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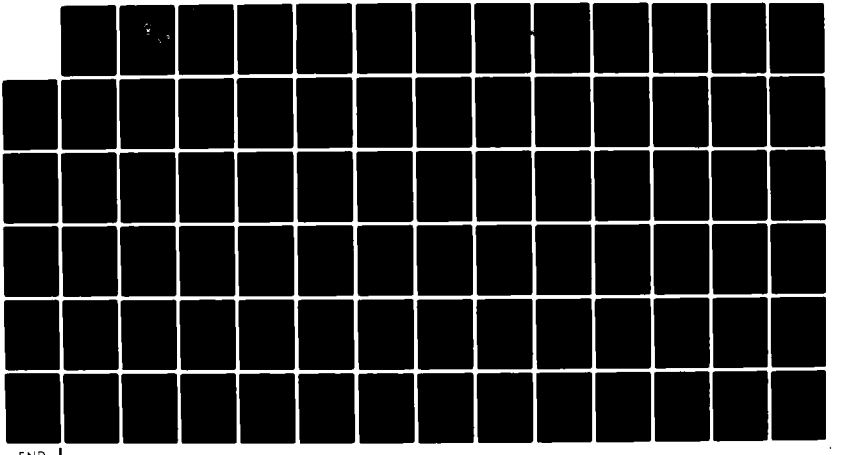

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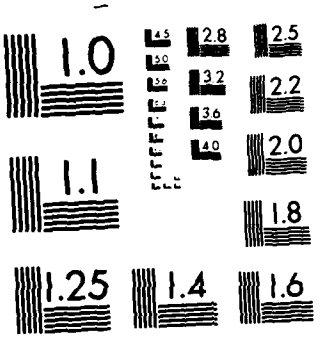

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NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

MANPOWER AND TRAINING REQUIREMENTS FOR THE U. S. NAVY'S FLEET DIVERS

by

Burton D. Smith

December 1982

Thesis Advisor: George W. Thomas

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existing shortages are pointed out. Future manpower requirements are presented, and inventories of each diving classification are projected through FY-87 based on historical transition rates and high and low accession scenarios. The FY-83 Training Input Plan is discussed, and a preferred plan is presented to meet manpower requirements by FY-86. The importance of recruiting sufficient numbers of accessions, and the means for doing so are brought out. Other items discussed are retention, compensation, and the distribution of divers by paygrade, including projections of the paygrade distribution.

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Manpower and Training Requirements for the U. S. Navy's Fleet Divers

by

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Lieutenant Commander, United States Navy
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Submitted in partial fulfillment of the
requirements for the degree of

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This thesis discusses the manpower requirements of the U. S. Navy's fleet divers. The divers' demographics are described, and comparisons are made with other Navy communities. The divers' training pipeline is discussed, including school capacities, numbers of inputs and attrition rates. The current inventory of divers is matched with the billets authorized for divers, and existing shortages are pointed out. Future manpower requirements are presented, and inventories of each diving classification are projected through FY-87 based on historical transition rates and high and low accession scenarios. The FY-83 Training Input Plan is discussed, and a preferred plan is presented to meet manpower requirements by FY-86. The importance of recruiting sufficient numbers of accessions, and the means for doing so are brought out. Other items discussed are retention, compensation, and the distribution of divers by paygrade, including projections of the paygrade distribution.

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I. INTRODUCTION

A. PURPOSE

The Navy diving community is relatively small in number, very specialized, and unfamiliar to most naval planners. Few officers come into contact with this unique group of highly-trained enlisted men. Most of the knowledge about the community is self-contained. Comprehensive studies and reports of manpower, personnel, or training issues for divers have been conducted only in the fields of diving physiology and psychology. The purposes of this thesis are: 1) to provide a detailed examination of the enlisted diving community regarding its personnel inventory, training pipelines, and manning requirements, 2) to model the training pipeline and projected stocks of divers, and 3) to recommend policy prescriptions where appropriate.

B. LITERATURE REVIEW

The existing literature relating to manpower, personnel, and training (MPT) requirements of divers is rather outdated, with most of the research focused on diver selection criteria. The most recent study was conducted in 1975 by T. E. Berghage, P. A. Rohrbaugh, A. J. Bachrach, and F. W. Armstrong of the Naval Medical Research Institute, Bethesda, MD, entitled Navy Diving: Who's Doing It and Under What Conditions. They

conducted a statistical survey by analyzing fleet diving logs from January 1972 through December 1973, emphasizing the physical characteristics of USN divers, the types of dives conducted, and the environmental conditions experienced during the conduct of those dives. Their findings included the following: 1) There were no relationships between diving accident rates and the divers' heights, weights, or body builds. 2) Over one-half of the dives were not in support of the fleet (46 percent were training and requalification dives). 3) The diving logs were plagued with erroneous data, misinterpreted instructions, and biased recording procedures.

An older, but more relevant study for the MPT planner conducted in 1970 by O. E. Painter of the Naval Personnel Research and Development Lab, Washington, D.C., entitled Personnel and Training Implications of the Deep Diving Systems. The author documented the need for personnel and training requirements for saturation diving, pointing out diver shortages and a lack of incentives for divers.

Other studies focus on the diver selection process. D. A. Wise of the Navy Experimental Diving Unit (NEDU), Washington, D.C. conducted a study in 1963 entitled Aptitude Selection Standards for the U. S. Navy's First Class Diving Course. It is a correlational analysis of first class diver trainees for determining what tests of the Navy's basic test battery could best be used as predictors of training success.

More recently, in 1972, Berghage evaluated the aptitude tests as predictors of success in his report The Use of Standard Navy Classification Test Scores for the Selection of Diver First Class Candidates.

R. Helmreich, R. Bakeman, and R. Radloff of the University of Texas (Austin) Social Psychology Lab published The Life History Questionnaire: Prediction of Performance in Navy Diver Training in 1971. The authors discussed the questionnaire's ability to explain differences among TEKTITE Aquanauts in their ability to work effectively underwater, to get along with their fellow teammates, and to generally adjust to a hyperbaric chamber environment.

In a study entitled Psychiatric Incidence Among Military Divers by R. J. Biersner and D. H. Ryman of the Navy Medical Neuropsychiatric Research Unit (NMNRU), San Diego, CA, the authors found the psychiatric incidence rate of Navy divers to be over twice that of a control group. Also in 1973 under the auspices of NMNRU, Biersner in Social Development of Navy Divers found Navy divers in their early social development to be more rebellious against social institutions than their non-diving Navy counterparts.

C. SCOPE

This thesis will be limited to the five separate, but related categories of "fleet divers" listed in Table 1 which follows:

TABLE 1

Diver Categories

CLASS	SNEC*
Second Class Diver	5343
First Class Diver	5342
Master Diver	5341
Saturation Diver	5311
Master Saturation Diver	5346

* Secondary Navy Enlisted Classification

These are the Navy's salvage divers and saturation divers. Some are also members of the SEABEE Underwater Construction Teams. Omitted are the UDT and SEAL personnel who are technically "combat swimmers," EOD technicians, and scuba divers, in that diving is not their primary duty. These latter communities have different missions, entry requirements, and career patterns; therefore, their manpower and training problem areas are not necessarily related to those of the fleet divers. Consequently, I have chosen to limit the scope of this thesis to fleet divers only. The thesis is intended to serve as background information for the enlisted community manager for divers, the divers' rating assignment officer, and any other naval planners requiring knowledge of the manpower, personnel, and training issues involving U. S. Navy divers.

D. PROBLEM

The primary problem facing the divers' Enlisted Community Manager today is manning. Currently (as of 1 July 1982),

there are 1,345 diving coded billets authorized for the SNEC's above, but there is an inventory of only 1,096 divers to draw from. The "fill rate" of authorized diving billets on 1 July 1982 was below 80 percent. This figure can be compared with the current 91 percent manning level for all Navy ratings, E-4 and above, [NAVPERS 15658, 30 June 1982]. To arrive at the root of the manning problem, diver accessions, training pipeline flows, attrition and retention rates will be examined.

E. CHAPTER SUMMARIES

In the following chapter, the inventory of divers will be discussed based on demographic descriptions of the personnel comprising the diving community. The demographics of the divers will be compared with those of the rest of the Navy, the SEABEE community, and another group of divers--the EOD technicians. The data analyzed are primarily from the Defense Manpower Data Center (DMDC) Enlisted Master File, which has been extracted from the Navy Military Personnel Command (NMPC) Enlisted Master Record. In Chapter 3, the training pipeline for Navy divers will be examined and modeled from initial entry through the various NEC granting "C-Schools" up to, and including, Master Diver. The courses will be briefly described with the focus on the flow (i.e. rates of trainee inputs and outputs).

Manpower requirements for divers will be addressed in Chapter 4, including diving billets authorized and personnel

requirements. Current and future requirements will be identified, possible shortfalls (and excesses) will be discussed, and an optimal training plan will be developed to meet manpower requirements for the next five years. The inventory projections will be obtained from the application of the Markov manpower flow model, MAN-MOD.

In Chapter 5, the diving career pattern will be discussed, including progression through the diving community, advancement by paygrade, retention, and special compensation issues as they affect the community. In the final chapter, the conclusions from the analyses will be presented, alternative courses of action proposed, and policy implications discussed.

II. INVENTORY OF DIVERS

In general, the Navy divers' primary role is support of the Fleet through the performance of underwater salvage and rescue operations, and other miscellaneous tasks. Operations range from re-floating sunken ships to performing deep submergence submarine rescue. In addition to direct fleet support, a large segment of the community is engaged in experimental diving techniques, including medical research, and in diving training in both student and staff roles. As previously indicated [Berghage et al, 1973], a survey of diving logs indicated only 46 percent of the recorded dives were "operational," the remainder being administrative (primarily training and requalification dives).

A. DIVER CATEGORIES

Divers are categorized by Navy Enlisted Classification (NEC) codes attained from formal "C-School" training. By omitting scuba divers, special warfare, and EOD divers, one can focus solely on fleet divers who belong to one of the following categories:

1. Diver Second Class (NEC 5343)--the entrance level category of working divers, capable of performing basic tasks and tending other divers.

2. Diver First Class (NEC 5342)--the advanced level diver who is capable of performing salvage and rescue operations, and plans the more routine diving operations.
3. Master Diver (NEC 5341)--the supervisory level, plans and directs all diving operations (less saturation).
4. Saturation Diver (NEC 5311)--a diver trained to live and work at depths in a saturated condition for extended periods of time. (Entry is from the First Class Diver category only.)
5. Saturation Master Diver (NEC 5346)--plans and directs all diving operations including those involving saturation techniques.

Navy divers are typically older caucasian males, senior careerists in ratings specifically related to diving operations and support. The tables in the following pages provide biographic profiles of Navy divers by category.

B. DATA UTILIZED

All data presented were obtained either directly or indirectly from the NMPC Enlisted Master Record which contains information from individual's service records. Two data sets were utilized in the analyses. The education data (including AFQT percentages) presented in Table 3, and rating, paygrade, length of service (LOS), and marital status presented in Table 6 are statistical summaries obtained from

a data tape prepared by the Defense Manpower Data Center (DMDC), Monterey, CA from the DMDC Enlisted Master File--a file extracted from the NMPC Enlisted Master Record. The data are valid as of 1 January 1982.

The remainder of the biographical data presented in this chapter were derived from a data tape prepared by NMPC-472, and extracted directly from the Enlisted Master Record as of 1 July 1982. The statistics presented were obtained by using the Statistical Package for the Social Sciences (SPSS) in analyzing the two data tapes. The data are from the entire diver population, rather than from samples of the populations.

C. INVENTORIES BY DIVER CATEGORY

The 1 July 1982 inventories were as follows:

1.	Divers Second Class	358
2.	Divers First Class	485
3.	Saturation Divers	164
4.	Master Divers	70
5.	Saturation Master Divers	19
6.	Total Divers	1,096

The above inventories were determined by screening the Enlisted Master Record for all personnel assigned diving SNEC's. It should be noted that SNEC entries may not be submitted for inclusion into the master record in a timely fashion; therefore, the data from the Enlisted Master Record may not accurately reflect the actual number of divers as of any given date.

D. DEMOGRAPHIC DESCRIPTIONS

Table 2 shows subgroup age means, portion female, percentages caucasian and black, and the percentage with one or more dependents. Mean ages reflect the intended progression through the various categories: means of 26 years for the second class divers, 32 years for first class and saturation divers, and 40 and 39 years, respectively, for the two master diver classes.

TABLE 2

Demographic Characteristics of Divers

	Second Class	First Class	Satura-tion	Master	Master Sat	Total
n	358	485	164	70	19	1,096
AGE						
Mean	25.6	31.9	32.1	40.4	38.8	30.5
SEX						
%Female	2.0	0.6	0	0	0	0.9
RACE						
%Cau	97.2	96.1	97.0	100	100	96.7
%Black	0.8	2.5	0.6	0	0	1.5
DEPENDENTS						
%With	51.7	84.5	86.0	100	100	75.3

The low percentages of females likely results from the diver source ratings being closed to them until 1978 (borne out by their concentration in the Diver Second Class category), and the strenuous physical requirements associated with working surface-supplied dives. The low percentages of blacks is also noteworthy. (None are in the Master Diver classes.)

As illustrated in Table 3, the mean years of education for each of the categories is almost twelve years. (Over 91 percent overall are high school graduates.) The AFQT percentages are very close for all categories except for the master divers who are 7 to 10 percentage points below the others. This may be attributed to the method of converting the scores on the earlier versions of the AFQT of the older personnel to the ASVAB standard now in use.

TABLE 3

Education

	Second Class	First Class	Satura-tion	Master	Master Sat	Total
YEARS						
Mean	11.93	11.87	11.91	11.90	11.79	11.90
(s.d.)	(0.71)	(0.80)	(0.55)	(0.61)	(0.63)	
AFQT						
Percentile	67.20	67.22	66.66	59.04	69.40	66.68
(s.d.)	(16.52)	(18.11)	(16.93)	(17.08)	(18.80)	

Table 4 presents comparisons of rating distributions of the divers. The column for second class divers shows that 25 percent of them are Hull Technicians, 12 percent are Boatswain Mates, 8 percent are Enginemen, and 7 percent are Machinist Mates. Over 40 percent of the divers are in one of two ratings--Hull Technician (HT) or Boatswain Mate (BM). The divers comprise 3.6 percent and 2.5 percent, respectively, of the total Navy inventories of those two ratings. The HT rating is particularly suited for underwater work such as welding and other hull repairs, whereas the BM rating

is appropriate for the deck-type "tending" tasks required to support the diver. The next three most common ratings--EN, MM, and EM--are applicable for maintaining various diving related equipment such as air compressors.

TABLE 4

Rating Distributions

	Second Class	First Class	Satura-tion	Master	Master Sat	Total
RATINGS Most Com (% in)	HT (25)	HT (24)	HT (21)	HT (27)	BM (37)	HT (24)
2nd	BM (12)	BM (22)	BM (16)	BM (27)	HT (11)	BM (19)
3rd	EN (8)	EN (9)	EN (13)	MM (16)	EN (11)	EN (9)
4th	MM (7)	MM (7)	EM (11)	EN (10)	MM (11)	MM (8)

Table 5 presents paygrade, length of service, and sea duty distributions. Second class divers are typically Petty Officers Second Class (E-5's), whereas first class divers and saturation divers tend to be First Class Petty Officers. Both master diver categories are comprised solely of Chief Petty Officers, and are more apt to be E-8's or E-9's than E-7's. Lengths of service (LOS) parallel the paygrades associated with each class of divers, with the average diver in his eleventh year of service. Approximately one-half of the divers are currently serving in a sea duty status. Over 60 percent of the second class divers are on sea duty while only

37 percent of both classes of saturation divers are on sea duty. The saturation divers on sea duty appear to remain on sea duty longer than their first class diver and master diver counterparts, however.

TABLE 5

Paygrade, LOS, and Sea Duty Distributions

	Second Class	First Class	Satura-tion	Master	Master Sat	Total
PAYGRADE Population						
E2	4					4
E3	24		1			25
E4	86	15				101
E5	185	113	17			315
E6	56	168	85			316
E7	3	134	43	14	2	196
E8		38	12	21	6	77
E9		12	4	35	11	62
LOS						
Mean	5.64	12.11	12.44	21.01	20.13	10.76
(s.d.)	(3.40)	(5.82)	(4.48)	(4.74)	(3.52)	(6.44)
SEADUTY STATUS%	61.2	49.3	37.2	52.9	36.8	51.4
CONTINUOUS SEADUTY%						
Over 5 yrs	12.9	22.5	26.4	25.0	33.3	19.4
10	0.4	3.9	1.4	0	11.1	2.1
15	0	0.7	1.4	0	11.1	0.2

E. COMPARISONS WITH OTHER GROUPS

To establish some perspective of the Navy divers' biographical profile compared to a Navy-wide profile of all enlisted personnel, E-4 and above, data were obtained from DMDC for the variables paygrade, education level, AFQT score

group, and marital status. Data was also provided for the SEABEE community and the EOD community for similar comparisons. The results are presented in Table 6.

TABLE 6

Biographical Comparisons

	Divers	Navy-wide	SEABEES	EOD
PAYGRADE				
% E-4	11	31	31	3
E-5	27	30	30	12.5
E-6	28	24	26	40.5
E-7	18	11	10	25.5
E-8	8	3	3	10.5
E-9	5	1	0.2	8
EDUCATION LEVEL				
Under 12 yrs	9	8	4	9
12 yrs	88	88	89	87.5
Some coll	3	2.5	1.7	3
Coll grad	0.3	1.3	0.4	0.7
AFQT CATEGORY				
% I	6	9	3	10
II	50	41	31	58
IIIA	29	26	35.5	25
IIIB	12	16	23	6
IVA	2	4.5	4	0.8
IVB	0.2	2.5	1	0
V	0	0.8	0.4	0
MARITAL STATUS				
% Married	70	59	64.5	79
Single	30	41	35.5	21

The uniqueness of the diving community becomes evident. The divers are considerably more senior than the rest of the Navy and the SEABEE community, but are not nearly as senior as their EOD "cousins." Their education levels are very

similar to those for both the Navy and EOD. There are some interesting differences between the divers and the other groups in the AFQT mental categories. Eighty-five percent of the divers are in mental category groups I-IIIA, compared to 76 percent Navy-wide, 69.5 percent of the SEABEES, and 93 percent of the EOD technicians. Comparing the percentages of the personnel in Categories I and II indicates 55 percent of the divers are in the top two mental category groups, followed by 50 percent of the Navy-wide population, and 34 percent of the SEABEES. The EOD technicians again have the highest percentage: 68 percent. A notably high percentage of divers are married, but not as high as among the EOD personnel.

To put into perspective the low manning levels of diving billets, an examination of the Navy-wide manning levels for the five most common ratings for Navy divers reveals the following (for E-4's and above for each rating): HT's are 75 percent manned, BM's are 88 percent, EN's 87 percent, MM's 96 percent, and EM's 96 percent [NAVPERS 15658, 30 June 1982]. The reasons behind this serious manning situation will be discussed in depth in the following chapter.

F. RETENTION

Retention for fleet divers in their first and second terms is generally higher than the Navy average. In FY 1979, the reenlistment rate for first-term divers was 40.9

percent compared to the Navy average of 30.5 percent; for career divers (two or more terms), it was 79.6 percent, and the Navy average was 55.2 percent [NAVPERS 15658 (A), 30 Sep 1979]. For the first six months of FY 1982, the first term reenlistment rate for divers was 52.7 percent compared to the Navy average of 53.9 percent; for careerists, the diver rate was 86.2 percent, and the Navy average was 81.0 percent [NAVPERS 15658, 31 Mar 1982]. Reenlistment rates over the past three fiscal years, and the first half of FY 1982, for the first term, second term, and divers with three or more enlistments are shown in Figure 1.

While the Navy's second-term reenlistment rate increased 51 percent from FY 1981 to the first half of FY 1982, the reenlistment rate for second-term divers dropped 13 percent over the same period; first-term reenlistment rates for divers was virtually unchanged. No specific explanation is obvious as to why diver retention has tapered off during FY 1982 while the Navy's figures have significantly improved. It may be that diver retention is not strongly correlated with the unemployment rate as is military retention, in general. The normally high retention for divers is somewhat surprising, in that their occupation is highly marketable outside the Navy. There is substantial demand for deep divers in the off-shore drilling industry, and pay is reputed to be outstanding.

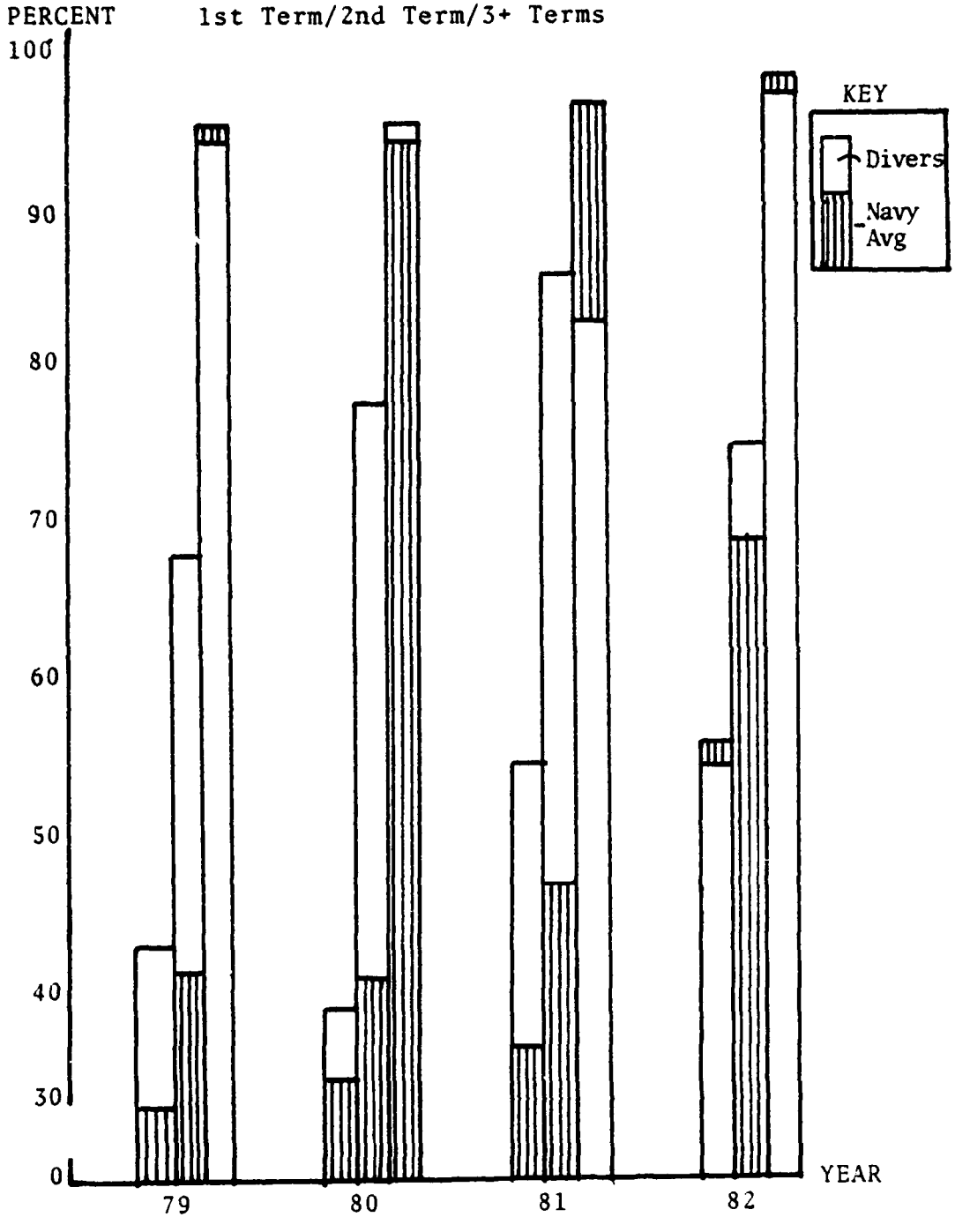

Figure 1: Reenlistment Rates for FY 1979 to FY 1982

III. DIVER TRAINING

The fleet is the primary source of Navy divers. Although there is no requirement for a tour at sea prior to entering the diving program, most applicants come from sea duty. About thirty percent enter directly from recruit training and apprenticeship training, or A-school. Entry into the community occurs upon successful completion of Diver Second Class training, and assignment of SNEC 5343. (All of the diving schools are NEC granting C-schools.)

A. DIVER SECOND CLASS

The second class diver aspirant must be a volunteer for the training, be recommended by his commanding officer, and be in pay grade E-2 to E-6 in one of twenty source ratings.[1] He must also be physically qualified, possess a minimum ASVAB score of 105 (AR + WK), and be qualified and screened in accordance with the Military Personnel Command Manual [MILPERSMAN Art 1410380]. The requirement that the applicant be in one of twenty source ratings has been recently waived [NAVOP 078/82].

Diver Second Class training is conducted at four locations by four separate and distinct commands:

---

[1]The prerequisites and course descriptions contained in this paragraph, and the following paragraphs, are from the Catalog of Navy Training Courses (CANTRAC) dated July 1982.

1. Navy Diving and Salvage Training Center, Panama City, FL
2. Naval Amphibious School Coronado, San Diego, CA
3. Mobile Diving and Salvage Unit TWO, NAB Little Creek, VA
4. Naval Submarine Training Center, Pacific, Pearl Harbor, HI

The course length is 86 days, with 18 classes conducted each year. Quotas are also available to naval reservists, the Coast Guard, Army, and foreign navies. The training is strenuous and mentally challenging, as evidenced by a high attrition rate of 38 percent. (Attritions are equally divided between academic and non-academic causes.) For comparison, attrition rates for all NEC granting C-schools have averaged between 5 percent and 6 percent for the past two years [OP-135E2, 30 Nov 1982].

The instruction includes diving physics and diving medicine, SCUBA, surface supported diving systems, underwater mechanics and tools, and underwater cutting and welding with all conventional air diving equipment. The graduate incurs 22 months of obligated service upon completion of the training. Attritions are either "setback" to the following class, or more often, reassigned to other duty.

All USN graduates of the Diver Second Class course are awarded the 5343 SNEC, and are assigned directly to diving billets, the vast majority being aboard ship. Once a sailor has attained the 5343 SNEC, he is no longer assigned by a Navy-rating detailer, but is instead assigned by the detailer for Navy divers. Practically speaking, he is a "loss" to

his rating and a "gain" to the diving community. A second class diver remains classified as such unless he voluntarily drops his NEC, has it revoked, completes Diver First Class training, or is advanced to Chief Petty Officer (E-7).

B. DIVER FIRST CLASS

The next stage in the progression through the diving community is Diver First Class. After a currently qualified second class diver completes one year in a SNEC 5343 billet, he becomes eligible for first class diver training, provided he volunteers for the training and is recommended by his commanding officer. The Diver First Class course is 126 days long, and is conducted eight times a year at the Navy Diving and Salvage Training Center at Panama City, FL. It is also available to divers from the reserves, Coast Guard, Army, and foreign navies. First class divers comprise the largest category of Navy divers, and are the backbone of the diving community, whereas the second class divers are frequently in a supporting capacity and perform the simpler diving tasks. Master divers perform in a supervisory role, and the saturation divers are quite specialized.

The first class diver receives training and instruction in all areas of diving, ship salvage, and submarine rescue operations, and is qualified to a depth of 300 feet. The specific instruction includes diving physics and medicine, underwater cutting and welding, diving systems certification, salvage machinery and demolition, submarine rescue chamber

operations, helium-oxygen diving, and underwater work experience with all conventional diving equipment. The attrition rate is normally between ten and twenty-five percent. Upon completion of the training, the graduate incurs 30 months of obligated service. Attritions are either setback or reassigned as second class divers.

As with second class diver training, the Diver First Class student is normally ordered to the training center in a permanent change of station (PCS) status, and can anticipate orders directly to a first class diver billet [DNEC]. His initial assignment is generally to sea duty aboard a ship that supports diving operations: Submarine Rescue Ship (ASR), Salvage Ship (ARS), Salvage Rescue Ship (ATS), Submarine Tender (AS), Destroyer Tender (AD), or Repair Ship (AR), or to one of the two Mobile Diving and Salvage Units. The SEABEE divers are assigned to the Underwater Construction Teams (UCT's).

There are no restrictions by paygrade for the first class diver; he is not forced to progress into a more advanced diving category upon advancement in paygrade as the second class diver is when he is promoted to chief. (Over ten percent of the first class divers are E-8's or E-9's.) However, he may have his NEC revoked for physical, disciplinary, or other reasons; or he may voluntarily drop it. Either circumstance is relatively unusual.

C. SATURATION DIVER

The Saturation Diver classification is a hybrid of the first class diver, and as such, is not considered a more "senior" category. Saturation diver applicants must be designated first class divers, be recommended by their commanding officers, and meet special physical qualifications. The Saturation Diver course provides training in saturation diving (dives requiring decompression) techniques and in various deep dive systems. The course is conducted twice a year by Submarine Development Group ONE in San Diego, and is of 120 days duration. This course is the only one attended by diving officers in addition to enlisted personnel; it is also available to reservists and personnel from foreign navies. (There are no requirements for Army or Coast Guard saturation divers.)

The instruction includes extensive training in diving physics, diving medicine, saturation diving theory, the MK I MOD S Underwater Breathing Apparatus, operations and maintenance of the MK II MOD O Deep Dive System, gas systems cleaning, diving systems quality assurance, systems certification, and operation and maintenance of atmospheric monitoring equipment. The attrition rate is slightly lower than that for first class diver training: it is usually between ten and twenty percent. (Attritors are assigned as first class divers.) The graduate receives an SNEC of 5311, incurs additional obligated service, and is assigned

directly to a 5311 billet. He also remains in the diving community unless he drops his NEC or has it revoked. On occasion, saturation divers may revert back to either first or second class diver status.

D. MASTER DIVER

The highest categories for divers are Master Diver (SNEC 5341) for first class divers and Master Saturation Diver (SNEC 5346) for saturation divers. There is one course of instruction for both categories: Master Diver Evaluation. It is a 35-day course conducted seven times a year by the Navy Diving and Salvage Training Center, and is available to reservists and personnel from foreign navies. (As with saturation training, the Army and Coast Guard do not have requirements for master divers.) The course provides refresher training in various aspects of diving and evaluates candidates for selection to Master Diver. Candidates must be in pay grade E-7 to E-9, have no annual evaluation marks less than 30 percent for the previous two years (thereby ensuring only the better chiefs qualify, for a mark below 30 percent is generally considered to indicate a serious deficiency), and be recommended by their commanding officers. Both first class divers and saturation divers must have two years experience in assignments to HEO2 equipped ships (e.g. ASR's or ATS's) or to diving activities (e.g. Mobile Diving and Salvage Units).

In addition to refresher training, the course provides advanced training in diving medicine and physics, instruction in new diving systems and techniques, and actual experience in supervising diving operations. The failure rate is quite high: about 65 percent. During the fifth and final week of the course, each candidate is observed and evaluated according to his responses to planned diving casualties and problems at-sea. A fourteen member board then votes for selection or non-selection of each candidate to Master Diver based on stringent established standards [Malloch, 1979]. Those who do not pass return to their commands as first class or saturation divers, or, in a few cases, are setback. Those who fail are often afforded the opportunity to reapply. Successful graduates are awarded SNEC's of 5341 or 5346, as appropriate, and are detailed accordingly.

E. TRAINING PIPELINE

The total annual capacity for the second class diver schools is 450 entering students; class capacity is 25 students with 18 classes conducted each year. Table 7 presents aggregate (all four schools and total students rather than USN students only) numbers of enrollees and graduates for Diver Second Class Training in FY 1982. The numbers of enrollees and graduates, including USN only figures, are presented by class for each school during FY 1981 and FY 1982 in Appendix B.

TABLE 7

Diver Second Class Training

Fiscal Year	Total Inputs	Total Outputs	Attrition Rate
1982	334	208	.38

The FY 1983 Training Input Plan [OP-13, 25 Mar 1982] allocates 406 of the 450 training billets to active duty U. S. Navy personnel for FY 1983, the remainder allocated to the U. S. Coast Guard (17), U. S. Army (12), U. S. Navy reserves (10), foreign military students (3), and civilians (2). With a 35 percent attrition rate, the second class diver schools would produce 264 new SNEC 5343's, provided every training billet is filled. The school's total capacity has not been utilized in the past two years, however, although on occasion, individual class capacities are exceeded. Considering the curriculum is standard, the difference in attrition rates between the schools for FY 1981 are striking. It ranged between 18 percent and 57 percent, with a mean of 37 percent. The range was considerably less for FY 1982: from 30 percent to 45 percent with a mean of 38 percent.

First class diver annual capacity has been recently raised from 155 students to 200 students, with class capacities of 25 students, and eight classes conducted each year. The numbers of students entering and graduating from

first class diver training in FY 1982 are depicted in Table 8 below; data by class for FY 1981 and FY 1982 are contained in Appendix B.

TABLE 8

Diver First Class Training

Fiscal Year	Total Inputs	Total Outputs	Attrition Rate
1982	125	98	.22

The FY 1983 Training Input Plan [OP-13, 25 Mar 1982], based on school capacity of 155 students, allocates 143 billets to active duty USN second class divers. The remainder are allocated as follows: five for U. S. Army, three for U. S. Coast Guard, two for foreign military, and two for civilians. The additional 45 student billets created from the school's increase in capacity may be allocated to USN second class divers, increasing the total available to 188. Applying a 20 percent attrition rate to first class diver training, the school could produce 150 new SNEC 5342's annually (again assuming all training billets are filled). As with second class diver training, Diver First school capacity has not been reached in the past two years. The numbers of students entering and graduating from training are shown by class in Appendix B.

Saturation diver training has an annual capacity of 56 entering divers. Two classes are conducted each year, with

class capacities of 28 students. The numbers of enrollees and graduates from Saturation Diver Training in FY 1982 are presented in Table 9.

TABLE 9

Saturation Diver Training

Fiscal Year	Total Inputs	Total Outputs	Attrition Rate
1982	38	34	.11

The FY 1983 Training Input Plan allocates 48 training billets to first class divers and eight to deep sea diving officers. If all the training billets for first class divers are filled, the school will graduate about 41 new saturation divers, based on a 15 percent attrition rate. Entering and graduating student data are presented by class in Appendix B.

Master Diver Evaluation has an annual capacity of 35 first class divers and saturation divers. Seven classes are scheduled annually with five master diver candidates per class. Table 10 shows the number of enrollees and graduates from Master Diver Evaluation in FY 1982.

TABLE 10

Master Diver Evaluation

Fiscal Year	Total Inputs	Total Outputs	Attrition Rate
1982	34	13	.62

The FY 1983 Training Input Plan allocated 33 billets to first class divers and two billets to saturation divers. With a 66 percent attrition rate for USN trainees, the school will graduate about 12 master divers (including master saturation divers). Student data by class are contained in Appendix B.

IV. MANPOWER REQUIREMENTS

The primary purpose of the diver training pipeline is to provide the necessary personnel to satisfy the Navy's manpower requirements for fleet divers. The manpower requirements determination process for divers is based on the Ship Manpower Document (SMD) program and the Shore Requirements, Standards, and Manpower Planning System (SHORSTAMPS) program. For each of the programs, manpower workload requirements for stated levels of either Required Operational Capabilities (ROC's) or Shore Required Operational Capabilities (SHOROC's) are determined from past analyses and established standards [Navy Enlisted Personnel Management Plan, June 1979]. The manpower requirements for divers stated throughout this chapter are from the Navy Manpower Data Accounting System (NMDAS), which is the authoritative source for manpower authorizations and current requirements, reflected from the SMD and SHORESTAMPS inputs.

Manpower requirements determine billet authorizations, which are in turn translated into personnel authorizations at the unit level by rate, rating, and NEC. The Navy Manning Plan (NMP) which is the near term (current fiscal year) allocation of expected personnel inventory to the unit level, is subsequently developed. The NMP uses Personnel Authorizations as the distribution target, but reacts to

short run changes in both the manpower program and personnel inventory availability [Navy Enlisted Personnel Management Plan, June 1979].

A. CURRENT REQUIREMENTS

Fleet divers are undermanned in every category except for master saturation diver, as depicted in Table 11.

TABLE 11

FY 1982 Manpower Requirements and Inventory

Diver Class	Billets Auth	Personnel Reqmts*	Inventory
DIV2 (5343)	459	499	358
DIV1 (5342)	573	630	485
SAT (5311)	205	215	165
MDV (5341)	94	99	72
MSAT (5346)	15	16	20

* estimated

For FY 1982, 459 billets (including 25 trainee billets) were authorized for second class divers [OP-132C10, 12 Mar 1982]. As of 1 July 1982, the inventory of Divers Second Class was only 359; therefore, if every diver were assigned to a diving billet, only 78 percent of the billets would be filled. (Paygrade constraints are omitted here to provide a clearer picture of aggregate requirements.) The manning appears even more deficient when allowances for individual accounts (transients, trainees, patients, prisoners, and holdees) are

included with the billet requirements. Adding 15 percent for individual accounts to the non-training billets authorized (434), a conservative figure in view of the large number of second class divers who must flow into first class diver training, the total personnel requirements are 499. The "fill rate" with a 358 diver inventory becomes 72 percent.

Shortfalls also exist for first class divers, but not to the extent they do for second class divers. The NMDAS billets authorized for first class divers total 573 divers [OP-132C10, 12 Mar 1982]. Adding 10 percent for individual accounts (based primarily on trainees in saturation and master diver courses), increases the total personnel requirements to 630. The fill rates with 485 first class divers are 85 percent of billets authorized, and 77 percent of total personnel requirements.

Manning shortfalls for saturation divers are similar to those for first class divers. There are 205 billets authorized for saturation divers; adding 5 percent for individual accounts (based on rough historical estimates), increases total personnel requirements to 215 divers (OP-132C10, 12 Mar 1982]. The fill rates with the present 165 saturation diver inventory are 80 percent of billets authorized and 77 percent of personnel requirements.

Master divers are in shorter supply. NMDAS billets authorized total 94 master divers [OP-132C10, 12 Mar 1982], yet the present inventory is 70. Adding 5 percent for

individual accounts (based on historical estimates), increases total personnel requirements to 99. The fill rates are then 74 percent and 71 percent, respectively. The manning situation improves somewhat when the excess of master saturation divers is applied to the master diver requirements. Presently, there are 19 master saturation divers and 15 billets authorized [OP-132C10, 12 Mar 1982]. With an individual account including one diver billet, the three excess master saturation divers could serve in master diver billets, leaving master saturation divers manned at 100 percent, and increasing master diver manning to 78 percent and 74 percent, respectively.

B. FUTURE REQUIREMENTS

It should be noted that the billets authorized which were discussed in the preceeding paragraphs are for FY 1982. Billet requirements are projected to increase through FY 1985, and then decrease in FY's 1986 and 1987 to approximately 1982 levels [OP-132C10, 12 Mar 1982]. Yearly requirement levels are illustrated in Table 12.

The shortfalls in first and second class diver inventories will undoubtedly dictate that the NMP for activities with diver billets be substantially less than billets authorized. The low inventory of second class divers is especially cause for concern. Not only are nearly 30 percent of the Diver Second Class billets potentially

unfilled, but the stocks for the advanced diving categories to draw from will not be sufficient to maintain their inventories at satisfactory levels.

TABLE 12

Billets Authorized FY 1982 - FY 1987

Fiscal Year	Diver Classification				
	Second Class	First Class	Sat	Master	Master Sat
1982	459	573	205	94	15
1983	460	585	205	95	15
1984	473	595	204	97	15
1985	479	606	204	99	15
1986	461	568	204	93	15
1987	455	562	204	92	15

C. DIVER FLOW MODEL

To illustrate the potential impact, a one year transition matrix presented in the first five rows and columns of Table 13 was formed based on beginning inventories on 1 July 1981, "recruits" into the Diver Second Class category (i.e. graduates of Diver Second Class training) during the year, flows or "advancements" into the other categories, and losses from the system, resulting in the ending inventories on 1 July 1982.

Each row in Table 13 represents the movement of divers who began the year in the category labeled in the left margin and end the year in the categories labelled across

the columns. For example, of the 473 first class divers at the beginning (1 July 1981), 389 (82 percent) remained first class divers, 34 (7 percent) transitioned to the saturation diver category, 12 (3 percent) transitioned to master diver, and 38 (8 percent) were attritions from the system (e.g. left the service or lost their NEC).

TABLE 13

Transition Matrix for Diver Categories
(with Beginning and Ending Inventories 7/81 - 7/82)

Recruits	107 DIV2	DIV1	SAT	MDV	MSAT	Losses	Begin Inven
DIV2	251 (.57)	96 (.22)	0	0	0	94 (.21)	441
DIV1	0	389 (.82)	34 (.07)	12 (.03)	0	38 (.08)	473
SAT	0	0	131 (.89)	0	1 (.01)	16 (.11)	148
MDV	0	0	0	58 (.85)	0	10 (.15)	68
MSAT	0	0	0	0	18 (.95)	1 (.05)	19
End Inv	358	485	165	70	19		

D. LOW ENTRY SCENARIO

A Markov chain manpower flow computer model, MAN-MOD, adapted from Bartholomew and Forbes' model, BASEQN [Bartholomew and Forbes, 1979], was applied over a six year time horizon using the rates (held constant) indicated in Table 13, and a constant number of entry level "recruits."

The number of recruits selected for the model is 107, which is the number of SNEC's granted during the twelve month period beginning 1 July 1981, according to the Enlisted Master Record (EMR) on 1 July 1982. (It is recognized that the accuracy of this figure may be suspect since some SNEC's granted were in error, and other divers who attained SNEC 5343 during this period were not recorded on the EMR.) The results are projected in Table 14.

TABLE 14

MAN-MOD Inventory Projections from 7/81 - 7/82 Flows
(Low Entry Scenario)

Fiscal Year	Diver Classification				
	DIV2	DIV1	SAT	MDV	SAT
1982	385	485	165	72	20
1983	311	476	181	76	20
1984	284	459	194	79	21
1985	269	439	205	81	22
1986	260	419	213	82	23
1987	255	401	219	82	24

The impact of low recruiting into the diving community is devastating. Table 15 compares requirements (billets authorized) with inventory projections by fiscal year. With the rates from 1 July 1981 to 1 July 1982 historical data, in FY 1985 there would be only 269 second class divers to fill 479 billets; when individual accounts are included,

one could expect approximately 50 percent of the Diver Second Class billets to be unmanned, and over 35 percent of the Diver First Class billets to be unmanned!

TABLE 15

Billets Authorized Compared with Inventory Projections (Low Entry Scenario)

Fiscal Year	Classification	Billets Auth/ Projections	Fill Rate
1982	DIV2	459/358	.78
	DIV1	573/485	.85
	SAT	205/165	.80
	MDV	94/72	.77
	MSAT	15/20	1.33
1983	DIV2	460/311	.68
	DIV1	585/476	.81
	SAT	205/181	.88
	MDV	95/76	.80
	MSAT	15/20	1.33
1984	DIV2	473/294	.60
	DIV1	595/459	.77
	SAT	204/194	.95
	MDV	97/79	.81
	MSAT	15/21	1.40
1985	DIV2	479/269	.56
	DIV1	606/439	.72
	SAT	204/205	1.00
	MDV	99/81	.82
	MSAT	15/22	1.47
1986	DIV2	461/260	.56
	DIV1	568/419	.74
	SAT	204/213	1.04
	MDV	93/82	.88
	MSAT	15/23	1.53
1987	DIV2	455/255	.56
	DIV1	562/401	.71
	SAT	204/219	1.07
	MDV	92/82	.89
	MSAT	15/24	1.60

Positive steps have been initiated recently to improve recruiting, including Congress' appropriation of increased diving pay, advertising in Link Magazine, publicity in Navy Times, and messages to the fleet from the CNO in a Navy Newsgram and to type commanders from NMPC. These measures appear to be effective, for requests for diving training have increased substantially since 1 July 1982.

E. MAXIMUM TRAINING CAPACITY SCENARIO

If the number of recruits each year is increased to 264 (the number expected if training billets are filled to capacity), and applying the same flow rates as before, manning levels improve significantly, as depicted in Table 16. With these assumptions, an excess of second class divers will result by FY 1985 (3 percent over total personnel requirements), and the first class diver manning deficiency (for total personnel) will be reduced to 19 percent. The two inventories can be better balanced by increasing the flow of second class divers into Diver First Class training.

A preferred scenario will be developed in the final section of this chapter.

F. THE FY 1983 TRAINING INPUT PLAN

The annual Class "C" (NEC) Training Input Plan is a principal result of the Navy's process for planning specialized training. C-school requirements are determined by comparing projected NEC inventories with projected NEC requirements; the student input to each school will

TABLE 16

Billets Authorized Compared with Inventory Projections
(Scenario with Maximum Recruits)

Fiscal Year	Classification	Billets Auth/ Projections	Fill Rate
1982	DIV2	459/358	.78
	DIV1	573/485	.85
	SAT	205/165	.80
	MDV	94/72	.77
	MSAT	15/20	1.33
1983	DIV2	460/468	1.02
	DIV1	585/476	.81
	SAT	205/181	.88
	MDV	95/76	.80
	MSAT	15/20	1.33
1984	DIV2	473/531	1.12
	DIV1	595/494	.83
	SAT	204/194	.95
	MDV	97/79	.81
	MSAT	15/21	1.40
1985	DIV2	479/567	1.18
	DIV1	606/522	.86
	SAT	204/207	1.01
	MDV	99/81	.82
	MSAT	15/22	1.47
1986	DIV2	461/587	1.27
	DIV1	568/552	.97
	SAT	204/221	1.08
	MDV	93/84	.88
	MSAT	15/23	1.53
1987	DIV2	455/599	1.32
	DIV1	562/582	1.04
	SAT	204/235	1.15
	MDV	92/88	.89
	MSAT	15/24	1.60

generally be the difference between requirements and projected inventory unless the school's capacity is less than the difference, or other limiting constraints are imposed by OP-01

or by the resource platform sponsor (OP-02 for fleet divers). The input requirement represents the number of students to the NEC pipeline required to make up the entire NEC deficit in one year. C-school requirements for the out-years are similarly determined, and predicated upon the requirements of the planned year being met. Therefore, requirements for the out-years are primarily driven by losses from the NEC inventories. After the training requirements have been determined, they are forwarded from OP-11 to CNET who examines the requirements and forwards them to CNTECHTRA for feasibility analyses. Capacity shortfalls are identified, the resource sponsors review them, adjustments are made as necessary, and a CNO approved C-school training input plan is promulgated. Table 17 shows the training input requirements for FY 1983 and the training input plan for FY 1983 and out-years for fleet divers according to the FY-83 Class "C" (NEC) Training Input Plan [OP-13, 25 Mar 1982].

The training requirements for each category of divers, except master saturation, exceed the school's capacities; therefore, the training input plan for FY 1983 reflects the schools' maximum capacities. The training input plan is not considered to be constrained by present school capacities for the out-years, hence extensive increases of student inputs are planned for FY 1984 for Diver First Class training (143 percent), Saturation Diver training (33 percent), and Master Diver Evaluation (194 percent). The number of

trainees planned for in FY 1985, however, reflects large reductions from the previous year for Diver First (29 percent) and Master Diver (44 percent). The projected reductions result from the decreased inventory requirements that commence with FY 1986 (see Table 12).

TABLE 17

FY-83 Training Input Plan
(With Requirements for FY 83 and Training Input Plan for FY 83-87)

Class	Reqmts	Training Input Plan				
	FY-83	FY-83	FY-84	FY-85	FY-86	FY-87
Diver Second	472	406	422	422	422	422
Diver First	451	143	347	246	246	246
Sat Diver	101	48	64	64	64	64
Master Diver	2*	2	2	3	3	3
	135**	33	101	55	55	55

* saturation divers
** first class divers

The training input plan is a useful tool for determining a community's requirements to "get well" (reach required end strengths); however, it does not necessarily represent a viable plan for achieving this goal. As previously mentioned, school capacities are not treated as constrained after the planning year, and may therefore be unrealistic. In addition, stocks from the pools from which school inputs originate may not be sufficient to fill the input requirements.

The training input plan for Diver First Class training is a case in point. The increase in student inputs indicated from FY 1983 to FY 1984 would require a doubling of the school's capacity, and would require more inputs than would be available from the second class diver inventory. The inventory on 1 July 1982 is 358, and new accessions would not meet the experience requirements to qualify for Diver First training; when projected losses from the system (e.g. separations), and divers' projected rotation dates (PRD's) are also considered, the number of potential entrants would be considerably less than the 347 inputs called for by the training input plan.

G. PREFERRED TRAINING PLAN

The most germane question is: What is a realistic plan to meet billet requirements for the next five years? That is, how many recruits will be required? and what should the new transition matrix be (including changes in school inputs and attrition rates)? As demonstrated in Table 14, if the accession rates experienced from 1 July 1981 to 1 July 1982 were to continue, the stocks of first class and second class divers would be substantially reduced. However, if enough second class diver applicants are recruited to fill all the Diver Second school quotas, diver inventories will increase, and billet authorization levels will be attained for each category, except first class and master divers, by FY 1985 (see Table 16).

Initially, stocks of second class divers will grow more rapidly than stocks of first class divers (e.g. by FY 1985 there will be 18 percent more second class divers than billets authorized, and 14 percent less first class divers than billets authorized). The inventories of these two groups can be balanced by increasing the flow of second class divers into Diver First Training. If the number of Diver Seconds transitioning to Diver Firsts each year is initially increased by 50 percent (from 22 percent to 33 percent), and assuming Diver Second accessions remain constant, at 264 Diver Second graduates per year (100 percent of school capacity with a 35 percent attrition rate), and Diver First transition rates stay at the historical rates indicated earlier, the stocks presented in Table 18 for FY 1983 and FY 1984 will result. Billet requirements are met by FY 1984 for Diver Second and the following year for Diver First; however, when individual accounts are included, both remain under-manned.

TABLE 18

Projections Toward Optimal Manning FY 83-84
(With Maximum Recruits and DIV2 to DIV1 Flow Increased 50 Percent)

Fiscal Year	Stocks Projections % BA Filled/% Total Pers Reqmts Diver Second	Diver First	Saturation	Master & MSAT
1983	429 .93/81	516 .88/.80	181 .88/.84	94 .85/.81
1984	461 1.00/.85	564 .96/.86	197 .97/.92	99 .88/.84

At the end of FY 1983, manning for each category would be near 90 percent of billets authorized, and about 82 percent of total personnel requirements. If these transition rates were held constant indefinitely, subsequent growth would result in widening differences in manning levels (e.g. by FY 1985, the saturation diver inventory would be at 100 percent of total personnel requirements while the Diver Second inventory would be at only 86 percent of total personnel requirements). It would therefore be prudent to adjust the transition rates to minimize discrepancies in manning between the categories of divers. Reducing the flow rate from Diver Second to Diver First to 27.5 percent, and slowing the transition from Diver First to saturation diver and master diver to 5 percent and 3 percent, respectively, in 1985, will accomplish these goals. The results are presented in Table 19. Note master diver and master saturation diver categories are combined to simplify the analysis; it may also be feasible to combine them in actual practice.

All categories will be at or near optimal manning levels by FY 1986, and will begin to be over-manned the following year, unless the reduction in requirements does not materialize, or the training pipeline is adjusted accordingly (i.e. fewer accessions and slower movement through the system).

The key to the health of the diving community is recruiting adequate numbers of second class diver applicants.

If the goal of filling all the presently planned training quotas is met, and if the relatively minor adjustments to the flows presented in this chapter (summarized in Table 20 which follows) are implemented, there will be no more diver shortages after 1985.

TABLE 19

Projections Toward Optimal Manning FY 85-87
(With Decreased Flow to and from DIV1)

Fiscal Year	Stocks Projections % BA Filled/% Total Pers Reqmts Diver Second	Diver First	Saturation	Master & MSAT
1985	501 1.05/.91	601 .99/.9	204 1.0/.95	105 .92/.92
1986	522 1.13/.98	642 1.13/1.03	211 1.03/.99	112 1.04/.99
1987	533 1.17/1.02	683 1.22/1.11	220 1.08/1.03	119 1.11/1.06

TABLE 20

A Preferred Training Plan

Fiscal Year	Transition Matrix*					Inventory	Billets Auth
	DIV2	DIV1	SAT	MDV	MSAT		
1983							
DIV2	.46**	.33**	0	0	0	429	460
DIV1	0	.82	.07	.03	0	516	585
SAT	0	0	.89	0	.01	181	205
MDV	0	0	0	.85	0	74	95
MSAT	0	0	0	0	.95	20	15
1984							
DIV2	.46	.33	0	0	0	461	473
DIV1	0	.82	.07	.03	0	564	595
SAT	0	0	.89	0	.01	197	204
MDV	0	0	0	.85	0	78	97
MSAT	0	0	0	0	.95	21	15
1985							
DIV2	.515**	.275**	0	0	0	501	479
DIV1	0	.84**	.05**	.03	0	601	606
SAT	0	0	.89	0	.01	204	204
MDV	0	0	0	.85	0	83	99
MSAT	0	0	0	0	.95	22	15
1986							
DIV2	.515	.275	0	0	0	522	461
DIV1	0	.84	.05	.03	0	642	568
SAT	0	0	.89	0	.01	211	204
MDV	0	0	0	.85	0	89	93
MSAT	0	0	0	0	.95	23	15
1987							
DIV2	.515	.275	0	0	0	533	455
DIV1	0	.84	.05	.03	0	683	562
SAT	0	0	.89	0	.01	220	204
MDV	0	0	0	.85	0	95	92
MSAT	0	0	0	0	.95	24	15

* with 264 accessions each year
** changed from previous year

V. CAREER PROGRESSION FOR FLEET DIVERS

Fleet divers are an autonomous group for the most part. They identify with one another as deep divers, hardly considering themselves to be ordinary sailors. They have a special career pattern whereby they serve in diving billets on successive assignments, rather than serving periodically as a "fleet sailor" who is assigned by his rating. His career progression is dual: both through the diver classification levels, and by advancement in paygrade. The two progressions are interrelated. As pointed out in the previous chapter, second class divers are restricted to paygrades E-6 and below, whereas master divers must be E-7 or above.

A. ADVANCEMENT AND DISTRIBUTION BY PAYGRADE

Divers advance in paygrade by rating, rather than by diver category, and consequently, compete with all Navy members in their rate for advancement. No quotas are set for the diving community as to how many advancements to allow, which precludes controlling the distribution by paygrade. However, periodically, special consideration is given to the divers when they are considered for advancement. "Multiples" for diver classifications may be added to test scores, performance marks, and the other factors making up the advancement process.

The paucity of new entrants into the diving community has markedly changed the distribution of divers by paygrade. Figure 2 illustrates the inventories of all divers (less new accessions during the year) by paygrade from FY 1978 through FY 1982. Since data regarding new accessions were not generally available, the historical distributions presented here, unless otherwise noted, exclude those second class divers entering the community during the year described. It can be seen that substantial losses occurred in paygrades E-3 and E-4, and that gains of equal magnitude took place in paygrades E-5 and E-6.

In FY 1979, 14 percent of the divers were E-4 or below; however, by the end of FY 1982, this segment represented less than 7 percent of the diving community. The percentage of E-5's rose three percentage points, from 24.5 percent to 27.5 percent, and the percentage of E-6's increased from 28 percent to 31.5 percent of the total. There was also significant growth in the number of master chiefs during this period: the percentage of E-9's increased from 2.5 percent to over 6 percent of all divers. This compression of the distribution will be reversed if the expected upturn in new accessions materializes.

The transition matrix presented in Table 21 which follows was constructed from the divers' average flow rates between paygrades over the last four fiscal years. Of the inventory of E-4's beginning the year (see the row labelled E-4),

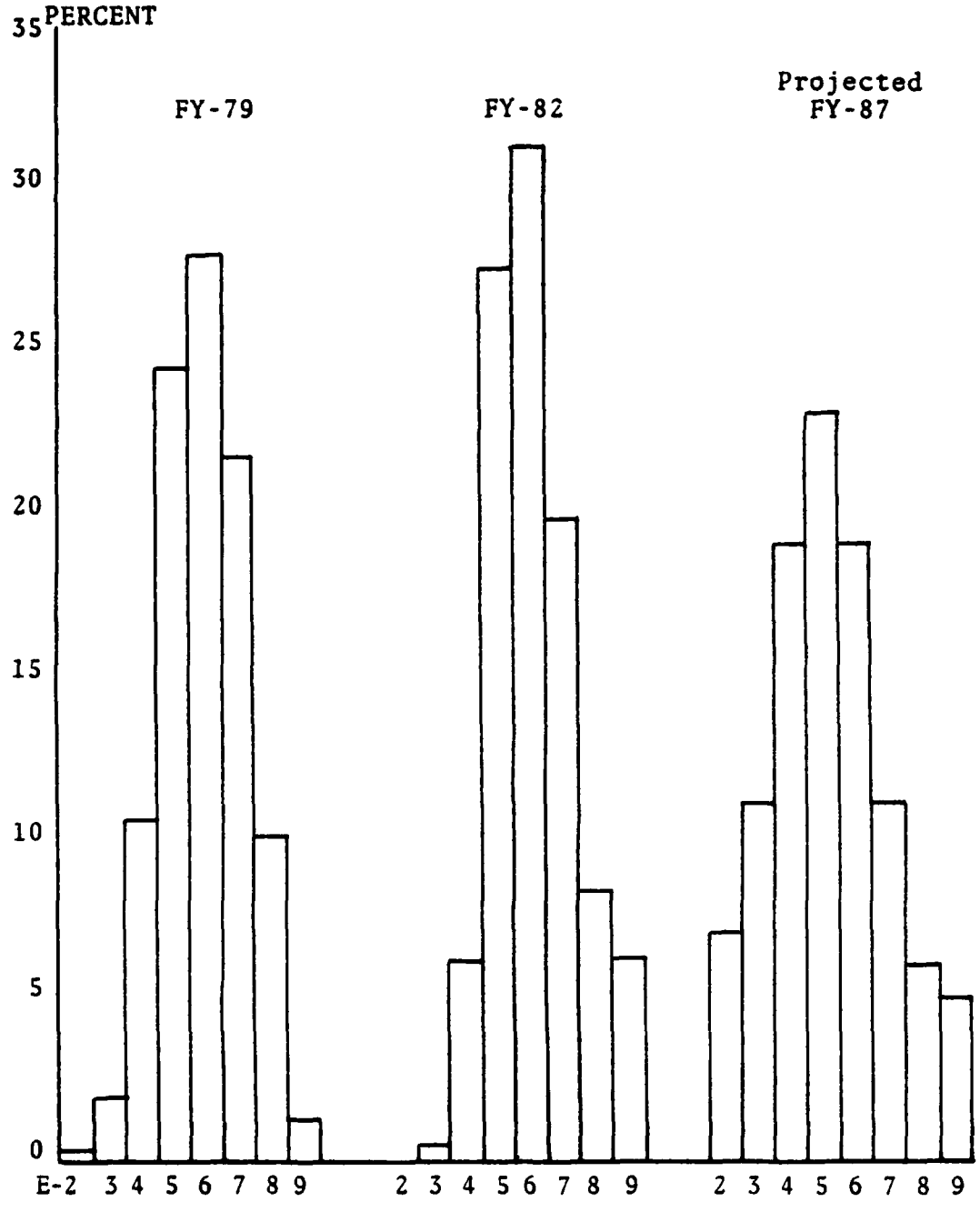

Figure 2: Inventories by Paygrade from FY 1978 through FY 1982

26.5 percent remained in paygrade E-4 at year end, 43.6 percent were advanced to E-5, and 0.8 percent were reduced to E-3. The remainder, 29.1 percent of the original inventory, were losses to the community. Losses, although not shown with the matrix, may be computed by adding the transition rates for a particular paygrade, and subtracting the sum from 1.0

TABLE 21

Distributions by Paygrade

Recruits	75 E-2	76 E-3	76 E-4	25 E-5	E-6	E-7	E-8	E-9
E-2	.1	.6	.1	0	0	0	0	0
E-3	.038	.113	.672	.011	0	0	0	0
E-4	0	.008	.265	.436	0	0	0	0
E-5	.001	.002	.006	.601	.216	0	0	0
E-6	0	0	0	.001	.782	.132	0	0
E-7	0	0	0	0	0	.75	.12	0
E-8	0	0	0	0	0	0	.727	.149
E-9	0	0	0	0	0	0	0	.81

Using the above transition rates, the MAN-MOD computer model was applied to project a paygrade distribution for FY 1987, illustrated in Figure 3. The projection is based on 250 accessions each year, about 95 percent of the maximum number possible, distributed as follows: 4 percent E-2, 19 percent E-3, 37 percent E-4, 35 percent E-5, and 5 percent E-6 (based on the distribution of accessions from July 1981 to July 1982).

The number of accessions selected for the model, 250, was arbitrarily chosen because it is probably unrealistic to assume that 100 percent of Diver Second school capacity (which would produce 264 graduates) will be consistently utilized. NMPC-401D considers full, or near full capacity to be attainable [NMPC-401D, 30 Nov 1982], therefore 95 percent was considered to be a realistic estimate.

There will be an influx of junior personnel: E-4's and below will comprise 20 percent of all divers, there will be more E-5's than E-6's, and the percentage of chiefs will drop (with most of the loss occuring in paygrade E-7).

B. COMPENSATION

Since 1886, divers have been entitled to a special pay for diving duty in addition to basic pay and the other, traditional pays and allowances. The stated purpose of Diving Duty Pay is "To provide additional pay to increase the ability of the military to attract and retain volunteers for diving duty, and in recognition of the more-than-normal hazard of such duty" [Military Compensation Background Papers, Aug 1976]. As with many of the other special pays for hazardous duty (e.g. Demolition Duty Pay and Parachute Duty Pay), there have been few increases in the rates. Until this year, the last raise in Diving Duty Pay occured in 1961. Diving pay at that time was raised to levels between $65 and $110 a month, depending on the diver classification. Diving pay for an E-6 first class diver with ten years of service constituted about

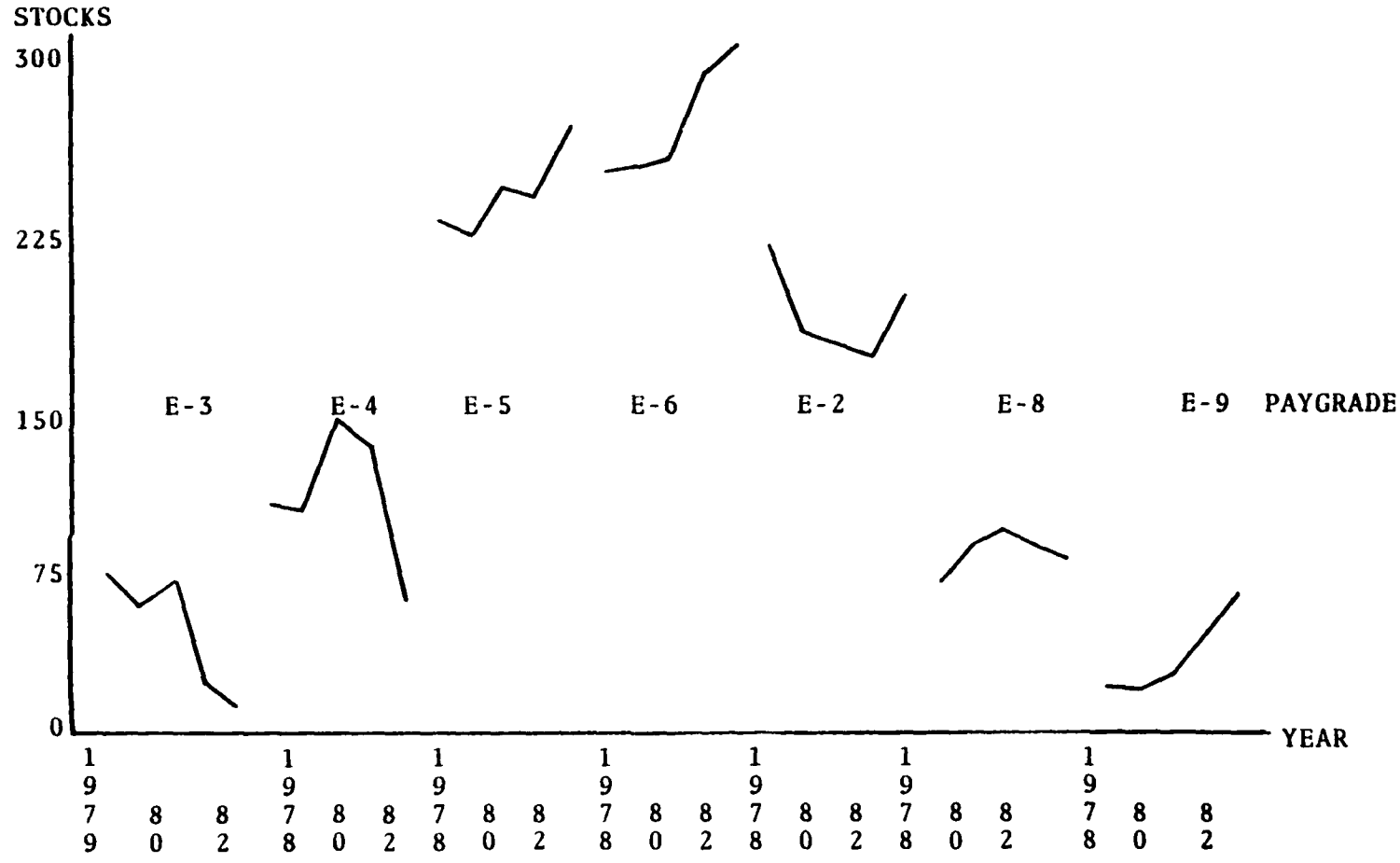

Figure 3: Paygrade Distributions--FY 1979, 1982, and 1987 (Projected)

25 percent of his base pay in the early sixties; however by 1981, it amounted to less than ten percent of his base pay.

In recognition of the shortage of divers, the Uniformed Services Pay Act of 1981 included pay increases for diving duty. Because of congressional delays in appropriating the funds, the entitlement to the increased rates did not become effective until 1 July 1982. The rates of increased diving pay were devised to reflect the relative level of diving skill, responsibilities, and hazards inherent to each diving classification. In addition to providing a significant financial incentive to attract new diver applicants, the pay graduations were designed to induce second class divers to apply for Diver First training, and first class divers to volunteer for Saturation Diver and Master Diver training.[2] The new monthly rates are as follows:

Master Diver (5341, 5346)	$300
Saturation Diver (5311)	$275
Diver First Class (5342)	$175
Diver Second Class (5343)	$100

In addition, second class diver trainees are now paid $100 a month commencing the date of their first dive.

Although the diving pay increases were not designed to improve retention, but, rather, to attract new applicants,

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[2]These statements were taken from a briefing prepared by OP-132C10, and presented to members of the diving community during 1982.

and to encourage the current divers to advance through the diving category levels, retention will undoubtedly benefit as well. Saturation divers, for instance, are now paid at levels comparable to the nuclear submarine community.

The camaraderie in the diving community, the nature of the work itself, and the degree of independence enjoyed by the divers are perhaps the major factors contributing to the high retention rates. Now that compensation has been increased, one might expect the career progression and retention to further improve.

VI. CONCLUSIONS AND RECOMMENDATIONS

The primary problem facing the diving community today is the shortage of divers. From 1 July 1980 to 1 July 1982, the inventory of fleet divers decreased 10 percent from 1,223 to 1,097, causing billets authorized for each category of divers, except master saturation, to be approximately 20 percent to 25 percent undermanned. Compounding the seriousness of this trend is the fact that manpower requirements for divers are increasing through FY 1985. The problem has been identified at OP-13 and NMPC, and corrective measures were recently undertaken to attract more diving applicants (e.g. emphasis on recruiting, extensive advertising, and increases in diving pay). Initial indications are that these measures are working: Since the beginning of FY 1983, NMPC-401D has been able to utilize virtually all of the Diver Second Class school quotas available [NMPC-401D, 30 Nov 1982]. It is not yet clear, however, whether this surge in applicants is temporary, or whether it will be sustained over the long-run. As indicated in Chapter 4, full utilization of second class diver school capacity is required through FY 1986 before the stocks of divers will be sufficient to meet manpower requirements.

Other measures should also be considered to ensure sufficient accessions are attained. More emphasis should be

placed on recruiting potential divers early on, that is upon their entry into the service. Recruits should be given increased exposure to the diving community during "boot camp," or earlier, by having the Navy Recruiting Command tout the program at recruiting stations, and perhaps guaranteeing quotas at Diver Second Class schools for those who qualify. Consideration should also be given to establishing a separate rating for divers so they would be distributed by this rating rather than by SNEC, and redesignating Diver Second Class Training as the A-school. Such a change would guarantee attention at the entry level in keeping the rating filled. Yet another possibility is establishing minimum quotas at the RTC's for assigning recruits to Diver Second Training.

The other primary source of divers is the fleet. Lack of exposure to the diving community, and the general reluctance of commanding officers to allow their personnel to transfer from their ships limit the number of potential applicants from this avenue. Orientation briefings by recruiting teams at the more active naval stations would increase the exposure, and information and guidance from higher authority (e.g. CNO, fleet and type commanders) to commanding officers would serve to make them aware of the diver shortage and the concomitant reduction of diver services. Also, qualified Scuba Divers (SNEC 5345) could be encouraged by the diving detailer to "move up" into the diving community.

Another source of diver accessions is the training pipeline. If the Diver Second Training attrition rate were reduced 50 percent from 35 percent to 17.5 percent, the number of trainee inputs required to produce 264 graduates would be lowered 21 percent (from 406 to 320). However, the principal means to achieve lower attrition, relaxing the standards, should be avoided. Instead, close monitoring of the attrition rates is recommended.

Lateral entry is also a possibility; however, the supply of civilian divers would probably have to exceed the demand in order to entice them to enter the naval service. This situation does not appear likely in the near-term.

With adequate accessions, the difficulties in managing the diving community should ease. The diving detailer is in position to control the transition flow rates by encouraging, or discouraging, movement through the diver categories. Assigning multiples for advancement to those categories where shortages exist could be an effective tool if its use were deemed warranted. In addition to monitoring the number of inputs to the diving schools, flow rates can also be affected by controlling the schools' attrition rates; however, as previously mentioned, relaxing the training curriculum standards is not recommended. The high (65 percent) attrition rate for Master Diver Evaluation is disconcerting because of the disruption caused by detaching them from their commands, and the expense of transferring the divers to the school,

only to have most of them fail to attain the qualification. A more thorough screening process should be developed to identify those divers most likely to succeed.

Attempting to determine the actual inventory of divers is a related problem, since the Enlisted Master Record is not always updated promptly or accurately. The automatic data processing procedures for submitting changes to SNEC's (i.e. SNEC qualification from successful completion of the course, especially for SNEC 5343) should be reviewed. It is also important that individual commands ensure the qualifications of their personnel are recorded accurately and in a timely fashion.

In view of the shortage of divers, it is incumbent on the diving detailer to ensure that an absolute minimum of divers are assigned to non-diving billets. Likewise, transfer from the diving community should be actively discouraged. Also, the present and projected manpower requirements should be carefully reviewed to verify that the diving billets identified are warranted.

Diver retention should be monitored closely. The inventory projections contained in this thesis are predicated on the traditionally high reenlistment rates for divers being maintained. As noted in Chapter 2, the improvement of diver reenlistment rates for the first half of FY 1982 was less than that for the Navy in general. If the economy improves, and reenlistment rates decline, especially for divers, action

(such as increased SRB levels) will become necessary to return the rates to high enough levels to keep the inventory of divers growing. Additionally, overall compensation for divers should remain sufficient to compete with civilian job offers. Diving duty pay, therefore, must not be allowed to deteriorate over the long-run.

The distribution of divers by paygrade appears to be more or less appropriate for the requirements. If the number of new accessions is sustained at maximum levels, the distribution will become slightly less senior; however, if accessions drop, the community could become top-heavy. Temporarily waiving the requirement that diver applicants come from designated source ratings will likely mean that in many cases, assignments will not be possible by rating (e.g. a new YN2 5343 might be assigned to an HT2 5343 billet). One solution is to require, or strongly advise, all divers to convert to one of the source ratings.

Since 1 July 1982, it appears the decline in the diver inventory has been arrested. With careful management of the community, including CNO interest and other high visibility (e.g. fleet and type commanders recognizing and addressing the need for divers), manpower requirements can be met by FY 1986.

APPENDIX A

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

AD--Destroyer Tender

AFQT--Armed Forces Qualification Test

AR--Arithmetic Reasoning Test

AR--Repair Ship

ARS--Salvage Ship

AS--Submarine Tender

ASR--Submarine Rescue Ship

ASVAB--Armed Services Vocational Aptitude Battery

BA--billets authorized

CNET--Chief of Naval Education and Training

CNTECHTRA--Chief of Naval Technical Training

C-school--skill progression training

DIV1--Diver First Class

DIV2--Diver Second Class

DMDC--Defense Manpower Data Center

DNEC--Distributed Navy Enlisted Classification

EMR--Enlisted Master Record

EOD--Explosive Ordnance Disposal

LOS--length of service (years)

MAN-MOD--a Markovian chain manpower flow computer model

MDV--Master Diver

MPT--manpower, personnel, and training

MSAT--Master Saturation Diver

NEC--Navy Enlisted Classification

NEDU--Navy Experimental Diving Unit

NMP--Navy Manning Plan

NMPC--Navy Military Personnel Command

NMPC-401D--Special Warfare, EOD, and Divers Distribution

OP-01--Deputy Chief of Naval Operations (Manpower, Personnel, Training)

OP-02--Deputy Chief of Naval Operations (Submarine Warfare)

OP-13--Director of Military Personnel/Training Division

OP-132C10--Enlisted Community Manager for Special Warfare, EOD, and Divers

OP-135E2--Assistant for C-schools Plans

PNEC--Primary Navy Enlisted Classification

ROC--Required Operational Capability

RTC--Recruit Training Command

SEABEE--member of a unit of the Naval Construction Force

SEAL--member of a USN Sea-Air-Land Team

SHOROC--Shore Required Operational Capability

SHORSTAMPS--Shore Requirements, Standards, and Manpower Planning System

SMD--Ship Manpower Document

SNEC--Secondary Navy Enlisted Classification

SRB--Selective Reenlistment Bonus

TNEC--Tertiary Navy Enlisted Classification

UCT--Underwater Construction Team

UDT--Underwater Demolition Team

WK--Word Knowledge Test

APPENDIX B

STUDENT ENROLLMENTS AND GRADUATES BY CLASS

The data contained in this appendix were extracted from the NITRAS data base during October and November 1982, with the exceptions of Diver First Training Class 8211 and Master Diver Evaluation Classes 8212 and 8213, which were obtained directly from the Navy Diving and Salvage Training Center.

The "Navy" students in each figure represent active duty members including TAR's. Naval reservists are included only in the "Total" students. Diving Medical Officers are included in the "Navy" Figures for Saturation Diver Training.

The reader will note there were no students for two Diver Second Training classes at Pearl Harbor, HI--they were cancelled. For some classes there were no graduates (e.g. Master Diver 8113). No graduates were indicated for Diver Second Class 8207 at Little Creek, VA since the class had not been concluded as of this writing.

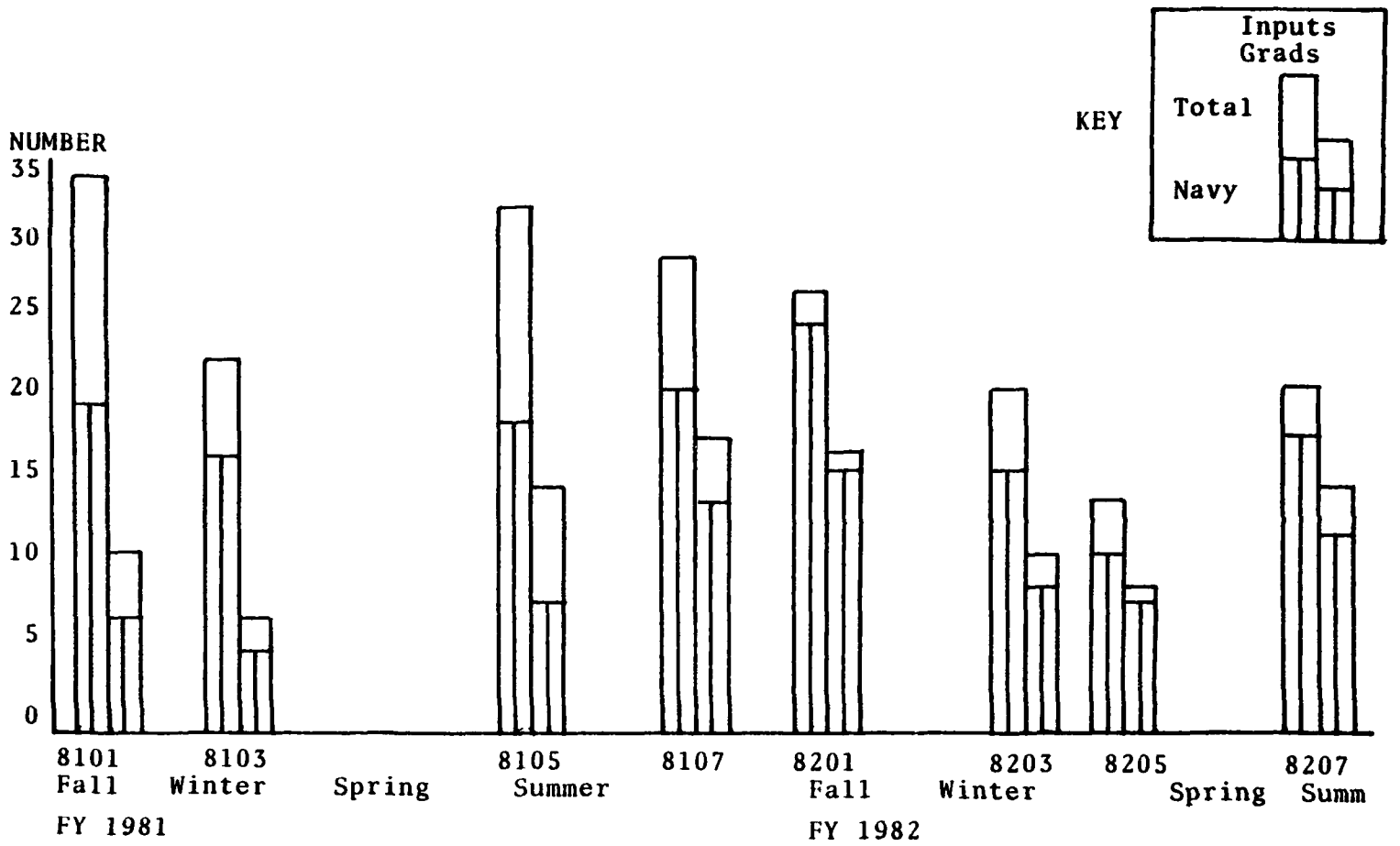

Figure 4: Diver Second Class Training Data (Panama City)

KEY--see page 71

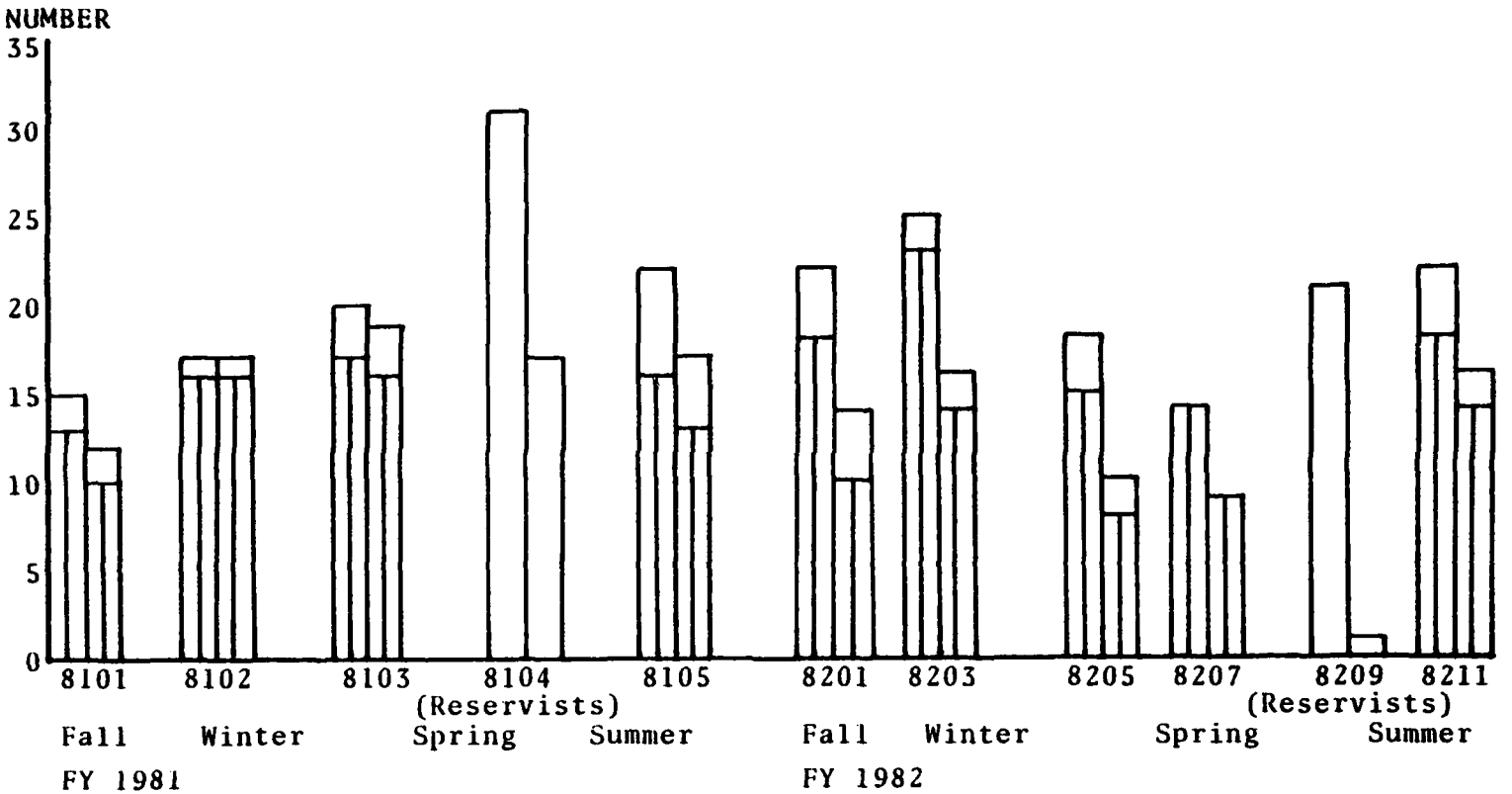

Figure 5: Diver Second Class Training Data (Coronado)

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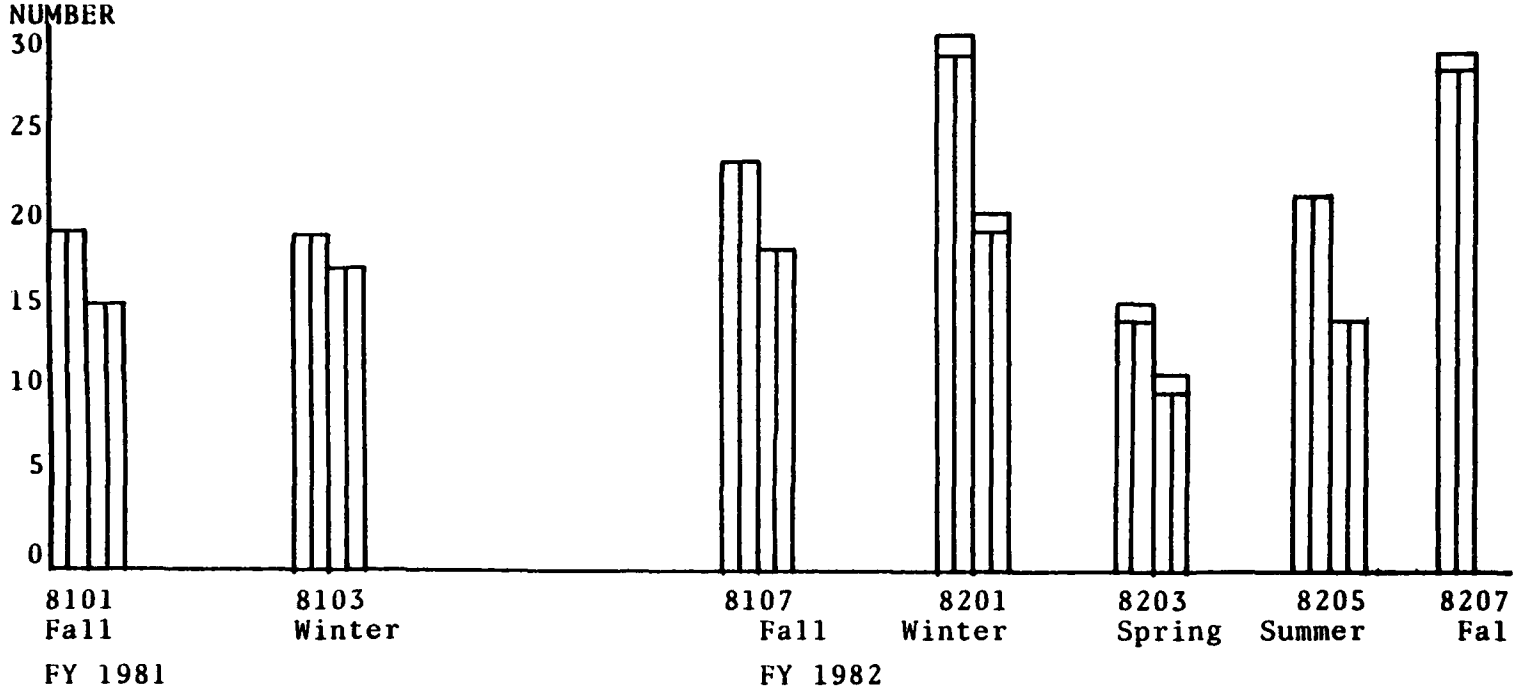

Figure 6: Diver Second Class Training Data (Little Creek)

KEY--see page 71

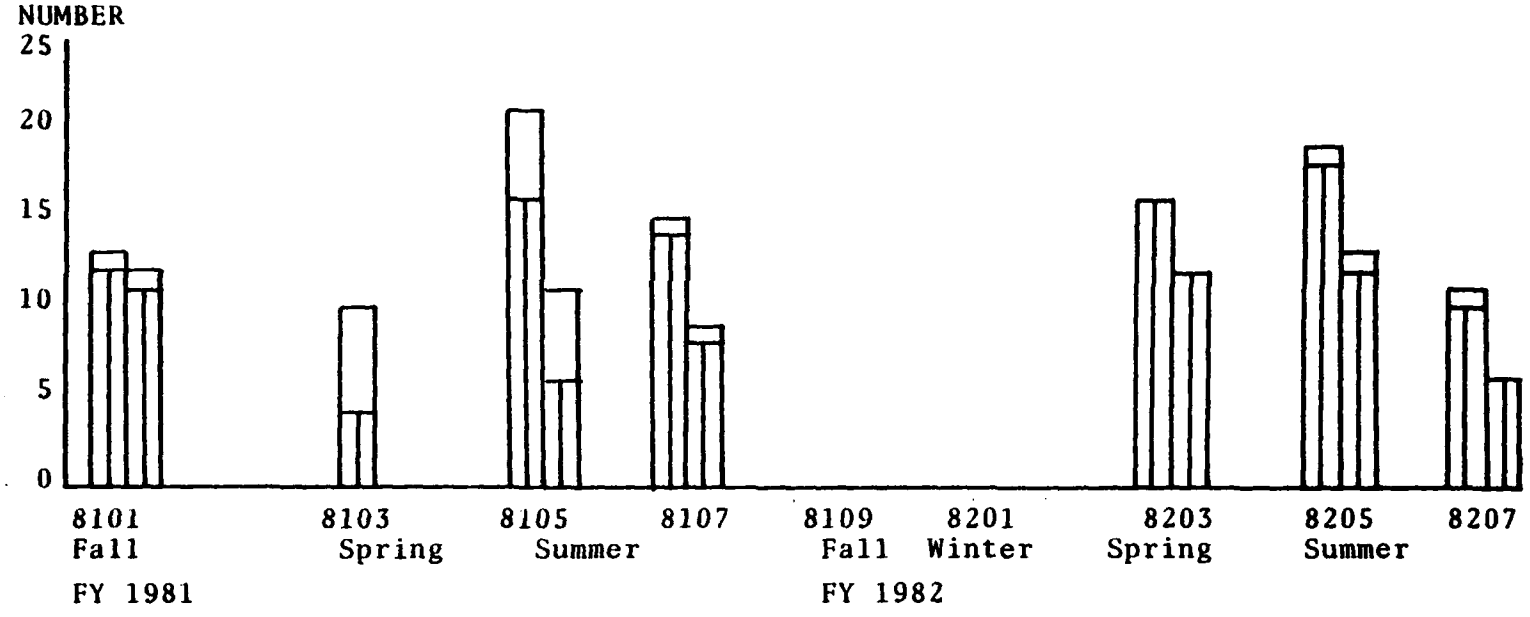

Figure 7: Diver Second Class Training Data (Pearl Harbor)

KEY--see page 71

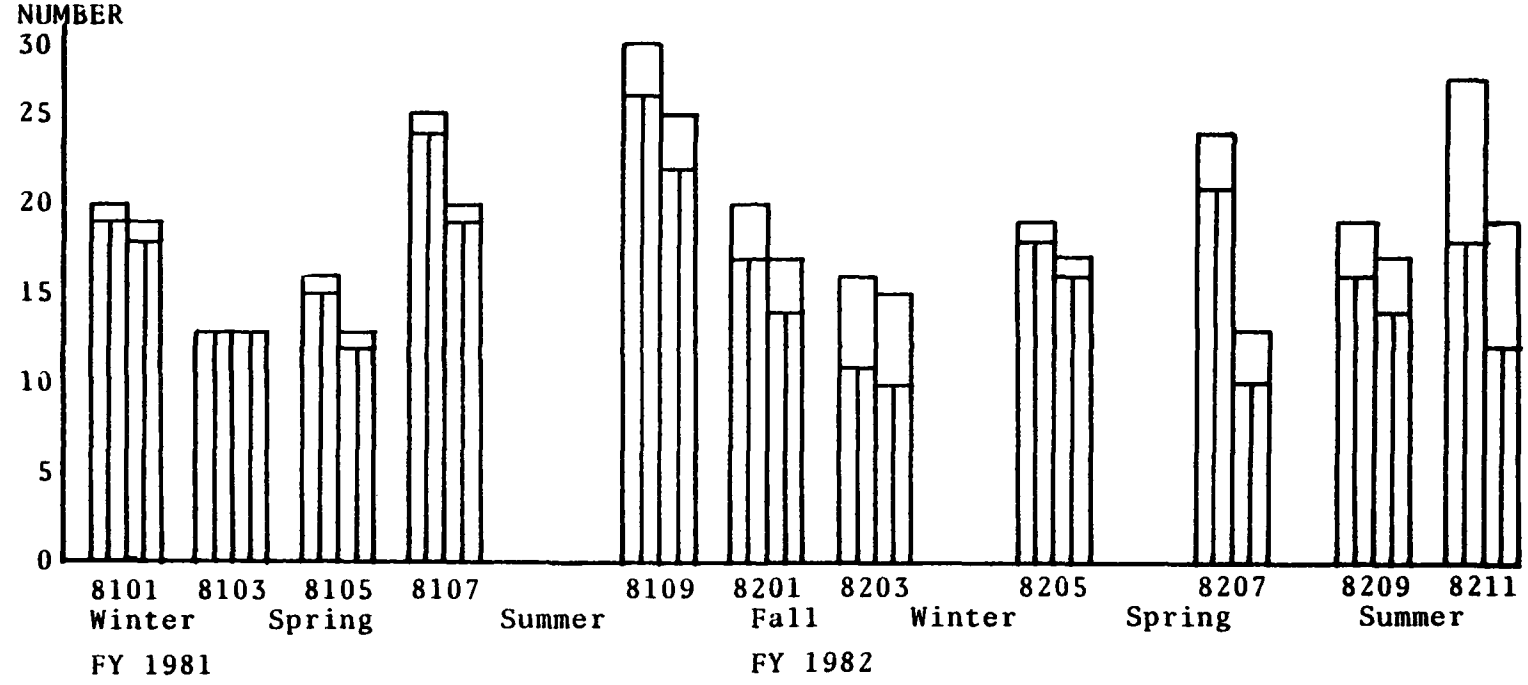

Figure 8: Diver First Class Training Data

KEY--see page 71

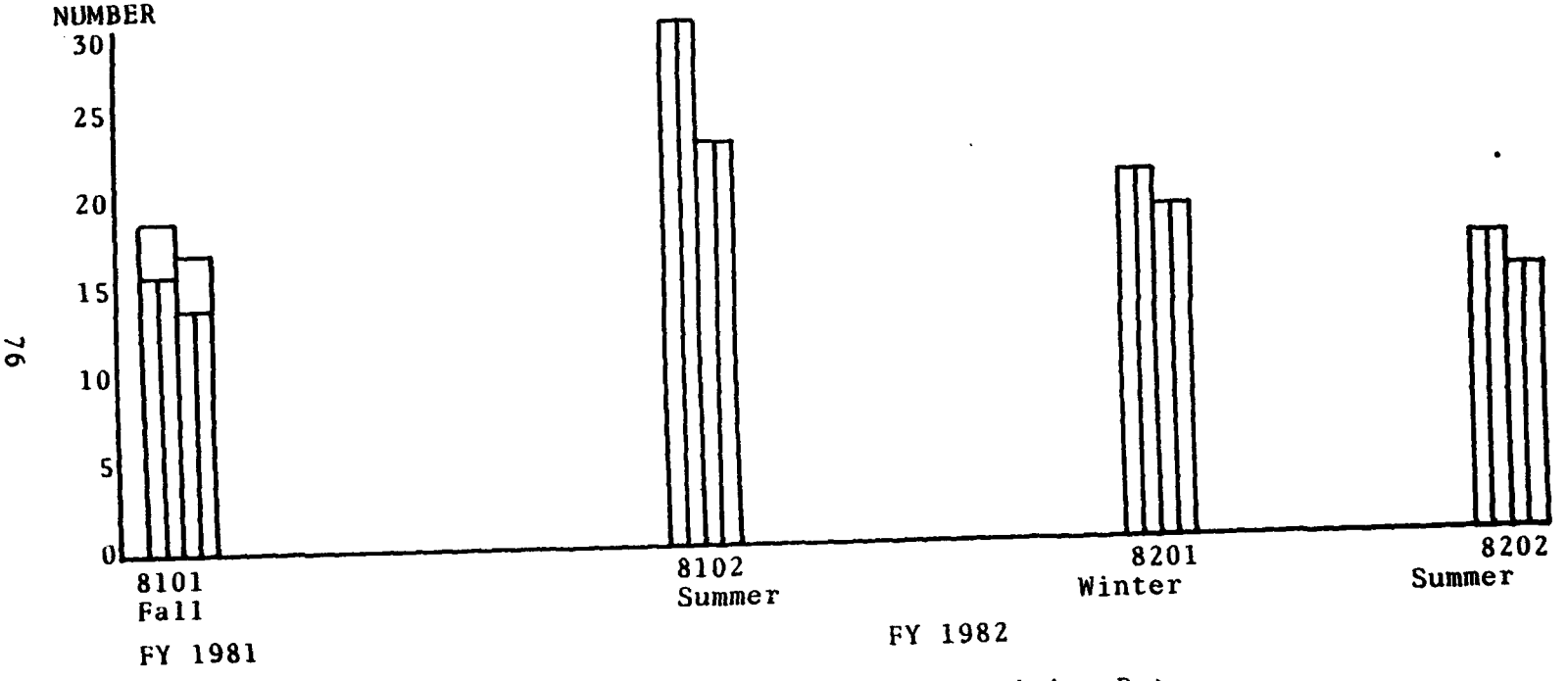

Figure 9: Saturation Diver Training Data

KEY--see page 71

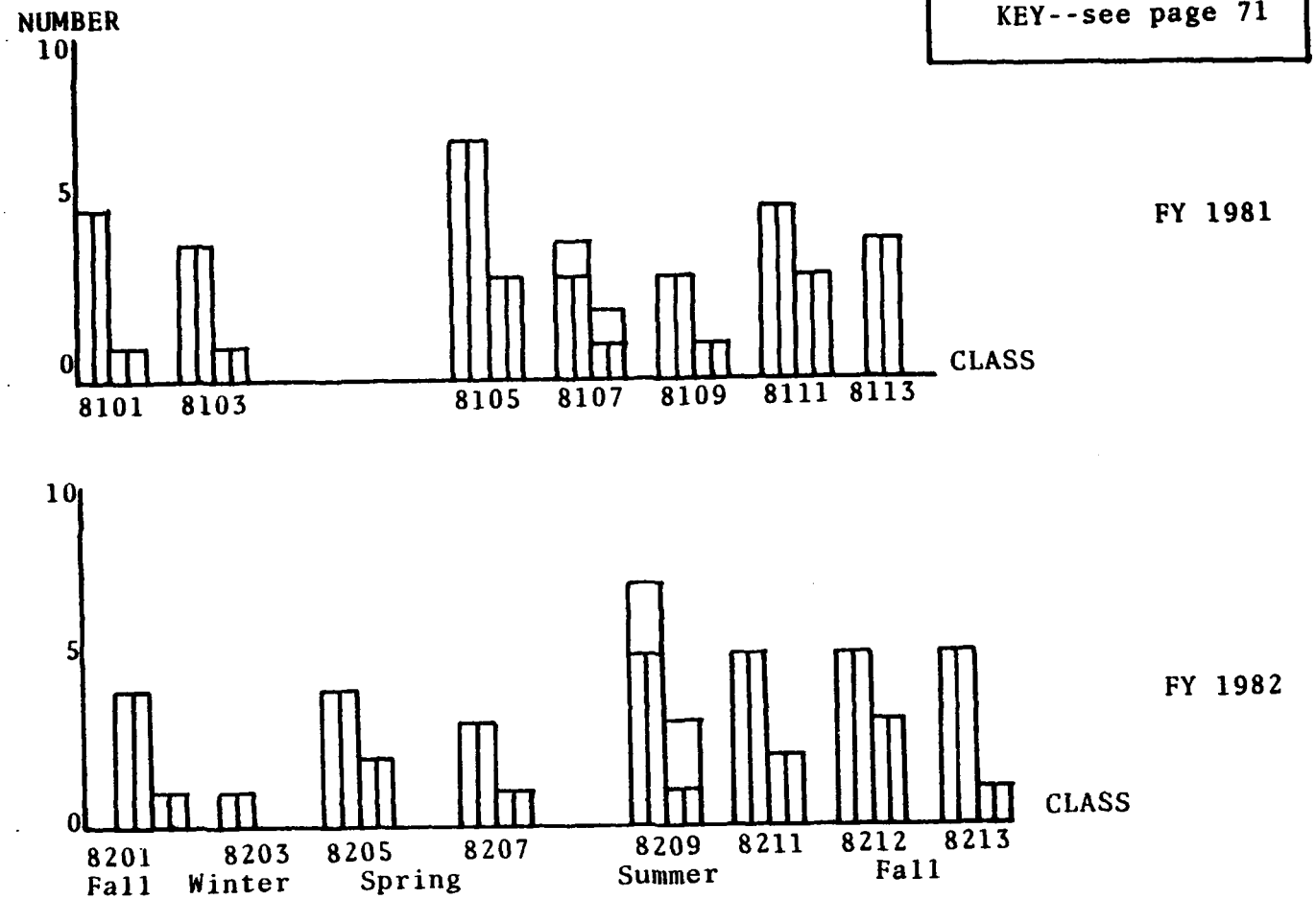

Figure 10: Master Diver Evaluation Training Data

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