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A COMPARISON OF BLACK STUDENT PERFORMANCE AND WHITE STUDENT PERFORMANCE IN NAVAL AVIATION TRAINING

Annette G. Baisden and Richard E. Doll

30 November 1978

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Naval Medical Research and Development Command
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Approved by

Ashton Graybiel, M. D.
Assistant for Scientific Programs

Released by

Captain R. E. Mitchel, MC, USN
Commanding Officer

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Naval Aerospace Medical Research Laboratory
Naval Air Station
Pensacola, Florida 32508

SUMMARY PAGE

THE PROBLEM

This report represents the first of a series of reports analyzing minority officer accessions as related to the Naval Aviation Training Program. It involves a comparison of black students and white students in pilot training during calendar years 1973-1976, using such performance measures as Aviation Selection Tests, Peer Rating, Officer-Like-Quality grade, Environmental Indoctrination Final grade, Basic and Advanced Flight grades, Basic and Advanced Academic grades, and pass/attrite.

FINDINGS

The data presented in this study indicate that when controlling for Aviation Selection Test Scores, procurement source, and class continguity, no differences existed between the black and the white students in overall attrition rates during undergraduate pilot training. This was true even though black students obtained significantly lower performance grades throughout training, with the exception of the Officer-Like-Quality grade. In terms of types of attrition, black students had a lower percentage of drop on request and a higher percentage of flight failure. Attritions among black students remained relatively constant across all stages of training, while attrition for white students gradually increased during the first three stages of training, then sharply decreased during advanced training.

RECOMMENDATIONS

Future reports should examine the two groups in terms of background variables such as college, grade point average, and test regions; performance in the naval flight officer training program; undergraduate pipeline assignments; and assignments after undergraduate training.

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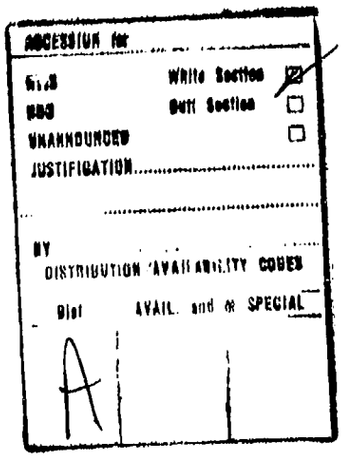

INTRODUCTION

Efforts to ensure equal opportunity for black students in naval aviation training resulted in the Naval Aerospace Medical Research Laboratory (NAMRL) being requested to develop a data collection system to evaluate black student performance in naval aviation training. In July 1977, in response to a Chief of Naval Air Training (CNATRA) request, NAMRL completed a comparative analysis of selected flight training grades and attrition rates for black and white student naval aviators entering pilot training during CY73 and CY74 (1). In September 1978, the Chief of Naval Personnel requested that NAMRL update the 1977 report to include black students entering naval aviation and pilot training during CY75 and CY76. Specifically, the request asked for an examination of black civilian applicants on such variables as Aviation Selection Test scores, college background, grade point average, reasons for declination, and test regions. It was also requested that the performance of minority students entering the naval aviation training programs be examined, using training grades and pass/attrite criteria. Pipeline assignments, and assignments after undergraduate pilot training (UPT), in addition to the previously mentioned factors, will be the subject of future reports. Student aviators and naval flight officers will be studied separately in those instances where appropriate.

This report represents the first of a series to examine minority accessions in naval aviation and involves a comparison of black students and white students in pilot training during calendar years 1973-1976, using such performance criteria as peer rating, Officer-Like-Quality grade, Environmental Indoctrination Final grade, Basic and Advanced Flight grades, Basic and Advanced Academic grades, and pass/attrite.

PROCEDURE

SUBJECTS

An extensive effort was made to identify all black students entering naval aviation pilot training during CY73-CY76; however, systematic procedures for minority identification were not implemented until January 1976. The effort resulted in the identification of 48 black aviation officer candidates (AOCs) and 51 black officer-under-instruction (OIs) for a total of 99 black students.

A comparative sample of 172 white students (82 AOCs, 90 OIs) was selected by matching each black student with two white students, where possible, on the following control variables.

1. Academic Qualification Test (AQT) and Flight Aptitude Rating (FAR).

2. Procurement source.

3. Class contiguity.

A perfect match on all three variables was not always possible. Constraints of the data required a small number of black students to be matched with only one white student. Table I describes the black and the white students in terms of annual input by procurement source.

Table I

Black/White Student Sample by Procurement Source and Year

	AOCS		AVROC		USNA		NROTC/OCS		USMC/USMCR		TOTAL	
	Black	White	Black	White	Black	White	Black	White	Black	White	Black	White
CY73	18	32	1	-*	-	-	-	2*	1	1	20	35
CY74	11	23	2	1	-	-	-	-	7	13	20	37
CY75	12	17	2	4	2	3	3	4	12	23	31	51
CY76	7	10	6	12	4	6	5	9	6	12	28	49
TOTAL	48	82	11	17	6	9	8	15	26	49	99	172

* Imperfect match on the control variable.

METHOD

The performance of the black students was compared with that of the white students on the Aviation Selection Tests, selected training variables, and pass/attrition. The statistical significance of performance differences between the two groups was determined by the use of t-tests and chi-square techniques as appropriate. Specifically, the measures were as follows:

- Aviation Selection Test
  - Academic Qualification Test (AQT) - Paper-and-pencil test measuring quantitative and verbal ability, practical judgment, clerical speed and accuracy, and direction following.
  - Flight Aptitude Rating (FAR) - Paper-and-pencil test consisting of the Mechanical Comprehension Test (MCT), Spatial Apperception Test (SAT), and Biographical Inventory (BI).

- Peer Rating - A peer evaluation grade limited to officer candidate students.

- Officer-Like-Qualities (OLQ) - Aviation Officer Candidate grade based upon peer rating, instructors' observation, watches, inspection and drill grades.

- Environmental Indoctrination Final (EI) - A weighted average of Naval Aviation Schools Command grades.

- Basic Flight Grade - A composite of all Primary and Basic flight grades.

- Basic Academic Grade - A composite of all Primary and Basic academic grades.

- Advanced Flight Grade - A composite of all Advanced flight grades.

- Advanced Academic Grade - A composite of all Advanced academic grades.

- Final Overall Grade (FOAG) - A composite of all Environmental Indoctrination, Primary, Basic and Advanced academic and flight grades.

RESULTS AND DISCUSSION

Group performance on the Aviation Selection Tests is reflected in Table II. As shown there, the mean AQT/FAR scores for the total black student

Table II

AQT/FAR Descriptive Statistics for CY73-76
Black/White Students

		CY73		CY74		CY75		CY76		Total	
		Black	White	Black	White	Black	White	Black	White	Black	White
AQT	$\bar{X}$	4.5	4.6	3.9	3.9	4.2	4.4	4.5	4.5	4.3	4.3
	S.D.	1.3	1.1	0.9	0.9	1.4	1.4	1.7	1.6	1.4	1.3
	N	20	35	20	37	31	51	28	49	99	172
FAR	$\bar{X}$	4.8	5.0	4.8	4.9	4.8	4.9	4.9	5.0	4.8	4.9
	S.D.	1.5	1.3	1.6	1.6	1.4	1.4	1.9	1.8	1.6	1.6
	N	20	35	20	37	31	51	28	49	99	172

sample were 4.3 and 4.8, respectively. The AQT/FAR means for the total white student sample were 4.3 and 4.9, respectively. The slight differences in the black and the white student means were due to matching some black students with only one white student, and others with two white students. These differences, however, are so small that the two groups can effectively be considered equal in terms of AQT/FAR scores.

Aviation Selection Test scores range from 1 to 9. The Bureau of Medicine and Surgery requires a minimum grade of 3/3 for acceptance into flight training. The Bureau of Naval Personnel, the U. S. Coast Guard, and the U. S. Marine Corps may impose higher standards if the manpower supply and demand indicate that this is desirable for their respective services. The average AQT/FAR score for all student naval aviators for CY73-76 time frame was 5/6 (2). Clearly, the samples under study represent the lower end of the AQT/FAR score continuum. Past research at NAMRL has shown that the probability for successfully completing aviation training with AQT/FAR scores of 4/4 or 4/5 is approximately 50 to 60 percent (3).

Table III compares the two groups using training grades from Naval Aviation Schools Command, Primary Training, Basic Training and Advanced Training. The number of students receiving each grade varies, since Officer-Under-Instruction, unlike officer candidates, do not receive peer ratings, nor Officer-Like-Qualities (OLQ) grades. In addition, those attriting do not receive all grades. The findings indicate the black students' scores were significantly lower, statistically, than the matched white students' scores on all grades, with the exception of OLQ.

Table III

Black/White Student Performance During Naval Aviation Training
CY73-76 Pilot Input

	Black			White			
Grade	N	Mean	S.D.	N	Mean	S.D.	t
Peer Rating	48	46.9	13.9	79	51.5	10.6	1.97*
Officer-Like Qualities (OLQ)	48	50.0	9.3	79	52.3	7.7	1.44
Environmental Indoctrination Final (EI)	86	44.2	7.1	151	49.4	6.2	5.67**
Basic Flight	60	3.01	0.04	95	3.04	0.05	4.12**
Basic Academic	60	45.8	7.6	95	51.2	6.1	4.64**
Advanced Flight	49	3.03	0.03	85	3.05	0.04	3.28**
Advanced Academic	49	47.7	6.9	85	52.1	7.3	3.48**
Final Overall Grade (FOAG)	46	39.1	8.3	76	47.2	9.2	5.01**

* $p \leq .05$
** $p \leq .01$

Table IV summarizes the pass/attrite rates for the two groups by year. The annual attrition rates ranged from 40.0 to 57.1 percent for black students, and from 36.7 to 68.6 percent for white students. The overall attrition rate was 50.5 percent for the black students, and 50.6 percent for the white students. Although these attrition rates were high as compared to an overall annual attrition rate of approximately 30 percent (4), they were within the range incurred in undergraduate pilot training, viz., 50-60 percent, for individuals with lower than average AQT/FAR scores.

Table IV

Summary of Attrition by Race and Year

Year Entry	Completed N	Completed %	Attrited N	Attrited %	Total N
		BLACK			
73	9	45.0	11	55.0	20
74	12	60.0	8	40.0	20
75	16	51.6	15	48.4	31
76	12	42.9	16	57.1	28
Total	49	49.5	50	50.5	99
		WHITE			
73	11	31.4	24	68.6	35
74	14	37.8	23	62.2	37
75	29	56.9	22	43.1	51
76	31	63.3	18	36.7	49
Total	85	49.4	87	50.6	172

Tables V and VI present the percentages of attrition by attrition type and training stage for the black group and white group, respectively. Although it was not feasible to perform a statistical analysis of these tables, certain observations should be made. It would appear from the data that there was a higher drop on request (DOR) rate within the white student sample (25%) vice black student sample (11%), while alternatively there was a higher flight failure rate among the black students (23%) than among the matched white students (13%). Also, it seems that attrition for all causes was slightly higher within the white group than the black group for the first three stages of training, but then sharply dropped during Advanced Training. The attrition rate within the black group, however, remained relatively constant across all stages of training with only a slight decrease during Advanced Training.

Table V

Percentages of Black Student Attrition by Type and Stage
CY73-76 Pilot Input

	Schools Command	Primary	Basic	Advanced	Total
Drop on Request	5.05	5.05	1.01	--	11.11
Not Physically Qualified	7.07	--	1.01	--	8.08
Not Aeronautically Adapted	--	2.02	1.01	--	3.03
Academic Failure	--	--	--	--	--
Flight Failure	--	6.06	9.09	8.08	23.23
Transfer to NFO	1.01	1.01	--	2.02	4.04
Other	--	--	1.01	--	1.01
Total	13.13	14.14	13.13	10.10	50.[illegible]

N = 99

Table VI

Percentages of White Student Attrition by Type and Stage
CY73-76 Pilot Input

	Schools Command	Primary	Basic	Advanced	Total
Drop on Request	9.30	4.66	9.89	1.16	25.01
Not Physically Qualified	2.91	2.91	1.74	--	7.56
Not Aeronautically Adapted	--	1.16	1.16	--	2.32
Academic Failure	.58	--	--	--	.58
Flight Failure	--	5.81	5.23	2.33	13.37
Transfer to NFO	.58	.58	--	--	1.16
Other	--	--	.58	--	.58
Total:	13.37	15.12	18.60	3.49	50.58

N = 172

Table VII shows the percentage of attrition by procurement source and attrition types for the two subject groups. Again, while it was not feasible to perform a statistical analysis of significance for such a detailed partitioning of categories because of the relatively small numbers involved, certain differences seem worthy of note. Black students had a lower percentage of DORs across all procurement sources and had no recorded DORs from the AVROC, USNA, and NROTC/OCS procurement sources. However, black students had

Table VII

Percentages of Attrition by Procurement Source and Attrition Type

	AOCS		AVROC		USNA		NROTC/OCS		USMC/USMCR	
	Black N=48	White N=82	Black N=11	White N=17	Black N=6	White N=9	Black N=8	White N=15	Black N=26	White N=49
Drop on Request	16.6	35.4	--	29.4	--	11.1	--	13.3	11.6	12.2
Not Physically Qualified	10.4	9.8	27.2	--	--	11.1	--	--	--	8.2
Not Aeronautically Adapted	4.2	3.6	--	--	--	--	--	--	3.8	2.0
Academic Failure	--	--	--	5.9	--	--	--	--	--	--
Flight Failure	10.4	9.8	36.4	5.9	50.0	11.1	62.5	26.7	23.1	18.4
Transfer to NFO	4.2	2.4	--	--	--	--	12.5	--	3.8	--
Other	2.1	1.2	--	--	--	--	--	--	--	--
Total:	47.9	62.2	63.6	41.2	50.0	33.3	75.0	40.0	42.3	40.8

a higher flight failure rate than the matched group of white students across all procurement sources, especially for the AVROC, USNA, and NROTC/OCS procurement sources.

Figures 1 and 2 portray, graphically, types of attrition and stage of attrition, respectively. From Figure 1, it can be readily seen that the black group and the white group differed in terms of types of attrition. A statistical test of significance (chi square) indicated the differences to be statistically significant ($p < .05$) and were attributable to the differences in DOR and flight failure rates.

Figure 2 presents, graphically, the findings contained in Table V and VI; namely, attrition remained relatively constant across all four stages of training within the black student sample, while within the white student sample attrition peaked in Basic Training then sharply dropped during Advanced Training. These differences are statistically significant at the $p < .02$ level of probability.

CONCLUSIONS

On the basis of the data presented in this study, one can draw certain legitimate conclusions. It is clear that when one controls for AQT/FAR scores, procurement source, and class contiguity, there is no difference between black and white students in terms of overall attrition from the undergraduate pilot training program even though the black students obtained statistically significant lower performance grades, both academic and flight. It should be noted

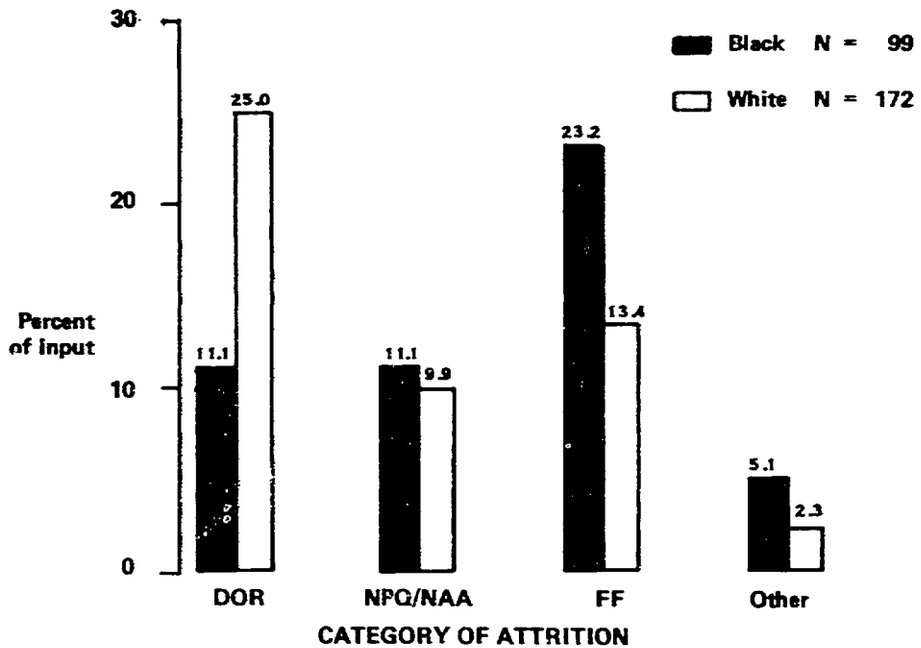

Figure 1. Types of pilot attrition by race. Percentages of CY73-76 Black/White student totals.

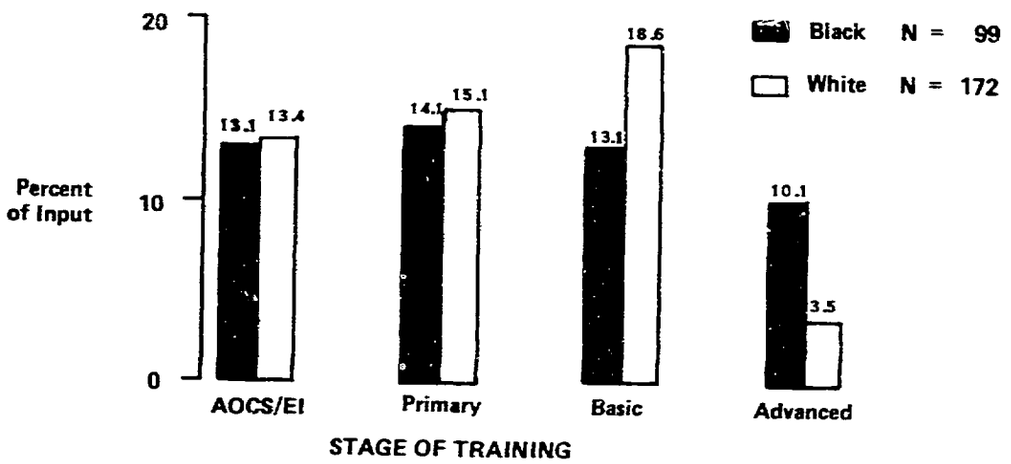

Figure 2. Attrition by stage of training. Percentages of CY73-76 Black/White student totals.

that peer ratings, often criticized for being biased, showed less of a difference in average scores between the two groups than did several academic and flight grades. The one variable for which no statistically significant difference was obtained between the black students and the white students was the OLQ score, of which peer rating is a component. The findings also indicated that the white students dropped on request more readily than do the black students, while the latter group had a higher flight failure rate. Finally, it should be pointed out that the two groups differed in terms of where the attritions took place. The attritions among black students were evenly split among NASC, Primary, Basic, and Advanced portions of training, while the white students had a gradual increase in attrition rate during the first three stages of training and then experienced a sharp decrease during Advanced Training. To attempt to explain some of the data at this time would be speculative, but further avenues of investigation are suggested.

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This report represents the first in a series of reports analyzing minority officer accessions as related to the Naval Aviation Training Program. It involves a comparison of black students with white students in pilot training during calendar years 1973-1976, using such performance measures as Aviation Selection Tests, Peer Rating, Officer-Like-Quality grade, Environmental Indoctrination Final grade, Basic and Advanced Flight grades, Basic and Advanced Academic grades, and pass/attrite.

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