where PR = promotion rate from O-3 to O-4 **(3.12)**

(3) Grades O-4 and O-5. Because grades O-4 and O-5 both have ranges of YOS consisting of 11 years and the time to the promotion flow point to the next higher grade is the same, the formula for O-4 and O-5:

$$N(PG) = \frac{PBR(PG)}{G_0+G_1+G_2+G_3+G_4+G_5+G_6\times NP+G_7\times NP+G_8\times NP+G_9\times NP+G_{10}\times NP}$$

where PG = O-4 or O-5
NP = 1 - PR(PG+1) **(3.13)**

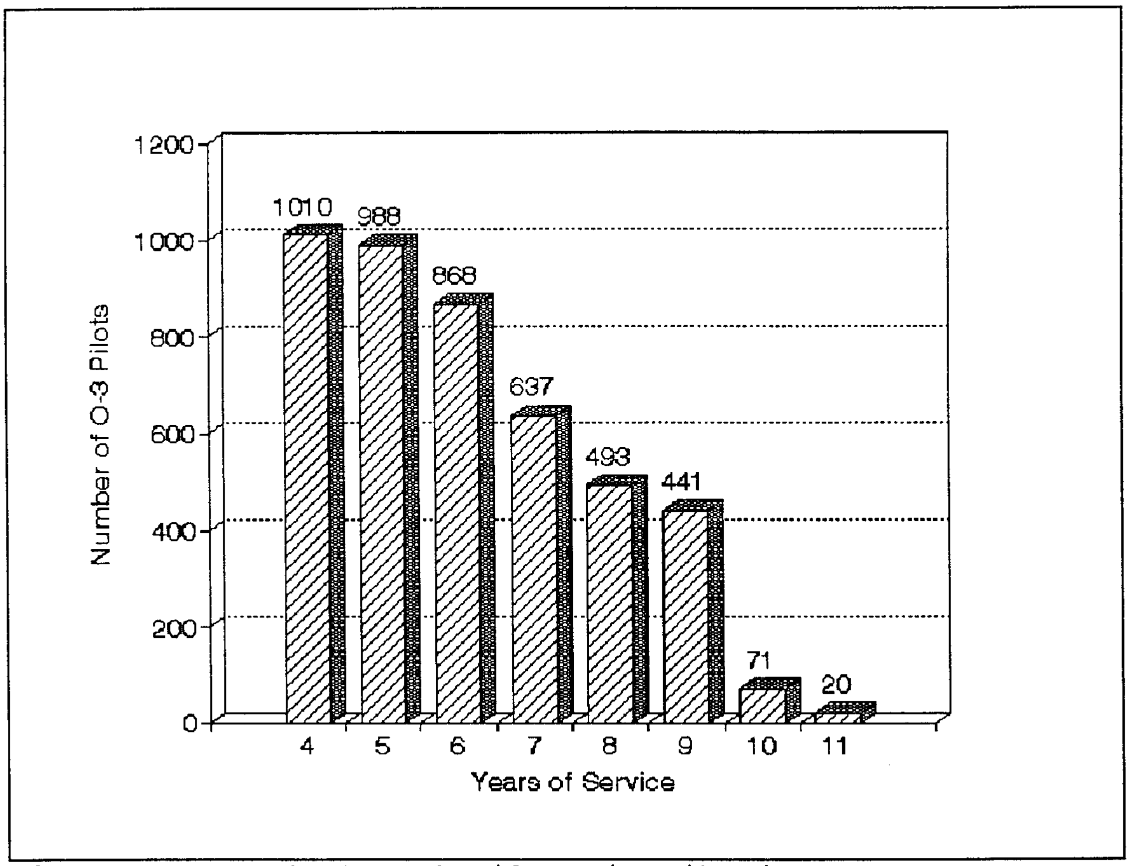

Figure 3.3 "Ideal" O-3 Pilot Distribution

(4) Grade O-6. As mentioned earlier, promotions from O-6 to O-7 are treated, here, as losses. So, the formula does not contain the promotion factors used in some of the other formulas:

$$N(O\text{-}6) = \frac{PBR(PG)}{G_0 + G_1 + G_2 + G_3 + G_4 + G_5 + G_6 + G_7 + G_8} \qquad \textbf{(3.14)}$$

b. Links Between Grades

Each grade is linked to the grades above and below it by promotion. A grade's initial inventory, N(PG), is a function of number of pilots that reach the promotion flow point to that grade and the promotion rate. Using the formulas for N(PG) above, we can identify the links between grades. For example, for grade O-3, the number of pilots reaching the promotion flow point for O-4 is $N(O\text{-}3)*G_5(O\text{-}3)$, and multiplying by the promotion rate to O-4 yields the initial inventory for grade O-4. So,

$$N(O\text{-}4) = N(O\text{-}3)*G_5(O\text{-}3)*PR(O\text{-}4) \qquad \textbf{(3.15)}$$

Likewise,

$$N(O\text{-}5) = N(O\text{-}4)*G_5(O\text{-}4)*PR(O\text{-}5) \qquad \textbf{(3.16)}$$

$$N(O\text{-}6) = N(O\text{-}5)*G_5(O\text{-}5)*PR(O\text{-}6) \qquad \textbf{(3.17)}$$

$$N(O\text{-}3) = N(O\text{-}2)*G_2(O\text{-}2)*PR(O\text{-}3) \qquad \textbf{(3.18)}$$

$$N(O\text{-}2) = N(O\text{-}1)*G_2(O\text{-}1)*PR(O\text{-}2) \qquad \textbf{(3.19)}$$

$$N(O\text{-}1) = \#\text{ of Pilot Accessions} \qquad \textbf{(3.20)}$$

IV. CONSTRUCTING THE "IDEAL" FORCE STRUCTURE

A. DETERMINING AN "IDEAL" DISTRIBUTION OF PILOTS

Having identified the pilot manpower requirements, including "fair share" requirements, the logical next step will be to assemble an "ideal" force structure that best satisfies these requirements. Until now, we have considered the grades independently. However, successive grades depend on the preceding grades to provide the manpower to meet their requirements. We cannot construct a pilot distribution to satisfy a grade's pilot requirements independently of other grades and expect the resulting force structure to be sustainable.

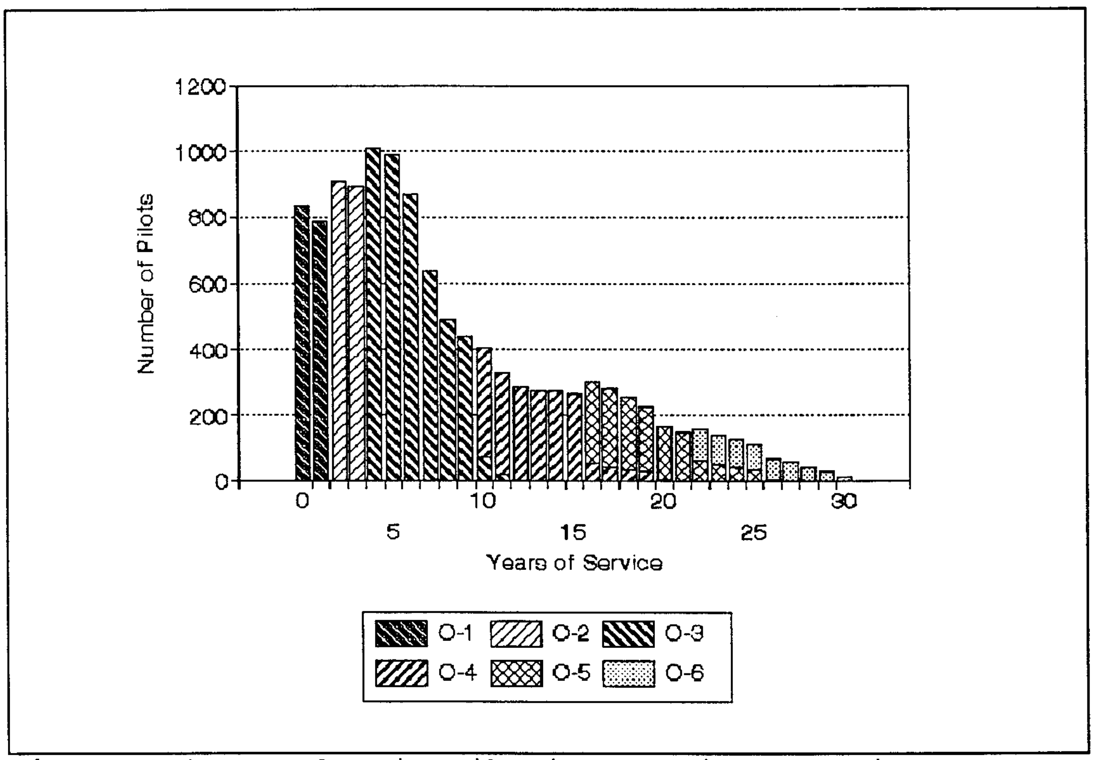

Figure 4.1 Sample Distribution of Pilot requirements

Figure 4.1 shows a force structure constructed from the various grade's pilot distributions derived independently for each grade. This distribution of pilots exactly satisfies the pilot requirements within each grade. However, this force structure is clearly not sustainable. A sustainable force cannot have a higher inventory in a successive YOS cell. For example, we cannot expect to grow 907 O-2 pilots with 2 YOS from a stock of 784 O-1 pilots with 1 YOS. Some grades may need to have excess inventory in order that the force structure be sustainable in the long run.

The IFS should be sustainable, but it should also resemble actual inventory, since actual inventory represents one feasible force structure. It is easy to build a sustainable force structure that satisfies all pilot requirements, if we are willing to have a large excess pilot inventory. However, it is not likely that using manpower inefficiently would be tolerated in a downsizing Navy. Therefore, in building the IFS we may need to compromise. It may not be possible to satisfy all requirements and maintain a reasonable pilot inventory.

1. Where to Start?

Using the links between grades described at the end of Chapter III, it is possible to determine one grade's pilot distribution and then calculate the implied distribution in all the other grades. For example, Table 3.1 shows the number of O-6 pilot billets to be 558. Using formula 3.14 with the YOS range from Table 3.2 for the O-6 grade as 22 to 30 YOS and historical pilot continuation rates, we determined that we require 94 O-6 pilots with 22 YOS. By working backward, using formula 3.17, we can solve for N(O-5), the inventory of the initial YOS for grade O-5, and determine the O-5 pilot distribution with historical continuation rates. Using the O-5 distribution and formula 3.16, we can continue the process for grade O-4, and so on for grades O-3 through O-1. In this case, the pilot distribution was based upon grade O-6 pilot requirements, but we could just as easily use any other grade as a base and then work forward as well as backward using formulas 3.15-3.20.

In constructing the IFS, the grade used as the base will profoundly affect the total inventory of the force structure. For example, using O-6 requirements as the foundation grade yielded a force structure with almost twice the inventory of the current force, and so was rejected as the foundation grade. By design, the foundation grade's requirements will be 100% satisfied, for this reason it seems logical that the foundation grade should be one of the grades considered critical to fill.

2. Choosing a Foundation Grade for the IFS

In choosing a foundation grade for the IFS, we will consider all grades, except O-1 because Figure 4.1 clearly shows that the "ideal" O-1 pilot distribution will not be sustainable even to grade O-2. An acceptable foundation grade will fill critical billets and result in a force structure that resembles the current inventory. By design, the resulting force structure from any foundation grade will be sustainable, based on current community continuation rates.

Within the pilot community, the mid-grades, O-3 and O-4, have historically had shortfalls. In FY1990, the mid-grade shortfall was 1100 pilots (House Armed Services Committee 1991, p. 211). Therefore, we will first evaluate the mid-grades as possible foundation grades.

a. Grade O-4

Referring to Tables 3.1 and 3.2, there are 1891 O-4 billets and the YOS range is 10 to 20 YOS. Distributing 1891 O-4 pilots over the O-4 YOS range (10-20 YOS) requires 340 O-4 pilots with 10 YOS as computed by equation 3.14. The resulting distribution is displayed in Figure 4.2. Next, the O-5 and O-6 pilot distributions were computed by applying continuation and promotion rates to the O-4 inventory at the promotion flow points. To determine the O-3 distribution, the initial O-3 pilot inventory, N(O-3), was calculated using equation 3.15, then pilot continuation rates were applied to that initial inventory over the O-3 YOS range. This procedure was then carried out for the O-2 and O-1 grades as well. The resulting force structure is displayed in Table 4.1 and Figure 4.3.

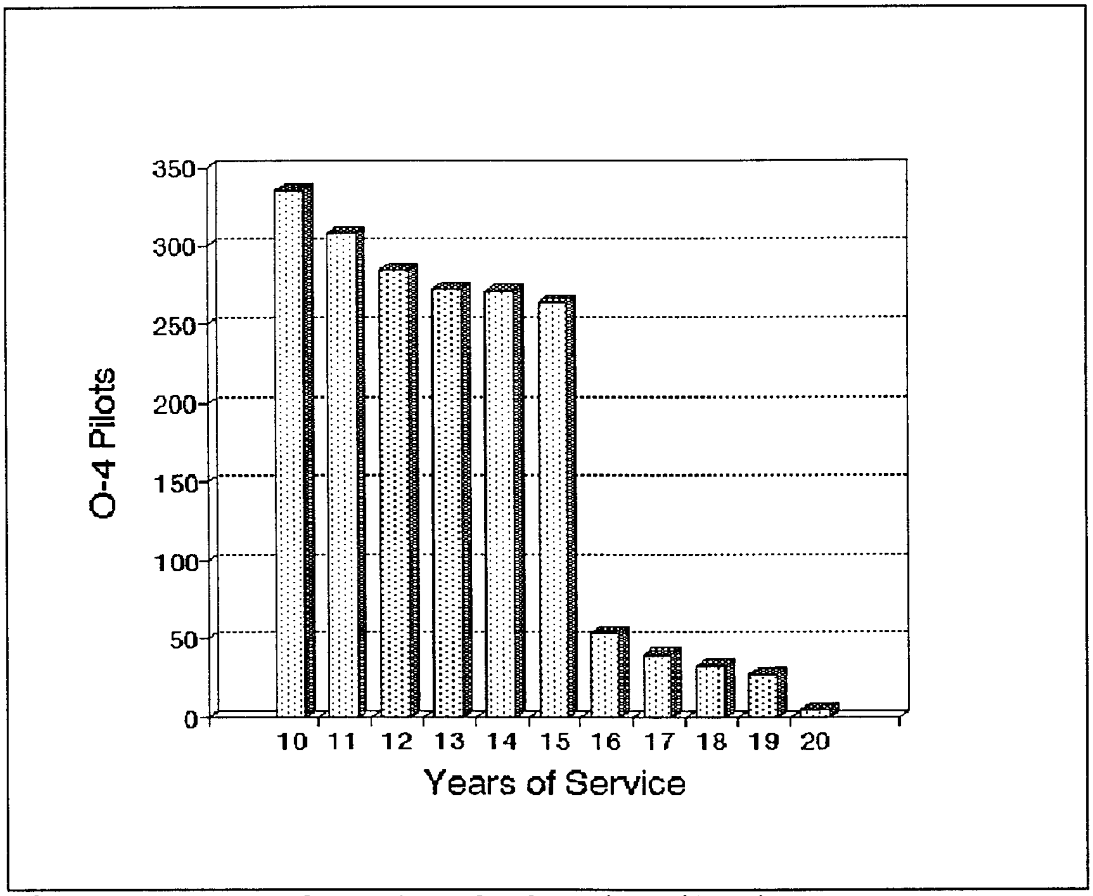

Figure 4.2 Grade O-4 "Ideal" Distribution

YOS/PG	O-1	O-2	O-3	O-4	O-5	O-6	TOTAL
0	1215						1215
1	1143						1143
2		1057					1057
3		1024					1024
4			944				944
5			905				905
6			812				812
7			642				642
8			470				470
9			407				407
10			78	312			390
11			46	294			340
12			11	280			291
13				264			264
14				253			253
15				247			247
16				68	160		228
17				64	160		224
18				61	155		216
19				45	144		189
20				3	117		120
21					102		102
22					36	36	73
23					21	36	57
24					12	34	46
25					6	29	35
26					1	23	24
27						16	16
28						11	11
29						7	7
30						2	2
	2358	2081	4316	1891	9142	195	11755

Table 4.1 The O-4 Foundation Grade Force Structure Matrix

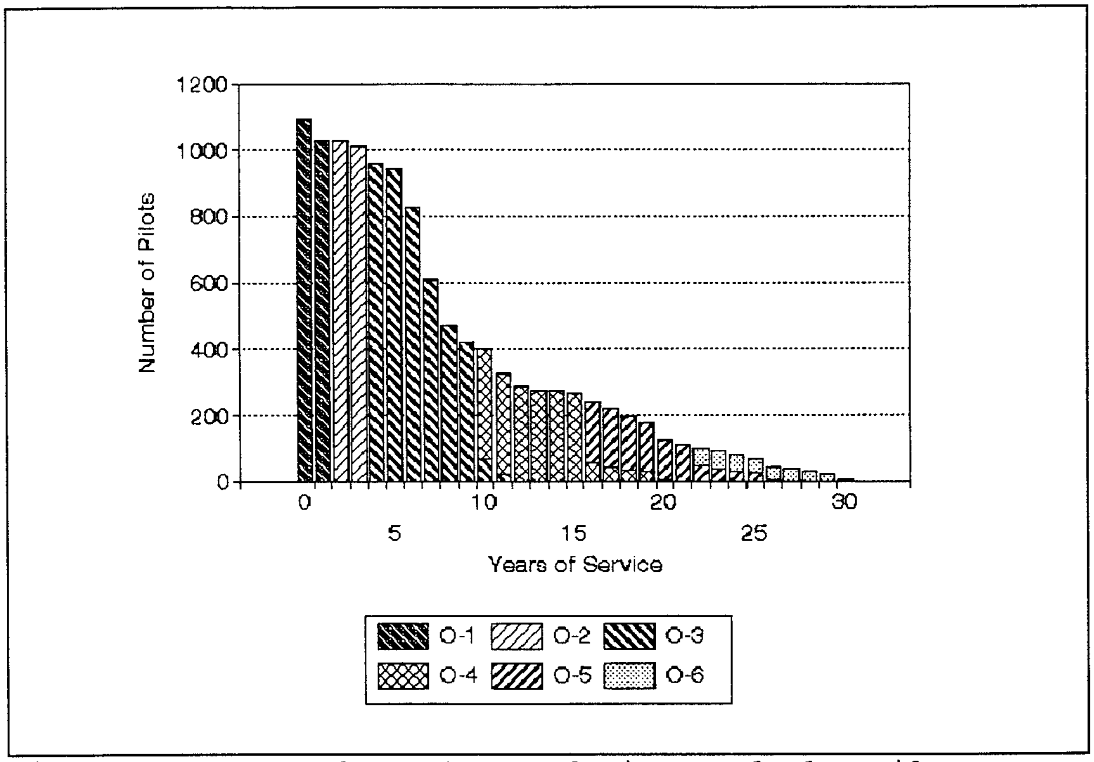

Figure 4.3 Grade O-4 Foundation "Ideal" Pilot Force Structure

Using Grade O-4 as a foundation grade yields some interesting results. Examining Table 4.2, the total inventory is consistent with current inventory, i.e. within 87 pilots. However, the distribution of these pilots could not be considered "ideal." Grades O-5 and O-6 have severe personnel shortages, approximately 42 percent for O-6s. Surpluses in grades O-1 and O-2 may be acceptable and these resources may be substitutable for a shortage O-3 pilots. Overall, the surpluses in lower grades will ensure adequate mid-grade inventory, but these surpluses cannot substitute for the severe shortages in the O-5 and O-6 grades.

PAYGRADE	O-1	O-2	O-3	O-4	O-5	O-6	Total
FORCE USING GRADE O-4 FOUNDATION	2116	2035	4298	1891	1046	325	11711
PILOT REQUIREMENTS	1617	1799	4528	1891	1405	558	11799
DIFFERENCE	499	236	-230	0	-359	-233	-87

Table 4.2 Comparing A Force Structure using Grade O-4 as a Foundation to the Pilot Requirements

b. O-3 Foundation Grade

Using the same techniques described with the O-4 foundation force structure, the O-3 requirements were also used to identify an "ideal" O-3 personnel distribution. Working forward and backward using equations 3.15-3.20 and historical continuation rates, O-1, O-2, O-4, O-5, and O-6 pilot distributions were extrapolated from the "ideal" O-3 distribution. Table 4.3 compares the results of the O-3 foundation grade distribution versus actual requirements.

PAYGRADE	O-1	O-2	O-3	O-4	O-5	O-6	Total
FORCE USING GRADE O-3 FOUNDATION	2229	2144	4528	1993	1102	342	12339
PILOT REQUIREMENTS	1617	1799	4528	1891	1405	558	11799
DIFFERENCE	612	345	0	101	-302	-216	541

Table 4.3 Comparing A Force Structure using Grade O-3 as a Foundation to the Pilot Requirements

Table 4.3 reveals again some of the same serious problems, mostly a very high shortage of grade O-5 and O-6 pilots. This variant's projected inventory exceeds requirements by 541, approximately 4.6 percent. While five percent isn't excessive, the force exceeds O-1 and O-2 requirements by almost 1000 personnel.

There are several possible reasons for the personnel distribution problems encountered with the O-3 and O-4 variants of the IFS. This IFS depends on historical continuation and promotion information. So, a very likely cause is the low continuation rates in grades O-3 and O-4 as computed from historical data. Also, promotion rates into more senior grades may be higher in reality than the DOPMA rates utilized in this analysis. Finally, the pilot "fair share" of certain types of billets within some grades may overstate actual requirements. The following paragraphs examine these problem areas.

Higher grades depend on enough personnel continuing in the service to fulfill their requirements. If continuation rates were lower than normal during the years used to represent pilot continuation in the IFS, not enough pilots will survive to fill the higher grades, assuming that all else remains constant. In this analysis, continuation rates were calculated using FY90 through FY93 data. This was a period of vigorous airline hiring. During this period Aviation Career Pay (ACP) doubled from $6,000 to $12,000 per year, indicating a recognition of the problem with retaining pilots and an attempt to minimize it.

The promotion rates used were DOPMA rates, however, the Navy actually varies promotion opportunity by as much as plus or minus ten percent. Promotion opportunity for grade O-4 and O-5 pilots was found to be consistent with DOPMA promotion guidelines, but the Navy's overall URL promotion opportunity for O-6s was 55 percent versus the mandated DOPMA 50 percent used in this analysis. (Greene, 1994) This discrepancy may account for a portion of the O-6 shortage, but has no impact on other grade shortages. Also, no early or late (below zone or above zone) promotions were accounted for in the computation of this IFS. This deliberate oversight, however, has a negligible effect on force structure because the total number of promotees can never exceed a set portion of the promotion zone, regardless of their source (above-zone, in-zone, or below-zone).

Finally, the problem may lie in how the pilot requirements were determined, most notably in how 1000 and 1050 billet are manned. Because of historic shortages of pilots, pilots have not manned their "fair share" of general billet types. Other officers can be easily substituted for pilots in most of these billets. In the higher grades, general billets make up a larger portion of the total billets available, e.g. greater than 50 percent of grade O-6 billets. It is possible that for some grades the pilot's "fair share" of general billets in an IFS should be less than that calculated in Chapter III.

c. Other Possible Foundation Grades

Tables 4.4, 4.5, and 4.6 show the results of IFS variants based on grades O-2, O-5, and O-6, respectively. These variants were derived using the same procedures described earlier for the O-3 and O-4 variants.

PAYGRADE	O-1	O-2	O-3	O-4	O-5	O-6	Total
FORCE USING GRADE O-2 FOUNDATION	1870	1799	3799	1672	925	287	10352
PILOT REQUIREMENTS	1617	1799	4528	1891	1405	558	11799
DIFFERENCE	253	0	-729	-220	-479	-271	-1446

Table 4.4 Comparing A Force Structure using Grade O-2 as a Foundation to the Pilot Requirements

PAYGRADE	O-1	O-2	O-3	O-4	O-5	O-6	Total
FORCE USING GRADE O-5 FOUNDATION	2840	2732	5769	2538	1404	436	15719
PILOT REQUIREMENTS	1617	1799	4528	1891	1405	558	11799
DIFFERENCE	1223	933	1240	647	0	-121	3921

Table 4.5 Comparing A Force Structure using Grade O-5 as a Foundation to the Pilot Requirements

PAYGRADE	O-1	O-2	O-3	O-4	O-5	O-6	Total
FORCE USING GRADE O-6 FOUNDATION	3634	3495	7382	3248	1791	558	20114
PILOT REQUIREMENTS	1617	1799	4528	1891	1405	558	11798
DIFFERENCE	2017	1696	2853	1357	393	0	8316

Table 4.6 Comparing A Force Structure using Grade O-6 as a Foundation to the Pilot Requirements

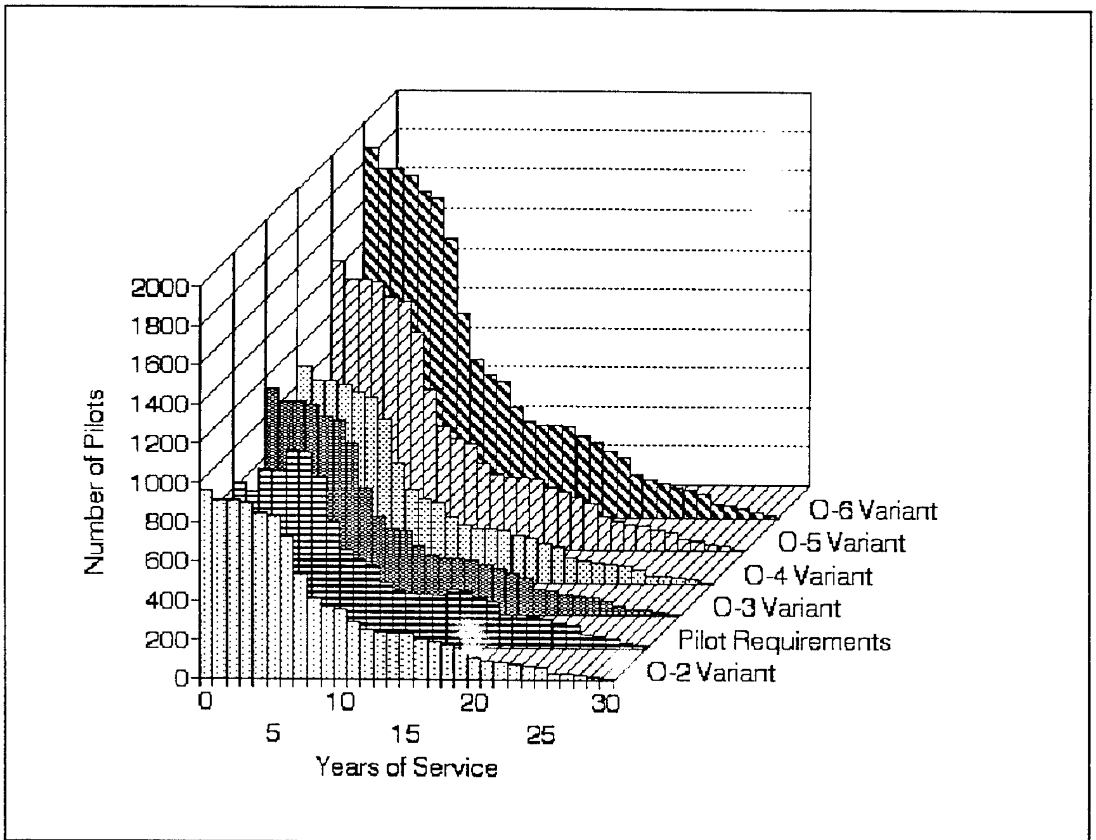

Figure 4.4 Variant Force Structures versus Pilot Requirements

Figure 4.4 shows the different variants of the IFS versus the requirements. The shape of these variants' force structures are very similar and the main difference among them is total inventory. With any variant, there would be a trade-off between matching total inventory or grade O-2, O-5 and O-6 inventory to requirements. Using total inventory to cull less desirable variants from consideration, it is unlikely that any one of the O-2, O-5, or O-6 variants would be suitable for the IFS. This leaves the O-3 and O-4 variants both of which have significant shortages in grades O-5 and O-6 pilot inventory.

By modifying the current design of our IFS model, we may be able to address the shortages in grades O-5 and O-6. In the current model, promotion rates and promotion points are held at DOPMA mandated levels. However, DOPMA and the Navy allow some flexibility in these areas. For example, promotion points may vary plus or minus one year and the Navy may vary promotion rates from DOPMA levels plus or minus ten percent. The next section examines a modification in the IFS model and its effects.

3. Modifications to Promotion Parameters

This section examines the effects of modifying promotion points and promotion rates on the IFS in attempting to bring O-5 and O-6 pilot inventories closer to the requirements for those grades. Table 3.2 and Table 3.3 show the DOPMA promotion points and promotion opportunities, respectively. In constructing a force structure, we can increase the number of O-5 and O-6 pilots by promoting to these grades earlier and at higher rates. We will examine promotion points of 15 YOS for O-5 pilots, and 21 YOS for O-6 pilots. Promotion rates will be set at the maximum allowed by the Navy, namely 80 percent for O-5s, and 60 percent for O-6s.

The procedures used to derive the force structures for the different base grades are the same as those described earlier in this chapter, however, as a result of changes to promotion points some of the formulas used in Chapter III will change. Shifting promotion points forward one year results in formulas 3.13 and 3.16 changing to reflect earlier promotion points. The changes are displayed below:

Formula 3.13

$$N(PG) = \frac{PBR(PG)}{G_0+G_1+G_2+G_3+G_4+G_5+G_6\times NP+G_7\times NP+G_8\times NP+G_9\times NP+G_{10}\times NP}$$

now becomes,

$$N(PG) = \frac{PBR(PG)}{G_0+G_1+G_2+G_3+G_4+G_5\times NP+G_6\times NP+G_7\times NP+G_8\times NP+G_9\times NP+G_{10}\times NP}$$

where PG = O-4 or O-5
NP = 1 - PR(PG+1)
PR(PG+1) = the promotion rate to next paygrade **(4.1)**

And formula 3.16

$$N(O-5) = N(O-4)*G_5(O-4)*PR(O-5) \quad \textbf{(3.16)}$$

becomes, $$N(O-5) = N(O-4)*G_4(O-4)*PR(O-5) \quad \textbf{(4.2)}$$

For grade O-6, there is only a minor change to formula 3.14 and no change to formula 3.17. Adding an additional survivor grade function, G_9, to the denominator of formula 3.14 reflects the extended O-6 YOS range, 21-30 YOS. Formula 3.17 does not require any changes because both grades O-5 and O-6 shift their promotion points one year, so there is no change relative to grade O-6.

Promotion rate changes do not effect the formulas used. In examining different foundation grades, the changes to promotion points and promotion rates will affect the distribution of pilots within the O-4, O-5, and O-6 foundation grades. For example, the 1891 O-4 pilots will be distributed the same YOS range, but earlier promotion to O-5 does affect O-4 pilot distribution. Comparing Figure 4.5 to Figure 4.2, we see higher initial inventory for grade O-4 because the time in grade between promotion points has been reduced.

The results of these modifications on the pilot distribution within the IFS model for the different foundation grades are displayed in Tables 4.7 through 4.11.

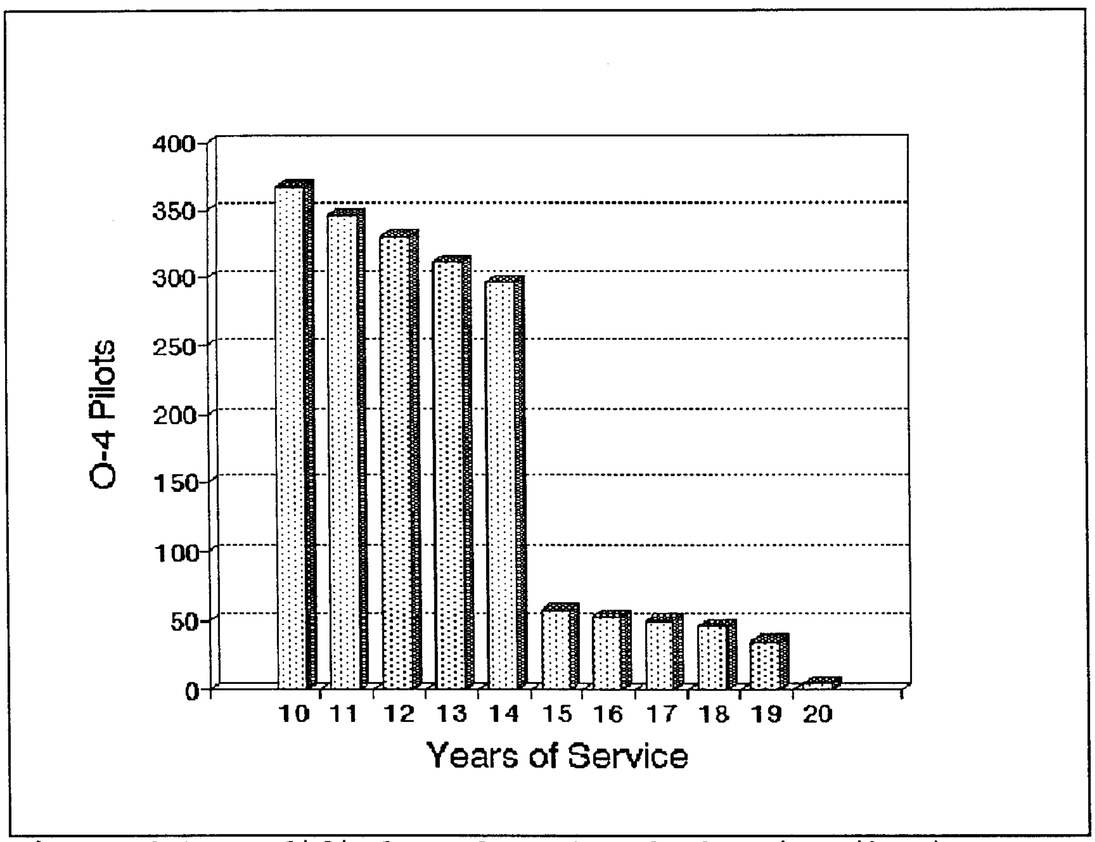

Figure 4.5 Modified Grade O-4 "Ideal" Distribution

a. Modified IFS Results

Tables 4.7 through 4.11 show the results of the modified promotion parameters for grades O-5 and O-6. All of these foundation grades now show reduced shortages in the higher grades. Comparing these table to Tables 4.2 through 4.6, we see lower shortages in the higher grades with, in some cases, improved total inventory. In general, the modified parameters improve O-5 and O-6 inventory at the expense of O-4 inventory, which decreases with all foundations grades, except grade O-4. Using foundation grades O-2, O-5, and O-6 results in the total inventory moving closer toward meeting the total pilot requirements. The resulting force derived from foundation grades O-3 and O-4 show higher total inventory, in fact much higher in the case of grade O-4. Overall, the modified promotion parameters have helped to move the IFS closer to meeting pilot requirements.

PAYGRADE	O-1	O-2	O-3	O-4	O-5	O-6	Total
FORCE USING GRADE O-2 FOUNDATION	2039	1799	3732	1395	1065	414	10443
PILOT REQUIREMENTS	1617	1799	4528	1891	1402	558	11795
DIFFERENCE	422	0	-796	-496	-337	-144	-1352

Table 4.7 Comparing a modified IFS using Grade O-2 as a Foundation to the Pilot Requirements

PAYGRADE	O-1	O-2	O-3	O-4	O-5	O-6	Total
FORCE USING GRADE O-3 FOUNDATION	2474	2183	4528	1692	1293	502	12672
PILOT REQUIREMENTS	1617	1799	4528	1891	1402	558	11795
DIFFERENCE	857	384	0	-199	-110	-56	877

Table 4.8 Comparing a modified IFS using Grade O-3 as a Foundation to the Pilot Requirements

PAYGRADE	O-1	O-2	O-3	O-4	O-5	O-6	Total
FORCE USING GRADE O-4 FOUNDATION	2474	2439	5060	1891	1444	561	14159
PILOT REQUIREMENTS	1617	1799	4528	1891	1402	558	11795
DIFFERENCE	1147	640	531	0	42	3	2364

Table 4.9 Comparing a modified IFS using Grade O-4 as a Foundation to the Pilot Requirements

PAYGRADE	O-1	O-2	O-3	O-4	O-5	O-6	Total
FORCE USING GRADE O-5 FOUNDATION	2685	2369	4915	1837	1403	544	13753
PILOT REQUIREMENTS	1617	1799	4528	1891	1402	558	11795
DIFFERENCE	1068	570	386	-54	1	-13	1958

Table 4.10 Comparing a modified IFS using Grade O-5 as a Foundation to the Pilot Requirements

PAYGRADE	O-1	O-2	O-3	O-4	O-5	O-6	Total
FORCE USING GRADE O-6 FOUNDATION	3144	2774	5754	2290	1400	558	15920
PILOT REQUIREMENTS	1617	1799	4528	1891	1402	558	11795
DIFFERENCE	1527	975	1226	399	-3	0	4125

Table 4.11 Comparing a modified IFS using Grade O-6 as a Foundation to the Pilot Requirements

4. Revising Continuation Rates

Until now, the continuation rates used in our force structure were calculated using aggregate pilot data from 1990, 1991, 1992 and 1993. These were the most recent data available. These were also very turbulent years in terms of Navy manpower, coming at the beginning of the force drawdown. The corresponding continuation rates may not be representative of the most current trends in the pilot community nor may they be indicative of future trends. By using only the most recent data, we might get a better representation of current pilot continuation trends. The following section uses the modified promotion points described in section 3 and applies continuation rates calculated using the pilot data from 1992 and 1993. The continuation rate matrix from these data is displayed in Appendix D.

a. Results from Revised Continuation Rates and Promotion Points

PAYGRADE	O-1	O-2	O-3	O-4	O-5	O-6	Total
FORCE USING GRADE O-2 FOUNDATION	1980	1799	3988	1634	1249	444	11093
PILOT REQUIREMENTS	1617	1799	4528	1891	1402	558	11795
DIFFERENCE	363	0	-541	-257	-153	-115	-703

Table 4.12 Comparing a revised IFS using Grade O-2 as a Foundation to the Pilot Requirements

PAYGRADE	O-1	O-2	O-3	O-4	O-5	O-6	Total
FORCE USING GRADE O-3 FOUNDATION	2248	2043	4528	1856	1418	504	12597
PILOT REQUIREMENTS	1617	1799	4528	1891	1402	558	11795
DIFFERENCE	631	244	0	-35	16	-54	802

Table 4.13 Comparing a revised IFS using Grade O-3 as a Foundation to the Pilot Requirements

PAYGRADE	O-1	O-2	O-3	O-4	O-5	O-6	Total
FORCE USING GRADE O-4 FOUNDATION	2291	2082	4614	1891	1445	513	12835
PILOT REQUIREMENTS	1617	1799	4528	1891	1402	558	11795
DIFFERENCE	674	283	86	0	43	-45	1040

Table 4.14 Comparing a revised IFS using Grade O-4 as a Foundation to the Pilot Requirements

PAYGRADE	O-1	O-2	O-3	O-4	O-5	O-6	Total
FORCE USING GRADE O-5 FOUNDATION	2224	2021	4479	1835	1403	498	12459
PILOT REQUIREMENTS	1617	1799	4528	1891	1402	558	11795
DIFFERENCE	607	222	-50	-55	1	-60	664

Table 4.15 Comparing a revised IFS using Grade O-5 as a Foundation to the Pilot Requirements

PAYGRADE	O-1	O-2	O-3	O-4	O-5	O-6	Total
FORCE USING GRADE O-6 FOUNDATION	2847	2587	5734	2507	1571	558	15804
PILOT REQUIREMENTS	1617	1799	4528	1891	1402	558	11799
DIFFERENCE	1230	788	1206	617	169	0	4009

Table 4.16 Comparing a revised IFS using Grade O-6 as a Foundation to the Pilot Requirements

5. Conclusions

Examining the results it appears that grade O-5 is the best choice for a foundation grade for our IFS. This is not, however, a grade that would be considered critical to fill. However, it yielded the best match between requirements and total inventory, while coming close to satisfying the higher grade requirements. Even so, not all grade O-3, O-4, and O-6 requirements were met, but the additional inventory required to satisfy these requirements might lead to an inefficient use

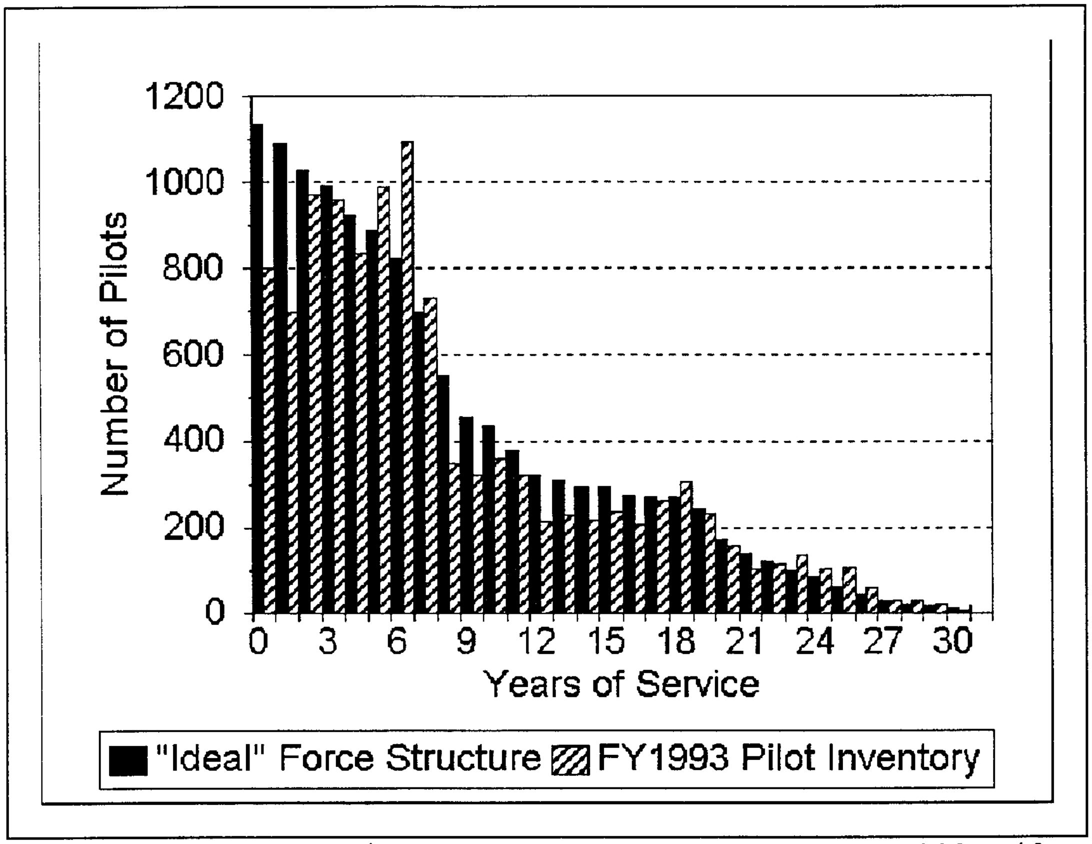

Figure 4.6 Comparison between the IFS and FY1993 Pilot Inventory

of pilot personnel. Table 4.13 shows that an increase of 138 pilots only reduces the grade O-6 requirements shortfall by six, from -60 to -54. Given the pilot requirements used in this thesis, it was impossible that we could have a perfect match between requirements and total inventory, as evidenced by Figure 4.1.

The promotion parameters used in constructing this IFS reflect the most current promotion policy. Using promotion rates lower than current rates causes higher total inventory because, with lower promotion rates, more personnel must reach promotion points in order to satisfy a set requirement. The effect on total inventory of an IFS can be dramatic when these lower rates occur in higher grades. For the force structure using an O-6 foundation grade, increasing promotion parameters resulted in decreasing total inventory by over 4000 pilots.

The period of data sampled to measure community continuation behavior should be varied depending on the type of community and the current conditions. The pilot community has less stable continuation behavior than other officer communities because they have skills that are directly transferrable to civilian markets. This community's continuation behavior generally responds to economic conditions and airline hiring swings. Also, this thesis used data from a period of a force drawdown, in which manpower policies were generally unstable. For these reasons, only the most recent data were used in the final analysis to measure continuation behavior. If this methodology were used with an officer community with more stable continuation behavior or during a more stable period for military manpower, longer periods of data might provide a better indicator of future continuation behavior.

Finally, accurately determining each grade's requirements is critical since these requirements are used as the primary criteria in selecting an IFS. Using a "fair share" of general billet requirements was a logical method of determining these requirements. However, this "fair share" may not represent the most efficient use of manpower, especially in the case of highly trained Navy pilots. If a more appropriate method of determining the pilots' "fair share" of general billet requirements can be identified, that method should be incorporated into this methodology.

V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY

The purpose of this thesis was to develop a methodology that would enable manpower managers to identify an ideal force structure for Navy pilots. The methodology developed uses data currently available to these manpower managers. These data include OPAs for various billet types, inventory data, promotion data, and lateral transfer data.

Navy pilots may fill five different types of billets. Applying pilot factors to the OPAs of these billet types, we can identify the pilot's "fair share" of each billet type. The pilot's "fair share" is simply their proportion of the officers eligible to fill that particular billet type. Aggregating the "fair shares" yields the number of pilot requirements in each grade.

We developed formulas that utilize pilot community continuation rates to determine a sustainable personnel distribution that will satisfy the pilot requirements. Initially, each grade was treated independently, but for the whole force structure to be sustainable we must establish sustainable transitions between consecutive grades.

At DOPMA promotion zones, we described these links based upon DOPMA promotion rates and pilot continuation rates. To utilize these links, we must select a grade to use as a foundation for the force structure. The foundation grade serves as a starting point for building a force structure. The links between grades allow us to work forward as well as backward from the foundation grade to construct a sustainable force structure.

The acceptable foundation grade is the grade that provides the best fit between grade inventories and grade requirements as well as between total inventory and total requirements. Because continuation rates play such a large role in the shape of the IFS, unusual continuation behavior, such as that occurring during a drawdown, can have a dramatic effect on the force structure when the goal is creating a sustainable force structure. This makes choosing a foundation grade difficult because we must choose between not satisfying certain grades' requirements or having excessive total inventory. After selecting an appropriate foundation grade, the IFS can be identified.

The objective for building an IFS for Navy pilots was to provide Navy manpower managers with a community target force structure that was based upon manpower requirements and community continuation behavior. The methodology developed here should allow them to construct a force structure that satisfies the billet authorizations, is sustainable based upon community continuation behavior, and conforms to DOPMA guidelines. The IFS is a target that will change whenever the variables used to construct it change. The OPAs are revised tri-annually and continuation behavior changes continuously in response to economic conditions, Navy policy, and numerous other factors. As a result, the IFS should also be revised from time to time.

B. CONCLUSIONS

The IFS provides manpower managers with a tool to evaluate the adequacy of the current inventory within an officer community. By determining a pilot distribution by grade and YOS, the manpower manager can compare the current inventory with the IFS regarded as a target force structure. Using the IFS, manpower managers can identify overages and underages in current inventory and may plan to compensate for them appropriately. For example, for O-4 pilots with 14 YOS, the IFS calls for an inventory of 294 and the FY1993 inventory was 218. In this instance manpower managers might recommend higher promotion rates or other policy changes to boost O-4 continuation rates. Of course, such changes should be contemplated only in concert with the entire force structure.

Determining the pilot requirements within each grade is the most essential step in constructing an IFS. We described the pilot's "fair share" of certain billet types by using the proportion of pilots within the population eligible to fill those billet types. In fact, the pilot's "fair share" of certain billets calculated in this thesis may not be realistic in some cases. For example, the actual fill for 1000 billets for O-3 pilots is probably lower than calculated in this thesis. However, if more accurate requirements information becomes available, it is relatively simple to input updated requirements data into the methodology used in this thesis.

Selecting the amount of data used to calculate continuation rates is also an important decision, since continuation rates are a major factor in shaping the force structure. The initial analysis in this thesis aggregated continuation rates from three fiscal years, but during a drawdown this may represent too long a period. Aggregating data over this long a period may give a false perception of continuation behavior by biasing rates with older data. We found the best fit for this IFS using a single year of data. However, using a single year of data may misrepresent continuation behavior swings caused by one time events, i.e. a reduction in force (RIF) or offering exit bonuses. Current conditions may be the best guide in deciding how far back to go to measure continuation behavior. In turbulent times, when sudden changes of large magnitude occur, using only the most current data available should provide a better prediction of future continuation behavior. In less turbulent times, it is likely that looking further back and using three or more years of data may prove to provide a better predictor of future continuation behavior.

The IFS may be used in different ways. Manpower managers can examine the whole force, individual YOS cells, or individual grades. During a drawdown, it is important that as we cut we also balance the new smaller force. OPAs provide a six year prediction of future requirements. Using OPA data we can construct an IFS that may be useful for the following few years, assuming relatively consistent continuation behavior.

C. RECOMMENDATIONS

This methodology for determining an IFS for Navy pilots should be transferrable to other officer communities, if it is possible to determine that communities' "fair share" of billet authorizations. Communities that have more stable continuation behavior than the pilot community should be an easier choice for construction of an IFS. Also, it would be easier to apply this methodology to broader officer communities, such as Unrestricted Line (URL) officers, since this would simplify the requirements calculations. Accurately determining grade requirements is a critical aspect in constructing a useful IFS. On the other hand, it would be difficult to use this methodology on an officer sub-community, e.g. Navy jet pilots, because of the difficulty associated with determining that sub-community's "fair share" of general billet authorizations.

Manpower managers may find it more useful to examine pieces of the IFS rather than the whole force structure. Individual grade profiles can be examined without the compromises made in order to construct a sustainable force structure. It was necessary to compromise some elements within the force structure to build an IFS. For example, in our final construction, not all O-3, O-4, and O-6 requirements were filled and O-5 and O-6 promotion zones were advanced. For manpower managers concerned with only a small portion of the force, these compromises may detract from the usefulness of the IFS for their specific purposes.

In the midst of the military drawdown of the 1990s, it is important that manpower managers have the tools necessary to make informed decisions. The IFS can be one of these tools. The IFS can help to identify overages and underages in current force structure and help Navy manpower managers spot areas in the current force structure that may become future problem areas. With information provided by the IFS, manpower managers can recommend policies to steer toward a more stable, balanced force in the future.

APPENDIX A. INVENTORY DATA

FY 1990 Pilot Inventory by Grade and YOS

YOS/PG	O-1	O-2	O-3	O-4	O-5	O-6	TOTAL
0	1165						1165
1	905						905
2	3	1100					1103
3	1	1272					1273
4		108	918				1026
5		2	640				642
6			728				728
7			610				610
8			462				462
9			269	3			272
10			62	229			291
11			1	267			268
12				271			271
13				250	1		251
14				265	10		275
15				120	197		317
16				74	198		272
17				56	207		263
18				52	170		222
19				58	197	3	258
20				9	213	11	233
21				10	65	74	149
22				2	46	126	174
23				6	31	88	125
24				4	20	64	88
25					10	65	75
26						45	45
27						42	42
28						32	32
29						22	22
30						15	15
	2074	2482	3690	1676	1365	587	11874

FY 1991 Pilot Inventory by Grade and YOS

YOS/PG	O-1	O-2	O-3	O-4	O-5	O-6	TOTAL
0	1121						1121
1	1125						1125
2		875					875
3		1072					1072
4		128	1117				1245
5		6	984				990
6			580				580
7			556				556
8			441	1			442
9			409	12			421
10			53	207			260
11			4	248			252
12			1	243			244
13				244	7		251
14				217	19		236
15				87	171		258
16				81	234		315
17				70	204		274
18				54	199		253
19				34	153		187
20				4	153	5	162
21				5	111	76	192
22				10	33	93	136
23				2	32	131	165
24				5	23	84	112
25				4	11	57	72
26					1	59	60
27						42	42
28						32	32
29						23	23
30						5	5
	2246	2081	4145	1528	1351	607	11958

FY 1992 Pilot Inventory by Grade and YOS

YOS/PG	O-1	O-2	O-3	O-4	O-5	O-6	TOTAL
0	720						720
1	1027						1027
2	1	987					988
3		855					855
4		25	1003				1028
5			1174				1174
6			861				861
7			439				439
8			387				387
9			375	1			376
10			201	201			402
11			3	212			215
12				235			235
13				229	1		230
14				234	9		243
15				69	152		221
16				67	187		254
17				72	236		308
18				62	195		257
19				40	189		229
20				4	121	2	127
21				3	91	46	140
22				4	49	114	167
23				10	18	93	121
24				2	15	121	138
25				3	11	76	90
26				2	1	412	44
27						34	34
28						23	23
29						14	14
30						7	7
	1748	1867	4443	1450	1275	571	11354

FY 1993 Pilot Inventory by Grade and YOS

YOS/PG	O-1	O-2	O-3	O-4	O-5	O-6	TOTAL
0	801						801
1	695	1					696
2	19	950					969
3		960	1				961
4		36	798				834
5		1	990				991
6			1092				1092
7			731				731
8			347				347
9			320				320
10			146	212			358
11			24	296			320
12				215			215
13				227			227
14				218			218
15				91	143		234
16				62	143		205
17				62	202		264
18				70	235		305
19				50	181		231
20					159		159
21				3	40	60	103
22				2	23	87	112
23				2	24	110	136
24				8	10	85	103
25				2	6	96	104
26				1	1	57	59
27						27	27
28						27	27
29						20	20
30						6	6
	1515	1948	4449	1522	1168	573	11175

APPENDIX B. PILOT PROMOTION DATA

FY 1990 Pilot Promotions by Grade and YOS

YOS/PG	O-1	O-2	O-3	O-4	O-5	O-6
0						
1						
2		871				
3		1				
4		1	1117			
5			92			
6			2			
7						
8				1		
9				12		
10				207		
11				30		
12						
13					7	
14					19	
15					171	
16					34	
17						
18						
19						
20						5
21						76
22						12
23						
24						
25						
26						
27						
28						
29						
30						
		873	1211	250	231	93

FY 1991 Pilot Promotions by Grade and YOS

YOS/PG	O-1	O-2	O-3	O-4	O-5	O-6
0						
1		1				
2		985				
3		1				
4		1	1003			
5			112			
6			4			
7						
8						
9						
10				190		
11				15		
12				1		
13					1	
14					4	
15					138	
16					11	
17					4	
18					1	
19						
20						2
21						46
22						34
23						
24						
25						
26						
27						
28						
29						
30						
		988	1119	206	159	82

FY 1992 Pilot Promotions by Grade and YOS

YOS/PG	O-1	O-2	O-3	O-4	O-5	O-6
0						
1		1				
2		949				
3		2	1			
4			798			
5			18			
6						
7						
8						
9						
10				212		
11				111		
12						
13						
14						
15					143	
16						
17						
18						
19						
20						
21						58
22						40
23						
24						
25						
26						
27						
28						
29						
30						
		952	817	323	143	98

APPENDIX C. CONTINUATION RATES USING 1990-1993 DATA

Pilot Continuation Rates using FY 1990-1993 Data

YOS/PG	O-1	O-2	O-3	O-4	O-5	O-6
0	0.9411					
1	0.9241					
2		0.9693				
3		0.9706				
4		0.8774	0.9579			
5			0.8978			
6			0.7907			
7			0.7327			
8			0.8651			
9			0.9582			
10			0.5918	0.9419		
11			0.2500	0.9519		
12				0.9453		
13				0.9571		
14				0.9763		
15				0.9239	0.9981	
16				0.9369	1.0000	
17				0.9444	0.9706	
18				0.7381	0.9273	
19				0.0606	0.8163	
20				0.6471	0.8665	
21				0.8889	0.7154	1.0000
22					0.5781	1.0000
23					0.5926	0.9295
24					0.4828	0.8513
25					0.0938	0.7929
26					0.5000	0.6966
27						0.6949
28						0.6552
29						0.3051
30						0.0000

APPENDIX D. CONTINUATION RATES USING 1992-1993 DATA

Pilot Continuation Rates using FY 1992-1993 Data

YOS/PG	O-1	O-2	O-3	O-4	O-5	O-6
0	0.9597					
1	0.9426					
2		0.9686				
3		0.9754				
4			0.9641			
5			0.9276			
6			0.8444			
7			0.7904			
8			0.8269			
9			0.9547			
10			0.6716	0.9204		
11				1.0000		
12				0.9660		
13				0.9520		
14				1.0000		
15				0.8986	0.9408	
16				0.9254	1.0000	
17				0.9722	0.9958	
18				0.8065	0.9282	
19				0.0000	0.8412	
20				0.7500	0.8099	1.0000
21				0.6667	0.6923	1.0000
22					0.4898	0.9649
23					0.5556	0.9140
24					0.4000	0.7934
25					0.0909	0.7500
26						0.6098
27						0.7941
28						0.8696
29						0.4286
30						0.0000

APPENDIX E. OFFICER PROGRAMMED AUTHORIZATIONS (OPA)

Designator 1000 Authorizations

GRADE	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97
CAPT	545	542	533	532	532	527
CDR	924	886	856	842	837	831
LCDR	1094	1051	1018	994	994	990
LT	2274	2212	2055	2026	2017	2001
LTJG	647	629	599	593	597	595
ENS	209	197	194	184	186	186
TOTAL	5765	5590	5326	5242	5233	5197

Designator 1050 Authorizations

GRADE	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97
CAPT	274	270	266	268	268	267
CDR	312	312	301	292	291	290
LCDR	254	247	251	246	246	243
LT	235	226	210	204	204	202
TOTAL	1150	1129	1102	1085	1082	1075

Designator 130X, Pilot/Naval Flight Officer

GRADE	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97
CAPT	307	302	295	293	292	292
CDR	868	847	818	804	801	790
LCDR	723	700	702	704	696	693
LT	947	900	884	870	864	864
TOTAL	2886	2790	2740	2712	2694	2680

Designator 131X, Navy Pilot

GRADE	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97
CDR	488	465	444	437	436	435
LCDR	1324	1281	1225	1214	1213	1213
LT	3631	3546	3442	3418	3424	3412
LTJG	2024	1917	1799	1766	1769	1765
ENS	218	220	189	189	189	189
TOTAL	7685	7429	7099	7024	7031	7014

Designator 1392, Navy Pilot, Flight Training Student

GRADE	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97
ENS	1442	1442	1428	1428	1428	1428
TOTAL	1442	1442	1428	1428	1428	1428

APPENDIX F. CALCULATION OF PILOT FACTORS

Calculation of the Pilot Factors used in the "Ideal" Force Structure

GRADE	O-1	O-2	O-3	O-4	O-5	O-6
Aggregate GenURL Inventory	10833	11990	15792	6134	2269	402
Aggregate Aviation Inventory	55351	52088	99513	58275	36713	14840
Aggregate URL Inventory	132163	128656	194384	112002	73194	33530
Aggregate Pilot Inventory	36444	33779	68830	37731	27678	13062
Pilot-URL Factor			0.3574	0.3564	0.3902	0.3943
Pilot-Aviation Factor			0.6414	0.6475	0.7539	0.8802

GenURL Community Inventory used to calculate Pilot Factors, provided by CDR Steadley, GenURL Community Manager.

GRADE	GenURL
CAPT	42
CDR	282
LCDR	676
LT	812
LTJG	410
ENS	375
TOTAL	2597

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