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Validation of Aircrew Training Manual Practice Iteration Requirements

John W. Ruffner
Anacapa Sciences, Inc.

William R. Bickley
Army Research Institute

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ARI Field Unit at Fort Rucker, Alabama
Training Research Laboratory

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Technical review by

John J. Kessler
Paul J. Tremont

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also indicate that overall checkride performance can be predicted reliably from performance on a small number of tasks. Additional research is needed to determine the amount of skill decay that occurs for a) no-practice periods longer than 6 months, and b) emergency, instrument, night, and mission-specific tasks not investigated in this research.

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John W. Ruffner
Anacapa Sciences, Inc.

William R. Bickley
Army Research Institute

ARI Field Unit at Fort Rucker, Alabama
Charles A. Gainer, Chief

Training Research Laboratory
Harold F. O'Neill, Jr., Director

U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES
5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600

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FOREWORD

The Fort Rucker Field Unit of the Army Research Institute for the Behavioral and Social Sciences (ARI) has as its primary responsibility the conduct of research and the development of products that serve to increase the effectiveness of Army aviator training--both institutional training and unit training. An important part of this research is to understand the type and amount of training required to sustain the flying skills that aviators initially acquire in the Army Initial Entry Rotary Wing (IERW) course.

This research was designed to make an empirical determination of the minimum of semiannual practice iterations necessary to maintain proficiency on a selected sample of flying tasks. The research was performed in response to a request by the U.S. Army Aviation Center (USAAVNC) Directorate of Evaluation and Standardization (DES).



EDGAR M. JOHNSON
Technical Director

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VALIDATION OF AIRCREW TRAINING MANUAL PRACTICE ITERATION REQUIREMENTS

EXECUTIVE SUMMARY

Requirement:

Because of the high cost of flying hours and the increasing demands on aviators' mission flight skills, a need exists to validate the number of semi-annual task iterations required by the Army Aircrew Training Manuals (ATMs) to maintain individual flying proficiency. The existing requirements were defined by aviation subject matter experts (SMEs) and have not been empirically confirmed. The research reported in this paper was conducted to provide empirical data regarding the minimum number of task iterations required to maintain proficiency in contact and tactical tasks in the UH-1 aircraft over a 6-month test period.

Procedure:

Seventy-nine staff aviators at the U.S. Army Aviation Center (USAAVNC) participated in a 6-month test period in which they flew either zero, two, four, or six iterations of 47 FAC 2 contact and terrain flight tasks in the UH-1 aircraft. Aviators' checkride performance was evaluated at the beginning (Initial Checkride Pretest) and at the end (Final Checkride Posttest) of the test period by standardization instructor pilots (SIPs). The dependent variable was subjects' checkride scores. Independent variables were the number of practice iterations, number of career flight hours, pretest-posttest periods, and ATM tasks. In addition, the reliability of aviators' self-rated confidence to perform checkride tasks to ATM standards was evaluated as a potential predictor of checkride performance.

Findings:

The results indicate that average level of performance in helicopter contact and terrain flight tasks is maintained after 6 months of no-practice. The average level of performance does not significantly improve with as many as six practice iterations. These findings are true regardless of (a) total career flight hours or (b) whether the tasks are psychomotor or procedural. In short, the results do not support the requirement for aviators to perform current semiannual minimum FAC 2 iterations for the majority of ATM contact and terrain flight tasks.

A factor analysis of final checkride data revealed the presence of six independent task dimensions. This finding suggests that a selected set of 10 tasks could be used to predict overall checkride performance with a reliability (R^2) of .87. Aviators' self-rated confidence in their ability to perform a task to ATM standards was found to be a nonreliable predictor of actual performance of the tasks.

Additional research is needed to determine the amount of skill decay that occurs for (a) no-practice periods longer than 6 months, and (b) emergency, instrument, night, and mission-specific tasks not investigated in this study.

Utilization of Findings:

The results of this research should be taken into account in implementing changes to the current ATM program. Two specific recommendations are: (a) modification of iteration performance requirements, and (b) redirection of evaluation emphasis during checkrides.

VALIDATION OF AIRCREW TRAINING MANUAL PRACTICE ITERATION REQUIREMENTS

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INTRODUCTION

PROBLEM

Aircrew Training Manuals (ATMs) are designed to help the aviation unit commander implement and monitor training in his unit and to standardize the individual aviator training program. ATM training is designed to ensure that each aviator achieves and maintains individual flight proficiency. The ATMs contain requirements for the minimum number of task iterations to be accomplished by individual aviators during a six-month period of continuation training. The iteration requirements were defined by a panel of subject matter experts (SMEs). Because the cost of flying hours and the demands on aviators' mission skills continue to increase, a need exists to make an empirical determination of the minimum number of ATM task iterations necessary to maintain individual flying proficiency. The U.S. Army Research Institute (ARI) was requested by the U.S. Army Aviation Center (USAAVNC) Directorate of Evaluation and Standardization (DES) to validate the ATM requirements.

BACKGROUND

Development of the ATMs

With the introduction of the Aviation Career Incentive Act of 1974, Congress and the General Accounting Office established that the Army's flying hour program would be acceptable for funding only if it was fully justified. At that time, the Army was less able than the other services to demonstrate a definitive program of training that carried the aviator through qualification, mission, and continuation training and that identified the specific tasks required in each phase of training. For continuation training,¹ the Army developed a flying hour program requiring 80 hours for each aviator; no satisfactory explanation could be given as to how and for what benefit these hours were being used (Lovejoy & Presley, 1980).

At the direction of the Vice Chief of Staff of the Army, a special task force from the Army Training and Doctrine Command (TRADOC) was created in late 1976 to develop a flying hour program designed to ensure combat readiness. The initial ATMs were drafted by members of the special task force. The ATMs specified the estimated amount of training required to train individual aviators to an acceptable level of proficiency (qualification and mission training) and to sustain proficiency at that level (continuation training). In addition, the TRADOC task

¹The research described in this paper addresses Army ATM continuation training requirements in general, with particular emphasis on training requirements for FAC 2 aviators. The part of continuation training that is designated for Army FAC 2 aviators has also been called "proficiency flying."

force established specific annual training criteria, identified tasks for individual aviators by type of aircraft, defined semiannual training requirements, and related the training requirements to flying hours. The latest version of the ATMs was distributed to the field in FY 81.

The ATMs were developed to help the unit commander fulfill his responsibility for assessing the combat-ready status of the unit, for identifying performance deficiencies of individual aviators, and for developing and implementing the required training program. Although portions of the program are mandated in order to standardize training, the program is sufficiently flexible to enable commanders to tailor training programs to the needs of their unit and the individual aviators within the unit.

ATM Training Requirements

The training requirements that a commander determines to be appropriate for an individual aviator depend on the Aviator Readiness Level (ARL) and Flight Activity Category (FAC) of the aviator. Each aviator is classified into an ARL according to the training status of that individual. Aviators are classified as ARL 1 only if they have completed mission training and are considered to be combat ready. Aviators are classified into other ARLs if they are a) participating in mission, refresher, or qualification training, b) assigned to a non-operational flying position, or c) restricted from flying for administrative or medical reasons.

Flight Activity Categories (FACs) are classifications of aviator positions. Aviators placed in FAC 2 positions typically occupy "career-broadening" assignments in which flying does not constitute a major part of their job. To minimize the potential deterioration of flight skills during such assignments, FAC 2 aviators are required to fly a minimum amount of hours per calendar period to maintain basic flight skills. The task list for a FAC 2 position consists of all FAC 2 tasks given in the ATMs plus any tactical/special, mission, and additional tasks that the commander designates as supporting Army training readiness goals (Department of the Army, 1981).

Aviators designated as FAC 1 perform combat, combat support, or combat service support missions. FAC 1 aviators are required to be proficient in the tactical tasks appropriate for the type of aircraft flown and for the particular mission of their unit. The commander determines the employment role for each position he designates as FAC 1 and develops a task list for that position. The task list for a FAC 1 position consists of all FAC 2 tasks, plus the FAC 1 tasks and the additional tasks not included in the ATM that the commander considers appropriate.

ARL 1 aviators in FAC 1 and FAC 2 positions are required to complete a minimum number of task iterations and flying hours during a six-month continuation training period. The ATMs specify the conditions under which each task is to be performed and the standards of acceptable performance. Both the iteration and flying hour requirements were analytically formulated by a panel of subject matter experts (SMEs) but were not empirically confirmed. It has been assumed that the number of iterations for each task and flying hour requirements are the minimum necessary to maintain proficiency over a six-month period.

RELEVANT RESEARCH

Task Performance

To develop an approach to validate the ATM iteration requirements for continuation training, literature on the retention of psychomotor and procedural skills was examined. The most frequently cited finding in the retention literature is that procedural skills decay after relatively short intervals of no practice (weeks, months), while psychomotor skills are generally well retained over extended no-practice intervals (months, years) (Mengelkoch, Adams, & Gainer, 1960; Prophet, 1976; Schendel, Shields, & Katz, 1978). Level of original learning is the single most important factor influencing how well psychomotor and procedural skills are retained following a period of no practice. The amount of proficiency loss depends on the length of the no-practice period; however, the absolute rate proficiency loss is approximately the same for individuals of varying initial ability levels (Schendel, Shields, & Katz, 1978).

In addition, several other variables have been found to affect retention; the two most operationally relevant variables are the type of tasks (i.e., psychomotor or procedural) and the activities an individual engages in during the retention interval. It has been shown that these variables often interact to affect retention (Naylor & Briggs, 1961; Gardlin & Sitterley, 1972).

Some research has focused specifically on the retention of flying skills. Although many studies deal with intervals of non-flying that are typically longer than those of concern in the present research, their findings are nonetheless of interest.

Smith and Matheny (1976) examined the level of skill retention among returning Air Force prisoners of war. Subjects' flight hours ranged from 300 to 7000 hours, and time away from flying ranged from 13 months to 102 months. The results indicate that contact flight skills were retained longer and were more quickly relearned than were instrument, procedural, and verbal skills. Aviators with less than 1,000 hours of flight time required significantly more hours to retrain than aviators with more than 1,000 flight hours.

Sitterley and his colleagues (e.g., Sitterley & Berge, 1972) examined the retention of procedural and continuous control skills for periods of one to six months for subjects flying simulated manned spacecraft. Their results indicate that time to execute procedural tasks increased significantly after only a one-month period of no practice. Proficiency on continuous control tasks decreased moderately for the first three months and rapidly from three months to six months.

In a review of literature relevant to Army proficiency flying, Wright (1969) was in agreement with the previously mentioned findings concerning the relative rates of proficiency loss for psychomotor and procedural skills, the importance of amount of initial learning, and the relationship between amount of proficiency loss and the length of the no-practice interval. In addition, he concluded that (a) flight skills are retained well for periods of up to two years, (b) skills that decay

can be retrained quickly, (c) forgetting curves for flight skills are negatively accelerated, and (d) initial retention performance is affected by the similarity of both the original learning task and interpolated tasks to the retention task.

Wright (1973) gathered Army aviators' self-ratings of skill levels achieved during proficiency training and refresher training following periods of nonflying as long as 36 months. His findings indicate that the amount of self-rated skill decrement and the amount of refresher training required are similar for aviators who engaged in proficiency flying and those who did no flying during equal periods. Self-rated basic visual flight skills remained at acceptable proficiency levels for nonflying or proficiency flying periods as long as 36 months; but, for one-half of the aviators in the study, self-rated instrument flight skills fell below acceptable levels within 12 months.

A small-scale study by the Human Resources Research Organization (HumRRO, 1974) obtained instrument flight performance data on aviators who were retrained in the 2B24 helicopter simulator. This simulator is motion-based but is not equipped with an external visual scene. The results indicate that aviators who are in proficiency flying assignments require approximately the same number of simulator training hours to pass an instrument checkride as aviators who are in a nonflying status for periods between 9 and 24 months.

Both the HumRRO (1974) study and Wright's (1973) study suggest that proficiency flying programs, as currently exercised, provide little, if any, improvement in training efficiency over a schedule of non-flying that is followed by a program of retraining appropriate to an aviator's next assignment. Data from these studies also suggest that, since the skills that are likely to decay are procedural skills, most of the proficiency maintenance or retraining requirements can be met by using simulators or other training devices that are effective for training and practicing procedural skills.

A recently completed research effort by the ARI Field Unit at USAAVNC provided data that are relevant to the present research. In Phase I of this effort, Allnutt and Everhart (1980) used the UH-1 aircraft to retrain a group of 17 Individual Ready Reserve (IRR) aviators to pass a contact checkride, excluding tactical flight and instrument flight proficiency. Previous experience of the subjects ranged from 400 to 2,500 total flight hours, with a mean of 1,292 hours. Time away from flying ranged from two to nine years, with an average of six years.

The results of Phase I show that an average of about 13 flight training hours are required to retrain the aviators to criterion. Aviators with fewer total military flight hours and more years away from flying required more retraining hours to pass the checkride. The main deficiencies in flying skills observed following the non-flying period are: slow cross-check, inadequate cockpit and emergency procedures, initial over-controlling, and difficulty with emergency maneuvers--particularly autorotations with turn and simulated antitorque failures.

In Phase II of the effort, additional retraining was conducted after a three- to five-month interval of nonflying. The results of the Phase II initial checkride indicate some decay of both psychomotor skills and procedural skills during the nonflying interval. Aviators' level of proficiency after the period of nonflying was found to be positively correlated with the level of proficiency measured on the final Phase I checkride. An average of 8.5 flight hours was required to retrain aviators to a satisfactory level of proficiency.

Confidence

The majority of studies reviewed deal with the behavioral aspects of flight skill retention. One variable that may influence an aviator's performance following a period of no practice (or of limited practice) of ATM tasks is the aviator's confidence in his or her ability to perform the tasks to standards. This variable has received little attention in the literature on flight skill retention. However, casual observation indicates that a common perception in the aviation community is that an aviator's confidence is related to actual performance on a task.

In a recent study conducted at USAAVNC, Ruffner, Ciley, and Wick (1981) found a significant pretest-to-posttest increase in aviators' confidence to perform five ATM emergency tasks following a training program, without any significant pretest-to-posttest change in measured proficiency. Furthermore, confidence was not found to be correlated with actual performance. The Ruffner et al. (1981) study examined only a small, homogeneous set of ATM tasks and dealt with a relatively small sample size ($n=8$). A need exists to evaluate the confidence-performance relationship following a period of no practice or limited practice using a larger number of heterogeneous ATM tasks and employing a larger sample size.

Conclusions From Previous Research

A review of the literature suggests the following broad conclusions. Both psychomotor skills and procedural skills are retained to some degree after periods of nonflying and both can be relearned. However, psychomotor skills are retained better than procedural skills. Second, retention of procedural and psychomotor flying skills depends upon the level of original learning and previous experience. Third, the effects of the type of task involved and the length of the retention interval are highly specific and are likely to interact to affect retention. Finally, it is important to control/have knowledge of the type of events that occur during the retention interval in order to determine the effects of potentially interfering variables on retention.

PURPOSE AND SCOPE

The purpose of this project is to investigate the task iterations required to maintain flight proficiency in FAC 2 tasks for ARL 1 aviators. Flying hours alone are not an adequate basis upon which to define the amount of practice needed to maintain flight proficiency. For example, much flying time can be expended enroute from a base field to a stagefield with little or no practice of ATM tasks. For this reason, it is essential that proficiency maintenance requirements be defined in terms of practice iterations rather than flying hours.

There are three reasons why a full-scale evaluation of ATM task iteration requirements for all Army aircraft is not a cost effective approach for meeting the research objectives. First, there are a number of common task requirements for many of the Army's rotary wing aircraft. This commonality of tasks should permit a limited amount of generalization of results from one aircraft to another since all rotary wing flight tasks likely draw upon some common underlying skills.

Second, the cost of collecting inflight data using different Army aircraft is directly affected by the relative cost of operating each aircraft. At Fort Rucker, for example, the operating costs for the UH-1 aircraft are approximately twice the operating costs for the OH-58 aircraft, 50% of the costs for the AH-1 aircraft, and 25% of the costs for the CH-47 aircraft. Thus, cost considerations weigh heavily against the use of all aircraft.

Finally, most minimum proficiency flying currently is accomplished in the UH-1, with a lesser amount in the OH-58. The AH-1 and the CH-47 aircraft typically are flown in support of mission requirements and are seldom flown for minimum proficiency maintenance; rather, they are flown by aviators whose primary job is flying these aircraft. Maintenance of proficiency for these aviators is accomplished through continuation training in the systems/mission equipment.

The majority of FAC 2 aviators at USAAVNC and in Forces Command (FORSCOM) units use the UH-1 for proficiency maintenance. Use of this aircraft enables the results to be more directly applicable to the largest number of aviators. Therefore, the UH-1 was judged to be the most appropriate aircraft for use in research on ATM proficiency maintenance.

The research reported in this paper was undertaken as the first step in an iterative process of validation. This study is designed to systematically evaluate the FAC 2 task iteration requirements for the UH-1 aircraft. Baseline data are provided on aviator performance in the UH-1 aircraft in a six-month period of controlled amounts of flying. In addition, the relationship between aviators' confidence to perform tasks and actual performance is evaluated.

RESEARCH OBJECTIVES

The specific objectives of the research are the following:

- to determine if the minimum number of semiannual task iterations specified in the ATMs are appropriate for the maintenance of individual aviator proficiency in FAC 2 tasks,
- to identify the tasks for which changes in the iteration requirements need to be made to better achieve training effectiveness,
- to determine if previous rotary wing experience (flying hours) is related to proficiency maintenance, and
- to determine if self-rated confidence is a reliable predictor of actual flight performance.

METHOD

CONSIDERATIONS AFFECTING RESEARCH APPROACH

Two major constraints on conducting research in field units were considered in formulating an approach that addresses the research objectives in a cost-effective and timely manner. The constraints stem from the difficulty of scheduling practice and collecting data in field units.

Scheduling of Practice

Because of the requirement to maintain a combat-ready posture, it is difficult to arrange for aviators in the field to receive less than the currently required number of iterations and flying hours without adversely affecting unit readiness. It is also difficult to control the number of times each ATM task is practiced, the conditions under which it is practiced, and when it is practiced during the six-month training period.

For example, certain ATM tasks (e.g., takeoffs, straight and level flight, hovering) are essential to flying the aircraft and are practiced on every flight. Because of this, aviators complete far more than the minimum number of required iterations on these flight-essential tasks. Even if another aviator in the aircraft performs these tasks, some practice effect is likely for the aviator who is a passive passenger.

Data Collection

A review of current documents and recordkeeping practices suggests that relying on already existing data and recordkeeping practices in the field does not provide sufficient or reliable data upon which to base a validation effort. Specifically, only the minimum number of task iterations required to meet ATM standards currently are recorded in field units. Data on tasks performed in excess of the minimums are not captured for later analysis.

Performance is assessed formally by a grade of "S" or "U" (satisfactory/unsatisfactory) on two occasions: once during the commander's evaluation checkride and again during the hands-on portion of each Annual Aviator Proficiency and Readiness Test (AAPART). Performance data are not gathered frequently enough or in sufficient objective detail to provide the basis for a validation effort. Altering recordkeeping practices in the field was considered to be unfeasible. Furthermore, it is difficult to control for differences among evaluators in remote locations.

In summary, constraints on the scheduling and control of practice and on data collection in field units strongly suggest that the initial phase of the ATM validation research be conducted by utilizing a sample of aviators and a research environment that allow a greater degree of control than is possible in field units.

SUBJECTS

The subjects were selected from FAC 2 aviators assigned to staff positions at Fort Rucker. Staff aviators typically have served in one or two aviation flying positions preceding their assignment to USAAVNC and do not engage in flying activities as a regular part of their current assignment. Therefore, these individuals are good examples of aviators who are required to fly minimum iterations and hours in order to maintain flight proficiency during continuation training. Furthermore, the iteration and flying hour requirements found to be appropriate for FAC 2 aviators extend directly to FAC 1 aviators who also must maintain proficiency in FAC 2 tasks.

Aviators were selected as potential subjects if they met the following criteria: (a) scheduled to be stationed at USAAVNC through project completion, (b) not required to fly as part of their duty assignments, (c) not required to fly a minimum amount of time each month in order to qualify for flight pay, and (d) had less than 750 hours of IP time or fixed wing aircraft time.

The total number of rotary wing flight hours for the aviators who were available to participate in the research was obtained from the information copy of DA Form 759, Individual Flight Record and Flight Certificate. Of the pool of aviators meeting the above criteria, the 84 aviators with the lowest number of rotary wing flight hours were chosen as subjects. All subjects were male. Subjects were current in the UH-1 aircraft. In addition, some subjects were qualified in other rotary wing aircraft. Although it was not possible to control experimentally for previous experience, an attempt was made to obtain subjects with a sufficient range of career flight hours to permit generalization of results to other aviators.

Subjects completed a demographic questionnaire to provide additional relevant information such as age, time since flight school graduation, time at Fort Rucker, aircraft qualifications, rotary wing flight hours, fixed wing flight hours, and simulator hours. The questionnaire is included in Appendix A. Major demographic characteristics of the subjects are summarized in Table 1. Flight hour data included in the table are taken from DA Form 759 for the period prior to 1 June 1982. Total flight hours ranged from 304 to 2,874 hours. Because the distributions of flight hour data were positively skewed, the median is presented as an alternate representative measure of central tendency.

A stratified random sampling procedure was used to assign the subjects to one of seven groups. The number of rotary wing flight hours was the basis of stratification. The subject groups are summarized in Figure 1.

TABLE 1
SUMMARY OF DEMOGRAPHIC DATA

VARIABLE	MEDIAN	MEAN	SD
AGE	33.06	33.22	3.33
MONTHS SINCE FLIGHT SCHOOL GRADUATION	93.50	90.18	45.21
MONTHS SINCE ASSIGNED TO FORT RUCKER	13.70	14.04	8.62
TOTAL ROTARY WING (RW) FLIGHT HOURS	915.00	1080.25	610.48
RW HOURS LAST 12 MONTHS	42.93	57.06	56.75
RW HOURS LAST 6 MONTHS	21.10	23.54	17.23
TOTAL RW SIMULATOR HOURS	107.25	108.92	35.69
SIMULATOR HOURS LAST 12 MONTHS	19.80	19.70	9.14

Subjects in Group 1, the control group, did not fly during the six months between the initial and final checkride. Subjects assigned to Group 2 were scheduled to complete two iterations of each task approximately four months (during Practice Period I) prior to the final checkride. Subjects assigned to Group 3 were scheduled to complete two iterations approximately two months (during Practice Period II) prior to the final checkride. Subjects assigned to Groups 4 and 5 were scheduled to complete four iterations during Practice Periods I and II respectively, while subjects assigned to Groups 6 and 7 were scheduled to complete six iterations during Practice Periods I and II respectively.

The assignment of subjects to separate groups with four- and two-month retention intervals was done with the intention of using both retention interval and number of iterations as independent variables. As described below, scheduling problems precluded the use of retention interval as an independent variable in the data analyses.

GROUP	N	INITIAL CHECKRIDE	PRACTICE PERIOD I	PRACTICE PERIOD II	FINAL CHECKRIDE
1	12	IC	6 MO.		FC
2	12	IC	TWO ITERATIONS	4 MO.	FC
3	12	IC	TWO ITERATIONS	2 MO.	FC
4	12	IC	FOUR ITERATIONS	4 MO.	FC
5	12	IC	FOUR ITERATIONS	2 MO.	FC
6	12	IC	SIX ITERATIONS	4 MO.	FC
7	12	IC	SIX ITERATIONS	2 MO.	FC
84					

Figure 1. Subject Groups.

INSTRUCTOR PILOTS

Two Standardization Instructor Pilots (SIPs) from DES and two SIPs from the Instrument Aviator Qualification Section (IAQS) served as SIPs for the initial and final checkrides. The DES SIPs were members of the standardization team responsible for evaluating U.S. Army aviator performance worldwide. The IAQS SIPs were members of a team responsible for giving annual checkrides to staff aviators at Fort Rucker. Staff IPs from USAAVNC agencies conducted the practice iteration flights. Task performance on the checkrides and practice flights was evaluated according to ATM standards using the rating scale described below.

AIRCRAFT

All checkrides and practice flights were given in the UH-1 aircraft.

ATM TASKS

The tasks chosen for evaluation in the study, along with the current FAC 2 semiannual iteration requirements, are listed in Table 2. A detailed description of these tasks can be found in Chapter 6 of TC 1-135, Aircrew Training Manual for the Utility Helicopter (Department of the Army, 1981). The task list was limited to 48 FAC 2 contact and terrain flight tasks in order to accomplish the checkride within a three-hour flight period.

Tasks were placed in a recommended order of completion on the data collection form to facilitate use of the form by IPs on checkride and practice flights. Because of numerous considerations, such as the airfield from which the flight would depart, the stagefields available on any particular day, air traffic, weather, and time constraints, the exact order in which the tasks actually were accomplished varied for some flights.

DEPENDENT VARIABLES

Checkride Task Scores

Task performance was rated in one of two ways, depending on whether the tasks were considered to be primarily psychomotor or procedural. The classification of tasks as psychomotor or procedural was based on the distinction made by Welford (1970). Tasks were considered to be psychomotor if the overt actions involved in performing the task constituted the essential part of the task and, without which the purpose of the task would disappear. Tasks were considered to be procedural if the overt actions played a more incidental part of task performance, serving to give expression to the task rather than forming an essential part of the task.

Performance on the 33 psychomotor tasks (see Table 2) was rated by the IPs on the basis of a 12-point verbally anchored rating scale (reproduced in Figure 2). The content of the verbal descriptors was based on rating scales used by Holman (1978) and Bickley (1980) in

TABLE 2
ATM TASKS EVALUATED

TASKS		FAC 2 SEMIANNUAL ITERATIONS
FLIGHT PLANNING TASKS		
1001	**Plan a VFR Flight	4
1003	**Prepare DD Form 365F (Weight and Balance)	
1004	**Use Performance Charts	4
1005	**Prepare Performance Planning Card (PPC)	4
BEFORE FLIGHT TASKS		
1501	**Perform Preflight Inspection	3
1502	**Perform Before-Takeoff Checks	3
HOVERING TASKS		
2001	Perform Takeoff to a Hover	3
2002	**Perform Hover (Power) Checks	3
2003	Perform Hovering Turns	3
2004	Perform Hovering Flight	3
2005	Perform Landing From a Hover	3
TAKEOFF TASKS		
2501	Perform Normal Takeoff	3
2502	Perform Simulated Maximum Performance Takeoff	3
BASIC FLIGHT TASKS		
3001	Perform Straight-and-Level Flight	4
3002	Perform Climbs and Descents	4
3003	Perform Turns	4
3004	Perform Deceleration/Acceleration	4
3005	Perform Traffic Pattern Flight	3
3006	**Perform Fuel Management Procedures	4
APPROACH AND LANDING TASKS		
3501	**Perform Before-Landing Checks	3
3502	Perform Normal Approach	3
3505	Perform Steep Approach	3
3506	Perform Go-Around	2
3509	Perform High Reconnaissance	2
3510	Perform Confined Area Operations	2
3511	Perform Slope Operations	2
3512	Perform Pinnacle/Ridgeline Operations	1
EMERGENCY TASKS		
4001	Perform Hovering Autorotation	1
4002	Perform Low-Level Autorotation	1
4003	*Perform Standard Autorotation With a 180-Degree Turn	
4004	Perform Low-Level Autorotation	1
4005	Perform Simulated Hydraulic System Malfunction	2
4006	Perform Simulated Antitorque	2
4007	Perform Manual Throttle Operation, Emergency Governor Mode	1
4008	Perform Simulated Engine Failure at Altitude	2
4009	Perform Simulated Engine Failure from Hover Altitude	2
4019	Perform Shallow Approach to a Running Landing	2
INSTRUMENT FLIGHT TASKS		
4506	**Perform Radio Communications Procedure	4
TACTICAL AND SPECIAL TASKS		
5001	**Perform Terrain Flight Mission Planning	2
5002	**Perform Terrain Flight Navigation	2
5003	Perform Low-Level Flight	2
5005	Perform NOE Flight	2
5007	Perform NOE Deceleration	2
5008	**Perform Hover Out-of-Ground Effect (OGE) Check	2
5009	Perform Terrain Flight Takeoff	2
5010	Perform Terrain Flight Approach	2
AFTER LANDING TASKS		
6501	**Perform After-Landing Tasks	3

Note. Task numbers, categories, and names are those listed in TC 1-135, Utility Helicopter ATM.

*Deleted from task list.

**Procedural tasks.

RATING	DESCRIPTION
1	Performance unsafe to the extent that the IP immediately had to take control of the aircraft.
2	Performance deteriorated until IP was finally required to take control of the aircraft.
3	Few of the ATM standards were met, student required considerable verbal assistance, but IP did not have to take control of the aircraft.
4	Less than half of the ATM standards were met, student required some verbal assistance and continually over/under controlled.
5	Less than half of the ATM standards were met, required little verbal assistance, but frequently over/under controlled.
6	Majority of the ATM standards were met, student required little or no verbal assistance, but tended to occasionally over-control or accepted slight deviations while attempting corrections.
7	Majority of the ATM standards were met, little or no verbal assistance needed, performance generally smooth but occasionally over-controlled or was slow making necessary corrections.
8	All ATM standards were met, most deviations from desired state were quickly noticed and smoothly corrected.
9	All ATM standards were met, all deviations from desired state were immediately noticed and smoothly corrected.
10	All ATM standards were met. Majority of performance within IP standards.
11	All performance within IP standards, any deviations from desired state were small and immediately corrected.
12	Outstanding. No noticeable deviations from desired performance.

Figure 2. Task rating scale.

research evaluating simulator-to-aircraft transfer of training. The scale was modified on the basis of recommendations by IPs who regularly evaluate aviators' performance in continuation training. The verbal anchors included in the scale are statements describing pilot behavior along such dimensions as the amount of under- or over-controlling of the aircraft, the amount of verbal assistance required from the IP, and the percentage of ATM standards met.

In addition to the 1-12 numerical rating, IPs noted deviations from desired standards for the 33 psychomotor tasks by marking one of two categories for each standard. For example, a deviation from desired altitude was indicated as either LO or HI. These data were retained for later analysis.

Fourteen of the tasks were procedural (step-following) tasks (see Table 2). For these tasks, the IP marked the number of omissions or mistakes made by the subject. The numerical score on the procedural tasks was obtained by subtracting the number of omissions marked from an arbitrary maximum score of 9. Paper-and-pencil academic tests were developed by the DES SIPs to assess knowledge in the following procedural tasks:

- Plan a VFR Flight,
- Prepare a Weight and Balance Form,
- Use Performance Charts,
- Prepare a Performance Planning Card (PPC), and
- Perform Fuel Management Procedures.

Academic tests were scored in the same manner as the other procedural tasks. Copies of the academic tests and reference material that were used by the aviators are included in Appendix B. A copy of the checkride data collection form is given in Appendix C.

Confidence Ratings

Confidence to perform each task to ATM standards was measured by using the same scale employed by Ruffner et al. (1981). Subjects placed a slash through a 100 mm line anchored at the left and right end-points with the verbal descriptors "Low Confidence" and "High Confidence," respectively. The resultant confidence score was calculated as the distance, in millimeters, from the left end-point to the subject's mark. The confidence rating form is shown in Appendix D.

PROCEDURE

Initial Checkrides

The initial checkrides began during the second week of June 1982. Up to six test subjects were scheduled each day, three in the morning and three in the afternoon, depending on IP availability.

Subjects indicated their confidence to perform each of the tasks to ATM standards, both before and after the initial checkride. Subjects filled out the confidence rating form and completed the academic test portion of the initial checkride prior to beginning the inflight portion

of the checkride. On a few occasions, subjects completed part or all of the academic tests following the flight. From 2 to 2.5 hours were required to complete the checkrides.

During the weeks designated for the initial checkrides, several flights had to be rescheduled because of bad weather, maintenance problems, or unavailability of IPs. In some cases, a second flight for the initial checkride had to be scheduled to evaluate tasks not completed during the first flight that was shortened because of weather or maintenance problems. There was insufficient time to evaluate two of the test subjects on the eight terrain flight tasks.

Of the 81 initial checkrides, 56 were given by SIPs from DES and 16 were given by SIPs from IAQS. Because one of the IAQS SIPs was not available for one week of the initial checkrides, eight checkrides were given by IPs from ARI and Anacapa Sciences, and one checkride was given by an IP from the U.S. Army Aeromedical Center.

Practice Iterations

Practice iteration flights began during the third week in July, 1982 and ended during the second week in November, 1982. A practice iteration was operationally defined as one attempt by the subject to perform a task per flight. On a few occasions, a task not completed on a preceding flight was practiced more than one time on a subsequent flight. The following procedures were adopted to standardize the practice flights and to increase the likelihood that the test subjects would be able to practice entire tasks:

- Subjects completed special Weight and Balance exercises constructed by the DES SIPs prior to each flight. Copies of these exercises are given in Appendix E.
- IPs demonstrated the Antitorque Failure (Left and Right Pedal) tasks once prior to the subjects performing the tasks. The IPs also established the entry point for the Standard Autorotation task.
- Except for Antitorque Failures and Standard Autorotations, all tasks were performed by the subjects without IP demonstration or prior instruction.
- IPs gave the subjects constructive feedback after each task if the task was performed below the satisfactory level or if feedback was requested by the subject.
- Psychomotor and procedural tasks were evaluated by the staff IPs in the same manner as in the initial and final checkrides. The rating data for the practice flights were retained for later analyses.

An instruction sheet listing these procedures was attached to the front of the data collection form. The procedures were briefed to the staff IPs conducting the practice flights.

Final Checkrides

The final checkrides began during the third week in November 1982. To keep the interval between the initial and final checkrides about the same, subjects were scheduled to take the final checkride in approximately the same order in which they had completed the initial checkride.

The final checkrides were conducted in the same manner as the initial checkrides. Both the subjects and the IPs were instructed prior to the flight not to discuss the number of iterations the subjects had been given during the practice periods or the subjects' flight hours to avoid contaminating the IPs' evaluation of checkride performance. The academic tests were completed by the subjects following the inflight portion of the checkride in order to minimize interference with airspace and stagefield usage.

As in the initial checkride, confidence ratings were completed both before and after the final checkrides. Following the completion of the post-checkride confidence rating, IPs debriefed the test subjects on their flight performance.

RESULTS

CHECKRIDE SCORES

Analysis of Variance

A one-way analysis of variance (ANOVA) was performed using the number of total flight hours as the dependent variable and the group to which subjects were assigned as the independent variable. The effect of group assignment was not significant ($F(6,74) = .14, p < .05$), indicating that subjects were randomly assigned to groups with respect to total flight hours.

Three of the 84 subjects discontinued participation in the study before they were able to take the initial checkride. Of the three subjects, one was transferred from Fort Rucker; one was withdrawn from the study by his superior due to conflicting duty requirements; and one was unavoidably sent on an extended temporary duty (TDY) assignment and was unable to return in time to take the initial checkride. A total of 81 subjects took the initial checkride.

Seventy-nine of the 81 subjects who took the initial checkride were able to complete the final checkride. One subject was removed from flying status midway through the study. Another subject was medically grounded and was unable to take the final checkride. Therefore, final checkride data were not available for these subjects. Seventy of the 79 final checkrides were given by the same IP who gave the subject's initial checkride. The nine checkrides not given by the same IP were nonsystematically distributed across the seven subject groups.

Means and standard deviations for the initial and final checkride raw scores are presented in Table 3. To permit the use of parametric statistical analyses, initial and final checkride raw data were transformed to normalized data following a method outlined by Hays (1967). Scores were normalized separately for each IP across initial and final checkrides. The normalization procedure is described in detail in Appendix F.

It became apparent during the first two weeks of practice flights that staff IPs would not be available as often as anticipated. This made it impossible to keep retention intervals of two- and four-months as originally planned. Therefore, inclusion of retention interval as a dichotomous independent variable was no longer practical. Instead, the data were analyzed using normalized final checkride scores as the dependent variable, with iteration groups and flight hour groups as independent variables.

For purposes of data analysis, subjects were placed in one of four iteration groups for each task. The first group consisted of the control group. The other three groups consisted of subjects who had completed two, four, or six iterations in a particular task, collapsing over practice periods. Subjects were also divided into two flight hour groups. The high flight hour group was composed of subjects with more than 900 total rotary wing hours; the low flight hour group was composed of subjects with less than 900 total rotary wing hours. Since the median number of flight hours was 915, this resulted in approximately the same number of subjects in both flight hour groups.

TABLE 3
MEANS AND STANDARD DEVIATIONS
FOR INITIAL AND FINAL CHECKRIDE RAW SCORES*

ATM TASK	INITIAL CHECKRIDE		FINAL CHECKRIDE	
	M	SD	M	SD
1. Plan VFR Flight	7.05	1.58	7.64	1.20
2. Weight and Balance Form	4.47	1.87	6.17	2.04
3. Use Performance Charts	7.47	1.59	8.14	1.20
4. Prepare Performance Planning Card (PPC)	7.20	1.60	8.06	1.04
5. Fuel Management	7.73	1.39	7.96	1.18
6. Preflight Inspection	8.63	.78	8.41	.52
7. Before Takeoff Checks	8.65	.66	8.08	1.17
8. Communications Procedures	8.35	1.04	8.36	.64
9. After Landing Tasks	7.68	1.80	7.69	.96
10. Takeoff to Hover	8.04	1.10	8.06	.78
11. Hover Check	8.00	1.25	8.06	.94
12. Hover Turn	8.32	.93	8.20	.49
13. Hover Flight	8.54	.94	8.23	.48
14. Landing from Hover	8.03	.93	8.08	.75
15. Manual Throttle Operation	6.78	1.60	6.58	1.62
16. Engine Failure at Hover	7.44	1.36	7.55	1.02
17. Hovering Autorotation	7.68	1.22	7.65	.92
18. Slope Operations	7.56	1.52	7.81	.74
19. Traffic Pattern	7.71	1.21	8.09	.74
20. Climb/Descend	7.88	1.01	8.15	.51
21. Turns	7.87	1.04	8.17	.59
22. Straight-and-Level Flight	8.19	.87	8.06	.78
23. Normal Takeoff	7.90	1.10	8.01	.75
24. Maximum Performance Takeoff	7.45	1.21	7.55	1.04
25. Before Landing Checks	7.58	1.86	7.60	1.40
26. Normal Approach	7.68	1.13	7.89	.72
27. Steep Approach	7.47	1.15	7.63	.85
28. Shallow Approach Running Landing	7.68	1.25	7.92	.96
29. Hydraulic Failure	7.18	1.54	6.89	1.83
30. Antitorque Failure - Left	5.32	2.44	6.30	1.94
31. Antitorque Failure - Right	5.59	2.32	6.18	1.94
32. Go Around	8.00	1.14	8.17	.61
33. Standard Autorotation	6.22	2.07	6.59	1.78
34. Low Level Autorotation	6.50	1.53	6.82	1.66
36. Deceleration/Acceleration	7.92	1.07	7.91	.91
37. Engine Failure at Altitude	7.50	1.69	7.83	1.00
38. High Reconnaissance	7.74	1.29	8.23	.68
39. Confined Area Operations	7.49	1.40	8.05	.85
40. Pinnacle/Ridgeline Operations	7.51	1.84	7.76	1.14
41. Terrain Flight Mission Planning	7.92	1.28	8.33	.53
42. Terrain Flight Navigation	7.48	1.99	8.05	1.22
43. Low-Level Flight	8.12	1.09	8.26	.73
44. NOE Flight	7.97	1.30	8.20	.76
45. NOE Deceleration	7.25	1.54	7.59	1.22
46. Terrain Flight Approach	7.71	1.45	8.26	.73
47. Out-of-Ground Effect Check	6.99	1.90	7.69	1.51
48. Terrain Flight Takeoff	7.58	1.38	8.08	.88

*N = 73

The initial checkride scores of one of the subjects in the control group were highly deviant from the rest of the group. Since including this subject's data would bias the statistical analysis, the subject's data were not used in the analysis of checkride scores. The data from five subjects who did not complete the scheduled number of iterations (i.e., 0, 2, 4, or 6) were not included in the analysis of variance. This resulted in a final sample size of 73 aviators for the analysis of variance. Missing values were estimated by the BMDP AM statistical program (Engelman, Frane, & Jennrich, 1977).

The task Perform Standard Autorotation with 180° Turn was removed as an ATM task during the research. Accordingly, it was deleted from the task list and not evaluated on the final checkride. This reduced the total number of tasks to 47.

Initial checkride normalized scores were used as dependent variables in a 2 (Flight Hour groups) x 4 (Iterations) x 47 (Tasks) ANOVA to determine if there were significant pre-treatment differences among the two Flight Hour Groups or among the four Iteration groups. Tasks were used as a within-subjects variable. The ANOVA was performed using the BMDP 2V repeated-measures program. No significant differences were found between Flight Hour groups ($F(1,65) = 2.29, p < .05$), among Iteration groups ($F(3,65) = 1.41, p < .05$), or for the Flight Hour x Iteration interaction ($F(3,65) = .54, p < .05$).

Normalized checkride scores for the 47 tasks were used as data in a 2 (Flight Hour group) x 4 (Iterations) x 47 (Tasks) x 2 (Initial Checkride Pretest-Final Checkride Posttest) ANOVA with repeated measures on the last two factors. The ANOVA was performed using the BMDP 2V statistical program. The results of the ANOVA are summarized in Table 4. Significant main effects were found for the independent variables of Flight Hours ($p < .05$) and Tasks ($p < .01$). Significant two-way interactions were found for Tasks x Flight Hours ($p < .01$), Tasks x Iterations ($p < .05$) and Pre-Post x Tasks ($p < .01$). None of the higher order interactions reached statistical significance ($p < .05$).

The amount of variance accounted for (ω^2) was also estimated for each main effect and interaction and is included in Table 4. Examination of the ω^2 values (Dwyer, 1974) indicates that a minimum of one percent of the total variance was accounted for by only two sources--the main effects of Tasks and the interaction of Pre-Post x Tasks. A Tukey HSD test for pairwise comparisons (Kirk, 1968) indicated that mean final checkride scores were significantly greater than mean initial checkride scores for the following tasks: Plan VFR Flight, Prepare Weight and Balance Form, Use Performance Charts, Prepare Performance Planning Card, Perform Terrain Flight Approach, and Perform Out-of-Ground Effect Check. Mean final checkride score was significantly less than mean initial checkride score for the task Perform Before Takeoff Checks.

Raw score means for the four iteration groups for the initial and final checkrides are graphically presented in Appendix G. The graphs in Appendix G illustrate the average increase or decrease in mean proficiency score from the initial checkride to final checkride. The

Table 4
ANOVA Summary Table for Normalized Checkride Ratings

Source of Variance	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	ω^2
Between Subjects					
Flight Hours (FH)	42.44	1	42.44	5.26*	.006
Iterations (I)	14.73	3	4.91	.61	.000
FH x I	8.96	3	2.99	.37	.000
Error	524.82	65	8.07		.086
Within Subjects					
Pre-Post (P)	22.85	1	22.85	3.25	.003
P x FH	0.00	1	0.00	0.00	.000
P x I	49.34	3	16.45	2.34	.005
P x FH x I	7.52	3	2.51	.36	.000
Error	456.43	65	7.02		.075
Tasks (T)	1039.94	46	22.61	41.01**	.169
T x FH	37.35	46	.81	1.47*	.002
T x I	97.19	138	.70	1.28*	.004
T x FH x I	69.79	138	.51	.92	.000
Error	1648.25	2990	.55		.270
P x T	82.47	46	1.79	4.13**	.010
P x T x FH	14.40	46	.31	.72	.000
P x T x I	67.21	138	.49	1.12	.001
P x T x FH x I	51.96	138	.38	.87	.000
Error	1299.46	2990	.43		.435

Note. * $p < .05$
** $p < .01$

satisfactory proficiency level of 8 (all ATM standards met) is noted by a dashed horizontal line. Raw score means and standard deviations for the four iteration groups are given in Table 5 for the total sample as well as for the two flight-hour groups. Means are rounded to the nearest whole number. Average proficiency was below 8 on both the initial and final checkrides for four tasks. Three of the four tasks are emergency tasks.

The correlation between overall initial checkride performance and overall final checkride performance for the 0 iteration group was calculated as an indication of the relationship between initial level of performance and level of performance following six months of no practice. A composite score (average of all 47 task scores) was used as an estimate of the overall level of performance for each subject, since the single overall rating was not obtained. Composite scores were calculated separately for both the initial checkride and the final checkride. The correlation between overall initial checkride performance and overall final checkride performance is .42 ($df = 9$, $p < .20$).

Correlations among total rotary wing flight hours, recent flight hours (within the last 12 and 6 months), and initial checkride normalized scores are presented in Table 6. The correlations of the flight hour variables and final checkride normalized scores are presented in Table 7. Retention interval (number of days between the completion of the last practice flight and the final checkride) was negatively correlated with five tasks and positively correlated with one task. No significant correlations were found between checkride performance and the variables of age, months since flight school graduation, and total simulator hours.

Factor Analysis

Means, standard deviations, correlations of final checkride normalized scores with the final checkride composite scores, and inter-correlations for the final checkride normalized scores are given in Appendix H. Examination of the correlation matrix indicated that several groups of tasks had high intercorrelations. Therefore, a principal factors extraction with varimax rotation was performed on the final checkride normalized scores.

Six factors emerged that had eigenvalues greater than 1.0 and that had a minimum of four tasks with factor loadings of .45 (20% of shared variance) or greater (Comrey, 1973). These factors were initially rotated to an orthogonal solution. Factor loadings, communalities, eigenvalues, and percentages of common variance for the six factor solutions are given in Table 8. Tasks are grouped under the factor for which they show the highest significant loading and are listed in decreasing order of loadings for that factor. Table 8 indicates that tasks generally load high on one factor and low on the other factors. In only a few cases do tasks have sizable loadings on more than one factor.

MEANS AND STANDARD DEVIATIONS FOR CHECKRIDE RAW SCORES:
AVIATORS WITH MORE THAN 900 HOURS

ATM TASK	ITERATIONS															
	0 (N = 5)				2 (N = 11)				4 (N = 12)				6 (N = 9)			
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
1. Plan VFR Flight	6	1.9	7	1.5	7	1.9	8	1.4	7	.9	8	1.3	7	1.3	8	1.4
2. Weight and Balance Form	4	1.1	5	.9	5	1.8	6	1.6	5	2.3	7	2.1	4	2.4	7	1.5
3. Use Performance Charts	7	1.6	7	2.5	7	1.6	9	.7	7	2.0	8	1.6	7	1.8	8	.9
4. Prepare PPC	7	1.6	8	.8	7	1.6	9	.7	7	1.8	8	1.6	7	1.7	8	.9
5. Fuel Management	8	1.3	8	1.1	8	1.0	8	1.2	7	2.3	8	1.5	8	.9	7	1.2
6. Preflight Inspection	9	.0	9	.5	9	.8	8	.7	8	1.2	9	.5	9	.4	8	.5
7. Before Takeoff Checks	9	.4	9	.5	9	.9	7	2.4	9	.9	9	.7	9	.4	8	.7
8. Communications Procedures	9	.4	8	.5	8	1.2	8	.7	8	1.1	9	.5	9	.4	9	.5
9. After Landing Tasks	8	1.2	8	.8	8	1.9	8	1.3	8	1.7	8	1.0	8	.9	8	.6
10. Takeoff to Hover	8	1.7	9	.5	8	1.3	8	.7	8	1.2	8	.8	9	.9	8	.5
11. Hover Check	9	.9	9	.5	8	1.3	7	1.4	8	1.3	8	.5	8	1.5	8	.5
12. Hover Turn	9	.5	9	.5	8	1.0	8	.5	8	1.0	8	.5	9	.9	8	.5
13. Hover Flight	8	1.3	9	.5	8	1.1	8	.3	8	1.2	8	.6	9	.9	8	.5
14. Landing from Hover	8	1.3	9	.5	8	1.0	8	.4	8	1.0	8	.5	8	.9	8	.5
15. Manual Throttle Operation	8	1.5	6	2.2	7	1.6	7	.9	6	1.6	7	1.8	7	1.9	6	1.8
16. Engine Failure at Hover	8	1.6	8	1.2	8	1.1	8	.5	8	1.4	8	.9	7	1.6	8	1.0
17. Hovering Autorotation	8	1.5	7	2.0	8	1.2	8	.6	8	1.3	8	.8	8	1.6	8	1.0
18. Slope Operations	8	1.4	8	.6	8	1.5	8	.8	8	1.1	8	.5	8	1.9	8	.3
19. Traffic Pattern	8	1.7	8	.9	8	1.2	8	.6	8	.9	9	.5	8	.8	8	1.0
20. Climb/Descend	8	1.3	9	.5	8	1.1	8	.3	8	.9	9	.5	8	.9	8	.7
21. Turns	8	.9	9	.5	9	1.0	8	.3	8	.9	9	.5	8	.9	8	.8
22. Straight and Level Flight	9	.8	8	.9	8	1.1	8	1.0	8	.7	9	.7	8	.7	8	.8
23. Normal Takeoff	8	1.7	8	.9	8	1.1	8	.6	8	1.2	8	.7	8	1.1	8	.9
24. Max. Performance Takeoff	8	.9	8	1.2	7	1.6	7	1.3	8	1.1	8	1.1	8	1.1	8	.5
25. Before Landing Checks	7	2.5	8	.7	7	2.6	7	2.3	8	.8	8	1.1	8	1.5	8	.5
26. Normal Approach	8	.9	8	.8	8	1.3	8	.5	8	1.2	8	.8	7	1.0	8	.4
27. Steep Approach	8	1.7	8	.8	7	1.1	8	.8	7	1.2	8	.9	7	1.0	8	1.1
28. Shallow App Running Land	8	2.0	8	.5	8	1.3	8	.9	8	1.4	8	.8	7	1.1	8	.9
29. Hydraulic Failure	8	1.6	8	.5	7	1.8	7	1.5	8	.9	8	.8	6	1.9	7	1.7
30. Antitorque Failure - Left	5	3.4	6	3.0	6	2.4	7	1.8	6	2.1	7	1.5	6	1.7	6	1.1
31. Antitorque Failure - Right	6	2.3	6	3.1	6	2.5	7	1.7	6	2.0	7	2.0	6	2.0	7	.8
32. Go Around	9	.5	8	.8	8	1.1	8	.5	8	1.0	8	.5	9	1.0	8	.8
33. Standard Autorotation	7	2.5	8	.8	8	2.1	8	1.3	6	2.1	6	1.9	6	1.2	6	1.0
34. Low Level Autorotation	7	1.5	7	2.9	7	1.3	7	1.8	6	1.8	7	1.6	8	1.2	7	1.2
35. *																
36. Decel/Accel	8	1.4	8	1.1	8	1.3	8	.9	8	1.2	8	1.0	8	.5	8	.8
37. Engine Failure at Altitude	8	.9	8	.9	8	1.9	8	.6	7	1.6	8	.9	8	1.5	8	1.4
38. High Reconnaissance	9	.4	9	.5	8	1.7	8	.5	8	1.1	8	1.1	8	1.5	8	.5
39. Confined Area Operations	9	.5	8	.5	7	1.9	8	.9	8	1.4	8	.7	8	1.6	8	1.0
40. Pinnacle/Ridgeline Operations	9	.5	8	.8	8	2.3	8	.7	7	1.3	8	1.1	7	2.0	8	.4
41. Ter. Flight Mission Planning	8	1.2	8	.8	7	2.2	8	.5	8	1.2	9	.5	8	1.0	8	.5
42. Ter. Flight Navigation	7	2.7	7	2.0	7	2.6	8	.9	8	1.2	8	.7	8	1.0	8	.4
43. Low-Level Flight	9	.8	9	.5	8	1.5	8	.6	8	1.0	9	.5	8	.7	8	.9
44. NOE Flight	8	1.5	9	.5	8	2.0	8	.7	8	1.2	9	.5	8	.7	8	.4
45. NOE Deceleration	8	1.4	8	.8	8	1.5	8	2.0	8	1.4	8	1.0	8	1.4	8	1.1
46. Ter. Flight Approach	8	1.2	8	.8	8	1.1	8	.5	8	1.4	8	.7	8	.7	8	.5
47. OGE Check	7	2.2	8	1.6	7	2.0	8	.9	7	1.9	8	.7	7	2.4	8	1.0
48. Ter. Flight Takeoff	3	1.4	8	1.3	7	1.9	8	.9	8	1.1	8	.7	8	.8	8	.7

*Note. Task 35, Standard Autorotation with 180° Turn, was deleted from the task list.

MEANS AND STANDARD DEVIATIONS FOR CHECKRIDE RAW SCORES:
AVIATORS WITH LESS THAN 900 HOURS

ATM TASK	ITERATIONS															
	0 (N = 6)				2 (N = 11)				4 (N = 11)				6 (N = 8)			
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
1. Plan VFR Flight	7	1.6	8	.5	7	1.0	8	.9	6	2.2	8	1.1	8	.9	8	.7
2. Weight and Balance Form	4	1.3	4	.4	4	1.4	6	1.9	4	1.8	6	2.2	4	1.8	7	2.2
3. Use Performance Charts	9	.5	8	1.9	7	1.6	8	.8	8	.9	9	.5	8	2.0	8	.5
4. Prepare PPC	8	1.2	8	1.8	7	1.4	8	.8	7	1.2	8	.9	7	1.9	8	.4
5. Fuel Management	8	.8	7	1.5	8	1.3	8	1.0	8	1.2	8	1.0	7	1.5	8	.7
6. Preflight Inspection	9	.4	8	.5	9	.9	8	.5	9	.5	8	.5	9	.7	8	.5
7. Before Takeoff Checks	9	.4	8	.5	9	.5	8	1.1	9	.5	8	.5	9	.7	8	.6
8. Communications Procedures	9	.8	8	1.1	8	1.1	9	.5	8	.7	8	.5	9	1.1	8	.9
9. After Landing Tasks	8	1.0	8	1.2	7	2.5	7	1.1	8	1.6	8	.6	8	1.4	8	.9
10. Takeoff to Hover	9	.8	8	.6	8	1.1	8	1.4	8	1.0	8	.7	8	1.0	8	.5
11. Hover Check	9	.8	8	1.4	8	1.1	8	1.1	8	1.2	8	.6	8	1.9	8	.5
12. Hover Turn	9	.8	8	.4	8	1.0	8	.8	8	.9	8	.3	8	1.0	8	.0
13. Hover Flight	9	.8	8	.4	8	.8	8	.5	9	.7	8	.4	8	1.0	8	.5
14. Landing from Hover	8	1.8	8	.4	8	.8	8	1.7	8	.6	8	.3	8	.9	8	.4
15. Manual Throttle Operation	6	1.7	6	1.2	7	1.9	7	1.6	7	1.1	6	1.8	6	1.2	6	1.8
16. Engine Failure at Hover	8	1.0	8	1.0	7	.9	7	1.7	7	1.7	7	.8	8	1.6	8	.8
17. Hovering Autorotation	8	1.0	7	.9	7	1.0	8	.6	7	1.3	8	.7	8	1.0	8	.8
18. Slope Operations	8	1.2	8	.8	7	1.2	8	.8	8	1.3	8	1.3	6	2.5	8	.5
19. Traffic Pattern	8	.8	8	.8	7	.9	8	.5	7	1.7	8	.5	8	1.2	8	.9
20. Climb/Descend	8	.9	8	.4	8	1.0	8	.5	8	.9	8	.5	8	1.3	8	.4
21. Turns	8	.8	8	.6	8	.9	8	.6	8	1.3	8	.8	7	1.3	8	.4
22. Straight and Level Flight	9	.5	8	1.0	8	1.1	8	.6	8	.5	8	.6	8	.9	8	.7
23. Normal Takeoff	8	.6	8	1.0	8	1.1	8	.8	8	.8	8	.4	8	1.2	7	.9
24. Max. Performance Takeoff	8	1.5	7	1.2	7	1.2	8	.9	7	1.0	7	1.4	7	1.1	8	.5
25. Before Landing Checks	8	1.3	8	1.0	7	2.4	8	.8	8	1.3	7	2.0	8	1.1	8	1.0
26. Normal Approach	8	.8	8	.4	7	1.1	8	.9	8	1.0	8	.5	7	1.2	8	.8
27. Steep Approach	8	.8	7	.5	7	1.3	8	1.1	8	1.0	8	.4	7	1.1	7	1.0
28. Shallow App Running Land	9	.8	7	1.3	8	1.0	8	1.2	7	1.2	8	.9	7	1.5	8	1.0
29. Hydraulic Failure	8	.5	7	1.5	8	.8	7	2.3	7	1.6	5	2.3	6	2.4	7	.7
30. Antitorque Failure - Left	6	2.2	6	2.5	6	2.9	6	2.0	5	2.3	5	2.0	4	2.4	6	1.4
31. Antitorque Failure - Right	6	2.5	5	2.1	5	2.7	6	2.2	6	2.3	6	2.0	4	2.7	6	2.0
32. Go Around	9	.5	8	.5	8	1.1	8	.4	8	1.7	8	.8	8	1.5	9	.6
33. Standard Autorotation	8	.8	6	1.9	6	1.1	6	2.2	5	2.2	6	1.6	5	2.7	7	1.8
34. Low Level Autorotation	7	.8	6	2.6	7	1.0	7	1.6	6	2.1	7	1.0	7	1.5	6	1.1
36. Decel/Accel	8	.8	8	1.0	8	.8	8	.8	8	1.1	8	.9	8	1.2	8	1.0
37. Engine Failure at Altitude	8	1.9	7	.8	7	1.3	8	.7	7	2.0	7	1.3	6	2.3	8	.7
38. High Reconnaissance	8	1.3	8	.6	7	1.1	8	.7	8	.9	8	.6	8	2.1	8	.4
39. Confined Area Operations	8	1.0	8	1.4	7	1.5	8	.9	7	1.0	8	.8	7	1.5	8	.9
40. Pinnacle/Ridgeline Operations	8	1.0	7	1.9	7	2.4	7	1.9	8	.8	8	.8	9	.6	7	1.2
41. Ter. Flight Mission Planning	8	1.0	8	.5	8	1.3	8	.5	8	1.1	8	.4	8	1.1	8	.5
42. Ter. Flight Navigation	8	1.1	7	2.0	7	1.2	8	2.2	7	2.0	8	.3	7	3.1	8	.5
43. Low-Level Flight	8	1.0	8	1.2	8	1.1	8	.5	8	1.3	8	.8	8	1.1	8	.9
44. NOE Flight	8	1.1	8	1.7	8	1.2	8	.5	8	1.6	8	.6	8	1.0	8	.8
45. NOE Deceleration	7	1.2	8	.7	7	1.3	8	1.4	6	2.1	7	1.3	7	2.0	7	.9
46. Ter. Flight Approach	8	1.1	8	1.7	8	1.5	9	.5	7	2.2	8	.5	8	1.2	8	.6
47. OGE Check	7	1.3	8	1.1	7	1.5	7	1.8	7	2.3	7	1.1	7	2.3	7	2.6
48. Ter. Flight Takeoff	8	.9	8	1.1	8	1.5	8	.9	7	1.4	8	.6	7	1.8	8	1.3

*Note. Task 35, Standard Autorotation with 180° Turn, was deleted from the task list.

TABLE 5 (CONTINUED)

MEANS AND STANDARD DEVIATIONS FOR CHECKRIE RAW SCORES:
ALL AVIATORS

A/TM TASK	ITERATIONS															
	0 (N = 11)				2 (N = 22)				4 (N = 23)				6 (N = 17)			
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
1. Plan VFR Flight	7	1.9	8	1.0	7	1.5	8	1.1	7	1.7	8	1.2	8	1.2	8	1.1
2. Weight and Balance Form	4	1.2	4	.7	4	1.6	6	1.7	5	2.1	7	2.2	4	2.1	7	1.8
3. Use Performance Charts	8	1.3	8	2.1	7	1.6	8	.7	7	1.6	8	1.3	7	1.8	8	.7
4. Prepare PPC	8	1.4	8	1.4	7	1.5	8	.7	7	1.6	8	1.3	7	1.7	8	.7
5. Fuel Management	8	1.0	7	1.3	8	1.2	8	1.1	7	1.8	8	1.3	8	1.3	8	1.1
6. Preflight Inspection	9	.3	8	.5	9	.9	8	.6	8	.9	8	.5	9	.6	8	.5
7. Before Takeoff Checks	9	.4	8	.5	9	.7	8	1.9	9	.7	8	.7	9	.6	8	.7
8. Communications Procedures	9	.7	8	.9	8	1.1	8	.6	8	.9	9	.5	9	.8	8	.8
9. After Landing Tasks	8	1.0	8	1.0	7	2.3	8	1.2	8	1.6	8	.9	8	1.2	8	.7
10. Takeoff to Hover	8	1.3	8	.6	8	1.2	8	1.1	8	1.1	8	.7	8	1.0	8	.6
11. Hover Check	9	.8	8	1.1	8	1.2	8	1.3	8	1.2	8	.6	8	1.7	8	.5
12. Hover Turn	9	.7	8	.5	8	1.0	8	.7	8	.9	8	.4	8	.9	8	.4
13. Hover Flight	8	1.0	8	.5	8	.9	8	.4	8	1.0	8	.5	8	.9	8	.5
14. Landing from Hover	8	1.0	8	.6	8	.9	8	1.2	8	.8	8	.4	8	1.0	8	.5
15. Manual Throttle Operation	7	1.9	6	1.7	7	1.7	7	1.3	7	1.4	6	1.8	6	1.6	6	1.8
16. Engine Failure at Hover	8	1.3	8	1.1	8	1.0	8	1.3	7	1.6	8	.9	7	1.5	8	.9
17. Hovering Autorotation	8	1.2	7	1.5	8	1.1	8	.6	8	1.3	8	.8	8	1.3	8	.9
18. Slope Operations	8	1.3	8	.7	7	1.3	8	.8	8	1.2	8	1.0	7	2.3	8	.4
19. Traffic Pattern	8	1.2	8	.8	8	1.1	8	.6	8	1.4	8	.5	8	1.0	8	1.0
20. Climb/Descend	8	1.0	8	.5	8	1.1	8	.4	8	.9	8	.6	8	1.1	8	.6
21. Turns	8	.8	8	.6	8	1.0	8	.5	8	1.1	8	.7	8	1.1	8	.6
22. Straight and Level Flight	9	.6	8	1.0	8	1.1	8	.8	8	.7	8	.6	6	.8	8	.8
23. Normal Takeoff	8	1.2	8	1.0	8	1.1	8	.7	8	1.0	8	.6	8	1.1	8	.9
24. Max. Performance Takeoff	8	1.2	7	1.2	7	1.4	8	1.1	7	1.1	7	1.3	7	1.2	8	.5
25. Before Landing Checks	8	1.8	8	.9	7	2.4	7	1.7	8	1.1	8	1.6	8	1.3	8	.7
26. Normal Approach	8	.8	8	.6	8	1.2	8	.8	8	1.1	8	.7	7	1.1	8	.7
27. Steep Approach	8	1.2	8	.7	7	1.2	8	1.0	8	1.1	8	.7	7	1.1	8	1.1
28. Shallow App Running Landing	8	1.1	8	1.2	8	1.1	8	1.0	8	1.3	8	.9	7	1.3	8	.9
29. Hydraulic Failure	8	1.1	7	1.5	7	1.4	7	1.9	7	1.3	7	2.0	6	2.1	7	1.3
30. Antitorque Failure - Left	5	2.7	6	2.6	6	2.6	7	2.0	6	2.1	6	2.1	5	2.2	6	1.2
31. Antitorque Failure - Right	6	2.3	6	2.5	6	2.6	6	2.0	6	2.1	6	2.0	5	2.5	6	1.5
32. Go Around	9	1.5	8	.7	8	1.1	8	.5	8	1.4	8	.7	8	1.1	8	.8
33. Standard Autorotation	7	1.8	7	1.7	7	1.7	7	1.9	5	2.2	6	1.7	6	2.1	7	1.4
34. Low Level Autorotation	7	1.2	6	2.7	7	1.2	7	1.6	6	1.9	7	1.3	7	1.3	7	1.2
35. *																
36. Decel/Accel	8	1.0	8	1.0	8	1.0	8	.8	8	1.1	8	.9	8	.9	8	.9
37. Engine Failure at Altitude	8	1.5	8	1.0	8	1.6	8	.7	7	1.8	7	1.2	7	1.9	8	1.2
38. High Reconnaissance	8	1.0	8	.6	7	1.4	8	.6	8	1.0	8	.9	8	1.7	8	.5
39. Confined Area Operations	8	.8	8	1.0	7	1.6	8	.9	7	1.2	8	.8	7	1.5	8	.9
40. Pinnacle/Ridgeline Operations	8	.8	8	1.6	7	2.3	8	1.3	7	1.1	8	1.0	8	1.7	8	.9
41. Ter. Flight Mission Planning	8	1.0	8	.7	8	1.8	8	.5	8	1.1	8	.5	8	1.0	8	.5
42. Ter. Flight Navigation	8	2.0	7	1.9	7	2.0	8	1.6	8	1.6	8	.5	8	2.1	8	.5
43. Low-Level Flight	8	.9	8	.9	8	1.3	8	.6	8	1.1	8	.7	8	.9	8	.9
44. NOE Flight	8	1.3	8	1.4	8	1.6	8	.6	8	1.4	8	.6	8	.8	8	.6
45. NOE Deceleration	7	1.2	8	.8	7	1.4	8	1.7	7	1.9	8	1.2	7	1.7	7	1.0
46. Ter. Flight Approach	8	1.2	8	1.4	8	1.3	8	.5	7	1.9	8	.6	8	.9	8	.5
47. OGE Check	7	1.7	8	1.3	7	1.7	8	1.4	7	2.1	8	1.0	7	2.3	8	1.9
48. Ter. Flight Takeoff	8	1.1	8	1.2	7	1.7	8	.9	8	1.2	8	.7	8	1.4	8	1.0

*Note. Task 35, Standard Autorotation with 180° Turn, was deleted from the task list.

TABLE 6

CORRELATIONS BETWEEN INITIAL CHECKRIDE NORMALIZED SCORES
AND ROTARY WING FLIGHT HOURS

ATM TASK	TOTAL RW HOURS	RW HRS LAST 12 MOS.	RW HRS LAST 6 MOS.
1. Plan VFR Flight	-.08	.05	-.12
2. Weight and Balance Form	.00	.07	.02
3. Use Performance Charts	-.13	-.07	-.09
4. Prepare Performance Planning Cards (PPC)	-.10	-.06	-.13
5. Fuel Management	-.07	.01	.04
6. Preflight Inspection	.01	.09	.24*
7. Before Takeoff Checks	.03	.17	.29*
8. Communications Procedures	.12	.21	.34*
9. After Landing Tasks	.16	.14	.15
10. Takeoff to Hover	.05	.03	.21
11. Hover Check	.14	.07	.03
12. Hover Turn	.07	.10	.15
13. Hover Flight	.07	.17	.27*
14. Landing from Hover	.15	.09	.18
15. Manual Throttle Operation	.25*	.12	.17
16. Engine Failure at Hover	.37**	.00	.19
17. Hovering Autorotation	.25*	.07	.23*
18. Slope Operations	.24*	.12	.26*
19. Traffic Pattern	.34**	.16	.15
20. Climb/Descend	.24*	.24*	.22
21. Turns	.18	.12	.19
22. Straight-and-Level Flight	.10	.24*	.30**
23. Normal Takeoff	.06	.18	.25*
24. Maximum Performance Takeoff	.26*	.15	.32**
25. Before Landing Checks	.10	.14	.13
26. Normal Approach	.20	.27*	.35**
27. Steep Approach	.03	.15	.23*
28. Shallow Approach Running Landing	.07	.12	.24*
29. Hydraulic Failure	.13	.25*	.19
30. Antitorque Failure - Left	.04	.24*	.19
31. Antitorque Failure - Right	.16	.28*	.22*
32. Go-Around	.20	.07	.13
33. Standard Autorotation	.21	.11	.02
34. Low-Level Autorotation	.11	.28*	.21
36. Deceleration/Acceleration	-.02	.04	.17
37. Engine Failure at Altitude	.12	.04	.13
38. High Reconnaissance	.12	-.07	.03
39. Confined Area Operations	.11	-.15	.01
40. Pinnacle/Ridgeline Operations	.15	-.06	.06
41. Terrain Flight Mission Planning	-.15	.16	.32**
42. Terrain Flight Navigation	-.12	.21	.23*
43. Low-Level Flight	.03	.13	.28*
44. NOE Flight	-.06	.16	.16
45. NOE Deceleration	.25*	-.02	-.12
46. Terrain Flight Approach	.20	.04	.16
47. Out-of-Ground Effect Check	.02	.30**	.33**
48. Terrain Flight Takeoff	.20	.07	.05

Note. *p <.05 **p <.01, N = 78

TABLE 7
CORRELATIONS BETWEEN FINAL CHECKRIDE NORMALIZED SCORES
AND ROTARY WING FLIGHT HOURS

ATM TASK	TOTAL RW HOURS	RW HRS LAST 12 MOS.	RW HRS LAST 6 MOS.
1. Plan VFR Flight	-.03	.17	.08
2. Weight and Balance Form	-.02	.08	.14
3. Use Performance Charts	-.07	.28*	.21
4. Prepare Performance Planning Card (PPC)	-.02	.22*	.14
5. Fuel Management	-.02	.06	.03
6. Preflight Inspection	.11	.23*	.25*
7. Before Takeoff Checks	.17	.10	.08
8. Communications Procedures	.12	.13	.20
9. After Landing Tasks	.12	.35**	.24*
10. Takeoff to Hover	.18	.03	.16
11. Hover Check	.07	.08	.03
12. Hover Turn	.30**	.01	-.00
13. Hover Flight	.17	-.10	.04
14. Landing from Hover	.33*	.11	.13
15. Manual Throttle Operation	.15	.00	-.05
16. Engine Failure at Hover	.29**	.04	.09
17. Hovering Autorotation	.21	.04	.03
18. Slope Operations	.16	.11	.14
19. Traffic Pattern	.18	.08	.04
20. Climb/Descend	.21	-.01	.05
21. Turns	.25*	.25*	.17
22. Straight-and-Level Flight	.32**	.25*	.19
23. Normal Takeoff	.18	.22*	.34**
24. Maximum Performance Takeoff	.10	.33**	.31**
25. Before Landing Checks	.13	.17	.21
26. Normal Approach	.15	.05	.19
27. Steep Approach	.00	.18	.19
28. Shallow Approach Running Landing	.11	.27*	.19
29. Hydraulic Failure	.09	-.07	-.14
30. Antitorque Failure - Left	.22	.30**	.30**
31. Antitorque Failure - Right	.23*	.21	.29**
32. Go-Around	.06	.01	.07
33. Standard Autorotation	.11	.40**	.29**
34. Low-Level Autorotation	.11	.24*	.32**
36. Decel/Accel	-.10	-.07	-.06
37. Engine Failure at Altitude	-.04	-.15	-.14
38. High Reconnaissance	.08	.10	-.01
39. Confined Area Operations	.14	.07	-.04
40. Pinnacle/Ridgeline Operations	.18	.18	.14
41. Terrain Flight Mission Planning	.04	.00	-.03
42. Terrain Flight Navigation	.08	.16	.13
43. Low-Level Flight	.13	.06	.05
44. NOE Flight	.17	.15	.06
45. NOE Deceleration	.03	-.09	-.19
46. Terrain Flight Approach	.16	.20	.07
47. Out-of-Ground Effect Check	.23*	-.19	-.11
48. Terrain Flight Takeoff	.09	.07	-.03

Note. *p < .05 **p < .01, N = 78

TABLE 8

FACTOR LOADINGS, COMMUNALITIES, EIGENVALUES, AND
PERCENTS OF VARIANCE FOR SIX FACTOR PRINCIPAL FACTORS
EXTRACTION AND VARIMAX ROTATION OF ATM TASKS

ATM TASK	F ₁	F ₂	F ₃	F ₄	F ₅	F ₆	h ²
FACTOR 1							
Antitorque Failure-Left	.71	.13	.02	.10	.36	.17	.69
Standard Autorotation	.67	.12	.11	.28	.07	.10	.57
Antitorque Failure-Right	.66	.13	.08	.21	.27	.07	.58
Hydraulics Failure	.57	.31	.14	.08	.04	.14	.47
Low Level Autorotation	.56	.06	.20	.31	.16	.11	.50
Engine Failure at Hover	.55	.14	.40	.15	.09	.10	.53
Hovering Autorotation	.52	.19	.29	.20	.01	.14	.44
Manual Throttle	.46	.20	.15	.33	-.00	-.05	.39
Shallow Approach to Running Landing	.45	.05	-.05	.23	.18	.11	.31
FACTOR 2							
Low Level Flight	.06	.76	.02	.12	.35	.11	.73
Terrain Flight Mission Planning	.15	.75	.18	.07	.18	.09	.66
Terrain Flight Takeoff	.14	.72	.07	.20	.23	.15	.66
Out-of-Ground-Effect Check	-.08	.61	.24	.16	.09	.14	.50
NOE Flight	.31	.61	.05	.44	.08	.07	.67
Terrain Flight Navigation	.28	.57	.07	.12	-.03	.01	.28
Terrain Flight Approach	.10	.52	.16	.48	.07	.14	.56
FACTOR 3							
Landing From a Hover	.20	.05	.91	.06	.07	.11	.90
Hovering Turn	.12	.26	.83	.03	.06	.15	.79
Hovering Flight	.04	.28	.66	.12	.04	.15	.56
Takeoff to a Hover	.12	.07	.65	.07	.22	.10	.51
Normal Approach	.42	.06	.54	.41	.01	.10	.65
FACTOR 4							
High Reconnaissance	.12	.39	.07	.70	.04	.09	.68
Confined Area Operations	.16	.16	.08	.60	.18	.10	.46
Pinnacle/Ridgeline Operations	.39	.00	.05	.53	.13	.14	.48
Steep Approach	.29	-.02	.22	.52	.15	.16	.45
FACTOR 5							
Before Takeoff Checks	.01	.21	.02	-.05	.73	.05	.58
After Landing Tasks	.20	.09	.14	.24	.60	.04	.48
Hover Check	-.11	-.04	.16	.14	.57	-.04	.38
Preflight Inspection	.23	.46	.01	-.24	.58	.28	.73
Before Landing Checks	.17	.25	.08	.08	.50	.07	.36
FACTOR 6							
Climb/Descend	.22	.20	.28	.06	-.13	.77	.78
Turns	.31	.26	.24	.11	.16	.71	.77
Traffic Pattern	.11	.17	.21	.34	.03	.68	.66
Streight and Level Flight	.21	.18	.22	.27	.32	.67	.74
VARIABLES WITH FACTOR LOADINGS UNDER .45							
Plan VFR Flight	.33	.11	.23	-.15	-.21	.05	.25
Weight and Balance Form	.28	.06	.02	-.10	-.15	.09	.12
Performance Planning	.34	.08	.10	.36	-.20	-.26	.37
Fuel Management	.23	.07	.02	.12	-.13	-.13	.11
Radio Communication	.21	.31	.07	.07	.37	.05	.29
Slope Operations	.44	.16	.24	.02	.04	.26	.34
Normal Takeoff	.29	.29	.38	.22	.14	.18	.42
Maximum Performance Takeoff	.41	.21	.26	.30	.18	.15	.43
Go-Around	.15	.41	.26	.06	.09	.09	.28
Deceleration/Acceleration	.10	.31	.05	.41	-.00	.20	.32
Engine Failure at Altitude	.21	.43	.16	.00	-.04	.04	.26
NOE Deceleration	.21	.31	.38	.13	.07	.18	.34
Eigenvalue	13.00	2.79	2.41	1.93	1.51	1.49	
Percent of Variance	56.30	12.10	10.40	8.30	6.50	6.40	
Cumulative Percent of Variance	56.30	68.40	78.70	87.10	93.60	100.00	

Note. N = 78

To check for the possibility of correlations among the factors, an oblique rotation was also performed. The oblique rotation yielded almost the identical six factors, with no two factors correlating greater than .36. Therefore, orthogonal rotation was retained because of its conceptual simplicity and its ease of interpretation.

Examination of the tasks with significant loadings on each factor suggests the following descriptive labels: Factor 1 (56.3% of common variance) - Emergency Tasks; Factor 2 (12.1%) - Terrain Flight Tasks; Factor 3 (10.4%) - Hovering Tasks; Factor 4 (8.3%) - High-Angle Approaches; Factor 5 (6.5%) - Procedural Tasks; Factor 6 (6.4%) - Basic Flight Tasks.

Examination of the correlations between final checkride normalized scores and final checkride composite scores (Appendix H) suggested that overall checkride performance (as estimated by the composite score) could be reliably predicted by using a small set of predictor tasks that have high predictor-criterion correlations and low predictor intercorrelations (Landy & Trumbo, 1980). Two unique sets of ten tasks were formed by sampling tasks from the six factors approximately in proportion to the number of tasks which had loadings greater than .45 on each factor. The sets are presented in Table 9. When tasks from the two sets are used as independent variables in separate multiple regression analyses to predict final checkride composite scores, a coefficient of multiple determination (R^2) of .87 (corrected for shrinkage) is obtained (Stein, 1960).

CONFIDENCE RATINGS

Means, standard deviations, and intercorrelations among the ratings on the 100-point confidence scale and the final checkride normalized scores for each of the 47 tasks are given in Appendix I. There are small or nonsignificant correlations between confidence ratings and checkride scores. In contrast, the confidence ratings obtained prior to a checkride are highly correlated with ratings obtained after the checkride.

TABLE 9

SETS OF ATM TASKS USED TO PREDICT
FINAL CHECKRIDE COMPOSITE SCORE

TASK SET A

ANTITORQUE FAILURE - RIGHT
STANDARD AUTOROTATION
ENGINE FAILURE AT A HOVER
TERRAIN FLIGHT MISSION PLANNING
NOE FLIGHT
LANDING FROM A HOVER
CONFINED AREA OPERATIONS
STEEP APPROACH
AFTER LANDING CHECKS
STRAIGHT AND LEVEL FLIGHT

TASK SET B

ANTITORQUE FAILURE - LEFT
LOW LEVEL AUTOROTATION
HOVERING AUTOROTATION
TERRAIN FLIGHT NAVIGATION
TERRAIN FLIGHT TAKEOFF
HOVERING TURN
NORMAL APPROACH
HIGH RECONNAISSANCE
PREFLIGHT INSPECTION
TRAFFIC PATTERN

DISCUSSION

The results indicate that the average level of flight performance in helicopter contact and terrain flight tasks is maintained after a six-month period of no practice. Furthermore, the average level of performance does not significantly increase with as many as six practice iterations. These finding applies to (a) both high flight time aviators (those with more than 900 rotary wing hours) and low flight time aviators (those with less than 900 hours) and (b) both psychomotor tasks and procedural tasks. Overall final checkride performance can be predicted reliably using scores on a small number of tasks sampled from independent task dimensions. Self-rated confidence to perform final checkride tasks is not a reliable predictor of either initial or final checkride performance.

CHECKRIDE SCORES

Analysis of Variance

The data from the analyses of the psychomotor tasks are consistent with past research on the retention of flight skills (e.g., Mengelkoch et al., 1960; Wright, 1973; Sitterley & Berge, 1972; Smith & Matheny, 1976) and the general literature on retention of psychomotor skills (e.g., Ammons et al., 1958; Parker & Fleishman, 1960). These studies indicate that skill levels for psychomotor tasks will be maintained at satisfactory levels for periods exceeding the six-month period used in the present study.

The lack of change in average proficiency level for the procedural tasks evaluated in this research (with the exception of an increase in average proficiency on the task Prepare Weight and Balance Form) was surprising. Based on past research, one would have expected some loss of proficiency on the procedural tasks after six months of no practice, even if no loss was observed on the psychomotor tasks. The results suggest that proficiency loss may be less severe for some types of procedural tasks than for others. This finding needs to be supported by additional research.

Most of the contact and terrain flight tasks examined in the present research have large psychomotor components. Many tasks that have large procedural components, such as the ATM FAC 2 instrument tasks and the ATM task Describe or Perform Emergency Procedures, were not evaluated in the present research because they are untrained and evaluated in the UH-1 flight simulator. Past research indicates that losses in proficiency and improvements with practice may be found in procedural tasks such as these after a no-practice period of six months (Mengelkoch, et al., 1960). This warrants further examination.

Overall initial checkride performance was correlated ($r = .42$) with overall final checkride performance for the subjects that did not fly for six months. Although the correlation did not reach statistical significance--possibly due to the small sample size of the 0 iteration group ($n = 11$)--it is in the expected direction and is consistent with past research.

Performance did not improve on tasks for which the average performance was below ATM proficiency levels on the initial checkride. This finding was unexpected. Initial checkride performance that was below proficiency was primarily on emergency tasks (e.g., Antitorque Failures, Hydraulic Failure, Standard Autorotation, Low Level Autorotation).

Two factors may have contributed to the failure to demonstrate a significant improvement in the performance of these tasks. First, in order to control the number of times each task was practiced, flights were structured so that each task was practiced once without previous instruction or demonstration, with the exception of the two Antitorque Failure tasks that were demonstrated once by the IP before they were attempted by the subject. Tasks that are inherently difficult and for which initial skill is deficient or marginal may require extensive instruction, demonstration, and massed practice trials for significant performance improvement to occur in a six-month period. Second, more than six iterations of distributed practice may be required to either regain or retain proficiency in these tasks.

Factor Analysis

The results of the factor analysis of final checkride normalized scores suggest the presence of independent dimensions underlying rotary wing contact and terrain flight skills. Although the sample size employed in the research ($N = 78$) is relatively small by standards adopted for factor analysis (Comrey, 1973), the six factors that emerged from the principal factors extraction and the varimax rotation appear to be reliable based on the size and pattern of factor loadings, eigenvalues, common variance accounted for, and communalities. The reliability of the factors should be investigated in additional research.

Examination of the tasks that loaded on each of the six factors suggests the descriptive categories of Emergency Tasks, Terrain Flight Tasks, Hovering Tasks, High-Angle Approaches, Procedural Tasks, and Basic Flight Tasks. The factors emerged on the basis of mathematical relationships among the variables; yet, with the exception of Factor 5, the groups are consistent with preexisting categories found in Army training literature defined on the basis of intuitive similarities of the tasks (e.g., Hovering, Terrain Flight).

It is noteworthy, in view of previous research in the area of flight skill retention, that a factor composed of procedural tasks was extracted independently from factors with tasks having large psychomotor components. Previous research indicates that psychomotor and procedural skills may have different proficiency maintenance requirements as well as different training requirements (Prophet, 1976).

The finding that overall checkride performance can be accurately predicted with a small subset of tasks has several implications for performance evaluation. These results suggest that it is possible to evaluate checkride performance with relatively few tasks, if the

individual tasks are highly correlated with overall checkride performance and are selected to sample relatively independent aspects of overall flight skill. The use of fewer tasks would reduce the time required for evaluation checkrides and save fuel and IP time, both being increasingly scarce resources in Army aviation.

CONFIDENCE RATINGS

As measured in the present study, self-rated confidence is not a reliable predictor of checkride performance. Similar data from the area of judgment and decision making (Lichtenstein & Fishhoff, 1977) indicate that subjects' predictions of task performance are subject to systematic biases, particularly overconfidence, and are generally not reliable predictors of actual performance. As stated previously, confidence ratings were obtained to provide data for exploratory analyses. The data, in conjunction with previous research, raise several questions about the viability of the construct of confidence.

GENERALIZABILITY OF RESULTS

The purpose of the present research is to validate, or determine the appropriateness of, the number of iterations required for Army aviators to maintain flight proficiency over a six-month training period. It is not possible to estimate from these data what flight proficiency loss might be expected for retention intervals longer than six months. The literature on the retention of flight skills suggests that significant decrements in flying proficiency might occur within a period of one to two years, particularly on flight tasks with large procedural components. Likewise, it is not possible to generalize directly from the data to emergency, instrument, night, or mission-specific tasks.

ARI is currently conducting research to evaluate the skill retention of Individual Ready Reserve aviators who have been trained to flight proficiency level and who have not flown for one year (Wick, 1983). Data from this research will provide an opportunity to examine the amount of proficiency loss among rotary wing aviators that occurs after a one-year retention interval. Additional research is needed to empirically investigate skill retention of rotary wing flight skills for periods longer than one year, using a representative sample that is large enough to allow examination of such variables as types of experience and types of flight tasks.

IMPLICATIONS FOR ATM PROGRAM

The results of the research have two major implications for the current ATM program. First, initial levels of aviator flight proficiency will be maintained in a large number of ATM FAC 2 contact and terrain flight tasks over a six-month period with little or no practice. No conclusion can be drawn about maintaining ATM standards in emergency tasks over six months. The data indicate that as many as six iterations of distributed practice without extensive instruction and demonstration may not improve performance in emergency tasks from an initial level of proficiency that is below ATM standards.

Second, the requirement for all aviators to fly current minimum semiannual FAC 2 iterations and for aviation field unit personnel to maintain records on performance of iterations for the majority of contact and terrain flight tasks may not be justified.

CONCLUSIONS

The following conclusions are drawn from this research.

1. The average level of flight performance in helicopter FAC 2 contact and terrain flight tasks is maintained after a six-month period of no practice. Furthermore, the average level of performance does not significantly increase with as many as six practice iterations. Sufficient data are not available to generalize the findings to periods beyond six months or to instrument, emergency, night, or mission-specific tasks.
2. The results do not support the requirement for aviators to perform the current minimum number of ATM FAC 2 contact and terrain flight task iterations over a six-month training period.
3. The total number of rotary wing flight hours is not a reliable predictor of an aviator's proficiency level at the end of a six-month period.
4. Overall final checkride performance can be reliably estimated using scores on a small number of final checkride tasks that are highly correlated with overall checkride performance and sampled from independent dimensions of flight skills.
5. Aviators' confidence ratings are not a reliable predictor of actual checkride performance.

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APPENDIX A
DEMOGRAPHIC QUESTIONNAIRE

ATM QUESTIONNAIRE

1. NAME: _____ (Last) _____ (First) _____ (M.I.) 2. DATE: _____ (Day/Month/Year)
 3. RANK: _____ 4. SSN: _____
 5. AGE: _____ Years 6. SS1: _____
 7. DATE GRADUATED FROM FLIGHT SCHOOL: _____ Month/Year

FOR ITEMS 8 - 15, PLEASE CHECK ☐ APPROPRIATE SPACES AND FILL IN THE BLANKS TO INDICATE YOUR TOTAL AVIATION BACKGROUND AND EXPERIENCE. MAKE YOUR BEST ESTIMATE OF HOURS ± 50 .

8. PLEASE INDICATE YOUR ROTARY WING QUALIFICATIONS AND HOURS LOGGED BY AIRCRAFT TYPE.

UH-1:	☐	Pilot	☐	UT	☐	IP	☐	SIP	Total Hours	_____
AH-1:	☐	Pilot	☐	UT	☐	IP	☐	SIP	Total Hours	_____
OH-58:	☐	Pilot	☐	UT	☐	IP	☐	SIP	Total Hours	_____
CH-47:	☐	Pilot	☐	UT	☐	IP	☐	SIP	Total Hours	_____
UH-60:	☐	Pilot	☐	UT	☐	IP	☐	SIP	Total Hours	_____
ROTARY WING IFE ☐										_____

9. PLEASE LIST OTHER ROTARY WING QUALIFICATIONS, IF APPROPRIATE:

Aircraft _____	Total Hours _____
Aircraft _____	Total Hours _____
Aircraft _____	Total Hours _____
Total Rotary Wing Hours _____	

10. IF YOU HAVE SERVED A TOUR AS A ROTARY WING IP AT FORT RUCKER, INDICATE IN WHAT CAPACITY AND THE NUMBER OF HOURS YOU LOGGED:

☐ Contact Hours	☐ Tactics Hours
☐ Instruments Hours	☐ IP MOI Hours
☐ NH/NVG Hours	

11. TOTAL ROTARY WING IP HOURS: _____

12. PLEASE INDICATE YOUR ROTARY WING HOURS DURING THE:

Previous 12 Months _____ Previous 6 Months _____ Previous 1 Month _____

13. PLEASE INDICATE YOUR SIMULATOR HOURS: Total Hours _____ Hours During Previous 12 Months _____

14. PLEASE INDICATE YOUR FIXED WING QUALIFICATIONS AND HOURS LOGGED:

☐ Fixed Wing Military	☐ Fixed Wing Instructor
☐ Fixed Wing Civilian	☐ Fixed Wing IFE
Total Fixed Wing Hours _____	Hours During Previous 12 Months _____

15. DESCRIBE BELOW THE DUTY ASSIGNMENT/POSITION YOU HELD PRIOR TO BEING ASSIGNED TO USAAVNC.

16. WAS PREVIOUS ASSIGNMENT IN AVIATION? ☐ YES ☐ NO

17. WHAT FAC WAS YOUR PREVIOUS ASSIGNMENT? ☐ FAC 1 ☐ FAC 2

18. DESCRIBE BELOW EACH DUTY ASSIGNMENT/POSITION YOU HAVE HELD AT FORT RUCKER DURING YOUR PRESENT TOUR.

1. _____
 2. _____
 3. _____

19. WHAT IS THE JOB TITLE OF YOUR PRESENT DUTY ASSIGNMENT?

20. WHAT WAS THE DATE OF YOUR PRESENT ASSIGNMENT TO FORT RUCKER?

Month/Year

APPENDIX B

ACADEMIC TEST MATERIALS

INSTRUCTIONS

1. This booklet contains reference material and data necessary to perform the following ATM tasks:

- Plan VFR Flight
- Prepare DD Form 365F (Weight and Balance)
- Use Performance Charts
- Prepare Planning Card (PPC)
- Perform Fuel Management Procedures

2. This booklet will be used by a number of aviators during this phase of the ATM Validation Project. Please do not make any marks in the booklet or remove any pages from the booklet.

3. Answer sheets (DD Form 175, DD Form 365F, DA Form 4887-R) as well as a blank sheet for calculations will be provided.

MILITARY FLIGHT PLAN				DEPARTURE TIME			
DATE	TIME	LOCATION	TO	DATE	TIME	LOCATION	TO
1. FLIGHT PLAN				2. DEPARTURE TIME			
3. FLIGHT PLAN				4. DEPARTURE TIME			
5. FLIGHT PLAN				6. DEPARTURE TIME			
7. FLIGHT PLAN				8. DEPARTURE TIME			
9. FLIGHT PLAN				10. DEPARTURE TIME			
11. FLIGHT PLAN				12. DEPARTURE TIME			
13. FLIGHT PLAN				14. DEPARTURE TIME			
15. FLIGHT PLAN				16. DEPARTURE TIME			
17. FLIGHT PLAN				18. DEPARTURE TIME			
19. FLIGHT PLAN				20. DEPARTURE TIME			
21. FLIGHT PLAN				22. DEPARTURE TIME			
23. FLIGHT PLAN				24. DEPARTURE TIME			
25. FLIGHT PLAN				26. DEPARTURE TIME			
27. FLIGHT PLAN				28. DEPARTURE TIME			
29. FLIGHT PLAN				30. DEPARTURE TIME			
31. FLIGHT PLAN				32. DEPARTURE TIME			
33. FLIGHT PLAN				34. DEPARTURE TIME			
35. FLIGHT PLAN				36. DEPARTURE TIME			
37. FLIGHT PLAN				38. DEPARTURE TIME			
39. FLIGHT PLAN				40. DEPARTURE TIME			
41. FLIGHT PLAN				42. DEPARTURE TIME			
43. FLIGHT PLAN				44. DEPARTURE TIME			
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87. FLIGHT PLAN				88. DEPARTURE TIME			
89. FLIGHT PLAN				90. DEPARTURE TIME			
91. FLIGHT PLAN				92. DEPARTURE TIME			
93. FLIGHT PLAN				94. DEPARTURE TIME			
95. FLIGHT PLAN				96. DEPARTURE TIME			
97. FLIGHT PLAN				98. DEPARTURE TIME			
99. FLIGHT PLAN				100. DEPARTURE TIME			

WEIGHT AND BALANCE CLEARANCE FORM				DEPARTURE TIME			
DATE	TIME	LOCATION	TO	DATE	TIME	LOCATION	TO
1. WEIGHT AND BALANCE CLEARANCE FORM				2. DEPARTURE TIME			
3. WEIGHT AND BALANCE CLEARANCE FORM				4. DEPARTURE TIME			
5. WEIGHT AND BALANCE CLEARANCE FORM				6. DEPARTURE TIME			
7. WEIGHT AND BALANCE CLEARANCE FORM				8. DEPARTURE TIME			
9. WEIGHT AND BALANCE CLEARANCE FORM				10. DEPARTURE TIME			
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13. WEIGHT AND BALANCE CLEARANCE FORM				14. DEPARTURE TIME			
15. WEIGHT AND BALANCE CLEARANCE FORM				16. DEPARTURE TIME			
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19. WEIGHT AND BALANCE CLEARANCE FORM				20. DEPARTURE TIME			
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45. WEIGHT AND BALANCE CLEARANCE FORM				46. DEPARTURE TIME			
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49. WEIGHT AND BALANCE CLEARANCE FORM				50. DEPARTURE TIME			
51. WEIGHT AND BALANCE CLEARANCE FORM				52. DEPARTURE TIME			
53. WEIGHT AND BALANCE CLEARANCE FORM				54. DEPARTURE TIME			
55. WEIGHT AND BALANCE CLEARANCE FORM				56. DEPARTURE TIME			
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69. WEIGHT AND BALANCE CLEARANCE FORM				70. DEPARTURE TIME			
71. WEIGHT AND BALANCE CLEARANCE FORM				72. DEPARTURE TIME			
73. WEIGHT AND BALANCE CLEARANCE FORM				74. DEPARTURE TIME			
75. WEIGHT AND BALANCE CLEARANCE FORM				76. DEPARTURE TIME			
77. WEIGHT AND BALANCE CLEARANCE FORM				78. DEPARTURE TIME			
79. WEIGHT AND BALANCE CLEARANCE FORM				80. DEPARTURE TIME			
81. WEIGHT AND BALANCE CLEARANCE FORM				82. DEPARTURE TIME			
83. WEIGHT AND BALANCE CLEARANCE FORM				84. DEPARTURE TIME			
85. WEIGHT AND BALANCE CLEARANCE FORM				86. DEPARTURE TIME			
87. WEIGHT AND BALANCE CLEARANCE FORM				88. DEPARTURE TIME			
89. WEIGHT AND BALANCE CLEARANCE FORM				90. DEPARTURE TIME			
91. WEIGHT AND BALANCE CLEARANCE FORM				92. DEPARTURE TIME			
93. WEIGHT AND BALANCE CLEARANCE FORM				94. DEPARTURE TIME			
95. WEIGHT AND BALANCE CLEARANCE FORM				96. DEPARTURE TIME			
97. WEIGHT AND BALANCE CLEARANCE FORM				98. DEPARTURE TIME			
99. WEIGHT AND BALANCE CLEARANCE FORM				100. DEPARTURE TIME			

DD FORM 365F

TC1-135

TC1-136

PERFORMANCE PLANNING CARD P/P			
DEPARTURE			
PA	FAT	LOAD	
CA/FAC	PUL	DUAL ENG	SINGLE ENG
		Ca	Eng
MAX (TQ/N) AVAR			
(TQ/N) AVAR (CONT)			
GO-NO-GO (TQ/N)			
PRELIM: JMO-EN (TQ/N)			
MOVES ONE (TQ/N)			
MAX ALLOWABLE GWT			
MAX ETC - ENDURANCE IAS			
MAX RANGES			
VALIDATION FACTOR			
24% FIDAL MARGIN	YES	NO	
ARRIVAL			
PA	FAT	LOAD	
LANDING GWT	MAX ALLOWABLE GWT	DUAL ENG	SINGLE ENG
		Ca	Eng
MAX (TQ/N) AVAR			
(TQ/N) RED TO MOVES ME			
(TQ/N) RED TO MOVES ONE			
24% FIDAL MARGIN	YES	NO	

Based on aircraft performance for existing atmospheric conditions

Arrival data is computed when significantly different from T/O conditions

Based on aircraft performance for existing conditions

*Mandatory for all flights

FIGURE 6-1

6-7

*Mandatory for all flights

FIGURE 6-1 (Cont)

6-8

PA	FAT	LOAD	
CRUISE SPEED	MAX ALLOWABLE GWT	DUAL ENG	SINGLE ENG
		Ca	Eng
MAX (TQ/N) AVAR			
(TQ/N) RED TO MOVES ME			
(TQ/N) RED TO MOVES ONE			
24% FIDAL MARGIN	YES	NO	

FUEL CHECK DATA

	<u>FUEL</u>	<u>TIME</u>
START:	1180	1400
STOP:	1000	1423

FUEL CONSUMPTION RATE CHECK IS COMPLETED AT
1425 HOURS WITH 980 LBS. OF FUEL REMAINING.

WEIGHT & BALANCE DATA

	<u>WEIGHT</u>	<u>MOMENT/100</u>
BASIC AIRCRAFT	5600	7700
OIL	27	47
CREW OF (2)	200 EA	93 EA
TAKEOFF FUEL	1359	2078
PASSENGERS (2)	200 EA @ F.S.	117.0

LESS FUEL - (BASED ON LANDING WITH THE MOST
CRITICAL FORWARD CG OF 73.2)

REMARKS:

1. FUEL USED IS JP-4
2. CRASHWORTHY FUEL SYSTEM

VFR FLIGHT PLAN DATA

UNIT	-	USAAVNC
------	---	---------

AIRCRAFT NUMBER	-	68-16354
-----------------	---	----------

TRANSPONDER WITH MODE "C"		
DEPARTURE TIME (Z)	-	1400
DEPARTURE POINT	-	LOWE AHP

ROUTE OF FLIGHT	-	AO VANGARD
-----------------	---	------------

FUEL ON BOARD	-	2 + 15
---------------	---	--------

WEIGHT & BALANCE	-	1 Jun 82
------------------	---	----------

CREW MEMBERS	-	ASSIGNED TO DES/FTR
PILOT	-	C. D. JONES, DAC, 215 631554
COPILOT	-	M. B. BROWN, CW3, 154 605405

DEPARTURE DATA

PRESSURE ALTITUDE	-	4000
-------------------	---	------

CALIBRATION FACTOR	-	58.0
--------------------	---	------

EAT	-	+20
-----	---	-----

T/O GWT	-	7500
---------	---	------

FLIGHT CONDITION	-	VFR
------------------	---	-----

WITH THE ABOVE INFORMATION, COMPLETE ALL
 ASTERISKED ITEMS LISTED ON THE RW PERFORMANCE PLANNING CARD (PPC). ARRIVAL DATA ARE NOT SIGNIFICANTLY DIFFERENT FROM T/O CONDITIONS.

LOWE			
TOWER	141.30	237.30	32.00
GND CON		265.60	
ATIS		364.90	
RUNKLE			
NORTH CON		365.20	
SOUTH CON		233.10	
FCC			
PIRATE CON		394.00	
SAVAGE CON		280.0	
ASR			
(ANGEL) FEEDER CON		373.50	
FINAL CON		339.90	
SHELL			
TOWER		240.80	46.90
REFUELING		249.00	
COMMON FREQ			50.65
NDB's			
LOWE	308		
BOLLWEEVIL	269		
RUNKLE	251		

VFR FLIGHT PLAN DATA

UNIT	-	USAAVNC
------	---	---------

AIRCRAFT NUMBER	-	68-16354
-----------------	---	----------

TRANSPONDER WITH MODE "C"

DEPARTURE TIME (Z)	-	1400
DEPARTURE POINT	-	LOWE AHP

ROUTE OF FLIGHT	-	AO VANGARD
-----------------	---	------------

FUEL ON BOARD	-	2 + 15
---------------	---	--------

WEIGHT & BALANCE	-	1 Jun 82
------------------	---	----------

CREW MEMBERS	-	ASSIGNED TO DES/FTR
--------------	---	---------------------

PILOT	-	C. D. JONES, DAC, 215 631554
-------	---	------------------------------

COPILOT	-	M. B. BROWN, CH3, 154 605405
---------	---	------------------------------

LOWE			
TOWER	141.30	237.30	32.00
CND CON		265.60	
ATIS		364.90	
RUNKLE			
NORTH CON		365.20	
SOUTH CON		233.10	
FCC			
PIRATE CON		394.00	
SAVAGE CON		280.0	
ASR			
(ANGEL) FEEDER CON		373.50	
FINAL CON		339.90	
SHELL			
TOWER		240.80	46.90
REFUELING		249.00	
COMMON FREQ			50.65

NDB's	
LOWE	308
BOLLWEEVIL	269
RUNKLE	251

TM 55-1520-210-10

FUEL LOADING CRASHWORTHY SYSTEM TANKS

FROM
INTEGRITY

Q

EXAMPLE

WANTED

WEIGHT AND MOMENT FOR
KNOWN FUEL TYPE AND
QUANTITY

KNOWN

QUANTITY - 200 GALLONS (1421
POUNDS ON P-1 SCALE)

METHOD

MOVE MC-1 FROM 1421 ON P-1
SCALE TO DIAGONAL LINE
PROJECT DOWN FROM THIS
POINT TO READ 3170 ON
MOMENT/100 SCALE

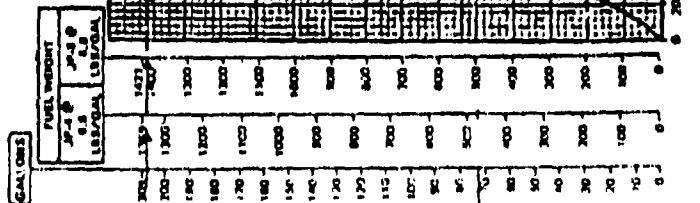


Figure 5-14. Fuel data (Sheet 1 of 4)

Q-13

TM 55-1520-210-10

PERSONNEL LOADING CHART MOMENT FOR PERSONNEL

Q

EXAMPLE

WANTED

PERSONNEL MOMENT FOR A GIVEN
WEIGHT AND LOCATION

KNOWN

PERSONNEL WEIGHT OF 200
POUNDS AT P-5 1128

METHOD

MOVE MC-1 FROM 200 POUNDS
TO THE PASSENGER LINE P-5
1128 PROJECT DOWN TO READ
224 ON THE MOMENT/100 SCALE

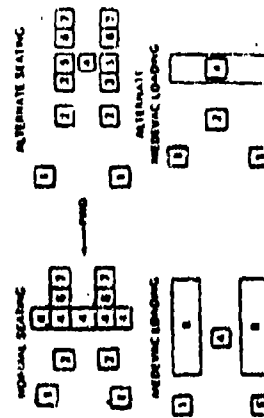
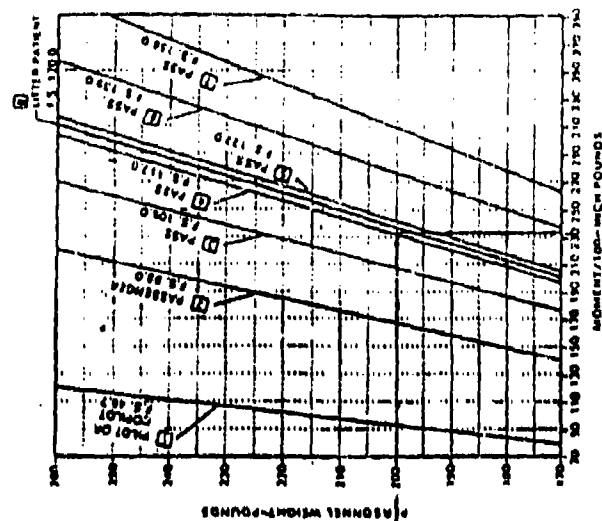


Figure 5-5. Personnel moment

Q-8

CENTER OF GRAVITY LIMITS

CD

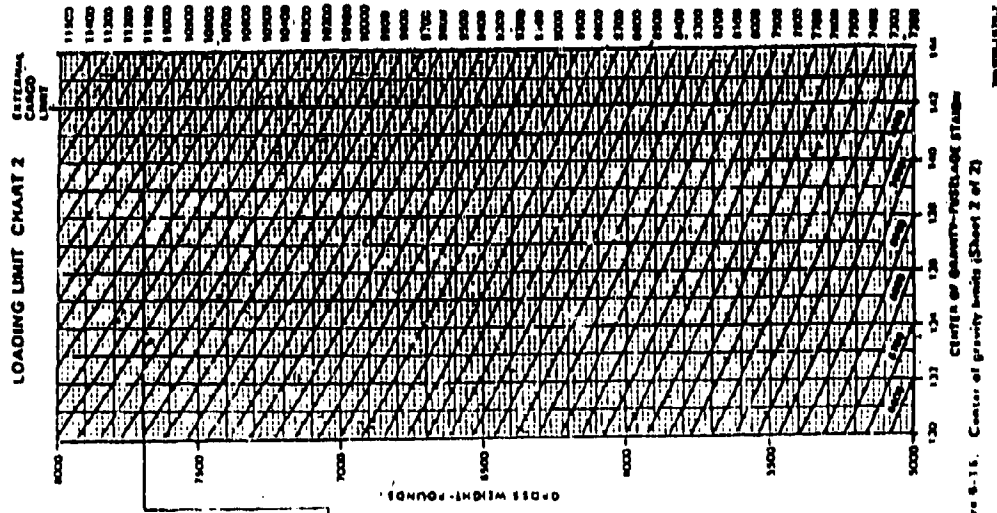


Figure 8-15. Center of gravity limits (Sheet 2 of 2)

References

ON DATA					
TYPE	TANK CAPACITY (GALL)	WEIGHT PER GALLON	TOTAL WEIGHT (KLB)	ARM F S.	MOMENT IN. LB/100
MSL-7000	3.35	7.5	25.6	173.0	47
MSL-7500	3.0	7.5	22.5	173.0	34.9
MSL-52009 -	2.25	8.4	17.2	173.0	47
MSL-52019	3.0	8.6	25.3	173.0	43.6

• Family History

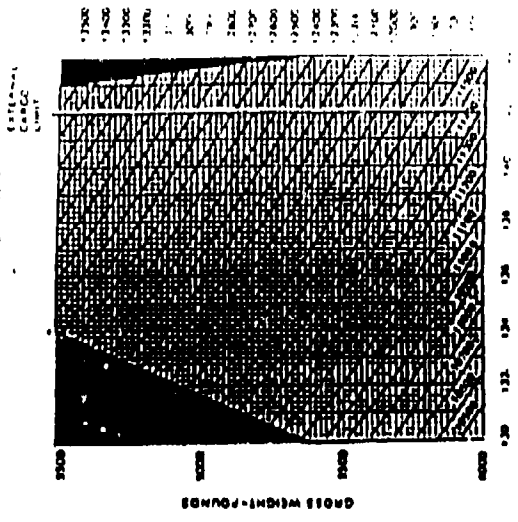
2025-08-13 27

Figure 8-15. Engine oil data

CENTER OF GRAVITY LIMITS

CC
100178

LOADING LIMIT CHART 1



Center for Community-Sustaining Justice

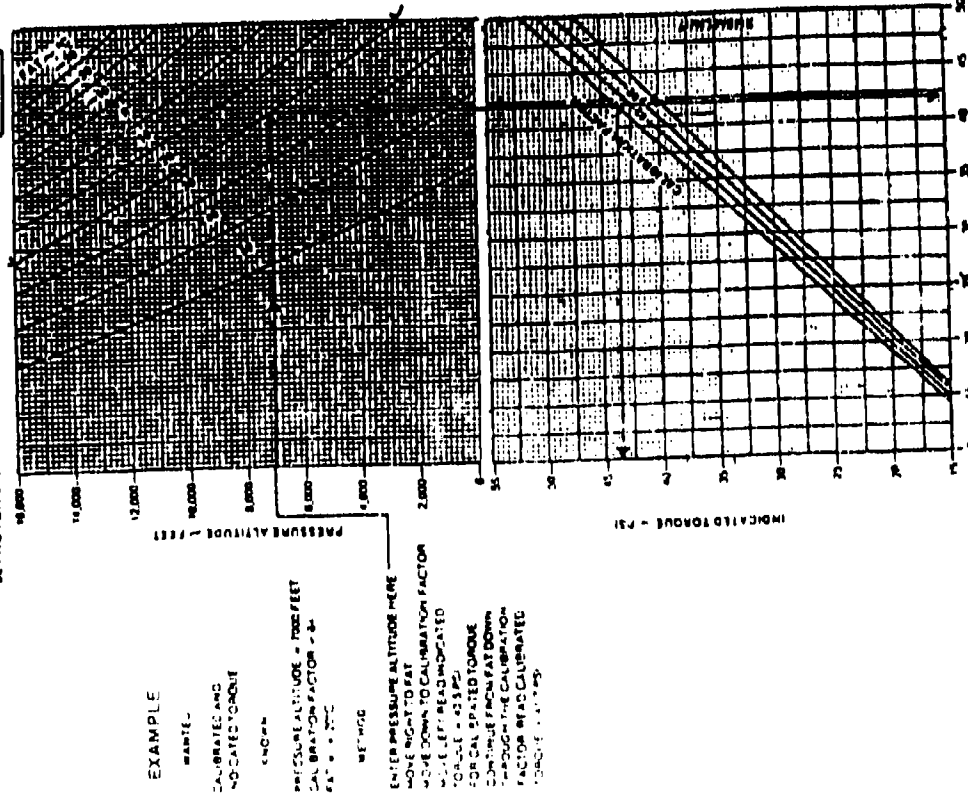
703900 1274

Figure 6-16 Center of gravity limits (Sheet 1 of 2)

MAXIMUM TORQUE AVAILABLE (30 MINUTE OPERATION)

ANT-ICE OFF BLEED AIR HEATER OFF
324 ROTONR600 ENGINE RPM JP-4 FUEL

MAXIMUM
TORQUE
AVAILABLE
324-10
133-13

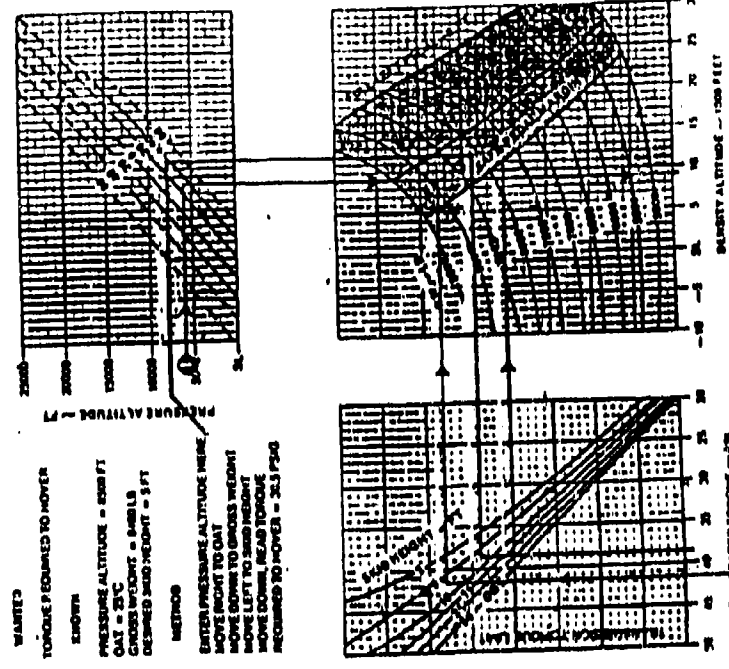


DATA BASE: DERIVED FROM 30 MINUTE FLIGHT TEST, ASTA-TOR 66-20, MOVED 1978

Figure 7-3 Maximum torque available (30 minute operation) chart

324 ROTONR600 ENGINE RPM
CALM WIND
LEVEL SURFACE

HOVER
324-10
133-13



DATA BASE: DERIVED FROM 30 MINUTE FLIGHT TEST, ASTA-TOR 66-20, MOVED 1978

Figure 7-5 Hover Chart

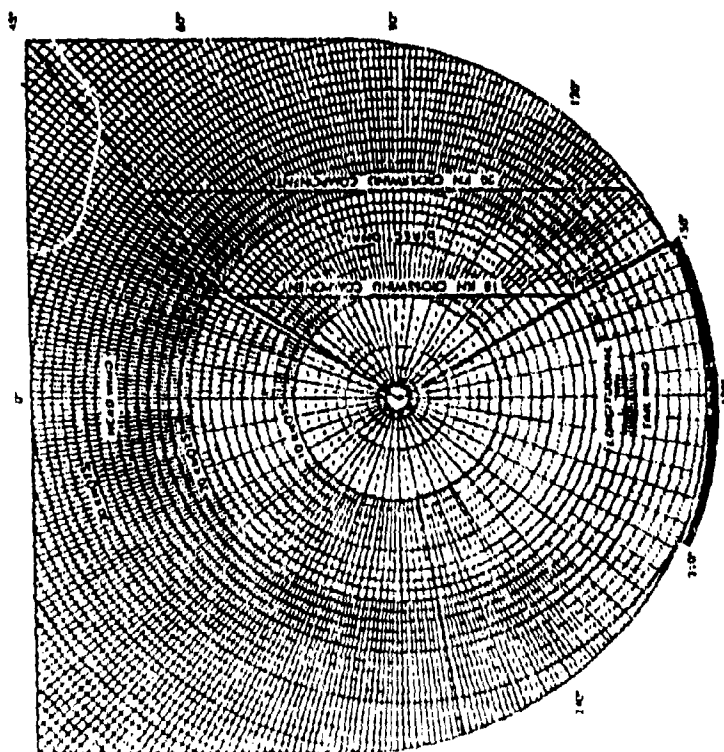
Figure 5-1.1 Directional Control Matrix (Sheet 1 of 2)

LONGITUDINAL AND DIRECTIONAL CONTROL MARGIN (IGE TRANSLATIONAL FLIGHT)

CONTROL
MARGIN
PERCENT
EIR IN

YELLOW INDICATES CONDITIONS WHERE THE CONTROL MARGIN MAY BE LESS THAN
10% SEE SHEET 1 FOR CROSS WEIGHTS AND ALTITUDES CORRESPONDING TO CROSSWIND
COMPONENTS

RED INDICATES AIRSPEED LIMITS



DATA BASE DERIVED FROM FLIGHT TEST USA AIRCRAFT 1967

Figure 1.1 Longitudinal and Directional Control Margins (Charts 1 and 2)

US-10 and A-10 gross weight
The gross weight calculation factor
increased due to the effect of the gross
weight on the gross weight. The gross
weight is calculated by the gross
weight factor which must be
multiplied by the gross weight
factor to obtain the gross weight.
The gross weight factor is a constant
value of 1.0. The gross weight factor
is a constant value of 1.0. The gross
weight factor is a constant value of 1.0.

Some caution must be taken to
gross weight and its applicability to the
gross weight factor. The gross weight
factor is a constant value of 1.0. The
gross weight factor is a constant value
of 1.0. The gross weight factor is a
constant value of 1.0. The gross weight
factor is a constant value of 1.0.

Because gross weight does not directly
control gross weight, they may
be used to estimate gross weight and
the maximum altitude. The gross
weight factor is a constant value of 1.0.
The gross weight factor is a constant
value of 1.0. The gross weight factor
is a constant value of 1.0. The gross
weight factor is a constant value of 1.0.

Five major values should be entered on
the PFC chart. The gross weight factor
is a constant value of 1.0. The gross
weight factor is a constant value of 1.0.
The gross weight factor is a constant
value of 1.0. The gross weight factor
is a constant value of 1.0. The gross
weight factor is a constant value of 1.0.

weight must be reduced before
calculation of the altitude.
The gross weight calculation factor
increased due to the effect of the gross
weight on the gross weight. The gross
weight is calculated by the gross
weight factor which must be
multiplied by the gross weight
factor to obtain the gross weight.
The gross weight factor is a constant
value of 1.0. The gross weight factor
is a constant value of 1.0. The gross
weight factor is a constant value of 1.0.

The Altitude Training Manual
Commander's Guide (EC 1-10) provides
guidance for the development of ATM
training. The gross weight factor is a
constant value of 1.0. The gross weight
factor is a constant value of 1.0. The
gross weight factor is a constant value
of 1.0. The gross weight factor is a
constant value of 1.0. The gross weight
factor is a constant value of 1.0.

A T-100
The gross weight calculation factor
increased due to the effect of the gross
weight on the gross weight. The gross
weight is calculated by the gross
weight factor which must be
multiplied by the gross weight
factor to obtain the gross weight.
The gross weight factor is a constant
value of 1.0. The gross weight factor
is a constant value of 1.0. The gross
weight factor is a constant value of 1.0.

The gross weight calculation factor
increased due to the effect of the gross
weight on the gross weight. The gross
weight is calculated by the gross
weight factor which must be
multiplied by the gross weight
factor to obtain the gross weight.
The gross weight factor is a constant
value of 1.0. The gross weight factor
is a constant value of 1.0. The gross
weight factor is a constant value of 1.0.

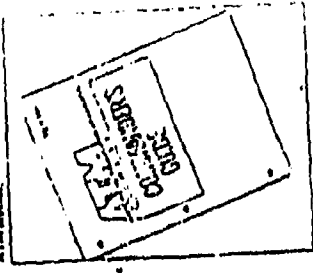


Figure 1.1

APPENDIX C
INFLIGHT DATA COLLECTION FORM
AND
TASK RATING SCALE

P _____
IP _____

ATM VALIDATION DATA COLLECTION FORM INSTRUCTIONS FOR FINAL CHECKRIDE

Aircraft are issued under 386-5 ADP code from Low Training Scheduling Branch (255-5885/5917). Log flight under aviator's agency ADP Code with a -5 suffix. Mission code is AM3.

Please do not discuss with the aviator his group assignment or flight hours.

Have aviator complete the PRE Confidence Rating Scale before the flight. Have him complete Academic Test and then the POST Confidence Rating Scale after the flight.

Give aviator feedback about his performance after the POST Confidence Rating Scale has been completed.

Discuss which maneuvers need refresher training in order to meet AAPART standards.

Indicate to aviator that, if he requests, he can have a DA Form 4507-1-R filled out for maneuvers that met AAPART standards during the checkride. Form 4507-1-R will be sent to him within two weeks of the date of the final checkride.

Dr. Dr. Ruffner, ASI (598-6326); Dr. Bickley (255-2873).

ATM INFLIGHT DATA COLLECTION FORM

NAME (Last) (First) (M.I.) SSR _____

NAME DATE Day/Month/Year IP _____

PURPOSE OF FLIGHT: CHK1 CHK2 -TRNG ITERATION of _____

FLIGHT TIME HOURS WINDS Direction / Velocity _____

STAGEFIELD _____

ACADEMIC TEST		12. HOV TURN (180°)	NO
1. PLAN VER FLT	1 2 3 4 +	CLEAR A/C	LC MI
2. WT-BAL FORM	1 2 3 4 +	ALT	FWD AFT
3. PERF CHARTS	1 2 3 4 +	DRIFT	LFT RT
4. PREPARE PPC	1 2 3 4 +	TURN RATE	SLO FST
5. FUEL MGT PROCEDURE	1 2 3 4 +		ERRATIC
6. PRELY INSPECT	1 2 3 4 +	13. HOV FLT (50m)	NO
7. BEE LINE V/O MIT CHKS	1 2 3 4 +	CLEAR A/C	LC MI
8. RADIO PROCEDURE	1 2 3 4 +	ALT	FWD AFT
9. AFTER LMDG TASKS	1 2 3 4 +	ORIFT	LFT RT
10. 1/2 TO HOVER	1 2 3 4 +	HOG	LFT RT
11. HOV CHK	1 2 3 4 +	SPEED	SLO FST
12. HOV CHK	1 2 3 4 +		ERRATIC
13. HOV CHK	1 2 3 4 +	14. LMDG FRM HOVER	NO
14. HOV CHK	1 2 3 4 +	HOG	LFT AFT
15. HOV CHK	1 2 3 4 +	DRIFT	LFT RT
16. HOV CHK	1 2 3 4 +	VERT SPEED	SLO FST
17. HOV CHK	1 2 3 4 +	TO	ROUGH
18. HOV CHK	1 2 3 4 +	15. MAX THRT OPN	NO
19. HOV CHK	1 2 3 4 +	170 RPM	LC MI
20. HOV CHK	1 2 3 4 +	3 FT RPM	FWD AFT
21. HOV CHK	1 2 3 4 +	ALT	LFT RT
22. HOV CHK	1 2 3 4 +	LFT TURN RPM	LFT RT
23. HOV CHK	1 2 3 4 +	RT TURN RPM	LFT RT
24. HOV CHK	1 2 3 4 +	LMDG RPM	LFT RT
25. HOV CHK	1 2 3 4 +	THROTTLE RATE	LFT RT
26. HOV CHK	1 2 3 4 +	DRIFT	LFT RT

19. ENG FAIL STAT MOV	LFT	RT	
20. CLIMB/DESCEND	LFT	RT	
21. CLEAR A/C	LFT	RT	
22. TRIM NEEDS (PED)	LFT	RT	
23. BANK ANGLE	LFT	RT	
24. AVG TURN RATE	LFT	RT	
25. ROLLOUT HDG	LFT	RT	
26. STRT/LVL FLT	LFT	RT	
27. A/S	LFT	RT	
28. TRIM NEEDS (PED)	LFT	RT	
29. ALT	LFT	RT	
30. HDG	LFT	RT	
31. GROUND TRACK	LFT	RT	
32. TAXI OFF	LFT	RT	
33. NORM T/O	LFT	RT	
34. CLEAR A/C	LFT	RT	
35. PRE-ETL ALT	LFT	RT	
36. PRE-ETL POWER	LFT	RT	
37. PRE-ETL HDG	LFT	RT	
38. ATTITUDE	LFT	RT	
39. CLIMB RATE	LFT	RT	
40. ACCEL	LFT	RT	
41. SIM MAX T/O	LFT	RT	
42. POWER CHK	LFT	RT	
43. POWER	LFT	RT	
44. HDG	LFT	RT	
45. GROUND TRACK	LFT	RT	
46. ATTITUDE	LFT	RT	
47. TRANSITION PT	LFT	RT	
48. APPROACHES	LFT	RT	
49. BEFORE LMDG CHKS	LFT	RT	
50. CRUISE	LFT	RT	
51. NORM APPROACH	LFT	RT	
52. ENTRY ALT	LFT	RT	
53. APPROACH ANGLE	LFT	RT	
54. TRIM NEEDS (PED)	LFT	RT	
55. CLOS RATE	LFT	RT	
56. RWY ALIGN	LFT	RT	
57. TO	LFT	RT	
58. STEEP APPROACH	LFT	RT	
59. ENTRY ALT	LFT	RT	
60. ENTRY A/S	LFT	RT	
61. APPROACH ANGLE	LFT	RT	
62. TRIM NEEDS (PED)	LFT	RT	
63. CLOS RATE	LFT	RT	
64. RWY ALIGN	LFT	RT	
65. TO	LFT	RT	

21. TURNS	NO		
22. CLEAR A/C	NO		
23. TRIM NEEDS (PED)	NO		
24. BANK ANGLE	NO		
25. AVG TURN RATE	NO		
26. ROLLOUT HDG	NO		
27. STRT/LVL FLT	NO		
28. A/S	NO		
29. TRIM NEEDS (PED)	NO		
30. ALT	NO		
31. HDG	NO		
32. GROUND TRACK	NO		
33. TAXI OFF	NO		
34. NORM T/O	NO		
35. CLEAR A/C	NO		
36. PRE-ETL ALT	NO		
37. PRE-ETL POWER	NO		
38. PRE-ETL HDG	NO		
39. ATTITUDE	NO		
40. CLIMB RATE	NO		
41. ACCEL	NO		
42. SIM MAX T/O	NO		
43. POWER CHK	NO		
44. POWER	NO		
45. HDG	NO		
46. GROUND TRACK	NO		
47. ATTITUDE	NO		
48. TRANSITION PT	NO		
49. APPROACHES	NO		
50. BEFORE LMDG CHKS	NO		
51. CRUISE	NO		
52. NORM APPROACH	NO		
53. ENTRY ALT	NO		
54. APPROACH ANGLE	NO		
55. TRIM NEEDS (PED)	NO		
56. CLOS RATE	NO		
57. RWY ALIGN	NO		
58. TO	NO		
59. STEEP APPROACH	NO		
60. ENTRY ALT	NO		
61. ENTRY A/S	NO		
62. APPROACH ANGLE	NO		
63. TRIM NEEDS (PED)	NO		
64. CLOS RATE	NO		
65. RWY ALIGN	NO		
66. TO	NO		

28. SHL APPRCH RING LMDG	LO	HI
29. ENTRY ALT	LO	HI
30. ENTRY A/S	LO	HI
31. APPROACH ANGLE	LO	HI
32. TRIM NEEDS (PED)	LO	HI
33. CLOS RATE	LO	HI
34. RWY ALIGN	LO	HI
35. TO	LO	HI
36. HYD FAILURE	LO	HI
37. CRCH PROCEDURE	LO	HI
38. A/S	LO	HI
39. RWY ALIGN	LO	HI
40. APPROACH ANGLE	LO	HI
41. TRIM NEEDS (PED)	LO	HI
42. CLOS RATE	LO	HI
43. TO SPEED	LO	HI
44. TO PT	LO	HI
45. TO COORD	LO	HI
46. ANTIRQ HALF (L)	LO	HI
47. THR/SLK RED AMT	LO	HI
48. ENTRY ALT	LO	HI
49. ENTRY A/S	LO	HI
50. RWY ALIGN	LO	HI
51. CLOS RATE	LO	HI
52. TO/HDG COORD	LO	HI
53. TO COORD	LO	HI
54. ANTIRQ HALF (R)	LO	HI
55. THR/SLK RED AMT	LO	HI
56. ENTRY ALT	LO	HI
57. ENTRY A/S	LO	HI
58. RWY ALIGN	LO	HI
59. CLOS RATE	LO	HI
60. TO/HDG COORD	LO	HI
61. TO COORD	LO	HI
62. GO-AROUND	LO	HI
63. POWER	LO	HI
64. A/S	LO	HI
65. GROUND TRACK	LO	HI
66. TRIM NEEDS (PED)	LO	HI
67. STD AUTO	LO	HI
68. ENTRY ALT	LO	HI
69. ENTRY A/S	LO	HI
70. TRIM NEEDS (PED)	LO	HI
71. DESCENT A/S	LO	HI
72. DECEL	LO	HI
73. INITIAL PITCH	LO	HI
74. CSNM PITCH COORD	LO	HI
75. TO COORD	LO	HI
76. TO DRIFT	LO	HI
77. GROUND SLIDE	LO	HI
78. GROUND TRACK	LO	HI
79. TO PT	LO	HI

34. L/L AUTO	LO	HI
35. ENTRY ALT	LO	HI
36. ENTRY A/S	LO	HI
37. ENTRY COORD	LO	HI
38. DECEL	LO	HI
39. INITIAL PITCH	LO	HI
40. CSNM PITCH COORD	LO	HI
41. TO COORD	LO	HI
42. TO DRIFT	LO	HI
43. GROUND SLIDE	LO	HI
44. TO PT	LO	HI

36. DECEL/ACCEL	LO	HI
37. A/S CONTROL	LO	HI
38. HDG/GROUND TRACK	LO	HI
39. TRIM NEEDS (PED)	LO	HI
40. ENG FAIL AT ALT	LO	HI
41. ENTRY COORD	LO	HI
42. RADIO PROCEDURE	LO	HI
43. MANEUVER COORD	LO	HI
44. RECOVERY COORD	LO	HI
45. HI RECON	LO	HI
46. ALT	LO	HI
47. A/S	LO	HI
48. OPERATION PLAN	LO	HI
49. CRND AREA OPNS	LO	HI
50. ENTRY ALT	LO	HI
51. ENTRY A/S	LO	HI
52. APPROACH ANGLE	LO	HI
53. CLOS RATE	LO	HI
54. TERMINATION	LO	HI
55. T/O PLAN	LO	HI
56. POWER CHK	LO	HI
57. HDG	LO	HI
58. GROUND TRACK	LO	HI
59. POWER	LO	HI
60. COORD	LO	HI

40. MIN/ROGUE OPNS			
ENTRT ALT	LO	HI	RT
ENTRT A/S	SLO	FSI	RT
APPROACH ANGLE	SIN	SIP	RT
CLOS RATE	SLO	FSI	RT
TER	POOR	FSI	RT
T/O PLAN	POOR	FSI	RT
HOG	LFT	RT	RT
GROUND TRACK	LFT	RT	RT
ALT	LO	MI	RT
POWER	INSF	EASY	RT
COORD	POOR	RT	RT
TACTICAL OPNS			
41. TER FLT MSH PLAN	1 2 3 4	1 2 3 4	1 2 3 4
42. TER FLT MAY	1 2 3 4	1 2 3 4	1 2 3 4
ERRUTE MAY ACTURAC	1 2 3 4	1 2 3 4	1 2 3 4
MISSED CHTPS	1 2 3 4	1 2 3 4	1 2 3 4
LOC FINAL OBJ	1 2 3 4	1 2 3 4	1 2 3 4
43. L/L FLT	SLO	FSI	RT
A/S	LO	MI	RT
ARY TIMES	EARLY	LATE	RT
REPORT CHTPS	POOR	RT	RT
44. MOE FLT	SLO	FSI	RT
A/S	LO	MI	RT
OBSTACLE CLRNCE	POOR	RT	RT
REPORT CHTPS	POOR	RT	RT

ATM VALIDATION MANEUVER RATING SCALE

RATING	DESCRIPTION
1	Performance unsafe to the extent that the IP immediately had to take control of the aircraft.
2	Performance deteriorated until IP was finally required to take control of the aircraft.
3	Few of the ATM standards were met, student required considerable verbal assistance but IP did not have to take control of the aircraft.
4	Less than half of the ATM standards were met, student required some verbal assistance and continually over/under controlled.
5	Less than half of the ATM standards were met, required little verbal assistance but frequently over/under controlled.
6	Majority of the ATM standards were met, student required little or no verbal assistance, but tended to occasionally over-control or accepted slight deviations while attempting corrections.
7	Majority of the ATM standards were met, little or no verbal assistance needed, performance generally smooth but occasionally over-controlled or was slow making necessary corrections.
8	All ATM standards were met, most deviations from desired state were quickly noticed and smoothly corrected.
9	All ATM standards were met, all deviations from desired state were immediately noticed and smoothly corrected.
10	All ATM standards were met, majority of performance within IP standards.
11	All performance within IP standards, any deviations from desired state were small and immediately corrected.
12	Outstanding. No noticeable deviations from desired performance.

APPENDIX D
CONFIDENCE RATING SCALE

POS

DATE _____ SSN _____
 _____ 10 _____ DATE _____

CONFIDENCE RATING SCALE

INSTRUCTIONS: Place a slash (/) through the horizontal line located below each item task to indicate the amount of confidence you have in your ability to perform that task in ATP standards.

Low Confidence	Plan a VFR Flight	High Confidence
Low Confidence	Prepare DB Form 3635 (Weight and Balance)	High Confidence
Low Confidence	Use Performance Charts	High Confidence
Low Confidence	Prepare Performance Planning Card (PPC)	High Confidence
Low Confidence	Perform Preflight Inspection	High Confidence
Low Confidence	Perform Before-Takeoff Checks	High Confidence
Low Confidence	Perform Late Communication Procedures	High Confidence
Low Confidence	Perform Takeoff to a Go/No-Go	High Confidence
Low Confidence	Perform Descent (Power) Checks	High Confidence
Low Confidence	Perform Landing Turns	High Confidence
Low Confidence	Perform Landing Flare	High Confidence
Low Confidence	Perform Manual Takeoff	High Confidence
Low Confidence	Perform Climb and Descent	High Confidence

Low Confidence	Perform Turns	High Confidence
Low Confidence	Perform Straight-and-Level Flight	High Confidence
Low Confidence	Perform Fuel Management Procedures	High Confidence
Low Confidence	Perform Deceleration/Power Reduction	High Confidence
Low Confidence	Navigate by Pilotsage and Dead Reckoning (DR)	High Confidence
Low Confidence	Perform Before-Landing Checks	High Confidence
Low Confidence	Perform Traffic Pattern Flight	High Confidence
Low Confidence	Perform Manual Approach	High Confidence
Low Confidence	Perform Landing From a Go/No-Go	High Confidence
Low Confidence	Perform Simulated Maximum Performance Takeoff	High Confidence
Low Confidence	Perform Steep Approach	High Confidence
Low Confidence	Perform Shallow Approach to a Landing Landing	High Confidence
Low Confidence	Perform Simulated Hypoxemia System Malfunction	High Confidence
Low Confidence	Perform Manual Throttle Operation, Emergency Governor Reset	High Confidence
Low Confidence	Perform Simulated Anticollision Malfunction (Flashed Panel Settings)	High Confidence

Low Confidence	Perform Countdown	High Confidence
Low Confidence	Perform Simulated Engine Failure From Lower Altitude	High Confidence
Low Confidence	Perform Manoeuvring Autotest/turns	High Confidence
Low Confidence	Perform Standard Autotest/turns	High Confidence
Low Confidence	Perform Low-Level Autotest/turns	High Confidence
Low Confidence	Perform Standard Autotest/turns With a 180-Degree Turn	High Confidence
Low Confidence	Perform Simulated Engine Failure at Altitude	High Confidence
Low Confidence	Perform High Recommunications	High Confidence
Low Confidence	Perform Confined Area Operations	High Confidence
Low Confidence	Perform Slope Operations	High Confidence
Low Confidence	Perform Flare/In/Out/Go/Stop Operations	High Confidence
Low Confidence	Perform After-Landing Tests	High Confidence

Low Confidence	Perform Terrain Flight Mission Planning	High Confidence
Low Confidence	Perform Terrain Flight Navigation	High Confidence
Low Confidence	Perform Low-Level Flight	High Confidence
Low Confidence	Perform Contour Flight	High Confidence
Low Confidence	Perform HSE Flight	High Confidence
Low Confidence	Perform HSE Descent/turns	High Confidence
Low Confidence	Perform Terrain Flight Approach	High Confidence
Low Confidence	Perform Out-of-Ground Effect (OGE) Climb	High Confidence
Low Confidence	Perform Terrain Flight Takeoff	High Confidence

APPENDIX E
WEIGHT AND BALANCE PRACTICE EXERCISES

[illegible]

WEIGHT AND BALANCE CLEARANCE FORM 1				UNITED STATES AIR FORCE		FORM 1-1-64	
USE PREVIOUS EDITIONS				UNITED STATES AIR FORCE		FORM 1-1-64	
19 Jul 67				016-14		022	
069-13479				022		022	
1. Description of item				2. Quantity		3. Unit	
4. Weight (lb)				5. Volume (cu ft)		6. Remarks	
7. Date of issue				8. Date of receipt		9. Date of expiration	
10. Date of issue				11. Date of receipt		12. Date of expiration	
13. Date of issue				14. Date of receipt		15. Date of expiration	
16. Date of issue				17. Date of receipt		18. Date of expiration	
19. Date of issue				20. Date of receipt		21. Date of expiration	
22. Date of issue				23. Date of receipt		24. Date of expiration	
25. Date of issue				26. Date of receipt		27. Date of expiration	
28. Date of issue				29. Date of receipt		30. Date of expiration	
31. Date of issue				32. Date of receipt		33. Date of expiration	
34. Date of issue				35. Date of receipt		36. Date of expiration	
37. Date of issue				38. Date of receipt		39. Date of expiration	
40. Date of issue				41. Date of receipt		42. Date of expiration	
43. Date of issue				44. Date of receipt		45. Date of expiration	
46. Date of issue				47. Date of receipt		48. Date of expiration	
49. Date of issue				50. Date of receipt		51. Date of expiration	
52. Date of issue				53. Date of receipt		54. Date of expiration	
55. Date of issue				56. Date of receipt		57. Date of expiration	
58. Date of issue				59. Date of receipt		60. Date of expiration	
61. Date of issue				62. Date of receipt		63. Date of expiration	
64. Date of issue				65. Date of receipt		66. Date of expiration	
67. Date of issue				68. Date of receipt		69. Date of expiration	
70. Date of issue				71. Date of receipt		72. Date of expiration	
73. Date of issue				74. Date of receipt		75. Date of expiration	
76. Date of issue				77. Date of receipt		78. Date of expiration	
79. Date of issue				80. Date of receipt		81. Date of expiration	
82. Date of issue				83. Date of receipt		84. Date of expiration	
85. Date of issue				86. Date of receipt		87. Date of expiration	
88. Date of issue				89. Date of receipt		90. Date of expiration	
91. Date of issue				92. Date of receipt		93. Date of expiration	
94. Date of issue				95. Date of receipt		96. Date of expiration	
97. Date of issue				98. Date of receipt		99. Date of expiration	
100. Date of issue				101. Date of receipt		102. Date of expiration	
103. Date of issue				104. Date of receipt		105. Date of expiration	
106. Date of issue				107. Date of receipt		108. Date of expiration	
109. Date of issue				110. Date of receipt		111. Date of expiration	
112. Date of issue				113. Date of receipt		114. Date of expiration	
115. Date of issue				116. Date of receipt		117. Date of expiration	
118. Date of issue				119. Date of receipt		120. Date of expiration	
121. Date of issue				122. Date of receipt		123. Date of expiration	
124. Date of issue				125. Date of receipt		126. Date of expiration	
127. Date of issue				128. Date of receipt		129. Date of expiration	
130. Date of issue				131. Date of receipt		132. Date of expiration	
133. Date of issue				134. Date of receipt		135. Date of expiration	
136. Date of issue				137. Date of receipt		138. Date of expiration	
139. Date of issue				140. Date of receipt		141. Date of expiration	
142. Date of issue				143. Date of receipt		144. Date of expiration	
145. Date of issue				146. Date of receipt		147. Date of expiration	
148. Date of issue				149. Date of receipt		150. Date of expiration	
151. Date of issue				152. Date of receipt		153. Date of expiration	
154. Date of issue				155. Date of receipt		156. Date of expiration	
157. Date of issue				158. Date of receipt		159. Date of expiration	
160. Date of issue				161. Date of receipt		162. Date of expiration	
163. Date of issue				164. Date of receipt		165. Date of expiration	
166. Date of issue				167. Date of receipt		168. Date of expiration	
169. Date of issue				170. Date of receipt		171. Date of expiration	
172. Date of issue				173. Date of receipt		174. Date of expiration	
175. Date of issue				176. Date of receipt		177. Date of expiration	
178. Date of issue				179. Date of receipt		180. Date of expiration	
181. Date of issue				182. Date of receipt		183. Date of expiration	
184. Date of issue				185. Date of receipt		186. Date of expiration	
187. Date of issue				188. Date of receipt		189. Date of expiration	
190. Date of issue				191. Date of receipt		192. Date of expiration	
193. Date of issue				194. Date of receipt		195. Date of expiration	
196. Date of issue				197. Date of receipt		198. Date of expiration	
199. Date of issue				200. Date of receipt		201. Date of expiration	
202. Date of issue				203. Date of receipt		204. Date of expiration	
205. Date of issue				206. Date of receipt		207. Date of expiration	
208. Date of issue				209. Date of receipt		210. Date of expiration	
211. Date of issue				212. Date of receipt		213. Date of expiration	
214. Date of issue				215. Date of receipt		216. Date of expiration	

APPENDIX F
DESCRIPTION OF PROCEDURE USED TO
NORMALIZE RAW SCORE DATA

The procedure used in this research to normalize the raw score data is based on a method for converting ordinal data to interval data. It is described in Hays' (1967) text Quantification in Psychology on pages 39-42. The procedure makes the assumption that the true values of aviator performance on the tasks are normally distributed.

In this experiment IPs rated the checkride performance of subjects on each of the 47 tasks by using a 1 through 12 rating scale (see Figure 1). The observed performance on each task was placed in one of the twelve successive categories of the rating scale. The categories are successive in the sense that they form a logical progression from the lowest (1) to the highest (12) proficiency. The following steps are then followed for all initial and final checkride scores given by each IP.

- Determine the number of times the IP uses each of the 12 raw score categories across all tasks.
- Convert the total number of scores assigned to a category to a proportion of the total scores given by the IP.
- Determine the cumulative proportion of scores for each category.
- Find the point (z score) on the normal distribution that corresponds to the cumulative proportion of scores at the lower and upper limit of each of the categories.
- Using a table of normal distribution densities and areas, find the mean z-score value for each of the categories using the formula:

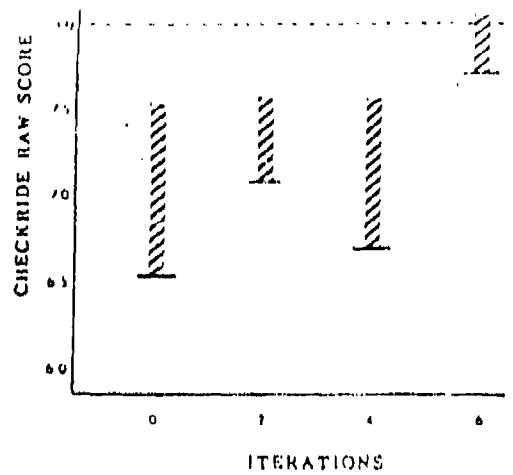
$$\text{mean of category} = \frac{(\text{density at lower limit}) - (\text{density at upper limit})}{(\text{area below upper limit}) - (\text{area below lower limit})}$$

- The mean value for a category is the normalized score for that category. It is substituted for the corresponding raw score.

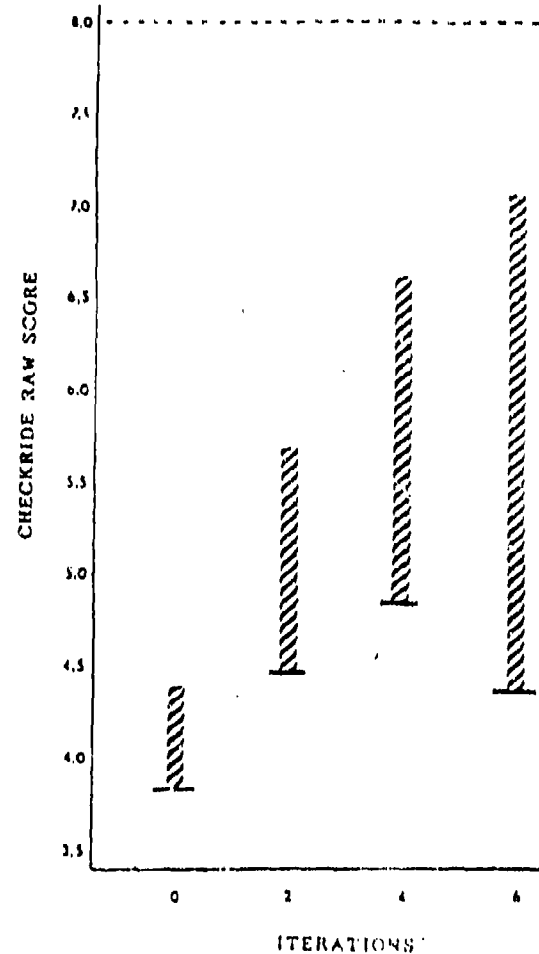
APPENDIX G

GRAPHICAL PRESENTATION OF INITIAL TO FINAL
CHECKRIDE CHANGES FOR RAW SCORE ITERATION GROUP MEANS

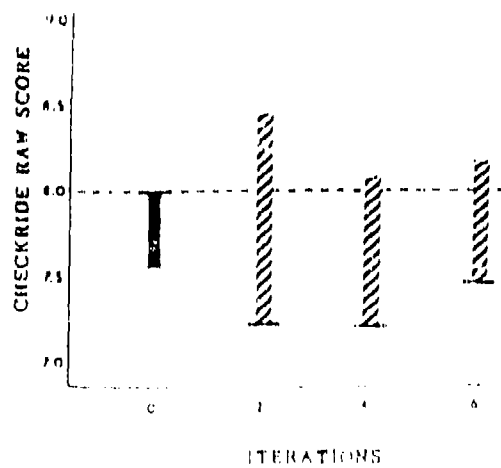
1. PLAN VER Flight



2. PREPARE WEIGHT AND BALANCE FORM

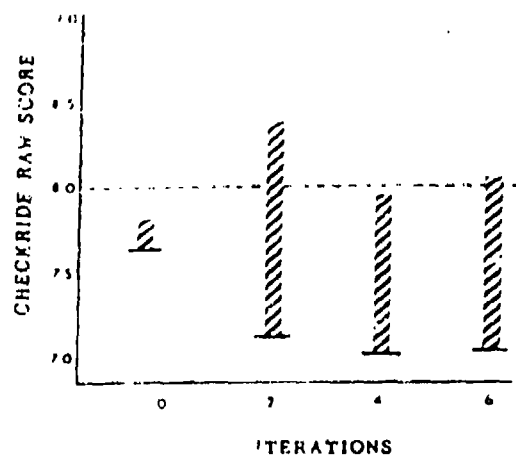


3. USE PERFORMANCE CHART

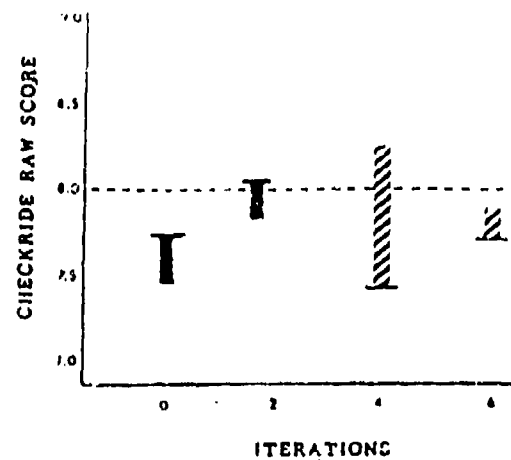


Note: **T** = Decrease from Initial Checkride; **///** = Increase from Initial Checkride.

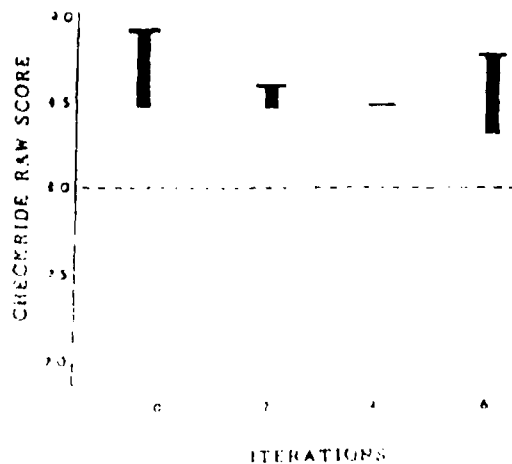
4. PREPARE PERFORMANCE PLANNING CARD



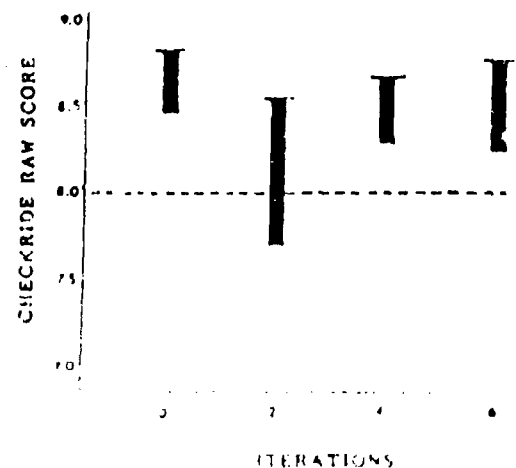
5. FUEL MANAGEMENT PROCEDURES



6. PREFLIGHT INSPECTION

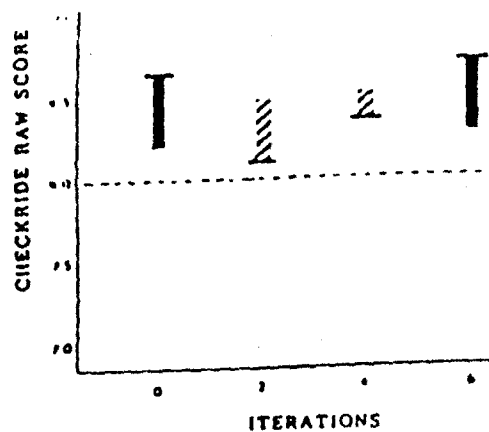


7. BEFORE TAKEOFF CHECKS

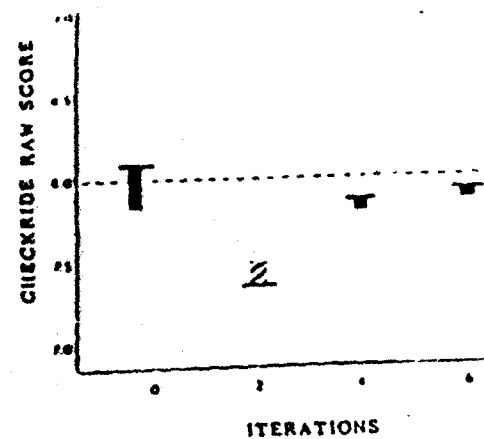


= Decrease from Initial Checkride
 = Increase from Initial Checkride

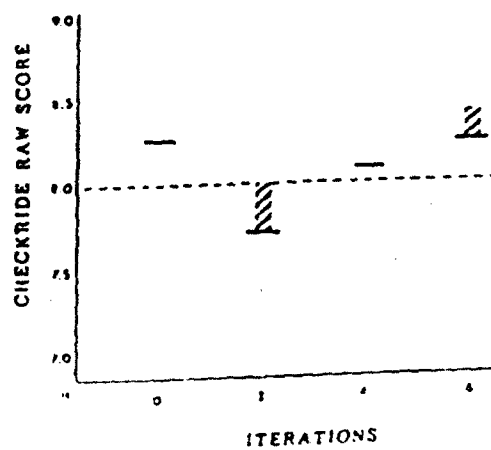
8. RADIO COMMUNICATIONS PROCEDURES



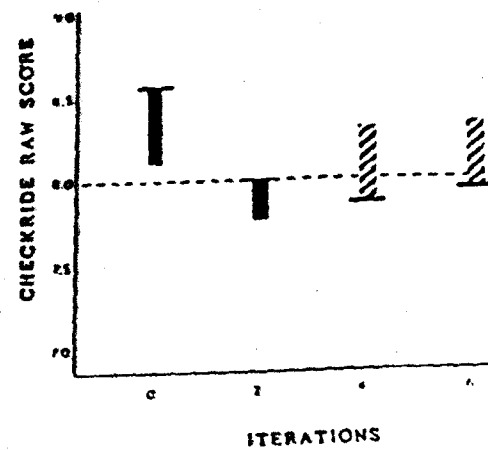
9. AFTER LANDING TASKS



10. TAKEOFF TO A HOVER

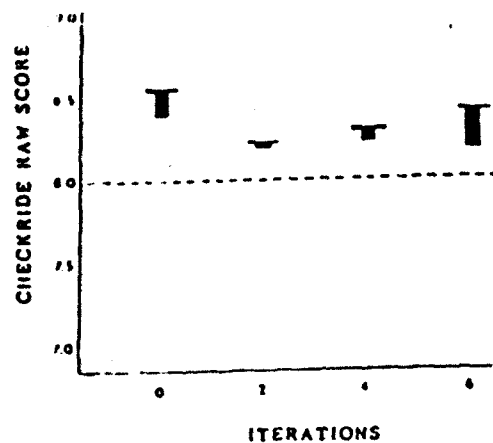


11. HOVER CHECKS

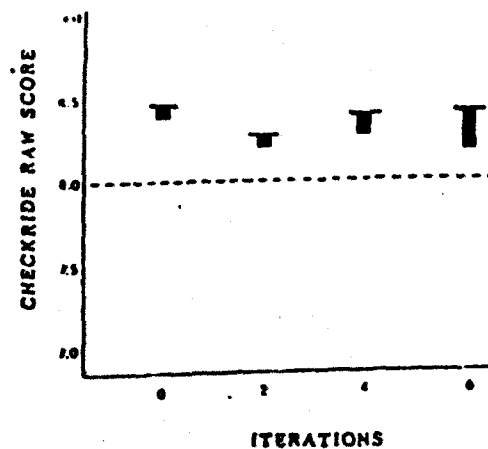


Note: **T** = Decrease from Initial Checkride; **Z** = Increase from Initial Checkride.

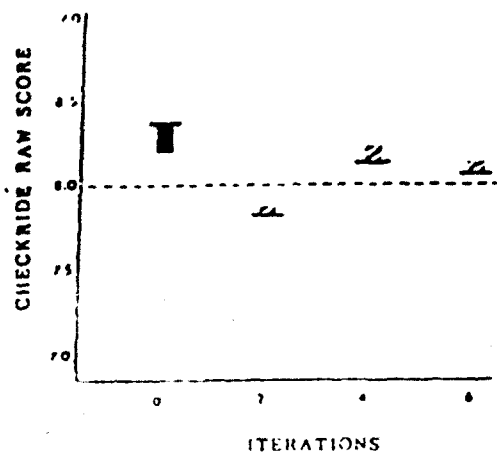
12. HOVERING TURN



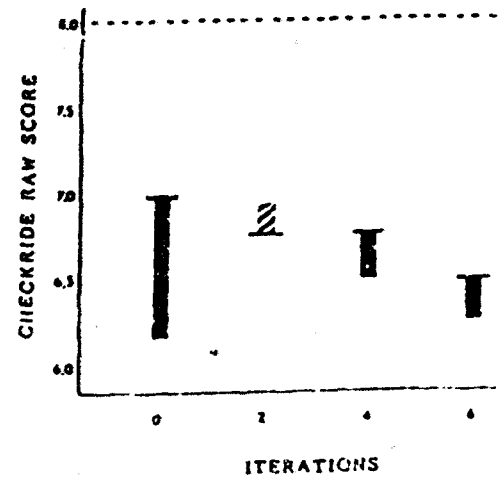
13. HOVERING FLIGHT



14. LANDING FROM A HOVER

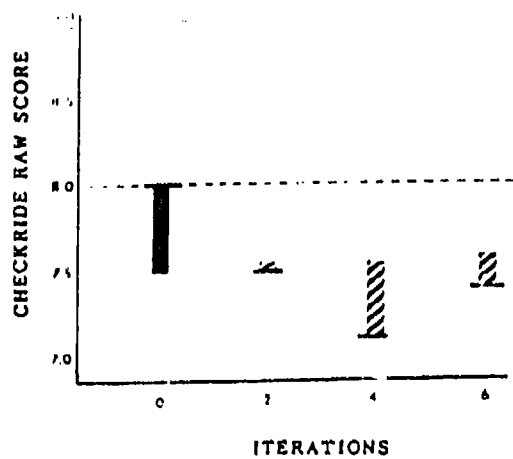


15. MANUAL THROTTLE OPERATION

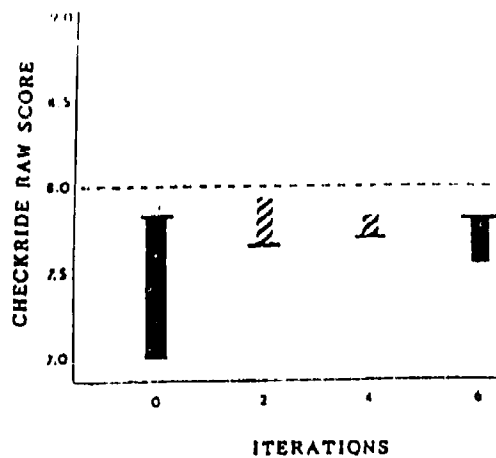


Note: T = Decrease from Initial Checkride; Z = Increase from Initial Checkride.

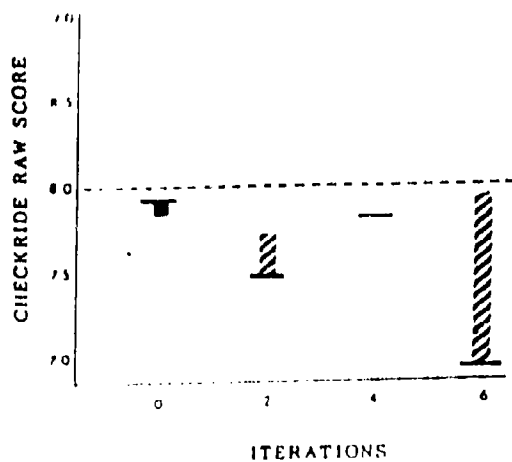
16. ENGINE FAILURE AT A HOVER



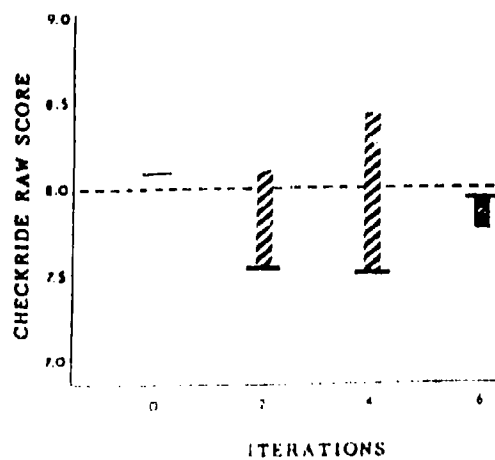
17. HOVERING AUTOROTATION



18. SLOPE OPERATIONS

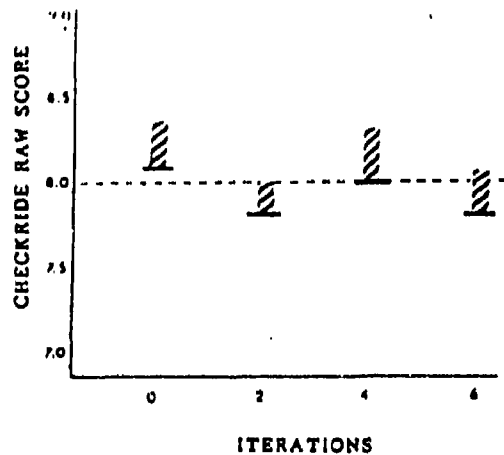


19. TRAFFIC PATTERN

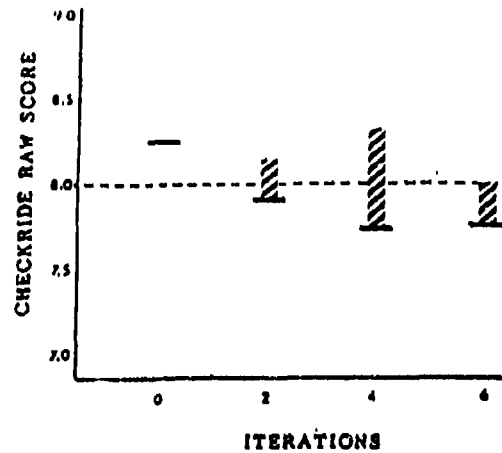


Note. **T** = Decrease from Initial Checkride. **///** = Increase from Initial Checkride.

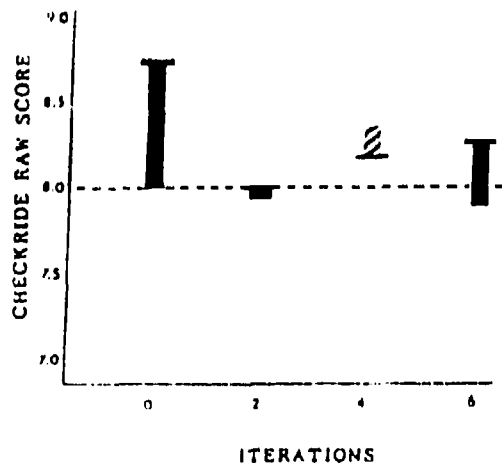
20. CLIMB/DESCEND



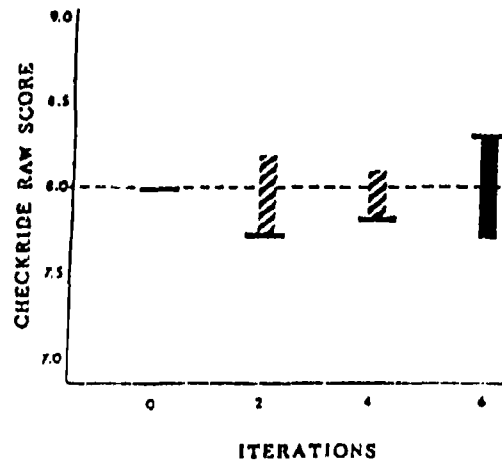
21. TURNS



22. STRAIGHT AND LEVEL FLIGHT

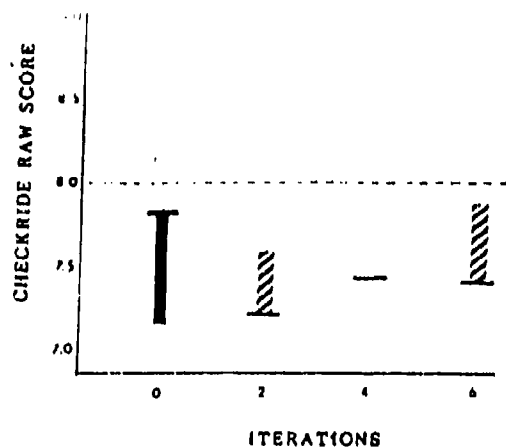


23. NORMAL TAKEOFF

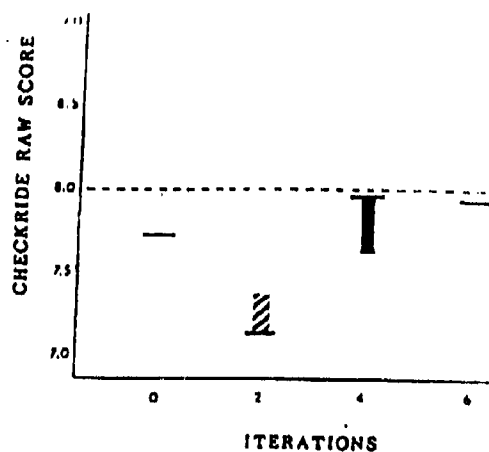


Note: **T** = Decrease from Initial Checkride; **I** = Increase from Initial Checkride.

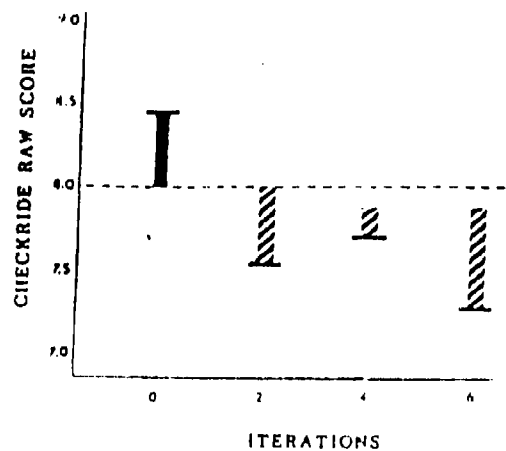
24. MAXIMUM PERFORMANCE TAKEOFF



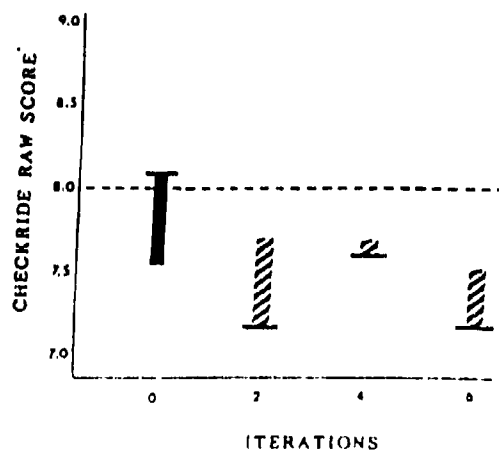
25. BEFORE LANDING CHECKS



26. NORMAL APPROACH

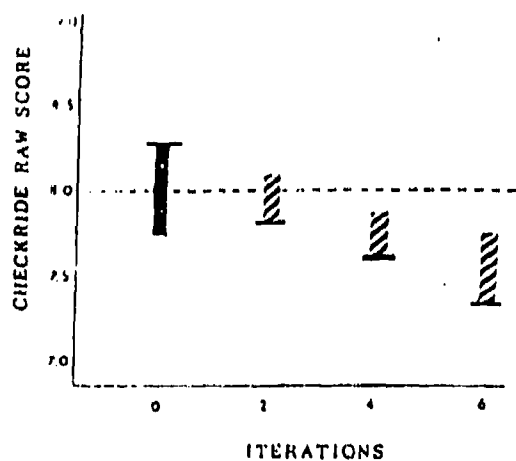


27. STEEP APPROACH

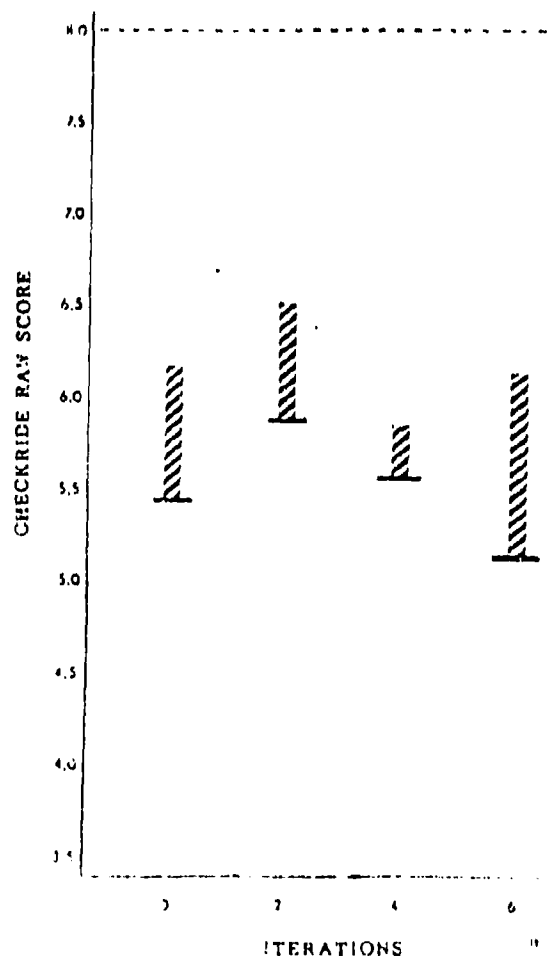


Note. **T** = Decrease from Initial Checkride; **hatched bar** = Increase from Initial Checkride.

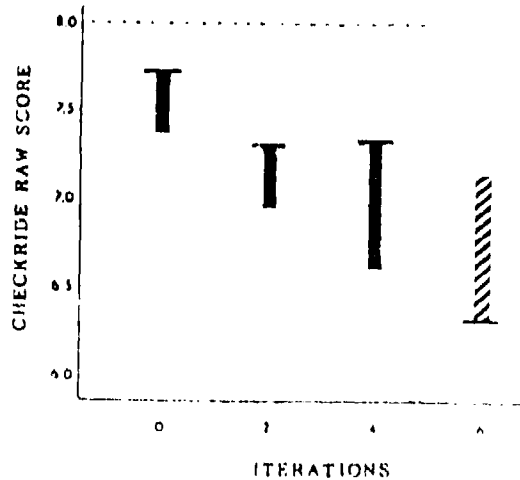
28. SHALLOW APPROACH TO A RUNNING LANDING



29. HYDRAULICS FAILURE

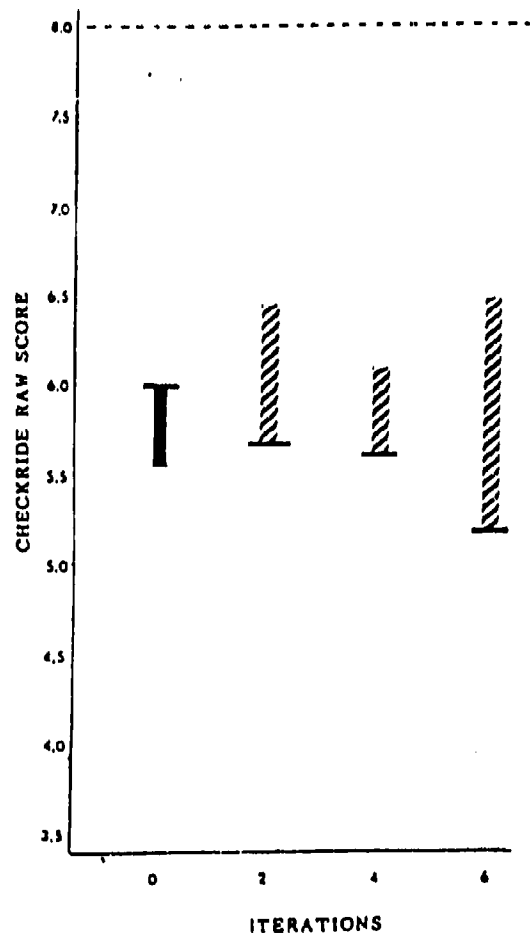


30. ANTITORQUE FAILURE--LEFT PEDAL

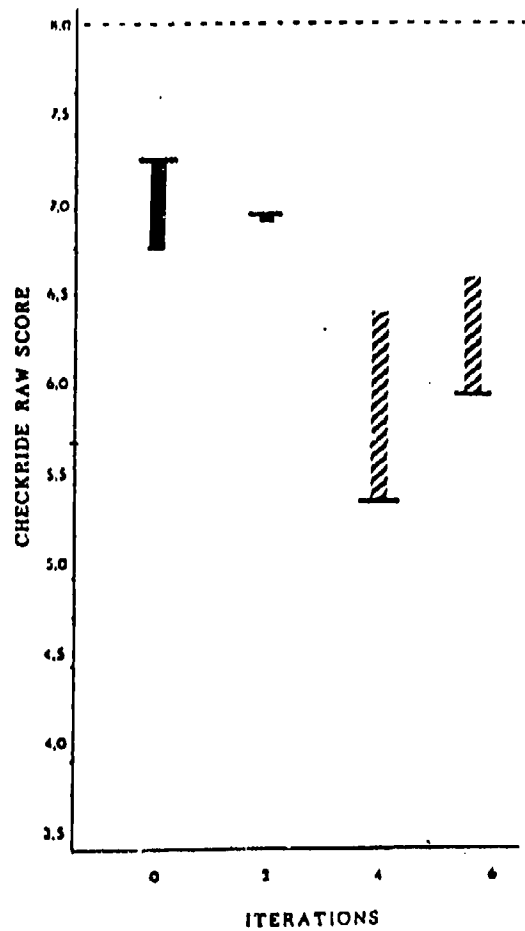


Note: **T** = Decrease from Initial Checkride; **|||||** = Increase from Initial Checkride.

31. ANTITORQUE FAILURE--RIGHT PEDAL

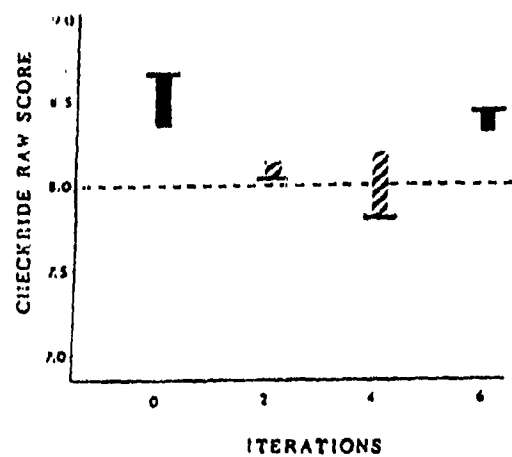


33. STANDARD AUTOROTATION

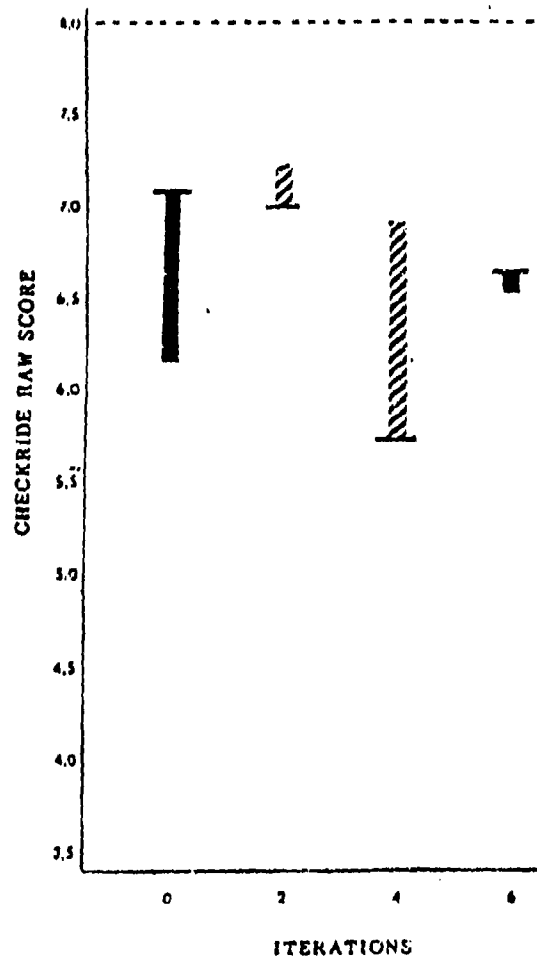


Note. **T** = Decrease from Initial Checkride; **▨** = Increase from Initial Checkride.

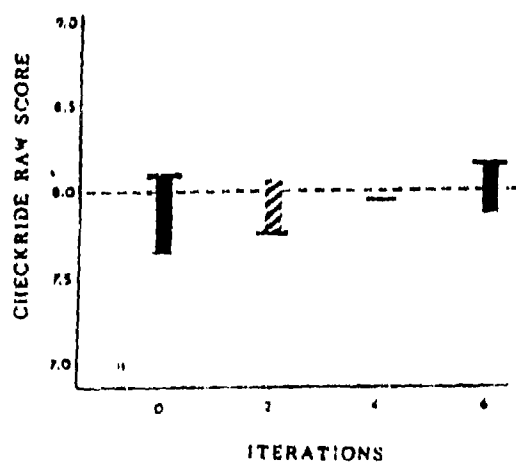
32. GO-AROUND



34. LOW LEVEL AUTOROTATION

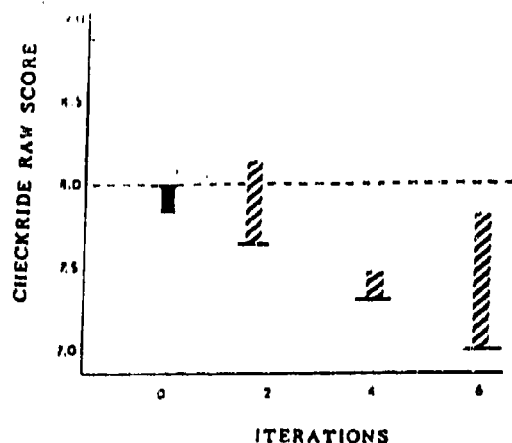


36. DECELERATION/ACCELERATION

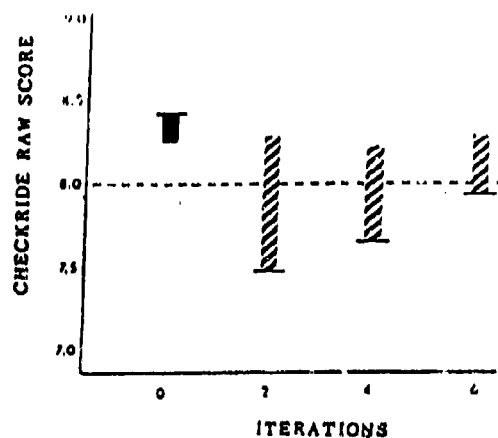


Note. **T** = Decrease from Initial Checkride; **hatched** = Increase from Initial Checkride.

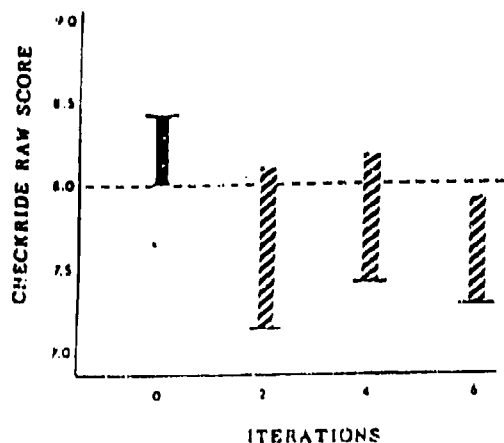
37. ENGINE FAILURE AT ALTITUDE



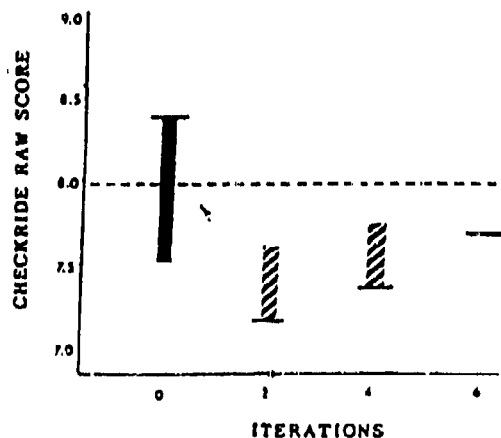
38. HIGH RECONNAISSANCE



39. CONFINED AREA OPERATIONS

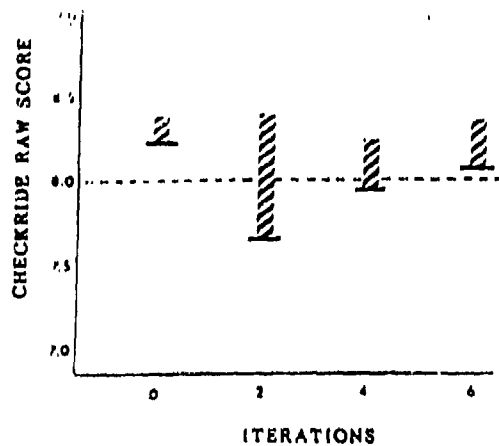


40. PINNACLE/RIDGELINE OPERATIONS

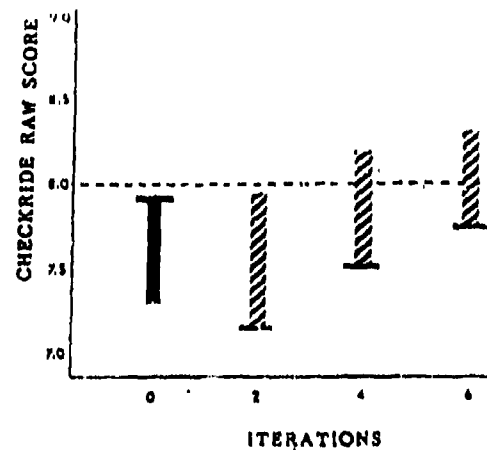


Note. **T** = Decrease from Initial Checkride; **▨** = Increase from Initial Checkride.

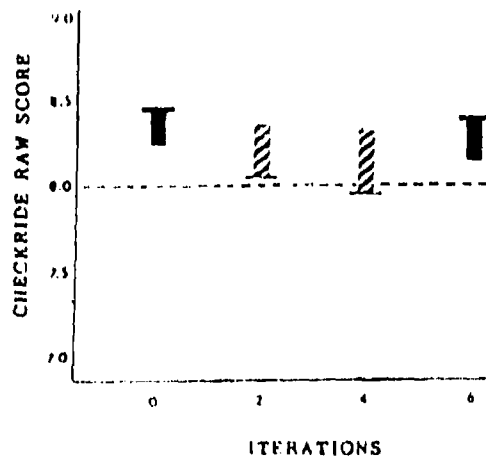
41. TERRAIN FLIGHT MISSION PLANNING



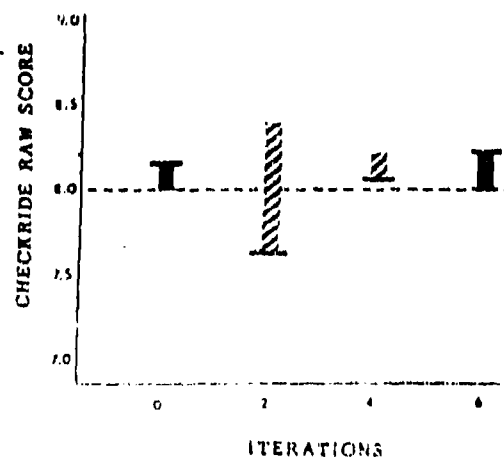
42. TERRAIN FLIGHT NAVIGATION



43. LOW-LEVEL FLIGHT

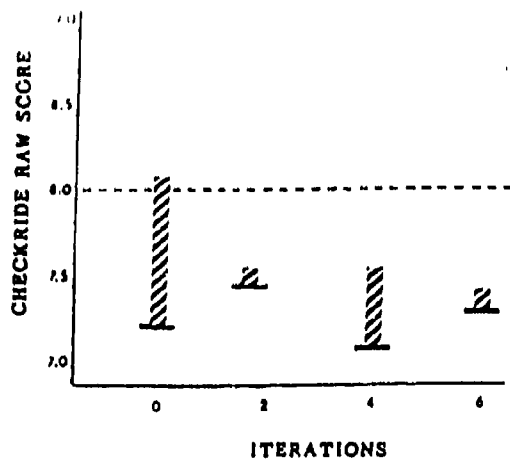


44. NOE FLIGHT

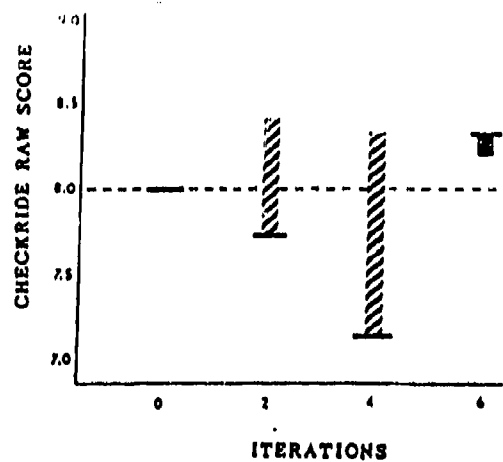


Note. **T** = Decrease from Initial Checkride; **hatched bar** = Increase from Initial Checkride.

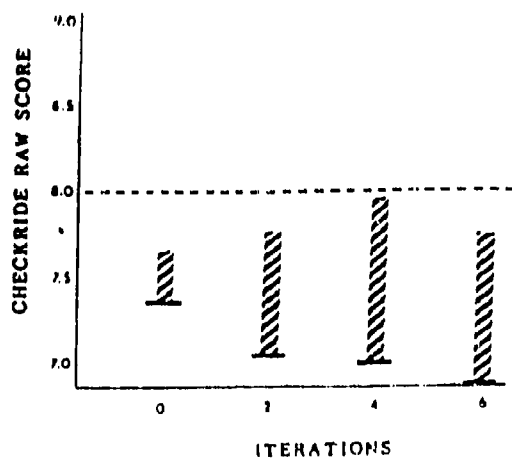
45. NOE DECELERATION



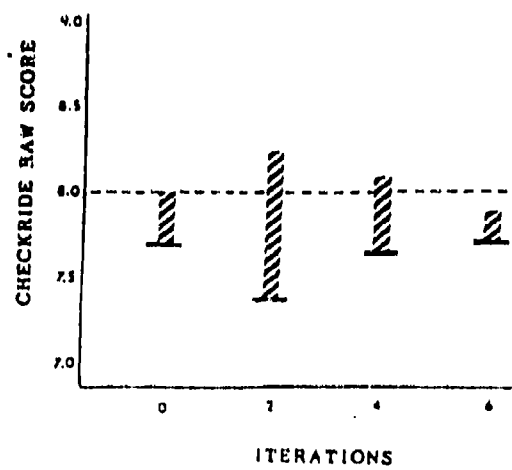
46. TERRAIN FLIGHT, APPROACH



47. OUT-OF-GROUND EFFECT CHECK



48. TERRAIN FLIGHT TAKEOFF



Note: **T** = Decrease from Initial Checkride, **▨** = Increase from Initial Checkride

APPENDIX H

MEANS, STANDARD DEVIATIONS, TASK-COMPOSITE CORRELATIONS,
AND CORRELATION MATRIX FOR FINAL CHECKRIDE NORMALIZED SCORES

SCORE CORRELATIONS AMONG FINAL CHECKRIDE NORMALIZED SCORES

ATM TASK	M	SD	r ^a
1. Plan FR Flight	.02	.95	.29
2. Weight and Balance Form	-.67	1.38	.23
3. Use Performance Charts	.47	.96	.34
4. Prepare Performance Planning Card (PPC)	.35	.85	.36
5. Fuel Management	.30	1.02	.23
6. Preflight Inspection	.57	.40	.46
7. Before Takeoff Checks	.32	.73	.28
8. Communications Procedures	.51	.51	.45
9. After Landing Tasks	-.06	.70	.48
10. Takeoff to Hover	.29	.57	.46
11. Hover Check	.28	.62	.17
12. Hover Turn	.36	.43	.55
13. Hover Flight	.37	.42	.50
14. Landing from Hover	.27	.53	.56
15. Manual Throttle Operation	-.67	.87	.57
16. Engine Failure at Hover	-.13	.81	.66
17. Hovering Autorotation	-.05	.74	.64
18. Slope Operations	.01	.61	.52
19. Traffic Pattern	.25	.58	.53
20. Climb/Descend	.29	.44	.50
21. Turns	.33	.55	.65
22. Straight-and-Level Flight	.25	.62	.63
23. Normal Takeoff	.21	.62	.64
24. Maximum Performance Takeoff	-.11	.78	.68
25. Before Landing Checks	-.06	.85	.45
26. Normal Approach	.07	.65	.68
27. Steep Approach	-.15	.66	.53
28. Shallow Approach Running Landing	.16	.76	.45
29. Hydraulic Failure	-.41	.96	.64
30. Antitorque Failure - Left	-.78	1.02	.66
31. Antitorque Failure - Right	-.85	.97	.67
32. Go-Around	.34	.47	.46
33. Standard Autorotation	-.62	.98	.66
34. Low-Level Autorotation	-.53	.93	.63
36. Deceleration/Acceleration	.17	.73	.45
37. Engine Failure at Altitude	.10	.76	.39
38. High Reconnaissance	.43	.53	.58
39. Confined Area Operations	.23	.59	.51
40. Pinnacle/Ridgeline Operations	.04	.72	.57
41. Terrain Flight Mission Planning	.51	.40	.59
42. Terrain Flight Navigation	.37	.74	.52
43. Low-Level Flight	.47	.51	.54
44. NOE Flight	.41	.60	.68
45. NOE Deceleration	-.04	.86	.52
46. Terrain Flight Approach	.45	.50	.59
47. Out-of-Ground-Effect Check	.10	.85	.46
48. Terrain Flight Takeoff	.32	.65	.61

^aCorrelations greater than .23 are significant at the .05 level. Those greater than .30 are significant at the .01 level.

INTERCORRELATIONS AMONG FINAL CHECKRIDE NORMALIZED SCORES

TASK	1	2	3	4	5	6	7	8	9	10	11	12
1. Plan VFR Flight	--	.26	.02	.06	.15	.05	-.14	-.04	.03	.05	-.25	.29
2. Weight and Balance	.26	--	.07	.07	.21	.07	-.14	.18	-.07	.10	-.14	.04
3. Performance Charts	.02	.07	--	.36	.18	-.06	-.19	.15	.13	.20	-.10	.04
4. Prepare PPC	.06	.07	.86	--	.31	-.13	-.19	.07	.07	.14	-.12	.03
5. Fuel Management	.15	.21	.18	.31	--	-.08	-.02	-.01	.07	.01	-.00	.02
6. Preflight Inspect	.05	.07	-.06	-.13	-.08	--	.50	.52	.38	.28	.18	.20
7. Before T/O Checks	-.14	-.14	-.19	-.19	-.02	.50	--	.33	.51	.10	.56	.08
8. Radio Procedure	-.04	.18	.15	.07	-.01	.52	.33	--	.32	.27	.07	.17
9. After Land Tasks	.03	-.07	.13	.07	.07	.38	.51	.32	--	.25	.32	.21
10. T/O to Hover	.05	.10	.20	.14	.01	.28	.10	.27	.25	--	.27	.59
11. Hover Check	-.25	-.14	-.10	-.12	-.00	.16	.56	.07	.32	.27	--	.10
12. Hovering Turn	.29	.04	.04	.03	.02	.20	.08	.17	.21	.59	.10	--
13. Hovering Flight	.24	.06	.02	-.00	.03	.19	.10	.22	.11	.41	.04	.69
14. Landing From Hover	.29	.08	.18	.15	.09	.14	.14	.10	.20	.70	.24	.80
15. Manual Throttle Opn	.16	.07	.26	.29	.35	.04	.03	.20	.30	.15	.00	.25
16. Engine Fail Hover	.26	.07	.24	.23	.04	.17	.07	.26	.23	.32	.05	.43
17. Hovering Auto	.19	.21	.34	.36	.02	.17	.05	.30	.05	.31	.08	.34
18. Slope Operations	.23	.12	.02	.05	.06	.29	.01	.25	.09	.19	.00	.32
19. Traffic Pattern	.09	.11	-.01	-.01	-.03	.14	.15	.19	.19	.20	.10	.31
20. Climb/Descend	.24	.13	-.04	-.02	.04	.29	.02	.07	.06	.26	-.12	.41
21. Turns	.15	.12	.14	.07	.01	.52	.13	.22	.29	.38	.03	.42
22. Straight/Level Flt	.05	.11	.04	-.04	-.02	.40	.27	.31	.40	.36	.19	.38
23. Normal Takeoff	.12	.18	.30	.30	.09	.36	.07	.28	.28	.43	.08	.42
24. Max Performance T/O	.17	.18	.31	.28	.19	.25	.08	.24	.41	.33	.09	.35
25. Before Land Checks	-.03	.06	.02	-.06	.09	.41	.36	.31	.50	.22	.39	.15
26. Normal Approach	.24	.06	.41	.38	.09	.04	.04	.24	.38	.41	-.05	.50
27. Steep Approach	.01	-.08	.31	.27	.07	.13	.03	.15	.40	.23	-.01	.26
28. Shallow App Run Land	.05	.05	.03	.05	.16	.23	.17	.13	.20	.04	.13	.04
29. Hydraulic Failure	.23	.14	.06	.13	.20	.27	.20	.13	.21	.15	.08	.32
30. Antitorque Fail-L	.15	.15	.07	.08	.11	.45	.33	.29	.39	.26	.11	.23
31. Antitorque Fail-R	.12	.12	.27	.29	.13	.29	.28	.33	.31	.20	.15	.16
32. Go-Around	.21	.00	.06	.15	.06	.24	.17	-.01	.19	.19	.03	.41
33. Standard Auto	.29	.12	.32	.39	.13	.26	.07	.28	.25	.22	-.01	.28
34. Low Level Auto	.13	.13	.21	.22	.02	.21	.05	.32	.28	.37	.08	.34
36. Deccl/Accel	.03	.07	.03	.06	.12	.12	.03	.25	.12	.01	.05	.15
37. Eng Fail at Alt	.23	.05	-.01	-.04	-.10	.17	.07	.14	.01	.07	-.07	.23
38. High Reconnaissance	.06	-.04	.21	.27	.14	.08	.05	.16	.22	.21	.14	.18
39. Confined Area Opns	.05	.03	.14	.18	.05	.10	.19	.21	.22	.15	.31	.17
40. Ptn/Ridgeline Opns	.72	.15	.13	.23	.05	.12	.08	.10	.35	.15	.06	.20
41. Ter Flight Plan	.16	-.01	.07	.11	.04	.48	.30	.36	.27	.21	.09	.40
42. Ter Flight Nav	.14	.12	.31	.26	.10	.31	.02	.25	.11	.11	-.06	.25
43. Low Level Flight	.55	-.01	-.03	.06	.04	.53	.37	.38	.34	.20	.15	.26
44. NOE Flight	.06	.09	.19	.32	.09	.33	.16	.29	.24	.15	.01	.30
45. NOE Deceleration	.09	-.02	.06	.05	-.01	.26	.13	.17	.18	.39	.18	.51
46. Ter Flight Approach	.11	.04	.18	.25	.05	.24	.07	.31	.22	.24	.06	.37
47. OGE Check	-.02	.03	-.00	.04	.03	.30	.25	.36	.19	.21	.06	.36
48. Ter Flight Takeoff	.07	.07	.11	.10	.08	.57	.26	.32	.28	.22	.04	.25

Note. N = 78. Correlations greater than .21 are significant at the .05 level. Those greater than .30 are significant at the .01 level.

INTERCORRELATIONS AMONG FINAL CHECKRIDE NORMALIZED SCORES

TASK	13	14	15	16	17	18	19	20	21	22	23	24
1. Plan VFR Flight	.24	.29	.16	.26	.19	.23	.09	.24	.15	.05	.12	.17
2. Weight and Balance	.06	.08	.07	.07	.21	.11	.11	.13	.12	.11	.18	.18
3. Performance Charts	.02	.18	.26	.24	.34	.02	-.01	-.04	.14	.04	.30	.31
4. Prepare PPC	-.00	.15	.29	.23	.36	.05	-.01	-.02	.07	-.04	.30	.28
5. Fuel Management	.03	.09	.33	.04	.02	.06	-.03	.04	.01	-.02	.09	.18
6. Preflight Inspect	.19	.14	.04	.17	.17	.29	.14	.29	.52	.40	.36	.25
7. Before T/O Checks	.10	.14	.03	.07	.05	.01	.15	.02	.13	.27	.07	.08
8. Radio Procedure	.22	.10	.20	.26	.30	.25	.19	.07	.22	.31	.28	.24
9. After Land Tasks	.11	.20	.30	.23	.06	.09	.19	.06	.29	.40	.28	.41
10. T/O to Hover	.41	.70	.15	.32	.31	.19	.20	.26	.38	.36	.43	.33
11. Hover Check	.04	.24	.00	.05	.08	.00	.10	-.12	.03	.19	.08	.09
12. Hovering Turn	.69	.80	.25	.43	.34	.32	.31	.41	.42	.38	.42	.35
13. Hovering Flight	--	.65	.26	.34	.25	.30	.33	.34	.32	.33	.53	.31
14. Landing From Hover	.65	--	.23	.48	.38	.32	.32	.39	.40	.37	.45	.38
15. Manual Throttle Opn	.26	.23	--	.38	.36	.31	.22	.12	.19	.32	.35	.38
16. Engine Fail Hover	.34	.48	.39	--	.70	.43	.30	.35	.37	.38	.33	.42
17. Hovering Auto	.25	.38	.36	.70	--	.41	.35	.35	.40	.39	.34	.39
18. Slope Operations	.30	.32	.31	.43	.41	--	.27	.41	.39	.33	.39	.32
19. Traffic Pattern	.33	.32	.22	.40	.35	.27	--	.62	.60	.74	.36	.28
20. Climb/Descend	.34	.39	.12	.35	.35	.41	.62	--	.78	.56	.33	.37
21. Turns	.32	.40	.19	.37	.40	.39	.60	.78	--	.74	.49	.52
22. Straight/Level Flt	.33	.37	.32	.38	.39	.33	.74	.56	.74	--	.44	.38
23. Normal Takeoff	.53	.45	.35	.33	.34	.39	.36	.33	.49	.44	--	.39
24. Max Performance T/O	.31	.38	.38	.42	.39	.32	.28	.37	.52	.38	.39	--
25. Before Land Checks	.15	.17	.33	.25	.16	.19	.19	.04	.25	.46	.21	.37
26. Normal Approach	.51	.54	.41	.55	.46	.38	.40	.40	.37	.35	.52	.48
27. Steep Approach	.23	.30	.27	.33	.27	.19	.33	.28	.37	.35	.32	.42
28. Shallow App Run Land	.18	.13	.33	.18	.26	.18	.12	.16	.31	.26	.33	.31
29. Hydraulic Failure	.24	.27	.45	.38	.43	.35	.24	.40	.42	.25	.30	.34
30. Antitorque Fail-L	.11	.24	.33	.45	.36	.38	.24	.25	.41	.40	.35	.38
31. Antitorque Fail-R	.21	.27	.37	.53	.47	.36	.33	.20	.32	.36	.27	.46
32. Go-Around	.35	.31	.19	.35	.27	.19	.28	.33	.29	.25	.26	.24
33. Standard Auto	.11	.29	.29	.53	.44	.34	.29	.25	.38	.38	.29	.41
34. Low Level Auto	.18	.30	.33	.50	.39	.35	.38	.21	.34	.36	.48	.34
36. Decel/Accel	.33	.06	.32	.18	.16	.34	.40	.31	.20	.27	.23	.31
37. Eng Fail at Alt	.32	.21	.29	.31	.27	.21	.16	.15	.19	.15	.23	.23
38. High Reconnaissance	.24	.19	.30	.30	.32	.14	.39	.25	.33	.31	.30	.40
39. Confined Area Opns"	.24	.23	.36	.25	.33	.24	.30	.15	.23	.40	.29	.19
40. Pin/Ridgeline Opns	.19	.23	.45	.28	.31	.20	.30	.24	.29	.37	.32	.40
41. Ter Flight Plan	.30	.23	.74	.32	.29	.32	.23	.32	.42	.30	.42	.27
42. Ter Flight Nav	.14	.18	.29	.25	.35	.25	.16	.22	.29	.25	.32	.36
43. Low Level Flight	.22	.13	.23	.21	.21	.14	.34	.22	.36	.40	.35	.31
44. NOE Flight	.22	.18	.35	.33	.39	.37	.32	.24	.38	.34	.40	.40
45. NOE Deceleration	.35	.41	.13	.41	.33	.41	.28	.37	.40	.26	.27	.29
46. Ter Flight Approach	.32	.24	.20	.29	.34	.11	.40	.32	.39	.39	.29	.41
47. OGE Check	.42	.25	.17	.17	.17	.10	.36	.27	.27	.29	.17	.18
48. Ter Flight Takeoff	.37	.15	.28	.27	.27	.16	.27	.24	.44	.44	.46	.46

Note. N = 78. Correlations greater than .23 are significant at the .05 level. Those greater than .30 are significant at the .01 level.

INTERCORRELATIONS AMONG FINAL CHECKRIDE NORMALIZED SCORES

TASK	25	26	27	28	29	30	31	32	33	34	36	37
1. Plan VFR Flight	-.03	.24	.01	.05	.23	.15	.12	.21	.29	.13	.03	.23
2. Weight and Balance	.06	.06	-.08	.05	.14	.15	.12	.00	.12	.13	.07	.05
3. Performance Charts	.02	.41	.31	.03	.06	.07	.27	.06	.32	.21	.03	-.01
4. Prepare PPC	-.06	.38	.27	.05	.13	.08	.29	.13	.39	.22	.06	-.04
5. Fuel Management	.09	.09	.07	.16	.20	.11	.13	.06	.13	.02	.12	-.10
6. Preflight Inspect	.41	.04	.13	.23	.27	.45	.29	.24	.26	.21	.12	.17
7. Before T/O Checks	.36	.04	.03	.17	.20	.33	.28	.17	.07	.05	.03	.07
8. Radio Procedure	.31	.24	.15	.13	.13	.29	.33	.01	.28	.32	.25	.14
9. After Land Tasks	.50	.38	.40	.20	.21	.40	.31	.19	.25	.28	.12	.01
10. T/O to Hover	.22	.41	.23	.04	.15	.26	.20	.19	.22	.32	.01	.07
11. Hover Check	.39	-.05	-.01	.13	.08	.11	.15	.03	-.01	.08	.05	-.07
12. Hovering Turn	.15	.50	.26	.04	.32	.23	.16	.41	.28	.34	.15	.23
13. Hovering Flight	.15	.51	.23	.18	.24	.11	.21	.35	.11	.18	.33	.32
14. Landing From Hover	.17	.54	.30	.13	.27	.24	.27	.31	.29	.30	.06	.21
15. Manual Throttle Opn	.33	.41	.27	.33	.45	.33	.37	.19	.29	.33	.32	.29
16. Engine Fail Hover	.25	.55	.33	.18	.38	.45	.53	.35	.53	.50	.18	.31
17. Hovering Auto	.16	.46	.27	.26	.43	.36	.47	.27	.44	.39	.16	.27
18. Slope Operations	.19	.38	.19	.18	.35	.38	.36	.19	.34	.35	.34	.21
19. Traffic Pattern	.19	.40	.33	.12	.24	.24	.33	.28	.29	.38	.40	.16
20. Climb/Descend	.04	.40	.28	.16	.40	.25	.21	.33	.25	.21	.31	.15
21. Turns	.25	.37	.37	.31	.42	.41	.32	.29	.36	.34	.20	.19
22. Straight/Level Flt	.46	.35	.35	.26	.25	.40	.36	.25	.38	.36	.27	.15
23. Normal Takeoff	.21	.52	.32	.33	.30	.35	.27	.26	.29	.48	.23	.23
24. Max Performance T/O	.37	.48	.42	.31	.34	.38	.46	.24	.41	.34	.31	.23
25. Before Land Checks	--	.10	.12	.14	.20	.25	.38	.32	.18	.16	.16	.09
26. Normal Approach	.10	--	.64	.20	.37	.36	.46	.21	.46	.47	.37	.19
27. Steep Approach	.12	.64	--	.26	.23	.34	.29	.14	.41	.46	.34	.02
28. Shallow App Run Land	.14	.20	.26	--	.49	.50	.42	.11	.33	.32	.14	.24
29. Hydraulic Failure	.20	.37	.23	.49	--	.55	.45	.31	.40	.39	.22	.45
30. Antitorque Fail-L	.25	.36	.34	.50	.55	--	.69	.21	.59	.54	.18	.45
31. Antitorque Fail-R	.38	.46	.29	.42	.45	.69	--	.28	.55	.52	.26	.28
32. Go-Around	.32	.21	.14	.11	.31	.21	.28	--	.14	.16	.10	.24
33. Standard Auto	.18	.46	.41	.33	.40	.59	.55	.14	--	.68	.19	.10
34. Low Level Auto	.16	.47	.46	.32	.39	.54	.52	.16	.68	--	.14	.20
36. Decel/Accel	.16	.37	.34	.14	.22	.18	.26	.10	.18	.14	--	.21
37. Eng Fail at Alt	.09	.19	.02	.24	.45	.13	.28	.24	.10	.20	.21	--
38. High Reconnaissance	.12	.38	.37	.33	.29	.24	.32	.25	.36	.30	.45	.26
39. Confined Area Opns	.23	.25	.29	.36	.29	.28	.26	.16	.28	.33	.37	.17
40. Pin/Ridgeline Opns	.17	.34	.43	.40	.35	.50	.42	.25	.39	.43	.34	.07
41. Ter Flight Plan	.25	.28	.18	.10	.38	.30	.24	.42	.23	.23	.41	.36
42. Ter Flight Nav	.20	.29	.27	.12	.33	.23	.24	.34	.31	.23	.27	.25
43. Low Level Flight	.41	.11	.08	.11	.26	.31	.26	.52	.20	.24	.21	.79
44. NOE Flight	.26	.35	.35	.27	.37	.39	.33	.37	.53	.45	.41	.26
45. OE Deceleration	.10	.36	.23	.06	.47	.31	.20	.33	.32	.34	.31	.31
46. Ter Flight Approach	.23	.31	.30	.17	.26	.24	.31	.31	.41	.35	.27	.29
47. OGE Check	.27	.27	.16	-.03	.23	.12	.21	.29	.09	.14	.30	.28
48. Ter Flight Takeoff	.29	.22	.20	.25	.33	.38	.26	.29	.27	.19	.36	.27

Note. N = 78. Correlations greater than .23 are significant at the .05 level. Those greater than .30 are significant at the .01 level.

INTERCORRELATIONS AMONG FINAL CHECKRIDE NORMALIZED SCORES

TASK	38	39	40	41	42	43	44	45	46	47	48
1. Plan VFR Flight	.56	-.05	.07	.16	.14	.05	.06	.09	.11	-.07	.07
2. Weight and Balance	-.04	.03	.15	-.01	.12	-.01	.09	-.02	-.04	.02	.07
3. Performance Chart	.21	.14	.13	.07	.31	-.03	.19	.06	.18	-.00	.11
4. Prepare PPC	.27	.18	.23	.11	.26	.06	.32	.05	.25	.04	.10
5. Fuel Management	.17	.05	.05	.04	.10	.04	.09	-.01	.05	.03	.08
6. Preflight Inspect	.08	.10	.12	.48	.31	.53	.33	.26	.24	.30	.57
7. Before T/O Checks	.05	.19	.08	.30	.02	.37	.16	.13	.07	.25	.26
8. Radio Procedure	.18	.21	.10	.36	.25	.38	.29	.17	.31	.36	.32
9. After Land Tasks	.22	.22	.35	.27	.11	.34	.24	.19	.22	.19	.28
10. T/O to Hover	.21	.15	.15	.21	.11	.20	.15	.39	.24	.21	.22
11. Hover Check	.14	.31	.06	.09	-.06	.15	.00	.18	.06	.06	.04
12. Hovering Turn	.18	.17	.20	.39	.25	.26	.30	.51	.37	.36	.29
13. Hovering Flight	.24	.24	.19	.30	.14	.22	.22	.35	.32	.42	.37
14. Landing From Hover	.19	.23	.23	.23	.18	.13	.18	.41	.24	.25	.15
15. Manual Throttle Opn	.30	.36	.45	.24	.29	.23	.35	.13	.20	.17	.26
16. Engine Fail Hover	.30	.25	.28	.32	.25	.21	.33	.41	.29	.17	.27
17. Hovering Auto	.32	.33	.31	.29	.35	.21	.39	.33	.34	.17	.27
18. Slope Operations	.14	.24	.20	.32	.25	.14	.37	.41	.11	.10	.16
19. Traffic Pattern	.39	.30	.30	.23	.16	.34	.32	.28	.40	.36	.27
20. Climb/Descend	.25	.15	.24	.32	.22	.22	.24	.37	.32	.27	.24
21. Turns	.33	.23	.29	.42	.29	.36	.38	.40	.39	.27	.44
22. Straight/Level Flt	.31	.40	.37	.30	.25	.40	.34	.26	.39	.29	.44
23. Normal Takeoff	.30	.29	.32	.42	.32	.35	.40	.22	.29	.37	.46
24. Max Performance T/O	.40	.19	.40	.27	.36	.31	.40	.29	.41	.18	.46
25. Before Land Checks	.12	.23	.18	.25	.20	.41	.26	.10	.23	.27	.29
26. Normal Approach	.38	.25	.34	.28	.29	.11	.35	.36	.31	.27	.22
27. Steep Approach	.37	.29	.43	.18	.27	.08	.35	.23	.30	.16	.23
28. Shallow App Run Land	.3	.36	.40	.10	.12	.11	.22	.06	.17	-.03	.25
29. Hydraulic Failure	.29	.29	.35	.38	.33	.26	.39	.47	.26	.23	.33
30. Antitorque Fail-L	.24	.28	.50	.30	.23	.31	.39	.31	.24	.12	.38
31. Antitorque Fail-R	.32	.26	.42	.24	.24	.26	.33	.20	.31	.21	.26
32. Go-Around	.25	.16	.25	.42	.34	.52	.37	.22	.31	.29	.29
33. Standard Autp	.36	.28	.40	.23	.31	.20	.53	.32	.41	.09	.27
34. Low Level Auto	.30	.33	.43	.23	.23	.24	.45	.34	.35	.14	.19
36. Decel/Accel	.45	.37	.34	.41	.27	.21	.41	.31	.27	.30	.36
37. Eng Fail at Alt	.26	.17	.07	.39	.28	.29	.26	.31	.29	.28	.37
38. High Reconnaissance	--	.63	.41	.39	.31	.45	.57	.29	.66	.31	.47
39. Confined Area Opns	.63	--	.61	.26	.19	.25	.42	.23	.40	.21	.23
40. Pin/Ridgeline Opns	.41	.61	--	.17	.15	.22	.41	.22	.36	.15	.25
41. Ter Flight Plan	.39	.26	.17	--	.58	.69	.56	.41	.40	.49	.57
42. Ter Flight Nav	.31	.19	.15	.58	--	.50	.46	.18	.33	.36	.48
43. Low Level Flight	.45	.25	.22	.69	.50	--	.60	.26	.52	.47	.65
44. NOE Flight	.57	.42	.41	.56	.46	.60	--	.48	.68	.39	.59
45. NOE Deceleration	.29	.25	.22	.41	.18	.26	.48	--	.36	.24	.37
46. Ter Flight Approach	.66	.40	.36	.40	.32	.52	.68	.36	--	.47	.59
47. OGE Check	.31	.21	.15	.49	.36	.47	.39	.24	.47	--	.58
48. Ter Flight Takeoff	.47	.23	.25	.57	.48	.65	.59	.37	.59	.58	--

Note. N = 78. Correlations greater than .23 are significant at the .05 level. Those greater than .30 are significant at the .01 level.

APPENDIX I

**MEANS, STANDARD DEVIATIONS, AND INTERCORRELATIONS
FOR CONFIDENCE RATINGS AND FINAL CHECKRIDE NORMALIZED SCORES**

1. PLAN VFR Flight

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	78.32	14.62	--	--	--	--	--	--
2. Checkride Score	-.41	.96	.04	--	--	--	--	--
3. Post-Confidence Rating	81.75	13.53	.60**	.11	--	--	--	--
Final Checkride								
4. Pre-Confidence Rating	75.41	16.50	.09	.21*	.30**	--	--	--
5. Checkride Score	.02	.95	.01	.24*	-.04	.02	--	--
6. Post-Confidence Rating	81.38	14.76	.32**	.02	.51**	.66**	.02	--

2. PREPARE WEIGHT AND BALANCE FORM

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	53.03	26.66	--	--	--	--	--	--
2. Checkride Score	-1.51	.89	.37**	--	--	--	--	--
3. Post-Confidence Rating	59.82	27.50	.74**	.47**	--	--	--	--
Final Checkride								
4. Pre-Confidence Rating	59.50	26.56	.42**	.37**	.37**	--	--	--
5. Checkride Score	-.67	1.38	-.01	.15	.05	.35**	--	--
6. Post-Confidence Rating	69.77	22.80	.42**	.27*	.36**	.68**	.30**	--

3. USE PERFORMANCE CHART

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	66.05	20.96	--	--	--	--	--	--
2. Checkride Score	-.11	1.04	.19	--	--	--	--	--
3. Post-Confidence Rating	65.77	23.29	.76**	.34**	--	--	--	--
Final Checkride								
4. Pre-Confidence Rating	66.05	20.96	.38**	.03	.39**	--	--	--
5. Checkride Score	-.11	1.04	.08	.15	.23**	.13	--	--
6. Post-Confidence Rating	65.77	23.19	.30**	.10	.42**	.76**	.12	--

4. PREPARE PERFORMANCE PLANNING CARD

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	64.03	22.71	--	--	--	--	--	--
2. Checkride Score	-.31	1.03	.22	--	--	--	--	--
3. Post-Confidence Rating	66.34	22.57	.78**	.36**	--	--	--	--
Final Checkride								
4. Pre-Confidence Rating	65.73	23.16	.37**	.03	.39**	--	--	--
5. Checkride Score	.35	.83	.07	.09	.24	.19	--	--
6. Post-Confidence Rating	72.50	21.31	.33**	.09	.43**	.77**	.28*	--

Note. *p < .05; **p < .01. Number of subjects = 75-78 except where noted otherwise.

5. FUEL MANAGEMENT PROCEDURES

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	81.55	14.99	--					
2. Checkride Score	.04	1.08	-.09	--				
3. Post-Confidence Rating	80.50	17.96	.55**	.19	--			
Final Checkride								
4. Pre-Confidence Rating	79.56	15.43	.38**	.10	.50**	--		
5. Checkride Score	.30	1.02	.15	.11	.18	.17	--	
6. Post-Confidence Rating	79.65	15.19	.27*	.23	.33**	.62**	.26*	--

6. PREFLIGHT INSPECTION

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	78.56	17.56	--					
2. Checkride Score	.76	.61	.13	--				
3. Post-Confidence Rating	82.72	15.25	.80**	.17	--			
Final Checkride								
4. Pre-Confidence Rating	78.12	16.40	.34**	.14	.43**	--		
5. Checkride Score	.57	.40	-.05	-.18	-.03	-.10	--	
6. Post-Confidence Rating	83.58	13.90	.34**	.03	.50**	.65**	-.08	--

7. BEFORE TAKEOFF CHECKS

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	82.07	14.77	--					
2. Checkride Score	.80	.50	.11	--				
3. Post-Confidence Rating	83.17	13.90	.62**	.11	--			
Final Checkride								
4. Pre-Confidence Rating	80.51	14.03	.38**	.04	.41**	--		
5. Checkride Score	.32	.73	-.00	-.04	.02	.04	--	
6. Post-Confidence Rating	82.96	14.95	.43**	-.03	.62**	.64**	.11	--

8. RADIO COMMUNICATIONS PROCEDURES

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	80.41	15.85	--					
2. Checkride Score	.54	.72	.08	--				
3. Post-Confidence Rating	82.17	15.01	.57**	.00	--			
Final Checkride								
4. Pre-Confidence Rating	77.49	16.74	.31**	.11	.41**	--		
5. Checkride Score	.51	.51	-.02	.02	.03	.10	--	
6. Post-Confidence Rating	82.77	13.03	.32**	.11	.54**	.67**	.09	--

Note. *p < .05; **p < .01. Number of subjects = 75-78 except where noted otherwise.

9. AFTER LANDING TASKS

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	78.1	16.71	--					
2. Checkride Score	.07	1.06	-.11	--				
3. Post-Confidence Rating	81.15	14.29	.60**	-.05	--			
Final Checkride								
4. Pre-Confidence Rating	78.42	15.64	.44**	-.00	.58**	--		
5. Checkride Score	-.06	.70	.05	.36**	.10	-.00	--	
6. Post-Confidence Rating	82.41	13.92	.49**	.00	.58**	.76**	.14	--

10. TAKEOFF TO A HOVER

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	84.51	14.17	--					
2. Checkride Score	.26	.81	-.14	--				
3. Post-Confidence Rating	.84	14.03	.65**	-.00	--			
Final Checkride								
4. Pre-Confidence Rating	81.52	14.02	.37**	-.06	.50**	--		
5. Checkride Score	.28	.56	-.04	.09	.06	.25*	--	
6. Post-Confidence Rating	83.96	12.61	.43**	.09	.61**	.74**	.09	--

11. HOVER CHECKS

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	81.56	16.11	--					
2. Checkride Score	.19	.85	-.08	--				
3. Post-Confidence Rating	81.91	15.94	.63**	.08	--			
Final Checkride								
4. Pre-Confidence Rating	80.97	14.00	.36**	.01	.49**	--		
5. Checkride Score	.28	.62	-.10	.14	-.10	.00	--	
6. Post-Confidence Rating	82.94	13.60	.36**	.06	.65**	.68**	.03	--

12. HOVERING TURN

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	83.76	14.04	--					
2. Checkride Score	.47	.75	-.05	--				
3. Post-Confidence Rating	81.18	14.04	.68**	-.02	--			
Final Checkride								
4. Pre-Confidence Rating	81.27	13.36	.36**	-.09	.48**	--		
5. Checkride Score	.36	.43	-.05	-.18	-.04	.15	--	
6. Post-Confidence Rating	83.62	12.49	.50*	-.02	.70**	.77**	.09	--

Note. *p < .05; **p < .01. Number of subjects = 75-78 except where noted otherwise.

13. HOVERING FLIGHT

Variable	M	SD	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	83.82	13.94	--					
2. Checkride Score	50	.74	-.10	--				
3. Post-Confidence Rating	83.36	13.80	.69**	.14		--		
Final Checkride								
4. Pre-Confidence Rating	80.76	13.38	.42**	-.06	.48**	--		
5. Checkride Score	.37	.42	.12	-.22	.11	.09	--	
6. Post-Confidence Rating	84.00	12.57	.49**	-.06	.70**	.74**	.05	--

14. LANDING FROM A HOVER

Variable	M	SD	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	81.87	15.79	--					
2. Checkride Score	.18	.76	-.00	--				
3. Post-Confidence Rating	81.42	15.56	.75**	.06	--			
Final Checkride								
4. Pre-Confidence Rating	79.32	14.66	.37**	-.00	.50**	--		
5. Checkride Score	.27	.53	.04	-.06	.03	.12	--	
6. Post-Confidence Rating	83.10	13.06	.41**	.00	.59**	.66**	.07	--

15. MANUAL THROTTLE OPERATION

Variable	M	SD	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	58.87	20.04	--					
2. Checkride Score	-.57	.94	.31**	--				
3. Post-Confidence Rating	66.97	23.36	.55**	.35**	--			
Final Checkride								
4. Pre-Confidence Rating	59.82	20.20	.44**	.40**	.61**	--		
5. Checkride Score	-.67	.87	.26*	.21	.05	.23	--	
6. Post-Confidence Rating	64.73	21.12	.36*	.21	.45**	.65**	.43**	--

16. ENGINE FAILURE AT A HOVER

Variable	M	SD	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	76.77	17.82	--					
2. Checkride Score	.21	.87	.05	--				
3. Post-Confidence Rating	80.05	16.32	.68**	.10	--			
Final Checkride								
4. Pre-Confidence Rating	74.19	15.90	.44**	.17	.56**	--		
5. Checkride Score	-.31	.81	.20	.08	.22	.33**	--	
6. Post-Confidence Rating	81.45	14.96	.42**	.06	.66**	.75**	.26*	--

Note. *p < .05; **p < .01. Number of subjects = 75-78 except where noted otherwise.

17. HOVERING AUTOROTATION

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	76.82	16.75	--	--	--	--	--	--
2. Checkride Score	-.05	.88	.11	--	--	--	--	--
3. Post-Confidence Rating	79.95	15.75	.69**	.18	--	--	--	--
Final Checkride								
4. Pre-Confidence Rating	73.84	16.89	.42**	.26*	.49**	--	--	--
5. Checkride Score	-.05	.74	.13	.14	.22	.28*	--	--
6. Post-Confidence Rating	81.28	15.13	.41**	.13	.60**	.78**	.27*	--

18. SLOPE OPERATIONS

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	69.26	18.01	--	--	--	--	--	--
2. Checkride Score	-.11	.96	.06	--	--	--	--	--
3. Post-Confidence Rating	75.96	17.84	.63**	.18	--	--	--	--
Final Checkride								
4. Pre-Confidence Rating	70.15	18.36	.58**	.17	.53**	--	--	--
5. Checkride Score	.01	.61	.24*	-.04	.15	.21	--	--
6. Post-Confidence Rating	77.31	15.11	.41**	.05	.49**	.72**	.18	--

19. TRAFFIC PATTERN

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	80.04	16.86	--	--	--	--	--	--
2. Checkride Score	-.03	.86	-.10	--	--	--	--	--
3. Post-Confidence Rating	78.03	18.25	.63**	.02	--	--	--	--
Final Checkride								
4. Pre-Confidence Rating	77.97	16.00	.52**	.05	.60**	--	--	--
5. Checkride Score	.25	.58	-.05	-.03	.02	-.03	--	--
6. Post-Confidence Rating	80.47	15.74	.42**	.03	.69**	.65**	.07	--

20. CLIMB/DESCEND

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	83.38	13.88	--	--	--	--	--	--
2. Checkride Score	.08	.77	-.11	--	--	--	--	--
3. Post-Confidence Rating	83.21	13.79	.67**	-.00	--	--	--	--
Final Checkride								
4. Pre-Confidence Rating	80.72	12.89	.35*	.04	.46**	--	--	--
5. Checkride Score	.29	.44	-.04	.02	-.02	-.02	--	--
6. Post-Confidence Rating	82.11	12.84	.36**	-.02	.66*	.69**	-.12	--

Note. *p < .05; **p < .01. Number of subjects = 25/28 except where noted otherwise.

21. TURNS

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	34.64	13.96	--					
2. Checkride Score	.07	.79	-.04	--				
3. Post-Confidence Rating	82.59	14.82	.67**	.04	--			
Final Checkride								
4. Pre-Confidence Rating	81.18	15.85	.44**	.05	.50**	--		
5. Checkride Score	.33	.54	-.10	.28*	.01	-.07	--	
6. Post-Confidence Rating	82.91	13.23	.55**	.03	.68**	.79**	-.12	--

22. STRAIGHT AND LEVEL FLIGHT

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	85.38	14.01	--					
2. Checkride Score	.34	.78	.02	--				
3. Post-Confidence Rating	83.44	14.81	.70**	-.05	--			
Final Checkride								
4. Pre-Confidence Rating	83.21	13.11	.47**	.16	.57**	--		
5. Checkride Score	.24	.61	.09	.06	.07	.06	--	
6. Post-Confidence Rating	83.49	13.01	.52**	.12	.70**	.74**	.04	--

23. NORMAL TAKEOFF

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	83.86	13.38	--					
2. Checkride Score	.09	.84	-.14	--				
3. Post-Confidence Rating	83.41	13.79	.67**	-.11	--			
Final Checkride								
4. Pre-Confidence Rating	80.10	13.46	.37**	-.01	.49**	--		
5. Checkride Score	.21	.62	.13	-.05	.20	.22	--	
6. Post-Confidence Rating	82.92	12.71	.39**	-.08	.70**	.71**	.24*	--

24. MAXIMUM PERFORMANCE TAKEOFF

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	78.99	15.36	--					
2. Checkride Score	-.30	.87	.12	--				
3. Post-Confidence Rating	80.63	15.30	.69**	.07	--			
Final Checkride								
4. Pre-Confidence Rating	77.22	15.54	.35**	.06	.48**	--		
5. Checkride Score	.11	.78	.07	-.00	.23	.18	--	
6. Post-Confidence Rating	79.97	15.05	.36**	.23	.59**	.57**	.15	--

Note. *p < .05; **p < .01. Number of subjects = 75-78 except where noted otherwise.

25. BEFORE LANDING CHECKS

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	83.84	15.33	--					
2. Checkride Score	.02	1.05	-.13	--				
3. Post-Confidence Rating	82.69	14.24	.71**	.08	--			
Final Checkride								
4. Pre-Confidence Rating	82.06	13.40	.41**	.01	.53**	--		
5. Checkride Score	-.06	.85	.11	.06	.17	.27*	--	
6. Post-Confidence Rating	82.93	15.28	.50**	.03	.65**	.72**	.21	--

26. NORMAL APPROACH

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	79.18	16.56	--					
2. Checkride Score	-.09	.89	-.13	--				
3. Post-Confidence Rating	78.95	17.53	.70**	.02	--			
Final Checkride								
4. Pre-Confidence Rating	78.52	15.01	.44**	.06	.53**	--		
5. Checkride Score	.07	.65	.11	.11	.17	.23	--	
6. Post-Confidence Rating	81.03	14.43	.43**	.11	.65**	.69**	.21	--

27. STEEP APPROACH

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	78.99	15.89	--					
2. Checkride Score	-.28	.81	.06	--				
3. Post-Confidence Rating	77.75	18.20	.71**	.02	--			
Final Checkride								
4. Pre-Confidence Rating	77.71	14.86	.40**	-.03	.47**	--		
5. Checkride Score	-.15	.66	.03	.00	.09	.06	--	
6. Post-Confidence Rating	79.10	14.68	.37**	-.01	.51**	.60**	.17	--

28. SHALLOW APPROACH TO A RUNNING LANDING

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	78.77	16.10	--					
2. Checkride Score	-.07	.94	.14	--				
3. Post-Confidence Rating	79.67	17.47	.65**	.15	--			
Final Checkride								
4. Pre-Confidence Rating	77.04	15.75	.42**	.02	.55**	--		
5. Checkride Score	.16	.76	.15	.10	.05	.18	--	
6. Post-Confidence Rating	80.62	14.80	.37**	.07	.66**	.72**	.16	--

Note. *p < .05; **p < .01. Number of subjects = 75-78 except where noted otherwise.

29. HYDRAULICS FAILURE

Variable	M	SD	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	74.50	16.70	--					
2. Checkride Score	-.35	.94	.07	--				
3. Post-Confidence Rating	77.97	16.43	.63**	.29*	--			
Final Checkride								
4. Pre-Confidence Rating	72.85	16.64	.43**	.01	.50**	--		
5. Checkride Score	-.41	.96	.00	.16	.05	.09	--	
6. Post-Confidence Rating	79.10	14.60	.31**	-.06	.60**	.65**	.11	--

30. ANTITORQUE FAILURE--LEFT PEDAL

Variable	M	SD	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	61.26	20.08	--					
2. Checkride Score	-1.15	1.07	.12	--				
3. Post-Confidence Rating	64.73	22.62	.65**	.26*	--			
Final Checkride								
4. Pre-Confidence Rating	59.41	20.56	.39**	.12	.58**	--		
5. Checkride Score	-.78	1.02	.30**	.39**	.23	.23	--	
6. Post-Confidence Rating	68.90	19.19	.39**	.02	.58**	.67**	.33**	--

31. ANTITORQUE FAILURE--RIGHT PEDAL

Variable	M	SD	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	61.26	20.08	--					
2. Checkride Score	-1.12	1.05	.23	--				
3. Post-Confidence Rating	64.73	22.62	.65**	.47**	--			
Final Checkride								
4. Pre-Confidence Rating	59.41	20.56	.39**	.20	.57**	--		
5. Checkride Score	-.85	.97	.20	.23	.25*	.28*	--	
6. Post-Confidence Rating	68.90	19.19	.39**	.19	.58**	.67**	.44**	--

32. GO-AROUND

Variable	M	SD	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	81.31	16.26	--					
2. Checkride Score	.20	.78	-.05	--				
3. Post-Confidence Rating	80.08	16.79	.54**	-.07	--			
Final Checkride								
4. Pre-Confidence Rating	79.68	14.76	.44**	.03	.46**	--		
5. Checkride Score	.34	.47	-.03	.06	.04	.07	--	
6. Post-Confidence Rating	81.94	15.83	.43**	.11	.50**	.78**	.25*	--

Note. *p < .05; **p < .01. Number of subjects = 75-78 except where noted otherwise.

33. STANDARD AUTOROTATION

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	74.20	18.85	--					
2. Checkride Score	-84	.97	.09	--				
3. Post-Confidence Rating	74.11	20.92	.61**	.39**	--			
Final Checkride								
4. Pre-Confidence Rating	71.14	19.08	.52**	.19	.53**	--		
5. Checkride Score	-62	.98	.30*	.14	.23	.20	--	
6. Post-Confidence Rating	77.45	16.28	.45**	.27	.57**	.73**	.33*	--

34. LOW LEVEL AUTOROTATION

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	73.15	18.86	--					
2. Checkride Score	-80	.81	.15	--				
3. Post-Confidence Rating	72.73	20.90	.58**	.22	--			
Final Checkride								
4. Pre-Confidence Rating	69.99	18.48	.49**	.07	.50**	--		
5. Checkride Score	-53	.93	.20	.23	.27*	.30**	--	
6. Post-Confidence Rating	75.99	17.72	.49**	.13	.57**	.72**	.34**	--

36. DECELERATION/ACCELERATION

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	79.79	14.51	--					
2. Checkride Score	.16	.85	.06	--				
3. Post-Confidence Rating	79.58	15.75	.48**	.07	--			
Final Checkride								
4. Pre-Confidence Rating	77.62	15.64	.41**	.09	.41**	--		
5. Checkride Score	.17	.73	-.04	.18	.04	.17	--	
6. Post-Confidence Rating	79.45	14.69	.34**	-.12	.56**	.73**	.25*	--

37. ENGINE FAILURE AT ALTITUDE

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	73.50	18.16	--					
2. Checkride Score	-05	1.05	.14	--				
3. Post-Confidence Rating	85.83	17.67	.71**	.10	--			
Final Checkride								
4. Pre-Confidence Rating	70.92	18.10	.59**	.17	.65**	--		
5. Checkride Score	.10	.76	.11	.17	.13	.11	--	
6. Post-Confidence Rating	76.99	17.56	.53**	-.04	.70**	.81**	.16	--

Note. *p < .05; **p < .01. Number of subjects = 75-78 except where noted otherwise.

38. HIGH RECONNAISSANCE

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	73.30	17.67						
2. Checkride Score	.06	.85	-.12	--				
3. Post-Confidence Rating	73.44	16.49	.58**	-.03	--			
Final Checkride								
4. Pre-Confidence Rating	73.44	16.49	.46**	-.06	.44**	--		
5. Checkride Score	.43	.53	.08	-.09	.18	.12	--	
6. Post-Confidence Rating	79.09	15.29	.44**	-.01	.59**	.82**	.24*	--

39. CONFINED AREA OPERATIONS

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	74.63	16.48	--					
2. Checkride Score	-.12	.89	-.06	--				
3. Post-Confidence Rating	77.05	15.99	.63**	.03	--			
Final Checkride								
4. Pre-Confidence Rating	73.50	15.47	.45**	.04	.44**	--		
5. Checkride Score	.23	.59	.11	.01	.26	.14	--	
6. Post-Confidence Rating	79.35	14.73	.42**	.04	.56**	.76**	.31**	--

40. PINNACLE/RIDGELINE OPERATIONS

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	71.88	17.47	--					
2. Checkride Score	.00	.95	-.16	--				
3. Post-Confidence Rating	76.45	16.18	.63**	.03	--			
Final Checkride								
4. Pre-Confidence Rating	72.19	15.44	.46**	.13	.49**	--		
5. Checkride Score	.04	.72	.12	-.13	.11	.23	--	
6. Post-Confidence Rating	78.42	15.24	.36**	.01	.50**	.71**	.31**	--

41. TERRAIN FLIGHT MISSION PLANNING

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	67.69	18.71	--					
2. Checkride Score	.17	.83	-.10	--				
3. Post-Confidence Rating	75.05	18.80	.73**	-.18	--			
Final Checkride								
4. Pre-Confidence Rating	69.6	18.56	.32**	-.01	.43**	--		
5. Checkride Score	.51	.40	-.04	.01	.10	.01	--	
6. Post-Confidence Rating	77.38	15.04	.31**	-.16	.48**	.73**	.17	--

Note. *p < .05; **p < .01. Number of subjects = 75-78 except where noted otherwise.

42. TERRAIN FLIGHT NAVIGATION

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	70.06	17.97	--					
2. Checkride Score	.01	1.00	-.17	--				
3. Post-Confidence Rating	75.87	16.82	.77**	-.01	--			
Final Checkride								
4. Pre-Confidence Rating	71.60	17.64	.42**	-.10	.45**	--		
5. Checkride Score	.34	.74	.15	-.00	.18	.04	--	
6. Post-Confidence Rating	78.91	15.45	.40**	-.25**	.52**	.76**	.27**	--

43. LOW-LEVEL FLIGHT

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	75.82	16.22	--					
2. Checkride Score	.32	.77	-.15	--				
3. Post-Confidence Rating	79.58	15.77	.79**	-.12	--			
Final Checkride								
4. Pre-Confidence Rating	75.99	16.35	.39**	.03	.55**	--		
5. Checkride Score	.47	.51	.06	-.17	.18	.12	--	
6. Post-Confidence Rating	80.90	13.91	.39**	-.18	.59**	.73**	.26*	--

44. NOE FLIGHT

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	75.14	19.04	--					
2. Checkride Score	.25	.80	-.24*	--				
3. Post-Confidence Rating	78.16	17.05	.75**	-.15	--			
Final Checkride								
4. Pre-Confidence Rating	73.59	16.92	.47**	-.08	.54**	--		
5. Checkride Score	.41	.60	.07	-.12	.08	.11	--	
6. Post-Confidence Rating	80.91	13.53	.36**	-.10	.58**	.73**	.26*	--

45. NOE DECELERATION

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	68.99	19.97	--					
2. Checkride Score	-.22	.89	-.08	--				
3. Post-Confidence Rating	72.50	20.11	.74**	.17	--			
Final Checkride								
4. Pre-Confidence Rating	68.88	19.19	.44**	.14	.52**	--		
5. Checkride Score	-.04	.86	.13	.06	.15	.02	--	
6. Post-Confidence Rating	75.50	18.42	.33**	.28*	.68**	.62**	.15	--

Note. *p: .05; **p: .01. Number of subjects = 75-78 except where noted otherwise.

46. TERRAIN FLIGHT APPROACH

Variable	M	SD	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	70.74	19.23	--					
2. Checkride Score	.07	.89	-.06	--				
3. Post-Confidence Rating	76.95	17.25	.70**	-.04	--			
Final Checkride								
4. Pre-Confidence Rating	73.10	17.45	.36**	.04	.47**	--		
5. Checkride Score	.45	.50	.12	-.00	.24*	.26*	--	
6. Post-Confidence Rating	80.30	14.75	.27*	-.09	.52**	.72**	.33**	--

47. OUT-OF-GROUND EFFECT CHECK

Variable	M	SD	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	71.64	18.72	--					
2. Checkride Score	-.40	.98	.02	--				
3. Post-Confidence Rating	74.04	17.66	.62**	.03	--			
Final Checkride								
4. Pre-Confidence Rating	73.60	17.27	.39**	.13	.33**	--		
5. Checkride Score	.09	.85	-.06	.06	-.07	.18	--	
6. Post-Confidence Rating	78.19	17.20	.32**	-.08	.51**	.69**	.19	--

48. TERRAIN FLIGHT TAKEOFF

Variable	M	SD	1	2	3	4	5	6
Initial Checkride								
1. Pre-Confidence Rating	74.21	18.80	--					
2. Checkride Score	-.05	.81	-.11	--				
3. Post-Confidence Rating	79.21	14.74	.61**	-.10	--			
Final Checkride								
4. Pre-Confidence Rating	75.61	15.65	.27*	.08	.48**	--		
5. Checkride Score	.32	.65	.07	.28*	.01	.10	--	
6. Post-Confidence Rating	80.86	14.86	.27*	-.03	.62**	.72**	.08	--

Note. *p < .05; **p < .01. Number of subjects = 75-78 except where noted otherwise.