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April 1980

**EVALUATION OF OFFICER ACCESSIONS AT
SURFACE WARFARE OFFICER SCHOOL**

Alice M. Crawford
Sandra K. Van Beenen

Reviewed by
John D. Ford, Jr.

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Donald F. Parker
Commanding Officer

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The purpose of this effort was to determine whether Black and White SWOS students differed as to performance and attrition. Data gathered on Black and White students who had attended SWOS during a 2-year period were compared. Results showed that Blacks had a significantly higher attrition rate and lower performance than Whites. For both racial groups, students who are commissioned through NROTC sources have a significantly greater chance of failing SWOS than do those commissioned through other sources. This is particularly true for Blacks who are commissioned through NROTC units at predominantly Black, Southern colleges. Also, Blacks		

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who come from schools rated as less competitive are more likely to fail than those who come from schools rated as more competitive. For both groups, attrition rates can be reduced considerably by allowing students to "roll back" and attempt SWOS a second time.

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FOREWORD

This research and development was conducted in response to a Naval Military Personnel Command (NMPC-6) request to evaluate the accession of Black officers at Surface Warfare Officer School (SWOS)-Basic. This report provides information on factors relating to the attrition of Black officers from SWOS.

Appreciation is expressed to CDR L. F. Picotte (then OIC, SWOS-Basic, San Diego) and CDR R. Cottom (then OIC, SWOS-Basic, Newport) for their support and cooperation in the development of this project. Further appreciation is extended to LT J. Golisch, SWOS-Basic, San Diego, and LT W. Syverson, ENS C. Roller, and ENS B. Barnes, SWOS-Basic, Newport, for their invaluable assistance in data collection.

DONALD F. PARKER
Commanding Officer

SUMMARY

Problem

To correct the imbalance in the number of Black naval officers, the attempting to increase the proportion of such officers from 2 to 6 percent. Serious impediments to attaining this goal include the decrease in the avail Blacks who are qualified as officer candidates and Blacks' disproportionately high rates from both commissioning sources and warfare specialty schools. Most commissioned Blacks enter the surface warfare community and receive the training at the Surface Warfare Officer School (SWOS).

Purpose

The purpose of this effort was to determine if differences exist between Blacks and Whites with respect to attrition and performance at SWOS.

Approach

Data were gathered for 358 SWOS students (162 Blacks and 196 Whites) attended SWOS during a 2-year period. This number included all of the Blacks who failed (N = 70) or succeeded (N = 92) during their first attempt at SWOS, all of the Blacks who had failed (N = 98), and a sample of the Whites who had succeeded (N = 98). SWOS performance variables, demographic variables, and SWOS input variables--were analyzed for each group.

Results

1. The first attempt attrition rate for Blacks was 43 percent, compared to 22 percent for Whites. When selected failing students were given an opportunity to "come back" and attempt the course a second time, however, the attrition rate was reduced to 22 percent for Blacks and 2 percent for Whites.
2. Although Whites consistently performed better than Blacks on SWOS tests, the scores of the two groups followed the same general pattern across tests. Students of both races have difficulties with the same areas of the curriculum.
3. The pretest scores obtained by Whites were significantly higher than those obtained by Blacks. Also, for both groups, these scores were significantly related to success at SWOS.
4. For both racial groups, students who are commissioned through NROTC have a significantly greater chance of failing SWOS than do those commissioned through other sources. This is particularly true for Blacks commissioned through NROTC at predominantly Black, Southern colleges (hereafter referred to as minority units). One percent of those commissioned through these units fail, accounting for 66 percent of the total Black attrition. This finding is particularly disturbing, in that 35 percent of Blacks entering SWOS come from minority units.
5. All Whites and passing Blacks tend to come from colleges rated near "Competitive" by Barron's competitiveness rating, while failing Blacks come from colleges rated as "Less Competitive." (These are the schools in which minority NROTC units are located.)

6. For both groups, students who attended schools in the West have the lowest attrition rate; and those who attended schools in the South, the highest. Also, Black and White science majors have lower attrition rates than do those with other majors. Findings for both college major and area are related to the college competitiveness rating.

7. Although Ns were small, the SWOS institutional data showed a pattern of increasing attrition for Blacks. An analyses of pretest data, however, indicated that increasing attrition cannot be attributed to a trend of less prepared students entering SWOS. Also, correlational analyses indicated that attrition of Blacks was related to the percentage included in a given class.

Conclusions

For both racial groups, the attrition rate at SWOS can be greatly reduced by providing extra training. Students who are allowed to attempt the course a second time have high success rates.

Recommendations

Further research should concentrate on the instructional interface between NROTC and SWOS. The effort should attempt to determine (1) the degree of consistency between SWOS and NROTC objectives, and (2) whether NROTC preparation is adequate for SWOS curriculum areas that are difficult for all students.

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INTRODUCTION

Problem

The predicted decline in the quantity and quality of personnel resources is of growing concern to the Navy. This decline is particularly critical with respect to Black officers, who comprise only 2 percent of the officer force. Further, their attrition rate is very high, both from commissioning sources (Naval Reserve Officers Training Corps (NROTC) programs, Officer Candidate School (OCS), and U.S. Naval Academy (USNA))¹ and from the follow-on warfare specialty schools.

The Navy has adopted a policy goal to increase the numbers of Black naval officers from 2 to 6 percent by 1985. Also, the Chief of Naval Operations, in his goals for 1980, has stressed the need for "fair share representation" of minority officers in all warfare communities. In an attempt to find ways to meet these goals, a Minority Accessions Study Group was tasked by OP-13 to evaluate policies and programs aimed at increasing minority accessions. The group procured a sample of the results of the Scholastic Aptitude Test (SAT) administered to minorities in FY79, and concluded that the number of Blacks who would qualify for NROTC or USNA is limited. Therefore, since improved recruiting strategies could help but not solve the problem, it appears that the best approach is to concentrate on decreasing the heavy attrition from training programs. Most newly commissioned Black officers enter the surface warfare community, and receive their first training through the 16-week Surface Warfare Officer School (SWOS) Basic Course, which is offered at Newport, RI and at San Diego, CA. Therefore, the present effort focused on the SWOS-Basic program.

Background

The surface warfare community has not experienced retention problems as severe as those experienced by other communities (i.e., nuclear submarine and aviation). Its retention goals for junior officers (JOs), however, have not been met since FY76 and this trend is expected to continue (Holzbach, 1979; Holzbach & Morrison, 1980).

The basic SWOS course is designed to prepare surface warfare JOs for their duties as a ship division officer. The course includes 25 units, covering the following topic areas:

1. Maneuvering board and tactics
2. Watchstanding and seamanship
3. CIC watch officer
4. External communications
5. Rules of the road
6. Navigation
7. Naval ordnance
8. Antisubmarine warfare
9. Surface combat operations
10. Mine and amphibious warfare
11. In-port watch officer
12. Personnel organization and administration
13. Human resources management
14. Shipboard training and administration

¹ Attrition rates of Blacks from commissioning sources range from 30 to 45 percent.

15. Inspections and safety
16. Material management
17. Steam propulsion and auxiliary systems
18. Diesel and gas turbine propulsion and auxiliary systems
19. Engineering administration and operations
20. Damage control (Phase I)
21. Damage control (Phase II)
22. Professional development
23. Ship simulator or underway training craft
24. Underway training
25. 20A61--Tactical trainer or underway training craft

Before students enter SWOS, they are given a diagnostic pretest to identify any areas where they may be deficient with respect to the above topics. As they complete each unit, they are administered a criterion test (CT). Students who fail SWOS may or may not be given a chance to "roll back" and try again, depending on the decision of a board comprised of SWOS staff officers. Although students may drop out at different points in the course, those allowed to roll back must do so at the beginning of the course. SWOS students must successfully complete 75 percent of the Personal Qualification Standards (PQS) in order to graduate from the school (the remaining 25% is completed during their first sea tour). Failure to do so renders them ineligible for sea duty, which essentially ends their career as a surface warfare officer.

Several years ago, the JO detailer for surface warfare officer distribution at the Naval Military Personnel Command (NMPC-41) noted that Blacks were attriting at a high rate from SWOS, and that many of these attrites had been commissioned through NROTC units located at predominantly Black, Southern universities (i.e., Prairie View A&M College, Southern University and A&M College, Savannah State College, Florida A&M University, and North Carolina Central).² Since 35 percent of the Blacks who enter SWOS come from these units, they must be maintained as long as they meet viability standards.

To discuss this problem, representatives of interested Navy agencies (e.g., Chief of Naval Education and Training, NMPC) met with Professors of Naval Science (PNS) from the concerned NROTC units in December 1977. As a result, it was recommended that (1) the SWOS diagnostic pretest be administered to senior NROTC students, and (2) selected NROTC graduates be detailed through Fleet Training Courses before they enter SWOS.

Researchers at the Navy Aerospace Medical Research Laboratory (NAMRL) have studied the problem of Black attrition within the aviation community (Baisden & Doll, 1978, Doll & Baisden, 1979). They matched all Black students entering naval aviation pilot training during calendar years 1973-1976 to a sample of White students, based on scores obtained on the Academic Qualification Test (AQT) and the Flight Aptitude Rating (FAR), procurement source, and class contiguity, and then compared the two groups on selected training variables against a pass/fail criterion. They found that the matched Black and White students did not differ in terms of overall attrition from the undergraduate pilot training program, even though the academic and flight scores obtained by the Blacks were significantly lower than those obtained by the Whites (Baisden & Doll, 1978).

In a subsequent effort, they compared Black and White civilians recruited for naval aviation training during calendar years 1976-1978 on pass rates for different AQT/FAR cutting scores by recruiting area and college major (Doll & Baisden, 1979). They reported the following:

²North Carolina Central no longer has an NROTC unit.

1. The passing rates for Blacks were significantly lower than those for Whites.
2. The passing rates for Blacks at the operative AQT/FAR cutting score were highest in the Rocky Mountain recruiting area, and lowest in the Southeast area.
3. Recruiting area had no effect on passing scores for Whites.
4. Passing rates for engineering, technical, and physical science majors were higher than those for social science and education majors, with the effect being stronger for Whites than for Blacks.
5. The passing rates for White social science and education majors were higher than those for Black engineering, technical, and physical science majors.

Doll and Baisden indicated that further information could be obtained by analyzing type of college and grade point average (GPA). For the present, they concluded that vigorously recruiting Blacks who can pass the aviation selection test at a high level would be more effective in reducing attrition than developing a preparatory program.

Purpose

The purpose of this effort was to investigate the Black attrition problem within SWOS in a two-phase research effort. The purpose of the first phase was to determine whether Blacks and Whites attending SWOS differed as to attrition and performance. The purpose of the second was to determine the reasons for any disparities found and to recommend actions needed to overcome these disparities.

The present report not only identifies differences between the two groups but also gives a preliminary indication of why such differences exist. Any subsequent study should elaborate on reasons for the disparities and suggest ways to correct them.

METHOD

Sample

Between January 1977, when SWOS officials first began to record student race, and March 1979, 2667 officers (2505 Whites and 162 Blacks) attended SWOS Basic--East and West--one or more times. Of these, 2499 (94%) (2407 Whites and 92 Blacks) succeeded during their first attempt, and 168 (4%) (98 Whites and 70 Blacks) failed.

For use in this effort, a group of 358 Blacks and Whites, drawn fairly equally from the two Basic schools, was identified. This number included all of the Blacks who had failed (N = 70) or succeeded (N = 92) during their first attempt at SWOS, all of the Whites who had failed (N = 98), and a random sample (N = 98) of the 2407 Whites who had succeeded.

Data Collected

An attempt was made to obtain SAT scores, college GPAs, and officer aptitude ratings (part of the AQT/FAR) for sample members from other Navy agencies. Because of the large amount of missing data, however, data obtained were not used in subsequent analyses.

The following data were obtained from SWOS records:

1. SWOS Performance Variables:

Attrition rate--Based on a pass/fail criterion (first and second attempts)
Criterion test (CT) scores
Diagnostic pretest scores

2. Demographic Variables:

Race--Black or White
Commissioning Source--USNA, OCS, NROTC unit, or Navy Enlisted Science and Engineering Program (NESEP)
Barron's rating of college attended--From noncompetitive to most competitive³
College major--Business, science, social science, humanities, or education
Region where college located--South, Southwest, etc.
Rank--Ensign (ENS) or lieutenant junior grade (LTJG)

3. SWOS Institutional Variables:

Location--East or West
Class attended--Year (1977-1979) and class within year (77002-79002)
Date of class relative to CNET-PNS meeting (77002 through 78003 classes occurred prior to the meeting; and 78004 through 79002 classes, after the meeting)

Analyses

The attrition measure was based on the number of attempts a student made to complete SWOS and his success or failure in these attempts. Thus, for the attrition analyses, students were classified as belonging to one of four categories: (1) One attempt--Pass, (2) One attempt--Fail, (3) Two attempts--Pass, and (4) Two attempts--Fail. With this system, analyses could be performed on first attempt attrition (those who fail the first time they attempt SWOS), or overall attrition (those who fail the first time and are not allowed to roll back, plus those who failed even after they were allowed to roll back).

Attrition from SWOS was examined in relation to all of the variables described. Since most of these variables are categorical, Chi-square tests were performed to determine the overall affect of these factors on success and failure at SWOS for Black and White students. Performance at SWOS was analyzed as a function of race by using correlations and t-tests.

Since only a small proportion of passing Whites were included in the sample, each was counted as 24.57 subjects (i.e., the 98 White passes were weighted as 2407 subjects) when estimating population parameters. Inferential statistics, however, were calculated on the unweighted sample to avoid inflated significance levels.

³Barron's Profiles of American Colleges, 1976, rates the competitiveness of American colleges and universities within six categories, ranging from "Noncompetitive" to "Most competitive." Ratings are based on college entry requirements and the proportion of applicants accepted (see Table 1).

Table 1
Barron's College Admission Selector Criteria

Rating Categories	Median ^a SAT Scores	GPA or High School Class Rank Required	Proportion of Applicants Accepted	Examples
Most Competitive	1300-1600	Top 10-20% (B+ to A)	"A Small Percentage"	U.S. Naval Academy M.I.T.
Highly Competitive	1200-1300	Top 20-30% (B to B+)	< 25%	Notre Dame Duke
Very Competitive	1100-1200	Top 30-50% (Not Less Than B-)	< 33%	Boston University Rutgers University
Competitive	900-1100	Top 67% (C+ to B-)	< 50%	U.C.L.A. American University
Less Competitive	-1100	Top 75%	--	Prairie View A&M Florida A&M
Noncompetitive	None	None	--	Idaho State University of Wyoming

^aIn some cases, the equivalent American college testing program score is required.

RESULTS AND DISCUSSION

SWOS Performance Variables

Attrition

Table 2, which compares attrition rates of Blacks and Whites, shows that the differences between the two groups were significant for both first attempt and overall attrition.⁴ As indicated previously, the first attempt attrition rate is based on those who failed SWOS during their first attempt; and the overall rate, on those who failed SWOS during their first attempt and were not allowed to roll back, plus those that failed even after they were allowed to roll back. In both cases, the attrition rate for Blacks is about 10 times that for Whites.

⁴These figures differ from those previously compiled in response to CNO and CNET requests because they were obtained over a longer period of time, and first attempt and overall attrition were analyzed separately.

Table 2
Attrition Rates for Black and White SWOS Students

Item	Blacks		Whites		χ^2
	N	%	N	%	
<u>First Attempt Attrition</u>					
Pass	92	57.8	2407	96.1	39.17*
Fail	70	43.2	98	3.9	
Total	162	100.0	2505	100.0	
<u>Roll Back (Second Attempt) Attrition</u>					
Pass	35	85.4	42	82.4	0.46
Fail	6	14.6	9	17.6	
	41	100.0	51	100.0	
	(58.6%)		(52.0%)		
<u>Overall Attrition</u>					
Pass	127	78.4	2449	97.8	203.5*
Fail	35	21.6	56	2.2	
Total	162	100.0	2505	100.0	

Note. The numbers in parentheses are the percentages of the first attempt failures who were allowed to roll back.

* $p < .01$.

While the roll back policy, which gives selected failing students an opportunity to attempt the course a second time, does not eradicate the attrition problem, it does provide a different perspective. As shown in Table 2, it reduces attrition from 43 to 22 percent for Blacks and from 4 to 2 percent for Whites. Although the percentage of Blacks who failed during their first attempt and were allowed to roll back was higher than that for Whites (59 vs. 52%), the difference does not approach statistical significance.

The fact that the success rate for Blacks is higher than that for Whites (85 vs. 82%) raises the question of how high the success rate would go if the percentage of those rolled back were increased. There are limits to this, however, due to costs and logistics associated with student flow through SWOS.

The most interesting research question regarding rollbacks is how they perform when they get to the Fleet--does it take them longer to master on-the-job skills or are they, at that point, as qualified as those who succeed on their first attempt in SWOS? Another interesting question is whether there is some cutoff point at which it would no longer be profitable to roll anyone back--or whether everyone should be allowed to roll back. Although there are no answers to these questions, the rollback results are very encouraging. Regardless of which variables are operating to cause attrition, it is clear that extra training does reduce the magnitude of the problem.

All attrition data presented in the following sections refer to first attempt failures unless otherwise indicated. Although Blacks and Whites do not differ as much on the overall attrition rates as they do on first attempt attrition rates, it was felt that the implications of cost effectiveness, schoolhouse space available, and general student preparedness could be fairly considered only by looking at the number of students who fail SWOS during their first attempt.

Criterion Test (CT) Scores

SWOS classes vary as to the order in which criterion tests (CTs) are given and the points in the course at which students may be dropped. Therefore, the data presented in this section serve only as a rough guide, with the areas that are most difficult for students being of primary interest.

As shown in Table 3, when the performance of the two racial groups was compared by combining CT scores of passing and failing students, Blacks consistently scored lower than Whites. Differences were significant for 22 of the 25 scores.

When the two groups were compared using mean scores of passing students only, Whites scored higher than Blacks on 23 of the 25 CTs, with the differences being significant on 13 of them. Although Blacks scored higher than Whites on two tests--Nos. 14 and 20, which correspond to shipboard training and administration and damage control (Phase I)--the differences were not significant. Finally, when the two groups were compared using mean scores of failing students only, Whites scored higher than Blacks on 22 of the 25 CTs, with the differences being significant on six of them. Blacks scored higher than Whites on CT 15 (inspections and safety), but the difference was not significant. The two groups had identical scores on CTs 13 and 19 (human resources management and engineering administration and operations).

As shown in Figures 1 and 2, which plot the scores obtained by passing and failing students, respectively, the scores of Blacks and Whites follow the same general pattern across tests. Passing students had the most difficulty with CTs 4, 6, 7, 11, and 21, which correspond to external communications, navigation, naval ordnance, in-port watch officer, and damage control (Phase II), respectively. For failing students, the most difficult CTs include those that were most difficult for passing students, plus Nos. 5, 16, and 22, corresponding to rules of the road, material management, and professional development, respectively. This relationship between Black and White passing and failing scores was verified using statistical analyses. The correlation between Black and White passing scores is $r(23) = .90, p < .01$; and that between Black and White failing scores, $r(23) = .82, p < .01$.

Diagnostic Pretest Scores

The mean pretest scores were 1.92 and 1.40 for Black successes and failures respectively, compared to 2.10 and 1.68 for Whites. Results of t-tests showed that the differences were significant for both successes ($t = 2.9, df = 168, p < .01$) and failures ($t = 3.03, df = 142, p < .01$).

When pretest scores were analyzed as predictors of attrition, it was found that they were significantly related to success at SWOS for both Blacks ($t = 5.0, df = 159, p < .001$) and Whites ($t = 5.9, df = 201, p < .001$).

Table 3
Mean Criterion Test (CT) Scores Obtained by SWOS Students

CT	CT Scores ^a		t	df	p
	Whites	Blacks			
Combined Passing and Failing Students					
1	3.55	3.31	5.32	359	.000**
2	3.67	3.43	7.86	355	.000**
3	3.67	3.45	6.96	340	.000**
4	3.40	3.15	6.20	344	.000**
5	3.49	3.19	7.28	359	.000**
6	3.46	3.16	5.52	163	.000**
7	3.43	3.20	5.52	327	.000**
8	3.52	3.41	2.87	320	.000**
9	3.49	3.39	2.54	312	.012*
10	3.48	3.33	3.98	308	.000**
11	3.44	3.31	2.98	296	.003*
12	3.53	3.49	1.25	308	.221
13	3.61	3.50	4.55	344	.000**
14	3.53	3.45	2.78	340	.006*
15	3.61	3.56	1.64	309	.101
16	3.45	3.29	4.32	331	.000**
17	3.55	3.49	2.07	308	.040*
18	3.57	3.35	4.83	330	.000**
19	3.51	3.40	2.47	310	.014*
20	3.62	3.53	1.74	309	.083
21	3.49	3.17	5.92	343	.000**
22	3.45	3.27	4.66	330	.000**
23	3.67	3.60	2.96	305	.003*
24	3.51	3.37	4.69	313	.000**
25	3.55	3.42	4.25	297	.000**
Passing Students Only					
1	3.57	3.49	1.44	188	.152
2	3.68	3.60	2.62	187	.009*
3	3.68	3.61	2.57	182	.011*
4	3.41	3.30	2.53	187	.012*
5	3.50	3.40	2.65	187	.009*
6	3.46	3.35	2.09	18	.040*
7	3.44	3.31	2.91	188	.004*
8	3.53	3.52	-.38	184	.706
9	3.49	3.44	1.15	185	.253
10	3.49	3.39	2.06	185	.040*
11	3.45	3.39	1.07	179	.285
12	3.53	3.50	.87	186	.384
13	3.62	3.56	1.83	188	.068
14	3.53	3.55	-.36	188	.721
15	3.61	3.57	1.15	185	.252
16	3.46	3.41	1.52	187	.130
17	3.55	3.51	1.45	186	.250
18	3.57	3.47	2.12	184	.039*
19	3.51	3.45	1.19	181	.235
20	3.62	3.66	-.77	182	.440
21	3.50	3.31	3.96	186	.000**
22	3.46	3.37	2.06	187	.041*
23	3.67	3.60	2.33	185	.021
24	3.51	3.42	2.54	184	.012*
25	3.56	3.46	2.48	180	.014*
Failing Students Only					
1	3.22	3.06	1.84	158	.068
2	3.46	3.17	4.84	153	.000**
3	3.43	3.20	3.45	147	.001**
4	3.11	2.90	2.67	130	.008*
5	3.14	2.90	3.11	155	.002*
6	3.13	2.83	2.70	54	.009*
7	3.28	2.96	2.33	98	.022*
8	3.25	3.15	1.00	95	.318
9	3.43	3.24	1.12	67	.265
10	3.17	3.10	.63	50	.534
11	3.21	3.01	1.69	48	.098
12	3.50	3.47	.45	53	.656
13	3.38	3.38	.13	128	.896
14	3.31	3.26	.83	116	.406
15	3.49	3.53	-.61	65	.541
16	3.07	3.04	.33	105	.745
17	3.42	3.40	.18	49	.861
18	3.27	3.11	1.48	117	.141
19	3.26	3.26	-.05	77	.962
20	3.43	3.12	1.81	64	.076
21	3.11	2.92	1.41	131	.160
22	3.13	3.04	.88	108	.383
23	3.64	3.59	1.15	48	.254
24	3.25	3.21	.39	77	.557
25	3.36	3.25	1.25	46	.219

^aBased on a 4-point scale, where a score of 3.2 is required to pass.

*p < .05.

**p < .001.

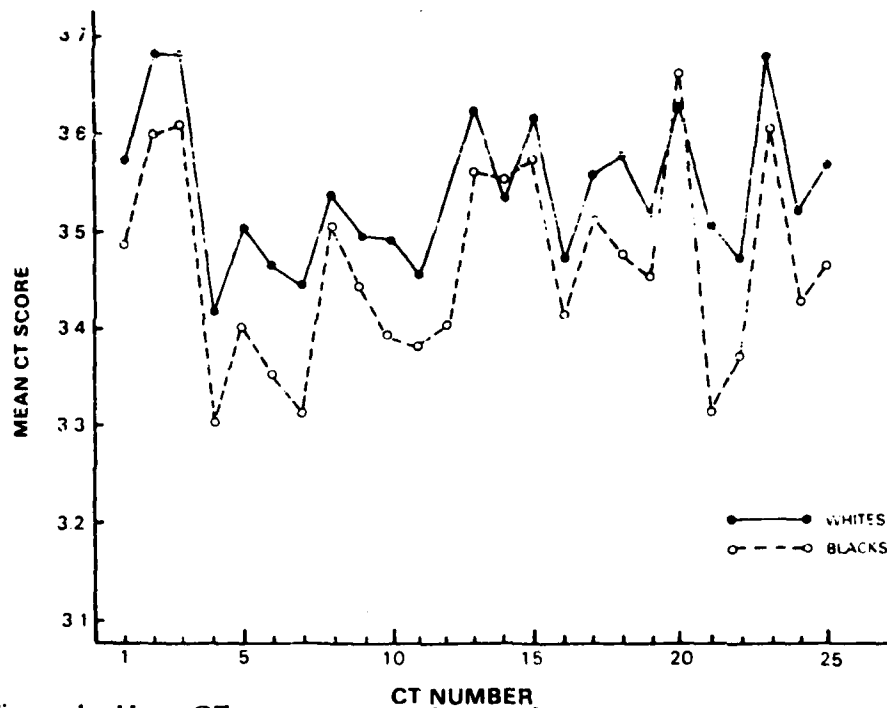


Figure 1. Mean CT scores across classes for passing Blacks and Whites.

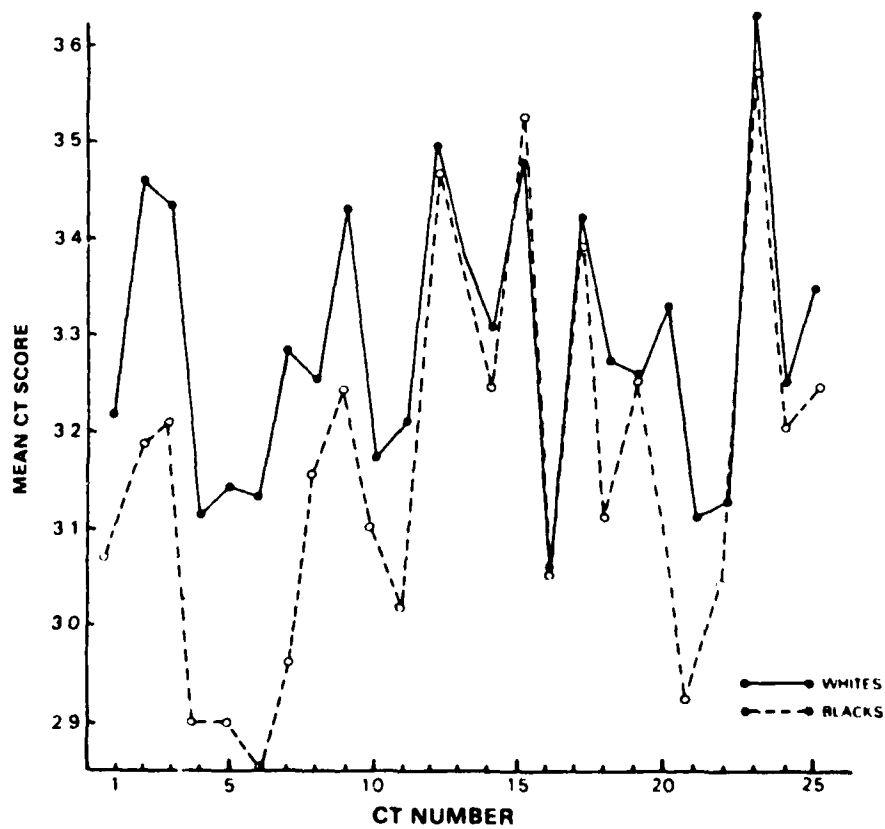


Figure 2. Mean CT scores across classes for failing Blacks and Whites.

Demographic Variables

Commissioning Source

The overall effect of commissioning source on attrition was significant (χ^2 (df = 4) = 66.5, $p < .01$); that is, the source through which an officer is commissioned is related to whether or not he succeeds in SWOS. Attrition data by the various sources is shown in Table 4.

Table 4
Attrition by Commissioning Source

Source	Total N	Attritees N	%	% of Total Attrition	χ^2
Blacks					
NROTC	82	59	72	84	53.6**
Minority Units	(57)	(46)	(81)	(66)	48.0**
All others	(25)	(13)	(52)	(18)	0.56
OCS	32	8	25	12	4.50*
USNA	42	1	2	1	36.3**
NESEP	6	2	33	3	0.01
Total	162	70		100	
Whites					
NROTC	82	55	8	56	16.5**
OCS	52	22	3	23	1.28
USNA	54	21	2	21	3.09
NESEP	8	0	0	0	6.39*
Total	196	98		100	

* $p < .05$.

** $p < .01$.

NROTC. As shown in Table 4, 72 percent of the Blacks from the NROTC source fail, accounting for 84 percent of the Black attrition. For Whites, 8 percent of the students from the NROTC source fail, accounting for 56 percent of the attrition. The Chi-square values show that, for both groups, those commissioned through NROTC have a significantly greater chance of failing SWOS than do students commissioned through other sources.

When the data are analyzed in terms of types of NROTC units, results show that Blacks from NROTC units located at predominantly Black, Southern colleges (which will subsequently be referred to as "minority" units) have significantly higher attrition rates than do those from other units (χ^2 (df = 1) = 5.74, $p < .05$). The minority units account for 35 percent of the Blacks entering SWOS. Of these, 81 percent fail, accounting for 66 percent of the Black attrition. This disturbing finding supports the observation noted earlier; that is, that disproportionate numbers of Blacks attriting from SWOS were commissioned through these units.

OCS. Twenty-five percent of Blacks commissioned through OCS attrite from SWOS, compared to 3 percent for Whites. This Black attrition rate is surprisingly high: Since OCS students are intensively exposed to Naval Science curriculum immediately before they enter SWOS, it has long been assumed that they should not have difficulty with the SWOS curriculum. Even though the 25 percent rate represents only eight students, it may be worthwhile to monitor future OCS input to determine whether results shown here are spurious or indicative of a trend. This could be particularly important if Black input to OCS is increased, as recommended by the OP-13 Minority Accessions Study Group.

USNA. As shown, for both Blacks and Whites, students commissioned through the Academy do very well at SWOS. This is not surprising, since USNA is a highly competitive school with very stringent entry requirements (see Table 1), and the graduates have been exposed to a far more rigorous naval environment than have students from other sources. Also, Academy students participate in three summer training cruises, while many other students--particularly those from the minority NROTC units--participate in only one. The hands-on training received during these cruises is considered essential by both students and instructors.

NESEP. The NESEP figures are included since the sample included students from this source. They should be generally ignored, however, because of the small sample size and because the program has been phased out.

Barron's Competitiveness Rating

Barron's college competitiveness ratings are a direct indicator of the entrance standards for the undergraduate institution that an individual attended and an indirect indicator of SAT or ACT scores he obtained (Table 1 shows the range of scores acceptable for each rating category used). To determine whether Barron's ratings had any relation to attrition at SWOS, subjects were assigned a numerical value ranging from 0 to 5, corresponding to the rating assigned the college they had attended:

- 0--Noncompetitive
- 1--Less competitive
- 2--Competitive
- 3--Very competitive
- 4--Highly competitive
- 5--Most competitive

Mean values were then computed for passing and failing students, both Blacks and Whites. Results showed that passing students of both racial groups had a mean value of 2.9; failing Whites, 2.7; and failing Blacks, 1.2. These data show that all Whites and passing Blacks tend to come from colleges rated very near to "Very Competitive," while failing Blacks come from those rated as "Less Competitive."

Analyses of these data using t-tests showed that:

1. Blacks from more competitive schools are more likely to pass at SWOS ($t = 8.7$, $df = 191$, $p < .001$).
2. Failing and passing Whites come from schools that do not differ significantly in their competitiveness rating ($t = 0.9$, $df = 242$, $p > .05$).
3. Passing Whites and passing Blacks come from schools that are equally competitive ($t = .02$, $df = 188$, $p > .05$).
4. Schools attended by failing Whites are significantly more competitive than those attended by failing Blacks ($t = 2.88$, $df = 168$, $p < .01$).

The Barron's rating is not related to attrition for Whites since failing Whites do not attend less competitive schools than do passing Whites. It is related to attrition for Blacks, however, since Blacks who come from more competitive schools are more likely to pass; and those who come from less competitive schools, to fail. These data support previous findings, which showed that Blacks from minority NROTC units (at schools rated "Less Competitive" by Barron) have the highest attrition rates at SWOS (see Table 4).

College Major

The overall effect of college major was significant for Blacks (χ^2 ($df = 3$) = 8.8, $p < .05$) but not for Whites (χ^2 ($df = 3$) = 6.1, $p > .05$). Since the overall effect of major was significant only for Blacks, further analyses were performed on data for Black students. These analyses showed that Blacks with science majors have a significantly better chance of passing SWOS than do those with other majors (χ^2 ($df = 1$) = 5.27, $p < .05$), and those with business or education majors have less chance of passing (χ^2 ($df = 1$) = 4.26, $p < .05$).

Table 5, which provides attrition rates by the various major areas, shows that science majors, both Blacks and Whites, have lower attrition rates than do those in other areas. This finding is related to the Barron's data in that more science majors come from schools that are academically superior. Fifty-three percent of science majors come from schools rated as "Highly Competitive" or "Most Competitive," while only 7 percent come from schools rated as "Noncompetitive" or "Less Competitive."

Region

As with college major, the overall effect of region was significant for Blacks (χ^2 ($df = 4$) = 44.9, $p < .01$) but not for Whites (χ^2 ($df = 4$) = 8.4, $p > .05$). These results are similar to those found by Doll and Baisden (1979); that is, the effect of region was significant for Black students only. Further analyses were performed on data for Blacks, but not for Whites.

Table 6, which includes attrition rates by the various regions, shows that students (both Blacks and Whites) who attended schools in the West have the lowest attrition rate; and those who attended schools in the South, the highest. If the West is discounted due to the small N, the table shows that those from the Mid-Atlantic and New England have the best chance of succeeding at SWOS; and those from the South and Southwest, the least. These results were statistically significant and are predictable in view of previous findings. First, the Mid-Atlantic and New England region includes graduates of the Naval Academy, which is the source with the lowest attrition rate and a Barron's rating of "Highly Competitive." Second, the South and Southwest includes students from the

Table 5
Attrition as a Function of College Major

Major	Blacks		Whites	
	Total N	Percent Attrited	Total N	Percent Attrited
Science	64	30	93	3
Social Science	54	46	42	6
Humanities	17	41	30	6
Business and Education	20	65	23	6
Total	155		188	

Note. Ns do not equal sample member Ns due to missing data.

Table 6
Attrition as a Function of College Region

Region	Blacks		χ^2	Whites	
	Total N	Percent Attrited		Total N	Percent Attrited
West	2	0	.26	27	2
Mid-West	17	41	.00	24	5
Mid-Atlantic & New England	52	8	36.69**	80	3
Southwest	27	63	4.41*	10	4
South	63	65	19.41**	47	8
Total	161			188	

Note. Ns do not equal sample member Ns due to missing data.

*p < .05.

**p < .01.

minority NROTC units, which account for 66 percent of the failing Black students (Table 4) and which are located at schools with a rating of "Less Competitive."

Rank

The data for rank are not very meaningful since 95 percent of the sample were ensigns (ENS); and 5 percent, lieutenants junior grade (LTJG). The attrition rates for those in both ranks were equal to those of the overall figures for Blacks and Whites--43 and 4 percent respectively.

SWOS Institutional Variables

Location

The location of the SWOS attended (East or West) had no effect on success in SWOS for either Blacks (χ^2 (df = 1) = .01, $p > .05$) or Whites (χ^2 (df = 1) = 1.7, $p > .05$). Attrition rates by location are presented in Table 7.

SWOS Class Attended

SWOS class data were analyzed by year and by class within year. The analysis for overall effect of year was significant for Blacks (χ^2 (df = 2) = 8.26, $p < .05$). As shown in Table 7, Blacks who attended SWOS in 1979 were more likely to fail than those who attended in 1977 or 1978. The N for 1979, however, is relatively small, since only two 1979 classes were included in the sample.

Analysis of the class within year data resulted in only one significant Chi-square, which was for Blacks in 1978 (χ^2 (df = 4) = 11.4, $p < .01$). Their failure rates were higher, but not significantly so, for classes 78004 (χ^2 (df = 1) = 3.81, $p > .05$) and 78005 (χ^2 (df = 1) = 1.19, $p > .05$) than for the other 1978 classes.

It is interesting to note the trend of increasing attrition for Blacks in classes 78004 through 79002. While these results may be due to chance, they do represent another aspect of the problem that merits tracking. For this reason, two additional analyses were performed. First, since the SWOS pretest data were significantly related to success at SWOS, the average scores for passes and fails combined within each class were examined to determine if the scores had decreased as the attrition increased. Results showed no significant relationships for either Blacks ($r(10) = -.32$, $p > .05$) or Whites ($r(10) = -.20$, $p > .05$). Therefore, it appears that increasing attrition cannot be attributed to a trend caused by persons entering SWOS who are less prepared than those in earlier classes. Second, a correlational analysis was performed to determine whether attrition of Blacks was related to the percentage of Blacks in a given class. It was found that a high percentage of Blacks in a class was significantly related to lower attrition ($r(10) = -.63$, $p < .05$). This racial mix effect should be examined further in any subsequent research efforts.

SWOS Class Relative to the CNET-PNS Meeting

As indicated previously, the December 1977 CNET-PNS meeting, the first attempt to address the issue of minority attrition at SWOS, resulted in recommendations directed toward NROTC graduates--the group correctly identified as contributing the most to the attrition problem. Therefore, to determine whether the attrition situation had changed since these recommendations were implemented, attrition data were separated, depending on whether they applied to students entering SWOS before or after the meeting was held.

Table 7
Attrition by SWOS Institutional Variables

Item	Total N	Blacks	Percent Attrited	Whites	Percent Attrited
				Total N	
By Location					
East	93		44	110	5
West	69		42	186	3
Total	162			196	
By Year Attended					
1977	74		40	88	5
1978	69		38	82	4
1979	19		74	26	2
Total	162			196	
By Class Within Year					
77002	18		33	14	4
77003	10		40	21	6
77004	14		50	17	3
77005	16		50	14	2
77006	16		31	22	8
78001	16		44	15	3
78002	24		21	20	6
78003	11		18	14	3
78004	12		67	17	4
78005	6		67	16	2
79001	9		67	15	3
79002	10		80	11	2
Total	162			196	
By Class Relative to CNET-PNS Meeting					
Before Meeting	125		35 (First attempt) 22 (Overall)	137	4 (First attempt) 3 (Overall)
After Meeting	37		70 (First attempt) 22 (Overall)	59	3 (First attempt) 1 (Overall)
Total	162			196	

As shown in Table 7, the first attempt attrition rate for Blacks entering SWOS after the meeting was twice that of Blacks entering before the meeting (χ^2 (df = 1) = 12.9, $p < .001$), while that for Whites decreased slightly (χ^2 (df = 1) = 1.55, $p > .05$). When overall failure rates are considered, Black attrition remains the same, and White attrition decreases (χ^2 (df = 1) = 3.41, $p > .05$), although the change is not significant.

Although it is clear that the meeting, per se, did not impact the problem, it could be that the resulting recommendations have not been systematically implemented. If so, this would explain a constant attrition rate over the two periods, but not the increase in the Black first attempt attrition rate. The meeting may have had a positive effect in terms of calling attention to the problem. The fact that the overall figures for Blacks are constant, in spite of the first attempt rates doubling, suggests extra effort on the part of SWOS to get people through the program. Although it would appear that these findings would be related to an increase in rollbacks allowed, perhaps because the severity of the problem has been formally recognized, this was not the case. After the meeting, the percentage of rollbacks increased from 48 to 60 percent for Whites, and from 50 to 54 percent for Blacks.

CONCLUSIONS

Although Blacks have a higher attrition rate than Whites at SWOS, this appears to be a source rather than a race problem. For both racial groups, students commissioned through NROTC units have a significantly greater chance of failing SWOS than do those commissioned through other sources. This is particularly true for Blacks who are commissioned through NROTC units at predominantly Black, Southern colleges. Further, when the academic quality of college attended is controlled, Blacks do as well as Whites. Analyses conducted to determine whether Barron's college competitiveness rating was related to attrition showed that all Whites and passing Blacks tend to come from colleges rated as "Very Competitive," while failing Blacks come from those rated as "Less Competitive." These are the schools in which the minority NROTC units are located.

It is not known whether the high attrition rate of SWOS students commissioned through NROTC minority units is due to the preparation students receive at that institution, the students' capabilities, or some combination of both. In any case, since the NROTC minority units provide 35 percent of Black input into SWOS, they must be maintained as long as they meet viability standards. Although the roll back data showed that attrition can be reduced by providing extra training, it is not economically or logically feasible to roll everyone back. Thus, improved or extra training must be provided before students enter SWOS. To determine where such training would be most effective, investigations could be directed at various segments of the surface officer pipeline. For example, investigations could be made of (1) SWOS student qualifications (e.g., reading skills), (2) preparation in Naval Science courses provided to NROTC students entering SWOS and the instructional interface between NROTC programs and SWOS, (3) OCS preparation for SWOS, (4) the instructional quality of SWOS curriculum, and (5) the relationship between performance at SWOS and in the Fleet.

RECOMMENDATIONS

It is recommended that follow-on efforts focus on the NROTC program and the NROTC/SWOS instructional interface. Since the NROTC source contributes most heavily to the attrition problem, instruction provided in the Naval sciences should be evaluated to

determine whether improvements could be made. The air and subsurface communities have provided some input relating to NROTC objectives for their training programs, but this has not been the case for the surface warfare community. Although the course objectives and text books are standardized across NROTC units, testing and instructional procedures vary.

This effort should emphasize those areas of the SWOS curriculum that are difficult for everyone. It should attempt to determine whether SWOS and NROTC objectives are consistent, and whether NROTC preparation is adequate for meeting SWOS objectives.

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