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AN EVALUATION OF MINORITY AND FEMALE PERFORMANCE IN ARMY ROTARY WING AVIATION TRAINING

Volume I: Executive Summary

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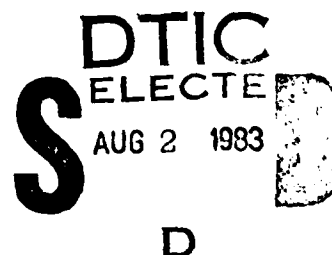
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(3) Flight performance grades by phase of training; (4) Overall grade;
(5) Attrition experience during the Warrant Officer Development Course and;
(6) Attrition experience during the flight portion of training.

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Volume I: Executive Summary

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FOREWORD

This report presents the results of a research effort in support of the U.S. Army Aviation Center's Human Relations and Assistance Program for Students (HRAPS). The HRAPS program is intended to provide students assistance for a smooth transition into the Fort Rucker training environment and surrounding communities, with the primary focus on successful completion of training.

As a part of the process of providing assistance to students, ARI Fort Rucker Field Unit was tasked to perform several activities. The projects performed by ARI generally related to two issues: (1) the evaluation of the aviator trainee selection process, and (2) the evaluation of student performance as a function of minority/majority status in the Army Initial Entry Rotary Wing (IERW) flight training program.

The evaluation of the selection process evolved into several projects, which will be detailed in future ARI technical reports. This report concerns only the evaluation of minority and female performance in the IERW program with a focus on the following objectives:

(1) to determine if minority and/or female students have academic and/or flight performance grades equivalent to their counterpart majority students;

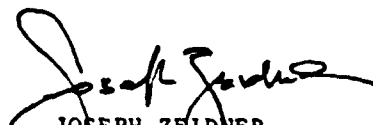
(2) to determine if attrition differs for minority female and majority students;

(3) to identify, if differences exist, the aspects of the IERW program in which the differences occurred;

(4) make recommendations, where possible, concerning ways to continually improve the IERW program for all students.

The report of this evaluation is large and contains several graphs and tables. For this reason, the report is divided into two parts, the executive summary and the evaluation report.

This evaluation is intended for use by the U.S. Army Aviation Center to assist in the continuing effort to improve the efficiency of the selection and training of Army aviators.


JOSEPH ZEIDNER
Technical Director

AN EVALUATION OF MINORITY AND FEMALE PERFORMANCE IN ARMY ROTARY WING
AVIATION TRAINING

BRIEF

Requirement:

To evaluate the IERW program by ascertaining if there are differences in performance and/or attrition between minority and female groups and their counterpart white males when the students are matched in terms of their scores on flight related selection tests and on military experience.

Procedure:

The comparisons of each minority group (Black, Hispanic, Asian, American Indian) and the female group was accomplished in four phases:

- (a) comparison of academic and military development grades for Warrant Officer Candidates (WOCs);
- (b) comparison of academic and flying performance grades for Primary, Transition, Instruments, Night, and Tactics stages of training as well as the overall IERW grade;
- (c) comparison of attrition experience during the Warrant Officer Candidate Military Development Course (WOCMDC);
- (d) comparison of attrition experience during the flight portion of IERW training.

Findings:

- (a) No significant differences were found in performance grades (academic or military development) during WOCMDC.
- (b) The only group found to have a statistically significant difference in academic grade was the Black group during the Primary stage of training. Although the primary academic average was significantly lower for Blacks, the average was much higher (85.27) than the minimum score (70) required for passing.
 - . There were no significant differences in flight performance grades across the stages of training.
 - . There were no significant differences in IERW overall grade.

(c) The Hispanic group was the only group to show significantly more recycles than their matched majority group.

. There were no significant differences in elimination between any minority and matched majority group.

(d) During flight training only two minority groups (Blacks and Hispanics) had significantly more recycles than did their matched majority groups. Also the Black group received significantly more eliminations than did their matched majority.

Utilization of Findings:

The results of this study will be used by the US Army Aviation Center to ensure that the flight training program maximizes the training for all students.

TABLE OF CONTENTS

	page
Executive Summary	1
Approach	2
Procedure	3
Results	4
Discussion	7
Recommendations	8

Tables

1. Officer and WOC IERW Students - July 1974 through July 1979	2
2. Number of Minorities and Female Students (JUL 74 - JUL 79) Having Both Matching and Performance Scores	3

EXECUTIVE SUMMARY

BACKGROUND

In mid 1979, the US Army Aviation Center instituted a concerted effort to assist students applying for and attending the various training programs at Fort Rucker, Alabama. This program is called the Human Relations and Assistance Program for Students (HRAPS) and is aimed at providing the student with information to help him/her make a smoother integration into the Fort Rucker area and the training environment.

As a part of the HRAPS program, the US Army Research Institute (ARI) Fort Rucker Field Unit was tasked to perform several support activities. The project or activities being performed by ARI generally relate to two issues: (1) the evaluation of the aviator trainee selection process, and (2) the evaluation of student performance as a function of minority/majority status in the Army Initial Entry Rotary Wing (IERW) flight training program.

The evaluation of the selection process, evolved into several projects which will be detailed and reported upon in subsequent ARI technical reports. The research reported herein concerns work related to the second issue. Specifically, an evaluation of minority and female performance in the IERW program by comparison with white male majority performance.

The objective of the report is to evaluate the IERW program by: (1) determining if minority and/or female IERW students have academic and/or flight performance scores equivalent to their counterpart majority students; (2) identifying, if performance differences are found, the aspects of the IERW program in which the differences occurred; (3) determining if attrition (recycles and eliminations) differs for minorities and majorities; and (4) making recommendations, where possible, concerning ways to improve the IERW training program for all students.

This report presents the evaluation of minority performance in the Army's Initial Entry Rotary Wing (IERW) flight training course and involves comparison of five groups of minority students:

- (1) Black
- (2) Hispanic (including persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish origin)
- (3) Asian (including Pacific Islanders)
- (4) American Indian (including Alaska natives)
- (5) Females¹

These samples were chosen based on the definition of "relevant" groups discussed in the Uniform Guidelines on Employee Selection, Section 4B.

¹ Females are considered as minorities for purposes of this report because they represent a small portion of the total

APPROACH

A matching design was used to equate each minority student with a white male student on entry scores/variables that predict flight training performance. This approach assures that performance comparisons are made between students who had entered flight training with essentially the same attributes. That is, the intent of the study was to ascertain if there were differences in performance and/or attrition between minority groups and counterpart white males when they are matched in terms of entry scores on flight related selection tests and demographic variables.

The subjects used for this evaluation were drawn from all commissioned officers, warrant officers, and warrant officer candidates (WOC) who had entered the flight training program after July 1974 and graduated or attrited from the program by July 1979. Each minority student was matched with a white male student based on the following variables:

- (1) Flight Aptitude Selection Test (FAST)
- (2) General Technical (GT) component of the Armed Services Vocational Aptitude Battery (ASVAB)
- (3) Class Number
- (4) Education Level
- (5) Age
- (6) Rank
- (7) Source of Entry

TABLE 1

OFFICER^a AND WOC IERW STUDENTS - JULY 1974 THROUGH JULY 1979

RANK	SEX AND ETHNIC GROUP					
	MALE CAUCASIAN	BLACK	HISPANIC	ASIAN	AMERICAN INDIAN	FEMALE
OFFICER	1463	80	38	8	20	27
WOC	2476	45	41	20	27	50
TOTAL	3939	125	79	28	47	77

^aWarrant officers who received their warrant appointment prior to entering flight training are included in the officer category.

The records of each of the students in Table 1 were reviewed to determine if appropriate matching data and performance scores were available. Table 2 presents the number of minorities, by group, who had both matching and performance data. The total sample used for this evaluation includes those 192 minorities plus the 192 matched control (MC) majority students.

TABLE 2
NUMBER OF MINORITIES AND FEMALE STUDENTS (JUL 74 - JUL 79)
HAVING BOTH MATCHING AND PERFORMANCE SCORES

RANK	SEX AND ETHNIC GROUP					
	BLACK	HISPANIC	ASIAN	AMERICAN INDIAN	FEMALE	TOTAL
OFFICER	27	16	3	9	15	70
WARRANT OFFICER CANDIDATE	30	30	15	20	27	122
TOTAL	57	46	18	29	42	192

PROCEDURE

The performance of each minority group was compared with that of each group's MC on several critical training scores and on attrition experience. The performance evaluation was divided into essentially four phases:

Phase 1 - (WOC only) Student performance during Warrant Officer Candidate Military Development Course (WOCMDC)

- (a) Academic grades
- (b) Military Development grades

Phase 2 - Officer and WOC student grades during flight training

- (a) WOC only - Military Development grades during initial 10 weeks of flight training (Presolo + Primary)
- (b) Academic and flying performance grades for primary, transition, instruments, night, and tactics stages as well as the overall IERW grade

- . Academic grades
- . IP putup grades
- . Checkride evaluation grades
- . Stage grades

(c) Overall grade

Phase 3 - Attrition experience during WOCMDC

- (a) Number of recycles and eliminations
- (b) Reason categories for attrition

Phase 4 - Attrition experience during flight portion of training

- (a) Number of recycles and eliminations
- (b) Reason categories for attrition

RESULTS

Phase 1 - Student performance during WOCMDC

(a) Academic grades for the six weeks of WOCMDC were averaged and then compared using a paired-t test.²

. Results - No significant differences between minorities and their MCs were found.

(b) Military development grades for the six weeks of WOCMDC were averaged and comparisons made using the Wilcoxon matched pairs signed-rank T test.

. Results - No significant differences between minorities and their MCs were found.

Phase 2 - Officer and WOC student grades during flight training

(a) Military development grades during 10 weeks of flight training (WOCs only) were averaged and comparisons made using the Wilcoxon matched pairs signed-rank T test.

. Results - No significant differences between minorities and their MCs were found.

² The approach used for these tests required the development of a critical t-value (t_c) based on selection of both an α and a β level. An in-depth discussion of this technique can be found at Appendix B.

(b) Academic grades for each stage of training (primary, transition, instruments, night, and tactics) were averaged and comparisons made using a paired-t test.

. Results:

(1) Primary - Blacks' academic average for Primary was significantly lower than their MC group (85.27 vs 88.36; $t_o = 3.37$).³ However, this difference does not appear to have practical significance. The average Primary academic grade for all students was 86.1 with a minimum grade for continuation of 70. Both groups (Blacks and their MC) were very close to the overall mean and were well above the minimum score of 70, therefore the difference between 85.27 and 88.36 is probably not important in a practical sense. No significant differences between any other minority and their MC were found.

(2) Transition - No significant differences between minorities and their MCs were found.

(3) Instruments - No significant differences between minorities and their MCs were found.

(4) Night - No significant differences between minorities and their MCs were found.

(5) Tactics - No significant differences between minorities and their MCs were found.

(c) Flight grades

(1) IP putup grades were compared by stage of training by using a paired-t test.

. Results - No significant differences between minorities and MCs were found.

(2) Checkride evaluation grades were compared by stage of training using a paired-t test.

. Results - No significant differences between minorities and MCs were found.

(3) Stage grades were compared by stage of training using a paired-t test.

. Results - No significant differences between minorities and MCs were found.

(d) Overall grades for those students who graduated were compared using a paired-t test.

³ t_o = Observed t-value

. Results - No significant differences between minorities and their MCs were found.

Phase 3 - Attrition experience during WOCMDC

(a) Recycles - The probability of recycle by group was compared by calculating the z score of the difference between the recycles for the minorities and their MC group.

. Results - Hispanics were the only group having significantly more recycles than their MCs (20% of the 30 Hispanics received a recycle while none of 30 MCs were recycled; $z = 2.58$).

(b) Eliminations - The probability of terminal elimination was compared by calculating the z score of the difference in number of eliminations between minorities and their MC groups.

. Results - None of the z score differences were significant.

- The most frequent reason for elimination for both minorities and MCs was military development deficiencies (64% for minorities and 33% for MCs).
- The black group had the highest elimination rate. The elimination percentages were:
Blacks - 23%, Hispanics - 3%, Asian - 0%,
Indian - 10%, Females - 15%.

Phase 4 - Attrition experience during the flight portion of training

(a) Recycles - The probability of recycle was compared by calculating the z score of the difference between the number of recycles for minorities and their MCs.

. Results - The z score of the difference in number of recycles was significant for two of the minority groups. Blacks and Hispanics had significantly more recycles⁴ than did their MC groups. There were no significant differences in the number of recycles between the Asian, Indian, and Female groups and their MCs.

- The most frequent reason for recycles for both minority and MCs was flight deficiency (52% for minority, 74% for MCs).
- The second most frequent reason was for medical problems (35% for minorities, 21% for MCs).

⁴The number of recycles used for this evaluation represent the first recycle only. Subsequent recycles received by the same individual were not included for this comparison.

- Blacks and females have 2 - 3 times as many medical recycles as do their MC groups.

. Multiple recycles, i.e., the number of individuals who receive more than one recycle, were also compared by calculating the z score of the difference between minorities and their MCs.

. Results - No significant differences in probability of a multiple recycle were found.

(b) Eliminations - The probability of elimination was compared by calculating the z score of the difference between minorities and their MCs.

. Results - One group, Blacks, had significantly more eliminations than their MC. (21.6% of 51 Blacks were eliminated, 7.4% of 54 MCs were eliminated; $z = 2.08$.) However, the number of eliminations was small, and a change of 1 or 2 people (Black or MC) could have moved the z score below the ± 1.96 required for significance.

. Comparisons of elimination rates for officers and WOCs were made separately by evaluating the z score of the difference between officers and WOCs.

. Results - Black WOCs received significantly more eliminations ($z = -2.58$) than did Black officers (2 officers out of 27 for 7.4%; 9 WOCs out of 24 for 37.5%). No other group differences were observed.

Discussion

WOCMDC Performance

The comparisons of academic and military development grades show that minority students did not differ from their MC majority counterparts. Only one comparison of recycles revealed a significant difference. The Hispanic group had significantly more ($z = 2.58$) recycles than did their MCs. The Hispanic recycles (6) were spread evenly over three reason categories. Their MC group had no recycles. As one would expect, the majority of the students, both minority and majority, attrited for military development deficiencies. It is, however, somewhat surprising that the second most frequent reason for attrition was medical. Data necessary to determine types of military development and medical problems causing attrition was not collected for this study. A further, more in-depth, analysis of these aspects would be required to discover the specific medical or military development deficiencies.

Flight Training Performance

It is clear that very few students in this evaluation experienced difficulty with the academic requirements of the flight training program. This is true even though Blacks' academic scores for the primary stage were significantly lower than their MC. Both these groups had academic averages well above the minimum scores required for course completion.

Flight performance grades did not differ across any group or stage of training. This is possibly due to the imprecise measure these grades

represent. As a function of the IERW syllabus, no student received an IP putup grade, checkride evaluation grade, or stage grade until he/she had reached a fairly high proficiency level. Students who had difficulty in a particular phase were usually recycled or eliminated prior to the formal end of stage evaluation represented by the IP putup, checkride, and stage grading process. For this reason all these scores are based on the attainment of flight proficiency, thus reducing the variance of the scores.

The analysis of attrition during flight training revealed that the Black and Hispanic groups had significantly more recycles than did their MCs. The major difference between the Black group and their MCs appears to be the high rate of medical recycles for Blacks (10 for Blacks, 3 for their MCs). The Hispanic group differs in the number of recycles for flight deficiencies (13 vs 6). It is not clear why these differences should occur since specific information about the nature of the medical and flight recycles was not collected. It remains for further research to elucidate these issues.

The Black group was the only group to have significantly more eliminations than their MCs. The majority of these eliminations (82%) were due to deficiencies in flight performance. This appears to support the finding of lower entry skills as measured by the FAST test. It can be seen that, in most cases, extra training (in terms of recycles) allows the Black student who is experiencing difficulty to acquire the skills necessary for completion of the program. Of the 25 Black students who were recycled, 18 eventually completed the program. Of the 18 recycles who completed the program, 9 had more than one recycle. It appears that a considerable amount of extra training time was given to these students which brought the overall completion rate for the Black group, which was the lowest for any group, to a relatively high 80% completion.

Recommendations

1. A computerized data base be developed for flight performance record keeping. It was necessary to hand search over 4,000 flight records to accomplish this study. A computerized data base would have considerably shortened the time required to complete the data collection.
2. USAAVNC evaluate the current grading system to determine its effectiveness in meeting present objectives. This study suggests that differences in performance between students cannot be reliably measured using IP putup, checkride, or stage grades, or these grades have considerable restriction in range and variability.
3. A further evaluation of the WOCMDC should be accomplished to examine the cause(s) of medical and military development deficiencies leading to attrition.
4. A further evaluation of Primary academics be performed to validate that the differences are consistent over time and to determine reasons for these differences.
5. A further evaluation of the reasons for medical recycles and eliminations during flight training be conducted.