AN ANALYSIS OF INSPECTORS' RATINGS OF CHECK FLIGHTS AS RECORDED ON FORM ACA 342Z

by

Leon Festinger
L. S. Kogan
H. S. Odbert
Seymour Wapner

A statistical analysis conducted at the University of Rochester, Rochester, New York, on data obtained in the Midwest-Navy Training Project at the Ohio State University, by means of a grant-in-aid from the National Research Council Committee on Selection and Training of Aircraft Pilots, from funds provided by the Civil Aeronautics Administration.

March 1946

CIVIL AERONAUTICS ADMINISTRATION
Division of Research
Report No. 58
Washington, D. C.

National Research Council

Committee on Selection and Training of Aircraft Pilots

Executive Subcommittee

M. S. Viteles, Chairman

E. C. Andrus

C. W. Bray

D. R. Brimhall

J. C. Flanagan

W. R. Miles

P. J. Rulon

LETTER OF TRANSMITTAL

NATIONAL RESEARCH COUNCIL

2101 Constitution Avenue, Washington, D. C.
Division of Anthropology and Psychology

Committee on Selection and Training of Aircraft Pilots

March 21, 1946

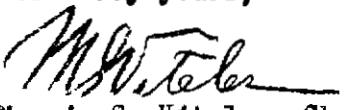
Dr. Dean R. Brimhall
Director, Division of Research
Civil Aeronautics Administration
Room 3895, Commerce Building
Washington 25, D. C.

Dear Dr. Brimhall:

Attached is a report entitled An Analysis of Inspectors' Ratings of Check Flights as Recorded on Form ACA 342Z, by Leon Festinger, L. S. Kogan, H. S. Odbert, and Seymour Wapner. This report is submitted by the Committee on Selection and Training of Aircraft Pilots with the recommendation that it be included in the series of technical reports issued by the Division of Research, Civil Aeronautics Administration.

The report is the outcome of close cooperation among the Committee on Selection and Training of Aircraft Pilots, the Division of Research, CAA; and the Safety Regulations Division, CAA. It embodies information of practical value to the Safety Regulations Division in assessing the value of inspector ratings of flight performance and the potential usefulness of standard rating forms of the type represented by ACA 342Z.

Cordially yours,



Morris S. Viteles, Chairman
Committee on Selection and
Training of Aircraft Pilots
National Research Council

MSV:rm

EDITORIAL FOREWORD

This report is one of a series growing out of an extensive study known as the 1943-44 Midwest-Navy Training Project. The report concerns itself with an analysis of inspector ratings of flight performance undertaken at the request of the Safety Regulations Division, Civil Aeronautics Administration, with a view of determining the reliability and other characteristics of a rating form (ACA 342Z) prepared by that agency. While some modifications of the form were required for purposes of the Midwest-Navy Training Project, the latter, nevertheless, provided an opportunity for obtaining data of value in assessing the usefulness of the form as a field instrument.

The 1943-44 Midwest-Navy Training Project was designed by M. S. Viteles, R. Y. Walker, and R. C. Rogers, with the assistance of A. S. Thompson, E. S. Ewart, and H. S. Odbert, and with the guidance and assistance of the Executive Subcommittee and of the CAA Division of Research, D. R. Brimhall, Director. Data were collected by R. Y. Walker, S. V. Bennett, Edward Girden, and E. S. Ewart. Opportunity to collect data from schools participating in the War Training Service, as well as the services of a number of CAA flight inspectors who served as check pilots, was provided by the Civil Aeronautics Administration through the efforts of D. R. Brimhall and F. M. Lanter. Subjects for the study were made available through the courtesy of the U. S. Navy.

The manual for the revised form of ACA 342Z (Appendix A) was prepared by the staff of the Chairman of the Committee on Selection and Training of Aircraft Pilots at the University of Pennsylvania. The analysis of the data was planned by the staffs of the Statistical Unit, University of Rochester, and of the University of Pennsylvania Project. The analysis was carried out by the Statistical Unit at the University of Rochester.

CONTENTS

SUMMARY

The present report is concerned with an analysis of ratings on Form ACA 342Z, described as a "Pilot Flight Test Report and Flight Instructor's Recommendation," which was developed by the Safety Regulation Division of the Civil Aeronautics Administration in 1942. The administration of this rating form and the analysis of results were parts of a larger research program known as the Midwest-Navy Training Project.

The investigation was undertaken to examine the variation in the ratings assigned by inspectors, the agreement between flight inspectors in rating successive flights for the same students, the consistency with which specific errors were recorded, the importance of certain errors discriminating between trainees, and the tendency of individual inspectors to show bias on certain items.

The procedure was designed to permit two check flights to be made for each student by different inspectors near the end of the War Training Service Program. Both flights were to be made on the same day, and the same series of maneuvers was to be employed for both check flights. An equal number of first and second check flights was to be made by each inspector. One pair of inspectors was to make check flights during each of the five testing periods in the experiment. Inspectors rated students at four training centers in each of the first four periods, while in the final testing period students were rated at a single training center.

Conditions at times made it impossible to obtain the same number of ratings by each inspector at each school. In certain instances a substitute inspector had to be employed when one of the original inspectors could not complete a testing period. At times second check flights could not be made on account of weather conditions. The present analysis is concerned only with the check sheets of those students who were rated by two inspectors.

The modified version of Form ACA 342Z employed in this study lists various types of errors for each maneuver to be marked during flight. The inspector was required to give a percentage grade on each maneuver independently of the marking of specific errors, and at the completion of the flight give an over-all grade for the flight as a whole.

A general summary of the findings of this study is as follows:

1. The correlation between over-all grades assigned in first and second flights by paired inspectors for all 143 subjects was .26. When the correlations were computed separately between the first-flight grades of a single inspector and the second-flight grades of another single inspector the correlation coefficients ranged from .11 to .66, the median correlation being .32.

2. Agreement between Inspectors C and D who graded the largest number of students was consistently higher than agreement between

other pairs. The over-all picture, however, appeared to indicate that a relatively low degree of relationship existed between the over-all grades an individual received on his first flight and on his second flight.

2. Grades on individual maneuvers were analyzed only for Inspectors C and D who rated the greatest number of cases. Correlations between the grades of these two inspectors on each maneuver ranged from .04 to .56. Only two approached the correlations between over-all grades on first and second flights of students rated by the same inspectors.

Mean grades assigned on a given maneuver ranged from 70.8 to 84.0 for Inspector C, and from 72.8 to 88.6 for Inspector D. When the maneuvers were ranked in order of grades for each inspector, the correlation between ranks was .86.

A comparison between mean maneuver grades and over-all grades for Inspectors C and D, presented separately for first and second flights, showed that the most uniformly low correlations occurred between over-all grades and grades on Taxiing, while the most uniformly high correlations were between over-all grades and the maneuvers Circular Approach and Precision Landing.

Since it was considered possible that an average maneuver grade might yield a more satisfactory measure of flight competency than a single over-all grade, all the maneuver grades on a single Form ACA 342Z were averaged to obtain a mean score. Correlations were computed between the first flight mean maneuver grades of a single inspector and the second flight mean maneuver grades assigned by another inspector to the same students, as done previously for over-all grades. These correlations ranged from .03 (N = 11) to .88 (N = 8), with a median correlation of .52. Only 8 of the 12 comparable correlations were higher for mean maneuver grades than for over-all grades.

3. The specific errors rated for each maneuver were examined to determine whether different inspectors tended to emphasize different errors. The percentage of times each inspector marked a specific item was obtained and the variability of these percentages was compared to the variability to be expected by chance. Extreme variability was interpreted as suggesting that inspectors differed in their accuracy of observation, in their care in marking the form, or in their interpretation of the various items on the form.

Of the 20 errors in Section 1 of Form ACA 342Z the following were marked most frequently by nine or more inspectors: "poor throttle use," "poor directional control," "poor attitude control," "too fast," "nose variable," "poor timing," and "rough control use." For no errors are the observed ranges uniformly

the predicted ranges. In Section 2 five errors are marked by nine or more inspectors on every maneuver: "slips," "skids," "too little rudder," "degree of bank varies," and "nose wanders." Other errors frequently marked are: "too much rudder," "too much aileron," "nose high," and "nose low."

In a comparison of variations in patterns of ratings by different inspectors it was observed, for example, that Inspector A did not use the items "rudder early," "rudder late," "elevator early," or "elevator late" at all, whereas Inspector B marked these four items on almost every maneuver. Eight inspectors marked "slips" and "skids" on every turn maneuver, while Inspector F did not mark "slips" at all, but marked "skids" on 11 of the 12 maneuvers. Clear differences can be seen in the marking of items like "too much aileron" and "too little aileron."

The number of errors on each ACA 342Z sheet were added to yield a total error score. The correlations between total error scores on first and second flights of paired inspectors ranged from -.13 (N = 5) to .74 (N = 8), with a median correlation of .49. The results suggested that pairs of inspectors tended to agree to a certain extent in assigning more errors to some individuals than to others.

AN ANALYSIS OF INSPECTORS' RATINGS OF CHECK FLIGHTS AS RECORDED ON FORM ACA 342Z

INTRODUCTION

Although ratings on flight tests occupy a very important place in the progress of the student pilot, it has been widely recognized that these ratings are not altogether adequate. Earlier studies have pointed out that inspectors do not use comparable standards, and that some do not give an adequate range of grades.[1] As a result, there have been efforts to develop improved rating forms.[2] The present report is concerned with an analysis of ratings on one such form, which was developed by the Safety Regulation Division of the Civil Aeronautics Administration in 1942. This form, known as Form ACA 342Z, provides space for an over-all grade, for grades on specific maneuvers, and for ratings on specific aspects of flight performance.

The data here reported on Form ACA 342Z were obtained as part of a research program known as the Midwest-Navy Training Project, which was conducted at a number of centers located in and around the Ohio State University at Columbus, Ohio, with the close cooperation of the U. S. Navy, which made students in the Navy War Training Service program available for the study.

This report examines the variation in the ratings assigned by inspectors, the agreement between flight inspectors in rating successive flights for the same students, the consistency with which specific errors are recorded, the importance of certain errors in discriminating between trainees, and the tendency of individual inspectors to show bias on certain items. Other aspects of the Midwest-Navy Training Project are reported elsewhere.[3]

---

[1] An analysis of instructors' and inspectors' ratings is presented in: Johnson, H. M., and Boots, M. L. Analysis of ratings in the preliminary phase of the CAA training program. Washington, D. C.: CAA Division of Research, Report No. 21, October 1943.

[2] Edgerton, H. A., and Walker, R. Y. History and development of the Ohio State Flight Inventory, Part I: Early versions and basic research. Washington, D. C.: CAA Division of Research, Report No. 47, July 1945. Also: NRC Committee on Selection and Training of Aircraft Pilots. History and development of the Ohio State Flight Inventory, Part II: Recent versions and current applications. Washington, D. C.: CAA Division of Research, Report No. 51, November 1945.

[3] Wapner, S., Festinger, L., and Odbert, H. S. Comparison of student pilot performance in successive check flights as measured by photographic records. (Report in preparation for the CAA Technical Series.)

SOURCE OF THE DATA

Pairs of inspectors were assigned by the Civil Aeronautics Administration to make check flights with all students in the Midwest-Navy Project. Two check flights were to be made for each student by different inspectors. Flights were to be made toward the end of the War Training Service Program (between 30 and 40 hours), and when possible both were to be made on the same day. Each inspector was to give an equal number of first and second check flights. The series of maneuvers was the same for both check flights.

The design of the experiment provided that one pair of inspectors should make check flights during each of the five testing periods in the experiment. In each of the first four periods, inspectors were to rate students at four training centers. (The visit of inspectors and experimenters to the various training centers during a given testing period is referred to as a "swing.") A single training center was to be studied in the final testing period.

Practical difficulties made it impossible to obtain the same number of ratings by each inspector at each school, and in certain instances a substitute inspector had to be used when one of the original inspectors was unable to complete a swing. There were also certain instances in which a second check flight could not be made because of weather conditions. The present report is concerned only with the check sheets of those students who were rated by two inspectors. The number of ratings made by each pair of inspectors and the flight schools at which these ratings were made are indicated in Table 1.[4]

THE FORM AND THE INSTRUCTIONS FOR ITS USE

Form ACA 3422 is reproduced in Appendix A along with the manual prepared for its use. The form, as modified for purposes of the present study, is reproduced in Figure 1. Sections 1 and 2 list various types of error for each maneuver. The inspector was required to mark these errors during the flight. He was also required to give a percentage grade on each maneuver, those grades to be made independently of the markings of specific errors.

At the completion of the flight, the inspector was to give the over-all grade for the flight as a whole. He received the specific

---

[4]It should be noted that Inspector A served in both Swing 1 and Swing 3, and Inspector E in both Swing 3 and Swing 5. Whenever the results are presented separately for swings, the Swing 1 results for Inspector A will be designated as A_1, and those for Swing 3 as A_2. Likewise, the results for Swings 3 of Inspector E will be designated as E_1, and for Swing 5 as E_2. Whenever <u>combined</u> results are presented for either inspector, the symbols A and E will be used.

CHECK TEST TAKEN: ______ PRIVATE ______ COMMERCIAL

DATE OF THIS FLIGHT TEST ______

NAME ______

ADDRESS ______
STREET OR RFD NO.

______
CITY STATE

MAKE OF AIRCRAFT USED ______ CLASS ______ H. P. ______

FLYING SCHOOL ______

ADDRESS OF FLYING SCHOOL ______

PILOT FLIGHT TEST REPORT
AND
FLIGHT INSTRUCTOR'S RECOMMENDATION

AIRPORT ______

______
CITY STATE

I HAVE EVERY REASON TO BELIEVE THAT THE APPLICANT HAS HAD AT LEAST ______ HOURS SOLO FLYING TIME, AND I CONSIDER HIM CAPABLE OF SUCCESSFULLY ACCOMPLISHING THE FLIGHT TEST FOR A ______ PILOT CERTIFICATE, AND OF FULFILLING THE RESPONSIBILITIES OF THE HOLDER OF SUCH CERTIFICATE.

______
SIGNATURE OF FLIGHT INSTRUCTOR CERTIFICATE NUMBER

SECTION 2

Items: 8. 900 CL. TR. R. 150 BANK; 9. 900 CL. TR. L. 150 BANK; 10. 900 CL. TR. R. 450 BANK; 11. 900 CL. TR. L. 450 BANK; 12. 900 TURN L. 180 BANK; 13. 900 TURN R. 180 BANK; 14. 1800 TURN L. 450 BANK; 15. 1800 TURN R. 450 BANK; 16. 3600 STEEP TR. L. 600 BANK; 17. 3600 STEEP TR. R. 600 BANK; 22. 900 GL. TR. R. 150 BANK; 23. 900 GL. TR. L. 150 BANK

PERFECT EXECUTION

EVALUATE ALL ITEMS IN THIS SECTION ACCORDING TO ITEMS LISTED ON LEFT

SLIPS
SKIDS
RUDDER EARLY
RUDDER LATE
TOO MUCH RUDDER

METHOD OF EXECUTION OF EACH MANEUVER IN THIS SECTION MUST BE INDICATED

TOO LITTLE RUDDER
WALKS RUDDER
AILERONS EARLY
AILERONS LATE
TOO MUCH AILERON

MAKE ALL MARKS HEAVY AND BLACK

TOO LITTLE AILERON
ELEVATOR EARLY
ELEVATOR LATE
TOO MUCH ELEVATOR
TOO LITTLE ELEVATOR

USE ONLY IBM TEST SCORING MACHINE P38 LEADS OR NO. 2 SOFT LEAD PENCIL

[illegible]
NOSE HIGH
NOSE LOW
NOSE WANDERS
ENTRY & RECOVERY [illegible]

FOLD ON THIS LINE AND USE ON KNEE BOARD WHILE FLYING WITH APPLICANT
SECTIONS 1 AND 2 TO BE FILLED OUT DURING FLIGHT TEST

SECTION 1

Items: 1. TAXI; 2. TAKE-OFF; 3. STRAIGHT & LEVEL; 5. S TURNS; 6. 2-BANK 8; 7. STR. CL. & RECOVERY; 17a. SERIES OF TURNS; 18. NORMAL POW-ER-OFF STALL; 19. FORWARD SLIP; 21. STR. GLIDE & RECOVERY; 26. CIRCULAR APPROACH; 27. PRECISION LANDING

PERFECT EXECUTION

EVALUATE ALL ITEMS IN THIS SECTION ACCORDING TO ITEMS LISTED ON RIGHT

TOO FAST
TOO SLOW
ALTITUDE [illegible]
[illegible]
PATTERN POOR

METHOD OF EXECUTION OF EACH MANEUVER IN THIS SECTION MUST BE INDICATED

SLIPS
SKIDS
[illegible]
[illegible] CONTROLS
WALKS RUDDER

MAKE ALL MARKS HEAVY AND BLACK

OVER-SHOOTS
UNDER-SHOOTS
[illegible] VARIABLE
POOR PLANNING
POOR TIMING

USE ONLY IBM TEST SCORING MACHINE P38 LEADS OR NO. 2 SOFT LEAD PENCIL

POOR THROTTLE USE
POOR [illegible]
[illegible]
[illegible]
[illegible]

WITHOUT FURTHER FLIGHT TEST, I HAVE ACCEPTED THE RECOMMENDATION OF THE EXAMINER.

____
INSPECTOR

UNITED STATES OF AMERICA
DEPARTMENT OF COMMERCE
CIVIL AERONAUTICS ADMINISTRATION
WASHINGTON

PILOT FLIGHT TEST REPORT AND FLIGHT INSTRUCTOR'S RECOMMENDATION

ENTER OVER-ALL GRADE IN PERCENTAGE
EXCELLENT (90-100)
ABOVE AVERAGE (85-90)
AVERAGE (80-85)
BELOW AVERAGE (70-80)
UNSATISFACTORY (0-70)

FLIGHT EXAMINER'S AFFADAVIT

I CERTIFY: (1) That I have this day flight tested the person whose name appears on the reverse side hereof. (2) That I rode in the airplane throughout this entire flight test. (3) That in Sections 1 and 2, I have made true and accurate entries and have indicated every error made during the execution of the maneuvers for which provision was made on the form. (4) That in Sections 3 through 11, I have made true and accurate entries as to his over-all performance and general flying habits as indicated by the flight test and from all other sources of information available to me. (5) That all entries herein have been made without prejudice or favoritism and to the best of my knowledge and ability.

I RECOMMEND HIM FOR A______________________

I HAVE EXAMINED THE STUDENT AND RECOMMEND HIM FOR A______________________ INSPECTOR

DATE__________ EXAMINER'S SIGNATURE______________________ DESIGNATION No.__________

SECTION 3 GENERAL EXECUTION

	RIGHT HAND MANEUVERS					LEFT HAND MANEUVERS				
	NEVER	OCCASIONALLY	CONSTANTLY	SLIGHTLY	EXTREMELY	NEVER	OCCASIONALLY	CONSTANTLY	SLIGHTLY	EXTREMELY
SLIPS										
SKIDS										
CROSSES CONTROLS										
NOSE WANDERS DURING ENTRY										
NOSE WANDERS DURING RECOVERY										
APPROACHES STALLS INADVERTANTLY										
STALLS INADVERTANTLY										
SPINS INADVERTANTLY										
ATTITUDE AND POWER UNCOORDINATED										
COORDINATES, ALL FACTORS OF MANEUVERS										
COORDINATES ALL CONTROLS										
OBTAINS MAXIMUM PERFORMANCE										
ATTEMPTS TO EXCEED PERFORMANCE CAPABILITIES										
UNNECESSARY LOAD FACTORS IMPOSED										
SPEED CONTROL ERRATIC										
SPEED SENSING ERRATIC										
KEEPS SAFE MARGIN OF SPEED										
COORDINATES ATTITUDE & PERFORMANCE CAPABILITIES										
PERFORMANCE SATISFACTORY										

NOTE: ALL ITEMS ON THIS PAGE EXCEPT SECTIONS 8, 9 AND 10 MUST BE EVALUATED. MAKE ENTRIES IN SECTIONS 8, 9 AND 10 ONLY WHEN APPLICABLE.

GENERAL RATING AND CHARACTERISTICS

SEC. 5	SMOOTH	ROUGH	UNCERTAIN	ERRATIC	MECHANICAL	SEC. 6	NERVOUS	APPREHENSIVE	TENSE	COOL	SLOW
CONTROLS USE						RE-ACTIONS					

SEC. 11	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	UNSATISFACTORY	SEC. 7	DEPENDABLE	UNCERTAIN	MEDIOCRE	ERRATIC	IMPULSIVE
OBSERVANCE OF SAFETY RULES						JUDGEMENT					

	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	UNSATISFACTORY	SEC. 8	OVERCONFIDENT	TIMID	STUBBORN	RECKLESS	COCKY
OBSERVANCE OF TRAFFIC RULES											
ENGINE STARTING AND STOPPING PRACTICES & TECHNIQUE						TEMPERAMENT					

	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	UNSATISFACTORY	SEC. 9	IRRESPONSIBLE	OVER-CAUTIOUS	FORGETFUL	INDIFFERENT	COOPERATIVE
PRE-FLIGHT INSPECTION TECHNIQUE											
CAREFULNESS						ATTITUDE					

	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	UNSATISFACTORY	SEC. 10	FRIGHT-PARALYSIS	NAUSEA	NERVOUS FATIGUE	VERTIGO	ABSENT-MINDEDNESS
APTITUDE											
OVER-ALL RATING						SUBJECT TO					

SECTION 4 GENERAL FLYING HABITS

	NEVER	OCCASIONALLY	CONSTANTLY
RIDES BRAKES			
LOOKS FOR OBSTACLES			
LOOKS FOR OTHER AIRCRAFT			
USES ALL AVAILABLE FIELD FOR TAKE-OFF			
SELECTS BEST AVAILABLE AREA			
ADHERES TO PROPER PATTERNS			
COORDINATES PATTERNS AND AREAS			
PRE-SELECTS EMERGENCY FIELDS			
EXHIBITS GOOD PLANNING			
EXHIBITS GOOD TIMING			
EXHIBITS GOOD THROTTLE COORDINATION			
EXHIBITS GOOD STALL APPROACH RECOGNITION			
EXERCISES PROPER ALTITUDE CONTROL			
EXERCISES PROPER DRIFT CONTROL			
EXERCISES PROPER VERTICLE ATTITUDE CONTROL			
EXERCISES PROPER LATERAL ATTITUDE CONTROL			
EXERCISES PROPER DIRECTIONAL CONTROL			
ORIENTED			
EXHIBITS PRECISION EXECUTION			
COORDINATES APPROACHES AND AREAS			
ESTIMATES GLIDING DISTANCE WELL			
VARIES GLIDING SPEED			
PLAYS TURN EFFECTIVELY			
SLIPS FOR LANDING			
UNDERSHOOTS			
OVERSHOOTS			
LANDS IN [redacted] 25% OF [redacted]			
DISPLAYS [redacted]SCIOUS COORDI[redacted]			
EXHIBITS [redacted] SUB-CONSCIO[redacted]TION			
USES C[redacted] BY TRIAL A[redacted]			

TABLE 1

NUMBER OF STUDENTS RATED BY EACH PAIR OF INSPECTORS AT EACH TRAINING CENTER DURING EACH SWING

Swing	Inspectors	Bowling Green	Muncie	Kalamazoo	Oxford	Milwaukee	Total
1	A_1, B	2	11	8	7	-	28
2	C, D	14	15	28	-	-	57
3	A_2, E_1	12	-	-	-	-	12
	F, G	-	10	-	-	-	10
	E_1, G	-	-	23	-	-	23
4	H, J	9	8	-	-	-	17
5	K, L	-	-	-	-	18	18
	E_2, L	-	-	-	-	6	6
Total		37	44	59	7	24	171

instruction: "Give your over-all grades on the flight as a whole and grades on the specific maneuvers just as if you had never filled in the form at all." The back of the form provides space for inspectors to enter this over-all percentage grade according to the following scale:

Excellent	(90-100)
Above Average	(85-90)
Average	(80-85)
Below Average	(70-80)
Unsatisfactory	(0-70)

Since the limits of these intervals were ambiguous, it was indicated in additional instructions to the inspectors that "unsatisfactory" should be interpreted to mean grades from 0 to (but not including) 70, "below average" to mean grades from 70 to (but not including) 80, etc. The lowest passing grade in a check flight is 70.

The back of Form ACA 342Z provides space for rating trainees on a number of general flight characteristics and traits of personality. These ratings are not considered in the present report.

RESULTS

In analyzing the ratings made by the inspectors, the over-all grades will be considered first, the maneuver grades second, and the specific

errors third. Some of the relationships among these three criteria of flight performance on the check flights will also be considered.

Over-all Grades.

1. Distributions. Table 2 presents the distributions of over-all grades assigned by ten inspectors.[5] Table 3 shows the same grades grouped in five-step intervals, and presented separately for the first and second flights of each inspector.

It is apparent that some inspectors gave higher grades on the average than others, and that some spread their grades out more than others did. Inspector G, for example, gave grades ranging from 0 to 95, whereas the range of grades for Inspector A_2 was only from 60 to 80. Inspectors also differed in the percentage of failing grades which they assigned. Inspector D gave failing grades to only 12 of his 57 men. Inspector L, on the other hand, gave failing grades to 21 men out of 24. It must be remarked, however, that the variations here observed are not as extreme as those sometimes reported.[6] The original intention to apply analysis of variance to the data was discarded because the data are too irregular and incomplete. In any event, application of Bartlett's test[7] to the data in Tables 2 and 3 indicates that the hypothesis of homogeneity of variance of over-all grades may be rejected at less than the 1% level of confidence. It should be stressed that the data on distributions are to be regarded only as suggestive, since the observed differences may be related to differences in the training at different schools and in different swings, as well as to differences in the grading practices of inspectors.[8]

2. Correlations Between Over-all Grades for First and Second Flights. The present data offer an opportunity to study the agreement between flight grades on first and second flights. If this agreement is low, the adequacy of a percentage grade based on a single check ride must be seriously questioned.

---

[5]Through a misunderstanding of instructions, Inspectors A_1 and B failed to record over-all grades.

[6]Examination of CAA record cards of 100 flight schools, for example, revealed instances where there was no overlap of grades between schools, and instances of very restricted ranges of scores. In that study, however, there may have been large differences in the flight training offered at different schools. See: Kogan, L. S., Odbert, H. S., and Wapner, S. CAA criterion study: An analysis of primary flight scores in relation to the National Testing Service screening battery. November 9, 1943. (Final report in the files of the NRC Committee on Selection and Training of Aircraft Pilots.)

[7]Snedecor, G. W. Statistical methods. (4th ed.) Ames, Iowa: Iowa State College Press, 1946, pp. 249-252.

[8]The evidence from Bartlett's test is of interest in itself, aside from its implication that analysis of variance would not be suitable.

TABLE 2

DISTRIBUTIONS OF OVER-ALL GRADES ASSIGNED BY INSPECTORS

Over-all Grade	C	D	E	A_2	F	G	H	J	K	L	Grand Total
95						3					3
94						-					-
93						-					-
92						-					-
91						-					-
90						1					1
89						-					-
88						-					-
87		1				-		1			2
86	3	2				-		1			6
85	-	1	7		1	1		-			10
84	1	2	-		2	-		-			5
83	4	-	-		-	-		-			4
82	-	4	-		-	1		-			5
81	-	-	-		-	-		-			-
80	4	4	6	1	-	2		-	3	-	20
79	1	-	-	-	2	-		-	-		3
78	2	3	-	2	-	-		-	1	1	9
77	2	-	-	-	-	-		-	-	-	2
76	1	4	-	-	-	-		-	2	-	7
75	7	4	3	-	-	4	4	-	-	-	22
74	2	4	-	-	-	-	-	1	-	-	7
73	2	3	-	-	-	-	1	-	-	-	7
72	2	6	-	-	2	4	-	-	-	-	14
71	1	-	-	-	-	-	-	1	-	-	2
70	8	7	3	1	-	7	1	1	-	2	30
69	-	-	3	-	-	-	-	1	-	-	4
68	3	2	8	3	1	-	3	4	4	3	31
67	2	3	-	-	-	-	-	1	1	-	7
66	1	-	-	-	-	-	-	1	3	-	5
65	4	3	8	2	1	2	4	1	3	13	41
64	-	2	-	-	-	-	-	1	-	-	4
63	1	-	-	-	-	-	-	1	-	-	2
62	2	-	-	-	1	-	-	2	-	-	5
61	-	-	-	-		-	-		-	-	-
60	2	-	7	7		5	3		-	2	18
55	1	1							2	3	6
50						2					2
0						1	1				2
N	57	57	61	12	10	33	17	27	18	24	286
M	72.9	73.2	72.2	69.5	75.0	78.0	69.9	69.3	69.8	64.7	70.9
σ	7.	7.	7.0	6.9	7.9	16.7	16.1	7.0	6.2	5.0	10.0

TABLE 3

DISTRIBUTIONS OF OVER-ALL GRADES ASSIGNED BY TEN INSPECTORS IN FIRST AND SECOND FLIGHTS*

Over-all Grade	C		D		E		A_2		F		G		H		J		K		L		Total	
	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
95-100											1	2									1	
90-94											-	1									-	
85-89		3	3	1	3	4			1		-	1			1	1					9	
80-84	3	6	4	6	4	2	1		1	1	1	2			-	-	2	1			16	
75-79	8	5	7	4	3	-	-	2	-	2	-	4	2	2	-	-	-	3		1	20	
70-74	10	6	8	12	2	1	-	1	1	1	7	4	-	2	2	1	-	-	1	1	31	
65-69	4	6	5	3	9	10	3	2	2	-	2	-	4	3	4	4	7	4	6	10	55	
60-64	2	3	1	2	1	2	1	2	-	1	2	3	3	-	1	3		-	2		17	
55-59	1		1								-			-				1	3		6	
50-54											2			-							2	
0											1			1							2	
N	28	29	29	28	22	19	5	7	5	5	16	17	9	8	8	9	9	9	12	12	143	
M	71.5	74.1	73.8	74.1	72.8	71.5	68.2	68.4	74.8	75.2	63.9	75.7	66.2	61.4	70.4	68.3	68.9	70.8	62.3	67.0	70.9	
σ	6.3	7.7	7.2	6.0	7.4	8.5	6.6	7.0	8.2	7.6	19.6	10.6	5.6	23.5	7.1	6.3	6.0	7.2	5.0	3.7		

*Roman numerals refer to Flight I and Flight II.

The correlation between first and second flight scores for all 143 students is .26 (see Table 4). The interpretation of this figure is difficult because a small sample of inspectors is involved and because the inspectors are not equally represented in the correlation. Many of the factors which influence the size of the correlation in this sample, however, would probably operate in any larger sample. If anything, the ratings in the present study may be better than those usually obtained, as the inspectors knew that their ratings would be studied. Inspectors' ratings under field conditions might in general show even less agreement. If a figure in the region of .26 were obtained in a larger sample of students and inspectors under field conditions, it would have to be recognized that the grade a student received on one check flight would have very little value in predicting the grade he would receive in a second check flight by another inspector.

TABLE 4

CORRELATIONS BETWEEN OVER-ALL GRADES ASSIGNED IN FIRST AND SECOND FLIGHTS BY PAIRED INSPECTORS

Inspectors			
Flight I	Flight II	N	r
C	D	28	.51
D	C	29	.57
E_1	A_2	7	.14
A_2	E_1	5	.16
E_1	G	12	.30
G	E_1	11	.35
F	G	5	.37
G	F	5	.11
H	J	9	.57
J	H	8	.24
K	L	9	.66
L	K	9	.27
L	E_2	3	-
E_2	L	3	-
Median Correlation			.32
Total Group		143	.26

It is obvious that marked discrepancies in the grading practices of the various inspectors effect correlations based on the grades of several inspectors, obscuring the actual amount of agreement between single pairs of inspectors. It is therefore of theoretical interest to compute correlations separately between the first-flight grades of a single inspector and the second-flight grades of another single inspector, even though many of these correlations must be based on very small numbers of cases in the present data. Such correlations are presented in Table 4. It can be seen that they range from .11 to .66, the median correlation being .32. The agreement between Inspectors C and D, who graded the largest number of students, is more consistently high than agreement between other pairs (.51 and .57). The over-all picture, however, is one of a relatively low degree of relationship between the grades a man receives on his first flight and on his second flight. While a larger sample might reveal many pairs of inspectors showing agreement as great as or greater than that shown by Inspectors C and D, there would probably also be inspectors between whom agreement was negligible.

It must be recognized that a low degree of agreement may result not only from differences between inspectors in standards or in accuracy of observation, but also from inconsistency in the performance of the student. The consistency of the students has been studied separately by correlating photographic records of performance on the two flights.[9] That study has revealed a rather marked lack of consistency on some aspects of performance, but greater consistency on others, especially when performance on several maneuvers is taken into account. No over-all measure corresponding to the inspectors' over-all grades was obtained from the photographic records, so that no direct comparison with the inspectors' marks is possible. In any event, the inspector may emphasize aspects of performance not shown by the camera. The analysis of agreement between inspectors on successive flights remains an important problem in view of the emphasis placed on the check flight given by a single inspector as a basic criterion of flight competency.

Maneuver Grades.

Form ACA 342Z provides space for a percentage grade for each maneuver. The inspector is cautioned that this grade need not conform to the number of errors he has entered (with the exception that the grade for a maneuver must be 100% if the maneuver is marked "Perfect Execution").

1. Grades on Individual Maneuvers. Grades on individual maneuvers have been analyzed only for Inspectors C and D, who rated the greatest number of cases. Table 5 shows the means and standard deviations of the grades assigned by these two inspectors, and the correlations between the grades of the two inspectors on each maneuver. First and second flights are combined in these calculations. (The maneuver numbers in this and later tables indicate the order of the maneuvers in the complete standard flight.) The correlations range from .04 to .56. Only two of these cor-

---

[9] Wapner, S., Festinger L., and Odbert, H. S. Op. cit.

TABLE 5

MEANS, SIGMAS, AND CORRELATIONS BETWEEN MANEUVER GRADES
FOR INSPECTOR C AND INSPECTOR D
(Flights I and II Combined)

	Maneuver	N*	M_C	σ_C	M_D	σ_D	r_{CD}
1.	Taxi	56	84.0	8.7	88.6	8.0	.13
2.	Take-off	57	77.8	6.9	80.2	7.4	.56
3.	Straight and Level	56	83.7	7.2	81.0	6.2	.43
5.	S-turns	54	76.5	7.4	76.3	6.0	.28
6.	2-Bank 8	54	73.6	8.4	72.8	6.4	.23
7.	Str. Cl. & Recovery	57	81.0	5.7	80.3	7.3	.35
8.	90° Cl.Tr. R 15° Bank	57	77.8	5.5	78.5	6.7	.38
9.	90° Cl.Tr. L 15° Bank	57	79.0	6.6	79.4	6.8	.41
10.	90° Cl.Tr. R 45° Bank	57	78.5	5.2	75.4	5.9	.04
11.	90° Cl.Tr. L 45° Bank	56	77.2	6.2	76.4	6.3	.14
12.	90° Turn L 15° Bank	57	80.1	5.7	80.0	6.2	.38
13.	90° Turn R 15° Bank	57	80.0	8.2	80.7	6.4	.25
14.	180° Turn L 45° Bank	57	79.8	5.9	77.1	5.6	.38
15.	180° Turn R 45° Bank	57	78.0	5.5	76.9	6.3	.35
16.	360° Steep Tr.L 60° Bank	57	77.4	8.5	75.3	6.5	.22
17.	360° Steep Tr.R 60° Bank	57	76.6	7.6	74.6	6.0	.29
17a.	Series of Turns	36	76.6	6.3	75.7	4.7	.22
18.	Normal Power-off Stall	56	76.8	8.3	76.7	8.1	.29
19.	Forward Slip	53	74.4	9.5	76.5	9.9	.26
21.	Str. Glide & Recovery	56	80.4	7.6	81.3	7.0	.55
22.	90° Gl.Tr. R 15° Bank	57	80.2	5.2	79.4	5.7	.39
23.	90° Gl.Tr. L 15° Bank	57	79.1	7.6	78.5	5.9	.33
26.	Circular Approach	55	71.3	9.3	75.8	9.8	.41
27.	Precision Landing	55	70.8	9.6	74.4	9.0	.12

*The number of cases varies for the different maneuvers because no maneuver grades were available for some of the maneuvers.

relations approach the correlations between over-all grades on first and second flights of students rated by these inspectors. It is probable, however, that the correlations are larger than might be expected on the average between maneuver grades on first and second flights of students rated by other pairs of inspectors in this study, since the correlations between over-all grades are generally lower for the other pairs of inspectors.

The mean grades assigned on a given maneuver are seen to range from 70.8 to 84.0 for Inspector C, and from 72.8 to 88.6 for Inspector D. The inspectors tend to assign the lower grades to the same maneuvers. If the maneuvers are ranked in order of grades, for each inspector, the correlation between the ranks is .86.

Table 6 shows the correlations between maneuver grades and over-all grade for Inspectors C and D, presented separately for first and second

flights of each inspector. Minor fluctuations in the size of the correlations must be disregarded in view of the small numbers of cases. The differences between corresponding correlations for the first and second flights of a given inspector appear to be as great as the variations between inspectors. It might be anticipated that extreme variations among inspectors in the importance which they attach to given maneuvers would be reflected by variations in the size of these correlations.

The most uniformly low correlations in Table 6 are those between over-all grades and grades on Taxiing. The most uniformly high correlations are those between over-all grades and the last two maneuvers: Circular Approach and Precision Landing.

2. Mean Maneuver Grades. It appeared possible that an average of maneuver grades would yield a more satisfactory measure of flight competency than the single over-all grade. All the maneuver grades on a single Form ACA 342Z were therefore averaged to yield a "mean maneuver grade." On a complete sheet the number of maneuver grades was 24; in

TABLE 6

CORRELATIONS OF INDIVIDUAL MANEUVER GRADES WITH OVER-ALL GRADES
(Inspectors C and D)

Maneuver	Inspector C				Inspector D			
	Flight I		Flight II		Flight I		Flight II	
	N	r	N	r	N	r	N	r
1. Taxi	28	.12	29	.26	29	.15	27	.09
2. Take-off	28	.35	29	.30	29	.47	28	.49
3. Straight and Level	28	.31	29	.49	28	.57	28	.57
5. S Turns	26	.30	29	.37	28	.59	28	.33
6. 2-Bank S	26	.47	29	.42	29	.66	27	.44
7. Str. Gl. & Recovery	28	.58	29	.58	29	.38	28	..
8. 90° Gl. Tr. R 15° Bank	28	.40	29	.53	29	.54	28	.2_
9. 90° Gl. Tr. L 15° Bank	28	.41	29	.53	29	.56	28	.37
10. 90° Gl. Tr. R 45° Bank	28	.21	29	.42	29	.53	28	.49
11. 90° Gl. Tr. L 45° Bank	27	.23	29	.50	29	.70	28	.51
12. 90° Turn L 15° Bank	28	.61	29	.35	29	.46	28	.50
13. 90° Turn R 15° Bank	28	.53	29	.49	29	.61	28	.51
14. 180° Turn L 45° Bank	28	.53	29	.64	29	.66	28	.40
15. 180° Turn R 45° Bank	28	.66	29	.54	29	.61	28	.41
16. 360° Steep Tr. L 60° Bank	28	.29	29	.61	29	.63	28	.27
17. 360° Steep Tr. R 60° Bank	28	.23	29	.58	29	.58	28	.35
17a. Series of Turns	27	.51	25	.56	20	.83	20	.23
18. Normal Power-off Stall	28	.37	28	.61	28	.64	28	.67
19. Forward Slip	28	.12	27	.49	29	.49	26	.71
21. Str. Glide & Recovery	28	.19	29	.60	29	.66	27	.58
22. 90° Gl. Tr. R 15° Bank	28	.45	29	.59	29	.41	28	.64
23. 90° Gl. Tr. L 15° Bank	28	.31	29	.67	29	.62	28	.58
26. Circular Approach	27	.69	29	.61	28	.77	28	.69
27. Precision Landing	27	.68	28	.57	28	.65	28	.73

some instances the number was somewhat lower. Table 7 shows the distributions of these mean maneuver grades, separately for first and second swings of each inspector. Differences among inspectors are striking, both in average grades and in spread of grades. Bartlett's test substantiates the latter point. The hypothesis of homogeneity of mean maneuver grade variance can be rejected below the 1% level of confidence. In this respect the mean maneuver grades appear no more satisfactory than over-all grades.

Correlations were computed between first-flight mean maneuver grades of a single inspector and the second-flight mean maneuver grades assigned by another inspector to the same students, just as was done previously for over-all grades. Table 8 shows that these correlations range from .03 (N = 11) to .88 (N = 8). The median correlation is .52, which may be compared with the median correlation of .32 for over-all grades. There is perhaps some indication here that greater agreement among inspectors might be achieved by routinely requiring them to grade individual maneuvers. The increase in agreement is by no means uniform, however, (only eight of the twelve comparable correlations are higher for mean maneuver grades than for over-all grades), and in any event this procedure would not be practical for field use unless inspectors were trained to achieve greater uniformity in grading practices.

Analysis of Specific Errors.

The specific errors which inspectors reported for each maneuver on Form ACA 342Z have been examined in detail to determine whether different inspectors emphasized different errors. Any such difference in emphasis might partially account for the low agreement already seen in percentage grades. At the same time this analysis gives information on the relative frequency with which the "average" inspector marked different items.

1. Method of Analysis. The basic method of analysis can be very briefly described. Tables have been prepared showing the percentage of times each inspector marked a specific item. The variability of these percentages has then been compared with the variability to be expected by chance. Extreme variability has been interpreted as suggesting that inspectors differed in their accuracy of observation, in their care in marking the form, or in their interpretation of the various items on the form.

Analysis in terms of percentages makes it easy to compare results for inspectors who rated different numbers of students. At the same time it is obvious that single percentages are very unstable values when based on such small numbers of cases. No great importance can be attached to any single comparison in the present data. The general results, however, are probably suggestive of the results that would be obtained in a more extended study.

2. Summary Tables of Maneuvers. A tally was first made of the number of times each inspector marked each specific item in first flights and second flights. (An "item" in this discussion refers to a single error such as "slips" in a single maneuver.) Table 9 shows the tallies for a single illustrative maneuver.

TABLE 7

DISTRIBUTION OF MEAN MANEUVER GRADES BY SWING, BY INSPECTOR, BY FLIGHT*

Swing:	I**				II				III						IV				V					
Inspector:	A_1		B		C		D		E_1		A_2		F		G		H		J		K		L		E_2	
Flight:	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
98-99										1						2										
96-97										-					1	1										
94-95										1					1	-										1
92-93										-			1		1	2										-
90-91									3	2			-	1	2	1									2	-
88-89									1	2			-	1	-	2									-	-
86-87						1			3	2			1	2	-	-									-	-
84-85						5	2	4	1	-			1	-	-	2									-	-
82-83					3	3	2	1	2	2			-	-	3	2									-	-
80-81		2	1	1	5	5	5	8	4	2			-	-	2	-			1			1			-	1
78-79	3	1	-	-	6	6	10	5	2	1		1	-	-	2	1			1	1	3	-			-	-
76-77	2	2	3	3	4	2	3	4	3	1	1	1	-	-	-	1	1	1	2	2	1	4		3	-	-
74-75	1	2	1	4	1	2	3	3		1	-	4	2	-	1	1	3	1	2	3	1	2	3	3	1	-
72-73	5	1	3	5	8	1	2	2		1	-	-		-	1	-	2	4	1	2	3	-	-	2		1
70-71	1	2	2	1	1	3	-	-			1	-		-	-	1	1	1	1	1	1	-	4	2		
68-69	5	-	-	-		1	-	1			1	-		-	-	1	1	-				1	2	2		
66-67		1	1	1			1				1	1		-	-		1	1				-	1	1		
64-65							-				1			1	1							-	1			
62-63							1								-							-	1			
60-61															-							-				
58-59															-							1				
23															1											
M_I	72.9		73.2		76.8		77.6		83.0		69.2		82.6		79.0		72.3		75.6		75.0		69.8		85.0	
M_{II}	74.6		73.8		78.7		78.5		84.6		74.3		83.4		85.2		72.5		74.8		73.7		72.2		82.7	
σI	3.7		3.8		3.7		4.8		4.7		4.4		7.0		16.6		3.1		2.8		3.1		3.7		---	
σII	4.4		3.3		4.7		3.8		7.1		3.2		9.4		8.9		2.7		2.3		6.2		3.2		---	
N_I	17		11		28		29		19		5		5		16		9		8		9		12		3	
N_{II}	11		15		29		28		16		7		5		17		8		9		9		12		3	

*Means and sigmas are calculated from raw scores.

**The number of cases for A and B are larger than those given elsewhere in this

TABLE 8

CORRELATIONS BETWEEN MEAN MANEUVER GRADES ASSIGNED IN FIRST AND SECOND FLIGHTS BY PAIRED INSPECTORS

Inspectors Flight I	Flight II	N	r
A	B	15	.27
B	A	10	.53
C	D	28	.69
D	C	29	.51
E_1	A_2	7	.30
A_2	E_1	5	.66
E_1	G	12	.22
G	E_1	11	.03
F	G	5	.77
G	F	5	.35
H	J	9	.65
J	H	8	.88
K	L	9	.40
L	K	9	.58
Median Correlation			.52

A summary table was then constructed for each maneuver by showing the percentage of times a given inspector marked a specific item. In these tables data from first and second flights were combined,[10] and all ratings by Inspector A were combined, regardless of swing, as were all ratings of Inspector E. Table 10 shows the percentages for an illustrative maneuver, the 180° Turn Right, 45° Bank (Maneuver 15). The column headings refer to the individual inspectors and the row designations to items in Section 2 of Form ACA 3422. The numbers in the tables refer to the percentage of his cases that a given inspector marked with a given item. Inspector A, for example, marked "slips" for 57% of his 37 cases. Similar tables for the remaining maneuvers appear in Appendix B.

3. Measures of Central Tendency and Variability. Table 10 shows that there are very wide differences in the frequency with which differ-

[10] Combination of flights increased the number of cases on which the percentages were based. One disadvantage of this procedure must be mentioned, however, namely that the cases rated by each inspector are not entirely independent of the cases rated by other inspectors. (The exact pairing of inspectors during each swing is shown in Table 1.) This partial dependency probably makes for reduced variability among inspectors.

TABLE 9

FREQUENCY OF ERROR MARKINGS ON MANEUVER 13 (90° CLIMBING TURN RIGHT, 15° BANK) FOR INDIVIDUAL INSPECTORS ON FIRST AND SECOND FLIGHTS

Inspector:	A_1		B		C		D		E_1		A_2		F		G		H		J		K		L		E_2	
Flight:	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
Number Rated:	15	10	10	15	28	29	29	28	19	16	5	7	5	5	16	17	9	8	8	9	9	9	12	12	3	3
Perfect Execution	-	-	-	-	-	-	-	-	2	9	-	-	1	2	6	9	-	-	-	-	-	-	-	-	2	2
Errors																										
Slips	11	8	5	7	16	19	17	16	4	3	1	2	-	-	2	-	8	5	4	9	2	2	4	6		
Skids	8	4	4	5	4	9	10	7					1	-	3	-	-	1	2	1	6	6	3	5	-	-
Rudder Early	-	-	1	1	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	2	-	-
Rudder Late	-	-	1	4	9	7	13	9	-	-	-	-	-	-	1	-	3	1	1	1	-	1	8	7	-	-
Too Much Rudder	1	-	-	1	4	2	6	5	-	-	-	-	-	-	1	2	-	-	2	0	6	5	2		-	-
Too Little Rudder	-	2	3	3	15	17	11	11	6	3	1	1	4	1	3	-	7	3	4		3	2	2	1	-	-
Walks Rudder	-	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-	2	3	-	-
Ailerons Early	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	6	2	-	-
Ailerons Late	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
Too Much Aileron	-	-	-	2	2	3	-	-	-	-	-	-	3	2	-	-	1	1	2	1	-	-				
Too Little Aileron	-	-	-	-	3	1	2	2	-	-	-	-	-	-	2	1	1	-	-	-	-	1	-	-		
Elevator Early	-	-	-	3	-	-	3	2	-	-	-	-	-	-	-	-	-	-	1	2			-	2	-	
Elevator Late	-	-	-	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	
Too Much Elevator	-	-	3	7	1	4	13	11	1	1	-	1	-	-	-	1	2	2	-	7	-	1	7	6	-	-
Too Little Elevator	-	-	2	4	6	7	2	3	2	-	-	-	-	-	2	-	2	1	3	1	4	2	-	1	1	-
Degree of Bank Varies	10	7	9	12	15	15	14	13	3	6	4	5	-	1	8	7	4	2	3	-	7	3	11	9	-	-
Nose High	7	5	3	3	1	5	13	11	2	1	2	3	-	-	2	3	2	2	3	6	-	-	7	6	-	-
Nose Low	7	5	3	5	11	8	3	2	1	-	3	1	-	-	5	-	1	1	1	1	3	4	1	1	1	1
Nose Wanders	-	-	1	1	13	13	6	6	3	1	-	-	-	1	7	3	1	2	4	3	-	2	11	9	-	-
Entry & Recovery Abrupt	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	2	-	-	-	-	1	2	-	-
Total No. Errors	44	31	35	60	103	112	116	103	22	15	11	13	8	5	38	17	32	23	32	39	31	35	71	60	2	2

TABLE 10

PERCENTAGE OF MEN RATED BY EACH INSPECTOR WHO WERE INDICATED AS COMMITTING SPECIFIC ERRORS IN MANEUVER 15 (180° TURN RIGHT, 45° BANK)

Inspector:	A	B	C	D	E	F	G	H	J	K	L
Number of Cases:	37	25	57	57	41	10	33	17	17	18	24
Errors											
Slips	57	64	25	58	32	-	15	47	59	33	54
Skids	57	32	33	14	2	20	21	-	29	72	13
Rudder Early	-	4	4	4	2	-	3	-	-	6	-
Rudder Late	-	28	49	49	-	-	9	18	24	17	25
Too Much Rudder	3	8	-	9	12	10	21	-	6	44	4
Too Little Rudder	3	16	30	28	15	30	9	29	29	11	4
Walks Rudder	-	-	-	2	-	-	-	-	6	-	4
Ailerons Early	3	8	-	-	-	-	9	-	12	6	38
Ailerons Late	-	-	-	-	-	-	6	-	6	6	-
Too Much Aileron	3	8	5	-	-	40	12	6	-	-	8
Too Little Aileron	-	-	5	4	-	-	12	12	24	-	4
Elevator Early	-	16	5	7	-	-	-	-	12	-	17
Elevator Late	-	4	11	12	-	-	-	12	12	6	17
Too Much Elevator	-	44	16	32	2	10	3	18	41	-	21
Too Little Elevator	-	28	11	26	7	-	-	41	71	11	8
Degree of Bank Varies	43	68	28	51	5	-	9	41	35	83	67
Nose High	57	44	35	32	-	10	3	12	35	6	8
Nose Low	32	32	23	32	2	-	-	41	53	17	29
Nose Wanders	-	-	25	7	5	10	21	24	12	17	58
Entry & Recovery Abrupt	-	4	2	2	5	-	12	18	-	11	33

ent items are recorded, and also in the frequency with which different inspectors record a specific item. Two measures have been selected to summarize the information on average frequency and variability for each item: the median percentage (or mid-percentage) and the range from the third percentage to the ninth, when the percentages are ranked in order of magnitude. These measures are illustrated in Figure 2, which shows the percentages of markings by each inspector on two items in Maneuver 15, ranked in order from smallest to the largest percentage.

The median percentage is the 6th of the 11 percentages, when the percentages are ranked in order. The median for the error "slips," for example, indicated by the middle red line in the figure, is 47%.

The limits of the range between the third highest and ninth highest percentages are indicated by the first and third red lines in the figure. This measure of variability is slightly larger than the interquartile range, including approximately the middle 64% of the inspectors instead of the middle 50%. For ease of discussion, however, the range will be referred to as the "approximate interquartile range." It may be seen in Figure 2 that this range is considerably larger for "degree of bank varies" (9% to 67%) than it is for "slips" (25% to 58%).

The median percentages and the approximate interquartile ranges of all items on all maneuvers are shown in Tables 11 and 12. The asterisks in these tables indicate items whose variability is no greater than would be expected by chance, according to the criterion described below.

4. Comparison with "Chance" Variation. Extreme differences among inspectors in the frequency with which they marked certain items are obvious in Tables 11 and 12. On several of the turns, for example, the approximate interquartile range on "degree of bank varies" is in the neighborhood of 50 points. Can these differences be assumed to reflect differences in the accuracy of observation of the inspectors, or in their interpretations of the meaning of an item, or are the differences only such as might be obtained by chance? A fair amount of variability is to be expected by chance in percentages based on such small numbers of cases. Some variation is also to be expected because of differences in the performance of students rated by different inspectors. Extreme variability, however, would suggest that there may be biases among the inspectors in their marking of a specific item.

The present data do not lend themselves to an exact evaluation in terms of probability, because of the variations in the numbers of cases among the different inspectors, and also because of the partial interdependence among the inspectors. A rough criterion has been developed, however, for judging the stability of usage of a given item in terms of the standard error of percentages. For any given percentage and any given number of cases in the sample, the standard error of the percentage indicates how much variability may be expected by chance in the percentages obtained from sample to sample.

MANEUVER 15: 180° TURN RIGHT, 45° BANK

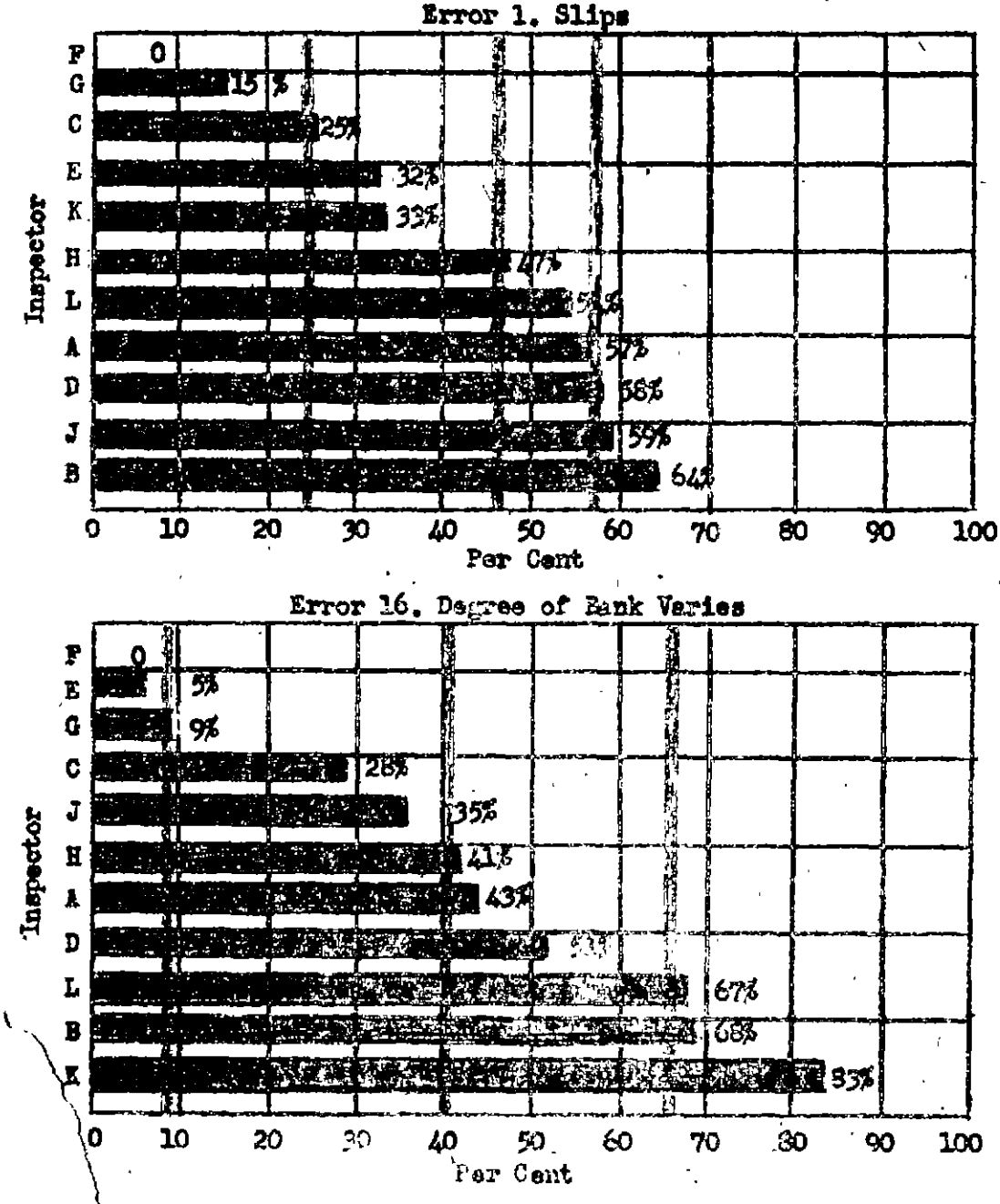


FIGURE 2

PER CENT OF STUDENTS MARKED FOR A SPECIFIC ERROR BY ELEVEN INSPECTORS
Red Lines indicate Median and Approximate Interquartile Range

TABLE 11

MEDIAN AND APPROXIMATE INTERQUARTILE RANGES OF PER CENTS FOR ALL INSPECTORS FOR EACH ERROR ON EACH MANEUVER IN SECTION 1 OF FORM ACA 342E

	Man. 1 Taxi		Man. 2 Take-off		Man. 3 St. & Level		Man. 5 S Turns		Man. 6 2-Bank 8		Man. 7 St.Cl. & Recovery	
	Med. %	Quart. Range***	Med. %	Quart. Range	Med. %	Quart. Range	Med. %	Quart. Range	Med. %	Quart. Range	Med. %	Quart. Range
Errors												
Too Fast	26	6-46	6**	3-19	3*	0-4	0	0-3	0	0-3	24**	10-38
Too Slow	3*	0-6	24**	17-46	0	0-2	0	0-0	0	0-0	18**	7-26
Alt. Select. Poor	0	0-0	0	0-0	0	0-8	2	0-14	4	0-23	0	0-0
Area Select. Poor	0	0-4	0	0-2	0	0-0	3*	0-6	0	0-3	0	0-0
Pattern Poor	25	6-42	5*	0-10	0	0-0	57**	44-60	60**	53-68	0	0-0
Slips	0	0-0	0	0-2	5	0-19	30	15-58	29**	24-53	12**	5-17
Skids	0	0-0	0	0-4	3*	0-6	35**	17-37	33**	22-47	4*	0-12
Rough Control Use	0	0-12	11	2-30	3*	0-9	9**	2-18	8**	2-12	10*	0-17
Fans Controls	0	0-6	5	0-17	4	0-20	2*	0-8	4*	0-9	6*	0-11
Walks Rudder	0	0-0	12**	6-24	0	0-4	0	0-0	0	0-2	0	0-0
Overshoots	0	0-0	0	0-0	0	0-0	0	0-6	2*	0-8	0	0-0
Undershoots	0	0-0	0	0-0	0	0-0	0	0-11	4	0-26	0	0-0
Nose Variable	0	0-0	17**	6-26	28	3-42	22**	16-41	23	10-46	18**	12-35
Poor Planning	9	2-24	6*	0-13	0	0-5	48**	40-61	56**	41-72	0	0-12
Poor Timing	0	0-6	18	0-33	0	0-0	29	18-55	35	6-49	4*	0-12
Poor Throttle Use	24**	7-35	6**	2-13	8**	4-24	6**	2-16	11	4-28	24**	17-37
Poor Trimming	0	0-0	0	0-3	10**	4-24	0	0-4	2*	0-5	0	0-0
Poor Alt. Control	0	0-0	0	0-4	20**	11-29	38	12-58	43**	30-65	0	0-5
Poor Att. Control	0	0-3	16	5-33	15**	8-22	10**	2-13	12	0-30	22	2-42
Poor Direct. Control	8	0-21	35	17-58	21**	14-29	5	0-29	17	0-35	25**	13-42

*This item satisfies the criteria for variability, but was marked by fewer than 9 inspectors.

**This item satisfies the criteria for variability, and was marked by 9 or more inspectors

***This is the approximate interquartile range. It is actually the range from the third to the ninth case, when the eleven inspectors are ranked according to the percentage of times they marked a specific error.

TABLE 11 (Continued)

MEDIAN AND APPROXIMATE INTERQUARTILE RANGES OF PER CENTS FOR ALL INSPECTORS FOR EACH ERROR ON EACH MANEUVER IN SECTION 1 OF FORM ACA 342ZZ

	Man. 17a Series of Turns		Man. 18 Normal Power-off Stall		Man. 19 Forward Slip		Man. 21 St. Gl. & Recovery		Man. 26 Circular Approach		Man. 27 Precision Landing	
	Med. %	Quart. Range***	Med. %	Quart. Range	Med. %	Quart. Range	Med. %	Quart. Range	Med. %	Quart. Range	Med. %	Quart. Range
Errors												
Too Fast	0	0-8	16	7-38	51**	19-53	71	22-82	36	8-47	12	6-43
Too Slow	3*	0-8	17	6-39	6*	0-16	3*	0-6	4*	0-12	13*	0-24
Alt. Select. Poor	0	0-28	0	0-0	0	0-0	0	0-0	0	0-12	0	0-0
Hdg. Select. Poor	0	0-0	0	0-0	0	0-0	0	0-0	0	0-0	0	0-6
Pattern Poor	7	0-20	0	0-0	0	0-6	0	0-0	23**	12-41	6*	0-13
Slips	61	30-83	0	0-4	0	0-6	4*	0-6	11	0-39	0	0-5
Skids	40	20-67	0	0-0	6**	2-12	2*	0-4	17	0-37	2*	0-6
Rough Control Use	17**	7-32	20**	9-30	20**	6-35	3*	0-11	0	0-6	6*	0-9
Pans Controls	2*	0-9	4*	0-5	4*	0-5	0	0-0	0	0-14	0	0-7
Walks Rudder	0	0-6	0	0-6	4*	0-12	0	0-6	0	0-0	2	0-12
Overshoots	10**	6-23	0	0-2	0	0-5	0	0-2	0	0-22	18**	12-28
Undershoots	3	3-30	0	0-0	0	0-0	0	0-0	11*	0-20	14**	9-26
Nose Variable	51	15-71	9*	0-17	30	12-46	12*	0-22	8	0-22	13*	0-18
Poor Planning	17**	3-29	5	0-28	2	0-14	0	0-8	29**	10-42	18*	0-27
Poor Timing	26	10-47	48	24-61	16	10-46	6*	0-8	0	0-7	24	5-41
Poor Throttle Use	20	12-48	46	15-60	5**	4-6	11**	3-21	17	2-36	24**	12-35
Poor Trimming	0	0-0	0	0-0	0	0-3	0	0-3	0	0-6	0	0-3
Poor Alt. Control	41**	20-56	0	0-4	0	0-4	0	0-2	0	0-2	0	0-4
Poor Att. Control	16	6-52	20**	6-33	50	19-60	7	0-33	12*	0-20	22**	2-27
Poor Direct. Control	5	0-33	25**	15-30	33**	22-53	8**	2-20	6**	2-12	20**	12-27

*This item satisfies the criteria for variability, but was marked by fewer than 9 inspectors.
**This item satisfies the criteria for variability and was marked by 9 or more inspectors.
***This is the approximate interquartile range. It is actually the range from the third to the ninth case, when the eleven inspectors are ranked according to the percentage of times they marked a specific error.

TABLE 12

MEDIAN AND APPROXIMATE INTERQUARTILE RANGES OF PER CENTS FOR ALL INSPECTORS FOR EACH ERROR ON EACH MANEUVER IN SECTION 2 OF FORM ACA 3422

	Man. 8		Man. 9		Man. 10		Man. 11		Man. 12		Man. 13	
	90°Cl.Tr.R. 15° Bank		90°Cl.Tr.L. 15° Bank		90°Cl.Tr.R. 45° Bank		90°Cl.Tr.L. 45° Bank		90° Turn L. 15° Bank		90° Turn R. 15° Bank	
	Med. %	Quart. Range***	Med. %	Quart. Range	Med. %	Quart. Range	Med. %	Quart. Range	Med. %	Quart. Range	Med. %	Quart. Range
Errors												
Slips	48	17-61	26**	12-35	59**	33-65	33	12-47	24	9-42	36**	20-41
Skids	23**	9-33	24	20-56	23**	17-35	35**	20-46	21	8-48	23**	8-35
Rudder Early	0	0-6	0	0-2	4*	0-6	6*	0-11	0	0-6	2*	0-4
Rudder Late	12	0-28	8*	0-12	17	2-42	12	0-29	16**	2-29	22*	0-25
Too Much Rudder	8*	0-12	10**	2-21	8	0-21	11**	4-26	12**	5-14	3	0-20
Too Little Rudder	28	13-56	12**	5-22	28**	6-35	10**	4-24	20**	8-24	20**	10-33
Walks Rudder	0	0-6	0	0-0	0	0-0	0	0-0	0	0-0	0	0-0
Ailerons Early	0	0-3	0	0-0	0	0-6	0	0-6	0	0-6	0	0-6
Ailerons Late	0	0-0	0	0-0	0	0-4	0	0-0	0	0-3	0	0-0
Too Much Aileron	4*	0-12	6**	2-8	6**	2-15	7**	2-13	11**	4-12	6**	3-7
Too Little Aileron	0	0-7	4*	0-6	5*	0-10	5*	0-9	4*	0-9	3*	0-6
Elevator Early	0	0-9	0	0-8	0	0-7	0	0-4	0	0-5	0	0-7
Elevator Late	0	0-4	0	0-0	0	0-11	0	0-4	0	0-0	0	0-0
Too Much Elevator	9	3-42	17	0-40	10	3-36	14	0-36	12*	0-18	12**	2-18
Too Little Elevator	10**	4-24	14**	6-24	12**	4-28	14	0-29	2	0-14	4*	0-12
Degree of Bank Varies	47	22-83	36	18-89	40	24-67	46	18-75	46**	29-63	39	20-70
Nose High	24	7-46	24	11-46	29**	19-43	29**	17-41	14**	3-28	25**	5-33
Nose Low	12	8-33	16	8-36	14	5-40	24**	10-35	9*	0-18	7**	2-9
Nose Wanders	18	10-41	21**	8-29	10**	6-24	20**	11-33	18**	7-30	18**	5-22
Entry & Recovery Abrupt	0	0-3	0	0-6	4	2-22	8**	2-22	4*	0-9	2*	0-6

*This item satisfies the criteria for variability, but was marked by fewer than 9 inspectors.
**This item satisfies the criteria for variability and was marked by 9 or more inspectors.
***This is the approximate interquartile range. It is actually the range from the third to the ninth case, when the eleven inspectors are ranked according to the percentage of times they marked a specific error.

TABLE 12 (Continued)

MEDIAN AND APPROXIMATE INTERQUARTILE RANGES OF PER CENTS FOR ALL INSPECTORS FOR EACH ERROR ON EACH MANEUVER IN SECTION 2 OF FORM ACA 3422

	Man. 14		Man. 15		Man. 16		Man. 17		Man. 22		Man. 23	
	180° Tr. L. 45° Bank		180° Tr. R 45° Bank		360° Stp.Tr.L. 60° Bank		360° Stp.Tr.R. 60° Bank		90° Gl.Tr.R. 15° Bank		90° Gl.Tr.L. 15° Bank	
	Med. %	Quart. Range***	Med. %	Quart. Range	Med. %	Quart. Range	Med. %	Quart. Range	Med. %	Quart. Range	Med. %	Quart. Range
ERRORS												
Slips	27	12-52	47**	25-58	32	20-59	51**	40-76	28**	10-35	33	3-40
Skids	30**	10-40	21**	13-33	28**	14-33	29**	11-42	17**	10-28	17**	9-24
Rudder Early	0	0-4	2*	0-4	3*	0-8	4*	0-4	0	0-0	0	0-3
Rudder Late	12	0-44	18*	0-28	10	3-39	21**	10-37	6*	0-12	3	0-26
Too Much Rudder	10**	4-18	8**	3-12	10**	6-24	10**	5-17	4	2-17	6**	2-7
Too Little Rudder	10**	6-28	16**	9-29	5	3-33	22**	9-32	18**	4-28	14	3-29
Wild Rudder	0	0-0	0	0-2	0	0-4	0	0-4	0	0-0	0	0-6
Ailerons Early	0	0-6	3*	0-9	0	0-9	3*	0-12	0	0-4	0	0-4
Ailerons Late	0	0-2	0	0-6	0	0-0	0	0-0	0	0-0	0	0-0
Too Much Aileron	6*	0-8	5*	0-8	6**	2-16	9**	4-18	6	2-29	6	0-20
Too Little Aileron	3*	0-6	4*	0-12	0	0-7	0	0-9	0	0-0	0	0-3
Elevator Early	2*	0-6	0	0-12	4*	0-10	11**	3-25	0	0-0	0	0-0
Elevator Late	8	0-23	6*	0-12	18	9-39	14*	0-23	0	0-6	0	0-4
Too Much Elevator	6*	0-13	16	2-32	14	7-35	12**	6-30	8*	0-18	7*	0-16
Too Little Elevator	13	10-47	11	0-28	13	10-53	24**	17-37	21	3-42	18	0-29
Degree of Bank Varies	40	12-67	41	9-67	24	17-63	29	18-65	47	33-72	42	12-53
Nose High	17**	3-28	12	6-35	21**	11-38	28**	21-46	9	0-28	12	0-30
Nose Low	28	6-41	29**	2-32	46	17-54	32**	21-54	24	12-46	33	6-41
Nose Wanders	12**	7-21	12**	5-24	18**	8-37	10	6-44	19**	4-25	21**	5-30
Entry & Recovery Abrupt	6**	2-9	4*	0-12	14**	5-21	11**	7-22	4**	2-12	0	0-4

*This item satisfies the criteria for variability, but was marked by fewer than 9 inspectors.
**This item satisfies the criteria for variability and was marked by 9 or more inspectors.
***This is the approximate interquartile range. It is actually the range from the third to the ninth case, when the eleven inspectors are ranked according to the percentage of times they marked a specific error.

In the present analysis, the median percentage on a given item has been used as the base for estimating chance variability. Four times the standard error has been tabulated for each percentage, representing the range of values which might be expected to include approximately 95% of samples if there were only chance variation from sample to sample. The average number of cases per inspector (30.55) has been used throughout in estimating this standard error. This "predicted" range has next been compared with the observed approximate interquartile range for each item. If the observed range is greater than the calculated range of two standard deviations on either side of the "true" per cent, it is considered likely that inspectors are not marking the item in a uniform manner.[11]

Many items were not marked at all by the "median" inspector. No effort has been made to evaluate the variability of these items. Many additional items were left unmarked by at least three of the inspectors. Some question might be raised concerning the uniformity of usage of such items. A distinction has therefore been made in Tables 11 and 12 by using a single asterisk for items which meet the criterion of variability but which were not marked at all by at least three inspectors, and by using a double asterisk for items meeting the criterion and marked by at least nine inspectors.

5. Evaluation of Items. In interpreting Tables 11 and 12 it should be kept in mind that not all items were applicable to all maneuvers, particularly in Section 1. For example, several items (such as "poor altitude control") do not apply to taxiing. The construction of the sheet was simplified by the occasional inclusion of such non-applicable items. It is interesting to note, however, that certain items were marked contrary to expectation. The manual of instructions (Appendix A) specified that "poor trimming" was to be marked only for "straight and level flight." This error was nevertheless marked by at least three inspectors on seven other maneuvers, and on one of these maneuvers by at least six inspectors. Some of these markings may have resulted from slips of the pencil; others probably indicate a failure to study the instructions carefully.

Of the 20 errors in Section 1, those most frequently marked by 9 or more inspectors are "poor throttle use," "poor directional control," "poor attitude control," "too fast," "nose variable," "poor timing," and "rough control use." Some other items are marked so seldom that their utility on the form may be questioned. For no errors are the observed ranges uniformly within the predicted ranges; "rough control use" is perhaps the most satisfactory in this respect. Among the less satisfactory items in terms of range are "poor timing" and "too fast." "Fans controls" was not marked by as many as nine inspectors on any maneuver,

---

[11] No particular importance can be attached to single instances in which the observed range falls outside the predicted range, especially in view of the series of approximations which this criterion involves. On the other hand, the criterion may be regarded in a sense as "lenient," since it requires only that the range of the observed middle 6% be no greater than that of the theoretical 95%.

and its median frequency was never great; the range of ratings, however, was usually within chance expectations.

Table 12, showing the errors in Section 2, offers a better basis for comparing items. Twelve turns are rated in this section, and the errors are more uniformly applicable. Five errors are marked by nine or more inspectors on every maneuver: "slips," "skids," "too little rudder," "degree of bank varies," and "nose wanders." Other errors frequently marked are "too much rudder," "too much aileron," "nose high," and "nose low." Items quite restricted in use are "walks rudder," "ailerons early," "ailerons late," "elevator early," and "elevator late." The manual for the use of Form ACA 342Z suggested that "rudder early" be used in preference to "aileron late," and "rudder late" in preference to "aileron early" in most instances. There were no special instructions restricting the use of other items.

One error in Section 2 is conspicuous for its wide range of markings: "degree of bank varies." A special explanation for this situation may be found in the manual, which states that this error should be marked if the "bank varies more than 5° from requirements of maneuver." It is possible that more uniform results would have been achieved if the instructions had not departed so far from the non-technical interpretation of the phrase "degree of bank varies."[12]

6. Inspector Differences. The data may be examined in a different way by observing evidence of consistent differences in the way the inspectors mark the forms. Perhaps the most striking evidence is seen in Table 13, which shows the percentage of men rated by each inspector who were indicated as showing "perfect execution" of each maneuver. Three inspectors (J, K, and L) never marked this item. Two other inspectors (E and G) marked it at least once for every maneuver, and one other inspector (F) marked it for all maneuvers but one. It appears very likely that standards for "perfect execution" were not the same for all instructors.

Inspector differences also become marked when markings of specific errors are considered. Table 14 furnishes a rough comparison of inspectors by showing the number of maneuvers on which an inspector marked a given error at least once. Inspector A, for example, used the item "too fast" at least once on each of the 12 maneuvers in Section 1. Inspector F, on the other hand, marked this error on only 2 of the 12 maneuvers. The data are not completely comparable for all inspectors, of course, since the inspectors flew with different numbers of students. Some consistent differences in pattern of marking appear obvious, however,

---

[12] Examination of photographic records in another part of this study has shown that few students attained the specified bank in the turn maneuvers. There is also an indication in another part of the study that some instructors, at least, were marking in terms of fluctuations in bank rather than failure to maintain a specified bank.

TABLE 13

PERCENTAGE OF ROX RATED BY EACH INSPECTOR WHO WERE INDICATED AS SHOWING "PERFECT EXECUTION" OF EACH MANEUVER

	Inspector:	A	B	C	D	E	F	G	H	J	K	L
	Number of Cases:	37	25	57	57	41	10	33	17	17	18	24
1.	Taxi	5	16	12	21	88	60	58	6	-	-	-
2.	Take-off	-	24	2	5	61	80	48	-	-	-	-
3.	Straight and Level	3	28	12	2	61	50	79	-	-	-	-
5.	S Turns	-	4	-	-	39	20	36	-	-	-	-
6.	2-Bank 8	-	-	-	-	37	10	21	-	-	-	-
7.	Str. Cl. & Recovery	-	8	-	2	49	70	39	-	-	-	-
8.	90° Cl. Tr. R 15° Bank	-	-	-	-	37	30	45	-	-	-	-
9.	90° Cl. Tr. L 15° Bank	-	-	-	-	41	30	52	-	-	-	-
10.	90° Cl. Tr. R 45° Bank	-	-	-	-	34	60	36	-	-	-	-
11.	90° Cl. Tr. L 45° Bank	-	-	2	-	24	60	45	-	-	-	-
12.	90° Turn L 15° Bank	-	4	-	-	54	50	52	-	-	-	-
13.	90° Turn R 15° Bank	-	-	2	2	44	20	61	-	-	-	-
14.	180° Turn L 45° Bank	3	-	-	-	49	60	55	-	-	-	-
15.	180° Turn R 45° Bank	-	4	-	-	49	30	61	-	-	-	-
16.	360° Steep Tr. L 60° Bank	-	-	2	-	9	30	45	-	-	-	-
17.	360° Steep Tr. R 60° Bank	-	-	-	-	15	30	42	-	-	-	-
17a.	Series of Turns	-	-	-	-	5	-	6	-	-	-	-
18.	Normal Power-off Stall	3	12	-	2	27	40	39	-	-	-	-
19.	Forward Slip	-	16	2	-	24	80	55	-	-	-	-
21.	Str. Glide & Recovery	-	24	2	-	66	90	82	-	-	-	-
22.	90° Gl. Tr. R 15° Bank	3	4	-	-	59	30	45	-	-	-	-
23.	90° Gl. Tr. L 15° Bank	-	4	2	-	63	50	55	-	-	-	-
26.	Circular Approach	-	-	-	-	51	60	85	-	-	-	-
27.	Precision Landing	-	-	-	-	51	60	52	-	-	-	-

especially in Section 2 where the 12 maneuvers are more directly comparable than are the 12 maneuvers in Section 1. Inspector A, for example, did not use the items "rudder early," "rudder late," "elevator early," or "elevator late" at all, whereas Inspector B marked these four items on almost every maneuver. It may be further noted that whereas 8 inspectors marked "slips" and "skids" on every turn maneuver, Inspector F did not mark "slips" at all, although he marked "skids" on 11 of the 12 maneuvers. Clear differences are also seen in the marking of the items "too much aileron" and "too little aileron." Some of these inconsistencies may be due to the fact that the form provides more than one item to cover a general error. Not all the inconsistencies, however, can be explained on this basis.

7. Total Error Score. The number of errors on each ACA 3422 sheet were added to yield a "total error score." The distribution of these scores is shown in Table 15, along with the means and standard deviations for first and second flights of each inspector. The means range from 21.6

TABLE 14

NUMBER OF MANEUVERS ON WHICH EACH INSPECTOR RECORDED EACH ERROR AT LEAST ONCE

Errors in Section 1	A	B	C	D	E	F	G	H	J	K	L
Too fast	12	8	8	12	8	2	7	7	11	12	10
Too slow	8	6	8	9	4	1	7	2	11	8	9
Alt. Select. poor	4	4	4	3	1	0	0	0	0	6	7
Area Select. poor	0	0	3	3	0	0	2	3	0	7	8
Pattern poor	7	7	6	5	6	6	7	7	5	6	12
Slips	7	8	11	8	5	1	7	7	11	8	9
Skids	9	6	8	9	7	4	7	6	10	10	6
Rough Control use	4	11	9	12	5	3	8	11	9	11	12
Fans Controls	5	7	12	11	5	9	1	6	2	7	2
Walks rudder	2	3	6	7	4	0	3	7	9	2	7
Overshoots	1	8	6	7	4	2	4	5	3	2	4
Undershoots	2	7	7	6	5	2	3	3	5	2	4
Nose Variable	11	11	11	11	7	2	9	9	11	10	11
Poor Planning	10	6	10	10	7	5	11	8	5	12	8
Poor Timing	5	12	10	10	5	4	10	11	9	9	11
Poor Throttle use	11	12	12	12	10	1	11	12	12	11	11
Poor Trimming	8	3	3	5	3	2	7	8	1	1	3
Poor alt. control	6	5	8	10	6	4	6	6	5	7	7
Poor att. control	10	11	11	9	10	4	12	11	4	11	12
Poor dis. control	12	11	9	12	9	7	12	10	10	10	12
Errors in Section 2											
Slips	12	12	12	12	12	0	12	12	12	12	12
Skids	12	12	12	12	7	11	12	8	12	12	12
Rudder Early	0	10	10	9	8	0	8	1	7	8	6
Rudder Late	0	12	12	12	5	3	11	7	12	11	12
Too much Rudder	12	9	10	12	9	9	10	5	12	12	11
Too little Rudder	10	12	12	12	12	11	10	10	12	12	9
Walks Rudder	0	0	3	11	0	0	0	6	4	0	4
Ailerons Early	3	8	0	0	0	0	11	0	7	7	12
Ailerons Late	0	0	1	1	0	0	8	1	4	4	5
Too much Aileron	1	12	12	9	3	12	11	12	11	7	12
Too little Aileron	1	4	12	10	0	2	12	8	9	4	6
Elevator Early	0	12	6	11	5	0	1	3	9	1	6
Elevator Late	0	11	10	9	2	0	0	7	6	4	9
Too much Elevator	3	12	12	12	12	4	8	12	12	7	11
Too little Elevator	2	12	10	12	12	3	7	12	12	12	10
Deg. Bank Varies	12	12	12	12	12	2	12	12	12	12	12
Nose High	12	12	12	12	10	1	12	11	12	9	11
Nose Low	12	11	12	12	11	1	10	12	12	11	8
Nose Wanders	6	8	12	12	12	9	12	12	12	12	12
Entry & Rec. Abt.	4	9	8	10	7	1	12	12	6	9	12

TABLE 15

DISTRIBUTION OF TOTAL ERRORS BY SWING, BY INSPECTOR, BY FLIGHT*

Swing:	I**		II				III						IV								V.			
Inspector:	A_1		B		C		D		E_1		A_2		F		G		H		J		K		L	
Flight:	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
140-149			1				1																	
130-139	1		-	1		2	-																1	
120-129	-		1	-		-	1								1						1		1	
110-119	-		-	2	1	1	1	1							-				1		-	1	1	3
100-109	-		2	3	2	-	1	-							-		1		-		-	-	3	3
90-99	1	1	2	1	3	-	6	6							-		2	-	1	2	-	2	2	1
80-89	3	2	2	3	3	5	8	5							3		-	-	3	1	2	2	3	-
70-79	3	2	2	3	6	4	4	6							1	3	2	2	-	3	1	4	3	3
60-69	3	2	-	-	8	5	5	6			1			1	1	1	3	1	2	1	1	-		2
50-59	3	2	-	-	4	2	2	4		1	-	1		-	1	1	2	4	1	1	-	1		-
40-49	2	2	1	1	1	3				2	3	1	1	-	1	2					1			
30-39	1			1		2			4	-	1	5	1	-	2	4								1
20-29									10	5			1	3	5	2								
10-19									5	5			2	1	-	4								
0-9										3					1	1								
M_I	69.8		92.5		74.8		85.2		23.5		45.4		27.3		58.1		70.3		81.3		82.1		96.0	28.3
M_{II}	67.2		89.7		67.2		78.0		21.6		39.1		29.2		57.4		56.6		79.4		81.0		89.6	32.7
σI	22.3		25.6		16.8		19.0		6.7		9.3		12.8		31.0		12.8		16.8		20.7		13.6	
σII	16.5		24.8		25.6		14.7		13.8		7.7		18.8		23.7		17.2		13.4		14.9		25.2	
N_I	17		11		28		29		19		5		5		16		9		8		9		12	
N_{II}	11		15		29		28		16		7		5		17		8		9		9		12	

*Means and sigmas are calculated from raw scores.

**The number of cases for Inspectors A and B are larger than those given elsewhere in this report, because data were included from records later found to be incomplete.

for the second flights of Inspector E_1 to 96.0 for the first flights of Inspector L_1. Differences in the variability of the scores are also obvious. This may be substantiated statistically by the use of Bartlett's test of homogeneity of variance. The hypothesis of homogeneity of variance may be rejected below the 1% level of confidence.

Correlations between total error scores on first and second flights of paired inspectors are shown in Table 16. (This table reproduces, for ease of comparison, the corresponding correlations for over-all grades and mean maneuver grades, from Tables 4 and 8.) The correlations for the total error scores range from -.13 (N = 5) to .74 (N = 8). The median correlation is .49. These figures indicate that pairs of inspectors agree moderately well in assigning more errors to some individuals than to others. The total error score shows little promise for large-scale studies involving many inspectors in view of the extreme inspector differences.

TABLE 16

CORRELATIONS BETWEEN CORRESPONDING 342Z MEASURES IN FIRST AND SECOND FLIGHTS, BY PAIRED INSPECTORS

Inspectors Flight I	Inspectors Flight II	N	Total Errors	Over-all Grade	Mean Man. Grade
A	B	15	.04	--	.27
B	A	10	.59	--	.53
C	D	28	.48	.51	.69
D	C	29	.50	.57	.51
E_1	A_2	7	.06	.14	.30
A_2	E_1	5	-.13	.16	.66
E	G	12	.57	.30	.22
G	E_1	11	.23	.35	.03
F	G	5	.73	.37	.77
G	F	5	.18	.11	.35
H	J	9	.05	.57	.65
J	H	8	.74	.24	.88
K	L	9	.50	.66	.40
L	K	9	.50	.27	.58
Median Correlation			.49	.32	.52

DISCUSSION

It is quite evident from the analysis presented in this report that there are marked differences among inspectors in the assignment of grades for check flights. Discrepancies are found for over-all grades, for maneuver grades, and for the number and type of errors observed. Some of these discrepancies are undoubtedly due to ambiguities of the form or of the instructions for its use. It is not the purpose of this discussion, however, to propose revisions of the form but to consider the general implications for the training of inspectors and instructors.

The problem of getting inspectors to observe and judge the check flights in an equivalent and competent manner is very important since the recommendation of the inspector is the most widely used measure of the adequacy of the student in handling the primary flight course. Many of the differences between inspectors might be overcome by careful training of inspectors in the art of assigning grades and recording observations. In this connection, it would be essential to indicate to inspectors that they avoid assigning "favorite" grades indiscriminately; that they use a wide range of grades when necessary; that they do not allow their judgments to be colored by trivial incidents occurring during flight; and above all, that they maintain uniformity of standards.

The need for uniformity of standards applies also to the observation and recording of specific errors, and for this purpose a strict adherence to the rules for the use of any rating form is imperative. A period of training should be useful in showing instructors whether they are interpreting the instructions correctly.

Study of the rate of occurrence of specific types of errors in Form ACA 342Z reveals information that may be valuable for instructors. The fact that certain errors are marked quite frequently by inspectors may be taken as pertinent evidence of inadequate training on these aspects of performance, possibly because too much emphasis has been pl... on certain "traditional" errors to the neglect of others which are ... more important in the operation of modern aircraft. Many maneuver err... which show a high rate of occurrence can be found in Tables 11 and 12. For example, in "S turns" and in "2-bank 8's," the errors "poor pattern" and "poor planning" are reported for about half the students by the "average" inspector. In general, errors in which the median percentage is above 50 on specific maneuvers might well be called to the attention of the instructors.

APPENDIX A

A-1. MANUAL FOR THE USE OF CAA PILOT FLIGHT TEST REPORT AND FLIGHT INSTRUCTOR'S RECOMMENDATION

A-2. PILOT FLIGHT TEST REPORT AND FLIGHT INSTRUCTOR'S RECOMMENDATION (FORM ACA 342Z)

MANUAL FOR THE USE OF CAA PILOT FLIGHT TEST REPORT AND FLIGHT INSTRUCTOR'S RECOMMENDATION

(Form ACA [illegible])

Prepared by

[illegible] S. Vitales
[illegible] G. Heart
Albert S. Thompson
Albert J. Walker

University of Pennsylvania
Philadelphia, Pennsylvania

in cooperation with

F. M. Kantor
Director, Safety Regulation
Civil Aeronautics Administration

September 1943

One of a series of projects conducted under the provisions of a contract between the Civil Aeronautics Administration and the National Research Council by means of grants-in-aid from the Committee on Selection and Training of Aircraft Pilots.

Form ACA 342Z is to be used to [illegible] the performance of the trainees on their flight test. The maneuvers are to be flown in the specified sequence, and the characteristics of the trainee's performance are to be noted on Form ACA 342Z by blackening the appropriate blanks with a #2 soft lead pencil.

Sections 1 and 2 deal with the performance of the trainee on individual maneuvers in the flight test and are to be filled out while in flight. The form is useless for evaluation purposes if it is filled out from memory after the flight. The errors listed on Sections 1 and 2, respectively, are those which are common to the majority of the maneuvers listed under these sections. However, all of the errors likely to occur in the maneuvers have not been listed. Therefore, the marking of the form for each maneuver may not, and probably will not, describe completely the performance of any given maneuver.

Errors not indicated in one place, however, are provided for in another section, possibly under another name. A complete description of the trainee's performance is therefore secured when the form as a whole is completed in accordance with the instructions given in this manual. An analysis of the form will provide all of the information needed to evaluate the trainee's performance, even though details appear to be lacking in noting errors on individual maneuvers.

The errors listed for Sections 1 and 2 are to be marked regardless of how slight the error is, or how infrequently it is observed. If the error is at all noticeable to the check pilot it is to be marked. Frequency and degree of such errors are provided for in Sections 3 and 4.

Your general impression of the flight performance of the trainee on the test flight is to be indicated immediately after the completion of the flight test by filling in Sections 3, 4, 5, and 11 on the reverse side of the form. Your general impression of the trainee's personal qualifications as a pilot are to be noted in the spaces provided in Sections 6 to 10, inclusive.

Throughout Form ACA 342Z, mark the items in terms of the trainee's performance and on the basis of your observations during the flight test. Do not, however, arrive at the over-all grade for the flight as a whole through adding up or attempting to analyze the number of marks made on the form. Neither should the over-all grade be an average of the grades given individual maneuvers. The over-all grade represents your general rating of the trainee's over-all performance, ability, and personal qualifications.

The grade on each maneuver should be made independently of your marking of the form, since nobody is absolutely certain just what all of the characteristics of a good pilot are at any given stage in his training. Give your over-all grades on the flight as a whole and grades on specific maneuvers just as if you had never filled in the form at all.

The only time that your grade for a maneuver need necessarily be related to the way you marked the form is in the case when the blank "Perfect Execution" is filled in. If the trainee's execution is perfect, his grade for that maneuver must be 100%. "Execution Perfect" does not mean "execution satisfactory" -- it means perfect.

Following is a list of definitions of all of the errors which can be marked in Sections 1 and 2, and further definitions and directions for filling in Sections 3 to 11, on the back of the sheet. Make certain that you understand these definitions and that the form is marked in terms of these definitions.

You may not agree with certain of these definitions. Different inspectors or instructors often use the same term in different ways, all of which may be essentially correct. However, insofar as this form is concerned, it is extremely important that the given definitions be followed. Since the specific performances and characteristics of groups of pilots are being studied on the basis of reports of a number of inspectors using Form ACA 342% experimentally, it is absolutely necessary that different inspectors are all "talking the same language."

DEFINITION OF TERMS ON FORM ACA 342Z

The definition of these terms, from maneuver to maneuver, (to which they are applicable) should be constant unless specifically designated otherwise. All specified limits are set up for planes with cruising speeds of 60-90 m.p.h.

SECTION 1.

Perfect Execution: No noticeable errors whatsoever in execution of maneuver. Performance merits grade of 100%.

Too Fast: Airspeed more than 5 m.p.h. above optimum for maneuver.[13]

Too Slow: Airspeed more than 3 m.p.h. below optimum for maneuver.[14]

Altitude Selection Poor: Trainee begins maneuver at altitude other than that specified by the requirements of the maneuver, or by the inspector.

Area Selection Poor: 1. In maneuvers which require ground course to be followed, the landmarks selected not in accordance with the requirements of the maneuver.

2. Terrain over which maneuver performed unsuitable, e.g., no emergency landing areas within gliding distance during performance of S's.

3. Flying into an area already congested or in use.

4. Taxiing, taking-off or landing towards a congested area, or taking-off or landing against the traffic tee.

Pattern Poor: Plane varies from prescribed pattern for any reason [illegible], failure of trainee to know sequence, lack of coordination or other errors in controlling plane, failure to plan ahead, inadequate drift allowance, etc. This definition includes poor taxi pattern and deviations from any pattern demanded by precision maneuvers.

Slips: Plane slips perceptibly during any part of the maneuver. NOTE: Slight momentary slips due to buffeting by rough air should be overlooked.

Skids: Plane skids noticeably during any part of the maneuver. NOTE: Slight momentary skids due to buffeting by rough air should be overlooked.

Rough Control Use: 1. Trainee [illegible] rudder pedals" rather than "exerts pressure."

---

[13],[14] or taxiing at improper speed.

2. Trainee [illegible] in a jerky manner.

3. Trainee overcontrols.

4. Trainee "fans" control.

Fans Controls: Trainee moves controls from one side to the other, rapidly and without coordination. NOTE: A mark on this item requires that a mark also be made under Rough Control Use since fanning controls is a type of rough control use. Rough Control Use, however, may be marked without an entry being made under Fans Controls.

Walks Rudder: This item is marked when the rudder only is moved rapidly from side to side (e.g., in stalls, take-offs, and steep turns) without regard to properly coordinated control pressures.

Over Shoots: 1. Trainee lands beyond 200 foot landing circle.

2. Trainee turns beyond desired heading or ground course during execution of maneuver.

3. Trainee overshoots reference point.

Under Shoots: 1. Trainee lands short of 200 foot landing circle.

2. Trainee fails to turn to desired heading or ground course during execution of maneuver.

3. Trainee under shoots reference point.

Nose Variable: Nose of plane varies from side to side or up and down other than in accordance with the requirements of the maneuver during course of its execution.

Poor Planning: Execution poor due to failure to plan ahead. Poor planning may result in failure to follow a specific ground pattern, in over shooting a reference point, in entering a maneuver incorrectly, and may be the basic cause for Pattern Poor, Over Shoots, etc. NOTE: If error is due to lack of coordination of controls primarily, mark Poor Timing rather than Poor Planning.

Poor Timing: Controls applied at wrong time during maneuver, or in incorrect sequence, resulting in poor execution of maneuver or series of maneuvers, e.g., back pressure released too soon at stall, rudder pressure released too soon in recovering from slip, etc.

Poor Throttle Use: 1. Improper coordination of throttle with other controls.

2. Rough handling of throttle.

[illegible]

[illegible] to other maneuvers.

Poor Trimming: [illegible] be marked only for maneuver Straight and Level Flight). Stabilizer adjustment improper. NOTE: If after the trainee has completed the maneuver Straight and Level Flight the ship is still improperly trimmed, the inspector should trim the ship properly so that the trainee will not be penalized for this specific error throughout the remainder of the flight.

Poor Altitude Control: Any variation in altitude greater than 20 feet[15] other than variations called for by the requirements of the maneuver. NOTE: If the only error is that the maneuver is entered at the wrong altitude, do not mark this item. This error is dealt with under the item Altitude Selection Poor.

Poor Attitude Control: 1. Plane is in improper attitude for maneuver, such as climbing angle too great, varies, nose too high, or too low at stall, etc.

2. Variations from designated bank of greater than 5° during maneuvers requiring bank, or flying with wing low in straight course maneuver.

3. Improper elevator control while taxiing.

Poor Directional Control: Failure to maintain constant direction during straight course maneuvers, or proper rate of turn during turn.

SECTION 2.

Perfect Execution: No noticeable errors whatsoever in execution of maneuver. Performance merits over-all grade of 100%.

Slips: Plane slips perceptibly during any part of the maneuver. NOTE: Slight momentary slips due to buffeting by rough air should be overlooked.

Skids: Plane skids perceptibly during any part of the maneuver. NOTE: Slight momentary skids due to buffeting by rough air should be overlooked.

Rudder Early: 1. Leads with rudder or,

2. Applies rudder too soon in control sequence.

Rudder Late: 1. "Drags" rudder or,

---

[15]Except in steep turns where variations of 50 feet are permissible.

2. Applies rudder too late in control sequence.

Too Much Rudder: Rudder pressure greater than necessary for:

1. Coordination with aileron;

2. the requirements of the maneuver.

Too Little Rudder: Rudder pressure less than necessary for:

1. Coordination with aileron;

2. the requirements of the maneuver.

Walks Rudder: Rudder only is moved rapidly from side to side without coordination with other controls.

Ailerons Early: 1. Leads with aileron or,

2. applies aileron too soon in control sequence.

Ailerons Late: 1. "Drags" aileron or,

2. applies aileron too late in control sequence. NOTE: In most elementary turning maneuvers, since the rudder is primarily an auxiliary control, it should be coordinated with the aileron. Therefore, unless the tendency to lead with the aileron is marked, Rudder Late rather than Aileron Early should be recorded (or Rudder Early rather than Aileron Late). This would not necessarily hold for more advanced maneuvers in which applications of pressures must be coordinated with the attitude of the plane during execution of a maneuver, e.g., in slow rolls or vertical reverses.

Too Much Aileron: Aileron pressure more than that required to execute the maneuver properly, e.g., individual who banks steeply through use of excessive aileron pressure or who maintains pressure too long, rather than by maintaining correct pressures the correct length of time.

Too Little Aileron: Aileron pressure insufficient to execute maneuver properly, or held insufficient length of time.

Elevator Early: Poor timing of elevator control, resulting in application of elevator too soon in control sequence.

Elevator Late: Poor timing of elevator control, resulting in application of elevator pressure too late in control sequence.

Too Much Elevator: Excessive back pressure on control stick in terms of:

1. Requirements of maneuver or,

2. [illegible] other controls.

Too Little Movement: [illegible] stick in terms of:

1. Requirements of maneuver or,

2. coordination with other controls.

Degree of Bank Varies: Bank varies [illegible] from requirements of maneuver.

Nose High: Nose too high (in relation to horizon) during any part of maneuver.

Nose Low: Nose too low (in relation to horizon) during any part of maneuver.

Nose Wanders: Nose varies from correct heading or not held steady in relation to horizon in accordance with the requirements of the maneuver.

Entry and Recovery Abrupt: Mark this item if either entry or recovery to maneuver is not smooth.

> The sections on the back of the form are to be filled out after the completion of the test flight, on the basis of the over-all impressions gained during the flight test. In Sections 3, 4, 5, and 11 the flight performance of the trainee is to be indicated. In Sections 6 to 10 the general impression of the trainee's personal qualifications as a pilot are to be noted.

SECTION 3. General Execution.

In this section you are to record your over-all impression of the trainee's specific flying habits in the execution of turn maneuvers. The items are self-explanatory. But NOTE:

1. Mark (a) how frequently the characteristic was observed, in terms of "Never," "Occasionally," and "Constantly," and also (b) the degree to which it is present, in terms of "Slightly," or "Extremely." Thus, two marks should be made following every item except in cases where "Never" is marked.

2. Evaluate the performance on right hand maneuvers and left hand maneuvers separately. Trainees frequently differ in their ability to execute maneuvers to the right, and to the left, as well as in the type of errors made.

SECTION 4. General Flying Habits.

The items in this section are marked similarly to the items in Section 3. Again, unless "Never" is checked, two marks are made following each item, one indicating how frequently the characteristic was observed, the other the degree to which it was present.

Although in general the items are self-explanatory, note the following points:

1. Coordinates Patterns and Areas: Refers to whether or not the trainee selects a pattern (e.g., selection of pylon for elementary eights, landmarks for series of turns) which is adapted to the area in which the maneuver is being performed, or whether or not he adapts his pattern to the area available.

2. Coordinates Approaches and Areas: Refers to whether or not the trainee adapts his approach to the characteristics of the area involved, e.g., in entering the congested traffic pattern, in approach to emergency landings away from the field, etc.

3. Displays Good Subconscious Coordination: Good "subconscious coordination" denotes the ability to coordinate properly when the attention is directed outside of the plane, and away from the control pressures as such, as in 8's, spirals, precision landings, and emergencies.

4. Exhibits Good "Subconscious Reactions": Good "subconscious reaction" denotes the ability to react rapidly and "automatically" to the requirements of emergencies, or in making corrections for rough air, bounce landings, etc.

5. Uses Controls by Trial and Error: This refers to the trainee who is generally uncoordinated, and who apparently applies first one control and then the other until the desired results are obtained.

SECTION 5. Control Use.

Mark the one or more blanks which best describe the way the trainee handles the controls.

SECTION 6. Reactions.

Mark the one or more blanks which best describe the way the trainee reacts to the flight situation.

SECTION 7. Judgment.

Mark the one or more blanks which best describe the trainee's judgment.

SECTIONS 8, 9, and 10: Make entries under these sections only if the characteristics are noted.

SECTION 11. Rate the trainees on the general characteristics included in this section.

APPENDIX A-2

PILOT FLIGHT TEST REPORT AND FLIGHT INSTRUCTOR'S RECOMMENDATION (FORM ACA 342Z)

C[illegible]CK TEST [illegible] ______ [illegible] ______ [illegible]

[illegible]IGTON

[illegible]GHT TEST REPORT AND FLIGHT INSTRUCTOR'S RECOMMENDATION

NAME ______________________

ADDRESS ______________________
STREET OR RFD NO.

____
CITY STATE

MAKE OF AIRCRAFT USED ______________ CLASS ______________ H. P. ______________

FLYING SCHOOL ______________________

ADDRESS OF FLYING SCHOOL ______________________

AIRPORT ______________________
CITY STATE

I HAVE EVERY REASON TO BELIEVE THAT THE APPLICANT HAS HAD AT LEAST ________ HOURS SOLO FLYING TIME, AND I CONSIDER HIM CAPABLE OF SUCCESSFULLY ACCOMPLISHING THE FLIGHT TEST FOR A ____________ PILOT CERTIFICATE, AND OF FULFILLING THE RESPONSIBILITIES OF THE HOLDER OF SUCH CERTIFICATE.

______________________ ______________________
SIGNATURE OF FLIGHT INSTRUCTOR CERTIFICATE NUMBER

SECTION 2

EVALUATE ALL ITEMS IN THIS SECTION ACCORDING TO ITEMS LISTED ON LEFT

METHOD OF EXECUTION OF EACH MANEUVER IN THIS SECTION MUST BE INDICATED

MAKE ALL MARKS HEAVY AND BLACK

USE ONLY IBM TEST SCORING MACHINE P38 LEADS OR NO 2 SOFT LEAD PENCIL

	LEVEL TURN 15° BANK - RIGHT	LEVEL TURN 15° BANK - LEFT	LEVEL TURN 45° BANK - RIGHT	LEVEL TURN 45° BANK - LEFT	720° TURN 60° BANK - RIGHT	720° TURN 60° BANK - LEFT	MAXIMUM CLIMBING TURN-15° BANK-RIGHT	MAXIMUM CLIMBING TURN-15° BANK-LEFT	MAXIMUM CLIMBING TURN-45° BANK-RIGHT	MAXIMUM CLIMBING TURN-45° BANK-LEFT	GLIDING TURN 15° BANK - RIGHT	GLIDING TURN 15° BANK - LEFT	GLIDING TURN 45° BANK - RIGHT	GLIDING TURN 45° BANK - LEFT	COORDINATION MANEUVERS
PERFECT EXECUTION															
SLIPS															
SKIDS															
RUDDER EARLY															
RUDDER LATE															
TOO MUCH RUDDER															
TOO LITTLE RUDDER															
WALKS RUDDER															
AILERONS EARLY															
AILERONS LATE															
TOO MUCH AILERON															
TOO LITTLE AILERON															
ELEVATOR EARLY															
ELEVATOR LATE															
TOO MUCH ELEVATOR															
TOO LITTLE ELEVATOR															
DEGREE OF BANK VARIES															
NOSE HIGH															
NOSE LOW															
NOSE WANDERS															
ENTRY & RECOVERY ABRUPT															

FOLD ON THIS LINE AND USE ON KNEE BOARD WHILE FLYING WITH APPLICANT
SECTIONS 1 AND 2 TO BE FILLED OUT DURING FLIGHT TEST

SECTION 1

EVALUATE ALL ITEMS IN THIS SECTION ACCORDING TO ITEMS LISTED ON RIGHT

METHOD OF EXECUTION OF EACH MANEUVER IN THIS SECTION MUST BE INDICATED

MAKE ALL MARKS HEAVY AND BLACK

USE ONLY IBM TEST SCORING MACHINE P38 LEADS OR NO 2 SOFT LEAD PENCIL

	TAXIING	TAKE-OFFS	STRAIGHT CLIMBS	STRAIGHT AND LEVEL FLIGHT	EIGHTS	STALLS-POWER ON	STALLS-POWER OFF	SPINS - RIGHT	SPINS - LEFT	1080° SPIRAL 60° BANK - RIGHT	1080° SPIRAL 60° BANK - LEFT	STRAIGHT GLIDES	SLIPS	ACCURACY LANDINGS	EMERGENCY LANDINGS
PERFECT EXECUTION															
TOO FAST															
TOO SLOW															
ALTITUDE SELECTION POOR															
AREA SELECTION POOR															
PATTERN POOR															
SLIPS															
SKIDS															
ROUGH CONTROL USE															
FANS CONTROLS															
WALKS RUDDER															
OVER-SHOOTS															
UNDER-SHOOTS															
NOSE VARIABLE															
POOR PLANNING															
POOR TIMING															
POOR THROTTLE USE															
POOR TRIMMING															
POOR ALTITUDE CONTROL															
POOR ATTITUDE CONTROL															
POOR OR [illegible] CONTROL															

UNITED STATES OF AMERICA
DEPARTMENT OF COMMERCE
CIVIL AERONAUTICS ADMINISTRATION
WASHINGTON

PILOT FLIGHT TEST REPORT AND FLIGHT INSTRUCTOR'S RECOMMENDATION

ENTER OVER-ALL GRADE IN PERCENTAGE
EXCELLENT (90-100)
ABOVE AVERAGE (85-90)
AVERAGE (80-85)
BELOW AVERAGE (70-80)
UNSATISFACTORY (0-70)

FLIGHT EXAMINER'S AFFADAVIT

I CERTIFY: (1) That I have this day flight tested the person whose name appears on the reverse side hereof. (2) That I rode in the airplane throughout this entire flight test. (3) That in Sections 1 and 2, I have made true and accurate entries and have indicated every error made during the execution of the maneuvers for which provision was made on the form. (4) That in Sections 3 through 11, I have made true and accurate entries as to his over-all performance and general flying habits as indicated by the flight test and from all other sources of information available to me. (5) That all entries herein have been made without prejudice or favoritism and to the best of my knowledge and ability.

I RECOMMEND HIM FOR A ______

DATE ______ EXAMINER'S SIGNATURE ______ DESIGNATION No. ______

I HAVE EXAMINED THE STUDENT AND RECOMMEND HIM FOR A ______

______ INSPECTOR

WITHOUT FURTHER FLIGHT TEST. I HAVE ACCEPTED THE RECOMMENDATION OF THE EXAMINER.

______ INSPECTOR

SECTION 3 GENERAL EXECUTION

	Right Hand Maneuvers: Never	Occasionally	Constantly	Slightly	Extremely	Left Hand Maneuvers: Never	Occasionally	Constantly	Slightly	Extremely
SLIPS										
SKIDS										
CROSSES CONTROLS										
NOSE WANDERS DURING ENTRY										
NOSE WANDERS DURING RECOVERY										
APPROACHES STALLS INADVERTANTLY										
STALLS INADVERTANTLY										
SPINS INADVERTANTLY										
ATTITUDE AND POWER UNCOORDINATED										
COORDINATES, ALL FACTORS OF MANEUVERS										
COORDINATES ALL CONTROLS										
OBTAINS MAXIMUM PERFORMANCE										
ATTEMPTS TO EXCEED PERFORMANCE CAPABILITIES										
UNNECESSARY LOAD FACTORS IMPOSED										
SPEED CONTROL ERRATIC										
SPEED SENSING ERRATIC										
KEEPS SAFE MARGIN OF SPEED										
COORDINATES ATTITUDE & PERFORMANCE CAPABILITIES										
PERFORMANCE SATISFACTORY										

NOTE: ALL ITEMS ON THIS PAGE EXCEPT SECTIONS 8, 9 AND 10 MUST BE EVALUATED. MAKE ENTRIES IN SECTIONS 8, 9 AND 10 ONLY WHEN APPLICABLE.

GENERAL RATING AND CHARACTERISTICS

SEC. 5	SMOOTH	ROUGH	UNCERTAIN	ERRATIC	MECHANICAL
CONTROLS USE					

SEC. 11	OUTSTANDING	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	UNSATISFACTORY
OBSERVANCE OF SAFETY RULES					
OBSERVANCE OF TRAFFIC RULES					
ENGINE STARTING AND STOPPING - PRACTICES & TECHNIQUE					
PRE-FLIGHT INSPECTION TECHNIQUE					
CAREFULNESS					
APTITUDE					
OVER-ALL RATING					

SEC. 6 REACTIONS	NERVOUS	APPREHENSIVE	TENSE	COOL	SLOW

SEC. 7 JUDGEMENT	DEPENDABLE	UNCERTAIN	MEDIOCRE	ERRATIC	IMPULSIVE

SEC. 8 TEMPERMENT	OVER-CONFIDENT	TIMID	STUBBORN	RECKLESS	COCKY

SEC. 9 ATTITUDE	IRRESPONSIBLE	OVER-CAUTIOUS	FORGETFUL	INDIFFERENT	COOPERATIVE

SEC. 10 SUBJECT TO	FRIGHT-PARALYSIS	NAUSEA	NERVOUS FATIGUE	VERTIGO	DISORIENTEDNESS

SECTION 4 GENERAL FLYING HABITS

	NEVER	
RIDES BRAKES		
LOOKS FOR OBSTACLES		
LOOKS FOR OTHER AIRCRAFT		
USES ALL AVAILABLE FIELD FOR TAKE-OFF		
SELECTS BEST AVAILABLE AREA		
ADHERES TO PROPER PATTERNS		
COORDINATES PATTERNS AND AREAS		
PRE-SELECTS EMERGENCY FIELDS		
EXHIBITS GOOD PLANNING		
EXHIBITS GOOD TIMING		
EXHIBITS GOOD THROTTLE COORDINATION		
EXHIBITS GOOD STALL APPROACH RECOGNITION		
EXERCISES PROPER ALTITUDE CONTROL		
EXERCISES PROPER DRIFT CONTROL		
EXERCISES PROPER VERTICLE ATTITUDE CONTROL		
EXERCISES PROPER LATERAL ATTITUDE CONTROL		
EXERCISES PROPER DIRECTIONAL CONTROL		
ORIENTED		
EXHIBITS PRECISION EXECUTION		
COORDINATES APPROACHES AND AREAS		
ESTIMATES G[illegible] DISTANCE WELL		
VARIES GLIDING [illegible]		
PLAYS [illegible] EFFECT[illegible]		
SLIPS [illegible] LAND[illegible]		
UND[illegible]		
OV[illegible]		
LAN[illegible] IN FIRST [illegible] FIELD		
[illegible] SUBCONSCIOUS [illegible]ATION		
[illegible]TS GOOD SUB-C[illegible]CIOUS REACTION		
[illegible] CONTROLS BY TRIAL AND ERROR		

[illegible] FORM [illegible]

APPENDIX B.

PERCENTAGE OF CASES MARKED BY EACH INSPECTOR WITH PARTICULAR ERROR ON FORM ACA 342Z

TAXI (Maneuver 2)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Too Fast	62	68	21	26	5	20	33	-	35	6	46
Too Slow	51	16	-	5	-	-	3	-	-	6	4
Altitude Selection Poor	-	-	-	-	-	-	-	-	-	-	-
Area Selection Poor	-	-	2	4	-	-	-	24	-	-	17
Pattern Poor	3	56	42	25	2	30	27	24	6	78	21
Slips	-	-	-	-	-	-	-	-	-	-	-
Skids	-	-	-	-	-	-	-	-	-	6	-
Rough Control Use	-	4	-	4	-	-	-	12	-	39	21
Fans Controls	-	-	11	-	-	-	-	6	-	6	-
Walks Rudder	-	-	-	-	-	-	-	-	-	-	4
Overshoots	-	-	-	-	-	-	-	-	-	-	-
Undershoots	-	-	19	2	-	-	-	-	-	-	-
Nose Variable	-	-	-	-	-	-	-	-	-	-	-
Poor Planning	-	8	9	4	2	-	21	24	18	33	50
Poor Timing	-	24	-	-	-	-	15	6	-	6	4
oor Throttle Use	35	28	7	21	-	-	24	24	12	39	58
oor Trimming	3	-	-	-	-	-	-	-	-	-	-
Poor Altitude Control	-	-	-	-	-	-	-	-	-	-	-
Poor Attitude Control	3	-	-	-	-	-	3	-	-	-	13
Poor Directional Control	46	8	-	4	-	-	12	24	-	17	21

TAKE-OFF (Page over 2)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Too Fast	30	-	19	26	5	-	3	6	6	6	4
Too Slow	35	28	46	19	-	-	18	24	47	17	67
Altitude Selection Poor	-	-	-	-	-	-	-	-	-	-	4
Area Selection Poor	-	-	2	-	-	-	-	-	-	6	29
Pattern Poor	5	8	5	-	-	10	12	6	-	-	17
Slips	-	-	7	2	2	-	-	-	35	-	-
Skids	-	-	-	4	2	-	-	-	35	11	4
Rough Control Use	11	4	2	30	-	-	6	35	18	61	21
Fans Controls	8	4	5	40	7	20	-	-	-	17	-
Walks Rudder	22	24	39	18	12	-	6	6	47	6	4
Overshoots	-	-	-	-	-	-	3	-	-	-	-
Undershoots	-	-	-	-	-	-	3	-	6	-	
Nose Variable	14	24	26	21	2	-	15	29	6	33	3
Poor Planning	3	-	12	2	-	-	24	12	6	22	
Poor Timing	-	36	7	32	-	-	27	53	18	33	
Poor Throttle Use	-	16	4	16	2	-	3	6	12	6	
Poor Trimming	3	-	-	7	-	-	-	12	-	-	
Poor Altitude Control	-	-	-	4	2	-	-	-	-	6	4
Poor Attitude Control	5	16	4	28	12	10	30	41	-	39	33
Poor Directional Control	62	28	49	46	10	-	27	35	65	17	58

STRAIGHT AND LEVEL (Maneuver 3)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Too Fast	3	-	-	4	-	-	3	-	18	28	4
Too Slow	-	-	-	2	2	-	-	-	29	11	-
Altitude Selection Poor	32	-	2	-	-	-	-	-	-	44	8
Area Selection Poor	-	-	-	-	-	-	-	-	-	-	-
Pattern Poor	-	-	-	-	-	-	-	6	-	-	21
Slips	5	40	19	4	-	-	6	-	24	11	-
Skids	3	36	4	4	-	-	3	-	24	6	-
Rough Control Use	3	16	-	9	-	-	-	12	-	6	4
Fans Controls	3	4	11	53	-	20	-	-	6	28	-
Walks Rudder	3	-	-	-	-	-	-	6	35	-	-
Overshoots	-	-	-	-	-	-	-	-	-	-	-
Undershoots	-	-	2	-	-	-	-	-	-	-	-
Nose Variable	41	28	21	30	2	-	3	47	53	11	42
Poor Planning	5	-	-	-	-	-	-	6	-	28	-
Poor Timing	-	24	-	-	-	-	-	-	-	6	-
Poor Throttle Use	8	4	25	19	5	-	3	12	24	39	8
Poor Trimming	5	4	39	40	5	10	3	24	-	11	21
Poor Altitude Control	17	28	14	51	10	20	-	24	12	39	29
Poor Attitude Control	8	16	2	12	17	10	15	24	6	22	54
Poor Directional Control	51	24	14	42	15	20	9	29	29	11	21

S TURNS (Maneuver 5)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Too Fast	3	-	-	2	-	-	-	-	24	17	-
Too Slow	-	-	-	-	-	-	-	-	12	-	-
Altitude Selection Poor	32	8	2	14	-	-	-	-	-	11	46
Area Selection Poor	-	-	7	5	-	-	3	6	-	6	17
Pattern Poor	57	44	60	58	17	30	52	53	65	83	58
Slips	59	52	60	58	15	-	30	18	35	11	29
Skids	65	36	35	37	17	10	24	-	35	28	58
Rough Control Use	-	8	2	9	2	-	9	18	18	39	29
Fans Controls	-	8	2	16	-	50	-	6	-	6	-
Walks Rudder	-	-	-	-	-	-	-	-	-	-	13
Overshoots	-	28	5	30	-	-	6	6	-	-	-
Undershoots	-	40	11	26	7	-	-	-	-	-	4
Nose Variable	49	16	26	18	10	-	21	47	41	22	25
Poor Planning	16	48	42	81	24	40	55	59	41	61	63
Poor Timing	3	20	26	56	2	70	55	18	29	39	[illegible]
Poor Throttle Use	14	16	9	4	2	-	6	6	29	28	-
Poor Trimming	5	4	-	-	2	-	3	12	-	-	-
Poor Altitude Control	38	52	58	77	12	10	12	35	12	44	67
Poor Attitude Control	5	12	2	-	10	-	33	12	6	33	13
Poor Directional Control	5	-	-	2	5	-	48	29	12	6	29

2-BANK 8 (Maneuver 6)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Too Fast	3	-	-	2	-	-	-	-	29	11	-
Too Slow	-	-	-	-	-	-	-	-	24	-	-
Altitude Selection Poor	38	4	4	11	-	-	-	-	-	28	58
Area Selection Poor	-	-	-	-	-	-	3	-	-	11	21
Pattern Poor	65	60	68	60	20	30	64	53	53	78	75
Slips	57	48	53	53	22	10	30	24	53	28	29
Skids	62	40	33	47	22	20	33	18	59	22	42
Rough Control Use	-	8	-	5	2	10	6	12	12	39	25
Fans Controls	-	4	9	28	-	50	3	6	6	-	-
Walks Rudder	-	-	2	-	-	-	-	-	6	-	8
Overshoots	-	32	5	35	2	-	-	-	6	-	8
Undershoots	-	36	26	32	10	-	-	-	12	-	4
Nose Variable	46	8	12	23	10	-	15	53	35	44	46
Poor Planning	22	72	56	74	24	50	58	41	65	72	50
oor Timing	3	16	35	49	5	40	64	18	6	50	38
oor Throttle Use	11	32	12	5	7	-	3	18	35	28	4
Poor Trimming	5	-	2	-	2	-	3	12	6	-	-
Poor Altitude Control	43	68	65	82	17	30	30	41	18	56	54
Poor Attitude Control	3	12	7	-	15	-	30	12	-	33	38
Poor Directional Control	27	8	-	2	-	-	36	35	24	17	67

[illegible] (Continued)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Too Fast	24	32	37	14	10	-	3	18	29	44	29
Too Slow	49	20	11	26	7	-	18	-	47	11	25
Altitude Selection Poor	-	-	-	-	-	-	-	-	-	-	-
Area Selection Poor	-	-	-	-	-	-	-	-	-	6	-
Pattern Poor	5	-	-	-	-	-	-	-	-	-	21
Slips	5	12	18	7	10	-	12	12	29	17	4
Skids	5	12	-	-	2	-	12	-	18	11	4
Rough Control Use	-	4	4	12	-	10	-	12	18	17	21
Fans Controls	11	4	14	44	-	10	-	6	-	11	-
Walks Rudder	-	-	-	-	-	-	-	12	24	-	-
Overshoots	-	-	-	-	-	-	-	-	-	-	-
Undershoots	-	-	-	-	-	-	-	-	6	-	-
Mean Variable	14	28	26	18	7	-	12	35	53	17	38
Poor Planning	3	-	-	-	-	-	21	12	-	39	-
Poor Timing	-	12	4	2	-	-	12	12	12	-	17
Poor Throttle Use	16	44	37	23	17	-	24	29	47	22	5
Poor Trimming	-	-	-	-	-	-	3	-	-	-	
Poor Altitude Control	-	-	-	5	5	-	38	6	-	-	-
Poor Attitude Control	5	16	2	32	22	-	36	53	-	44	42
Poor Directional Control	70	36	19	42	17	30	24	53	12	22	25

90° CLIMB TURN RIGHT 15° BANK (Maneuver 8)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Slips	59	48	61	58	17	-	6	76	76	22	42
Skids	32	36	23	30	-	10	9	6	18	67	33
Rudder Early	-	8	2	4	-	-	-	-	-	6	25
Rudder Late	-	20	28	39	-	-	3	24	12	6	46
Too Much Rudder	3	4	11	19	-	-	9	-	12	61	8
Too Little Rudder	11	24	56	39	22	50	9	59	59	28	13
Walks Rudder	-	-	-	9	-	-	-	-	6	-	21
Ailerons Early	-	-	-	-	-	-	3	-	6	-	33
Ailerons Late	-	-	-	-	-	-	-	-	-	-	8
Too Much Aileron	-	8	9	-	-	50	-	12	18	-	4
Too Little Aileron	-	-	7	7	-	-	9	6	-	6	-
Elevator Early	-	12	-	9	-	-	-	-	18	-	8
Elevator Late	-	8	5	-	-	-	-	-	-	-	4
Too Much Elevator	3	40	9	42	5	-	3	24	47	6	54
Too Little Elevator	-	24	23	9	10	-	6	18	24	33	4
Degree of Bank Varies	70	84	54	47	22	10	45	35	18	83	83
Nose High	46	24	11	42	7	-	15	24	53	-	54
Nose Low	43	32	3	9	7	-	15	12	12	39	8
Nose Wanders	-	8	46	21	10	10	30	18	41	11	83
Entry & Rec. Abrupt	-	-	-	2	-	-	3	12	-	-	13

90° BLIND TURN LEFT 15° BANK (Maneuver 9)

Percentage of Cases Marked by Each
Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Slips	32	40	26	35	2	-	12	12	29	22	58
Skids	57	40	23	51	22	20	12	18	24	56	42
Rudder Early	-	-	2	-	2	-	-	-	-	6	13
Rudder Late	-	3	9	35	-	10	3	-	12	6	42
Too Much Rudder	3	-	7	44	2	10	-	12	18	44	21
Too Little Rudder	5	16	26	16	2	40	12	6	12	22	-
Walks Rudder	-	-	-	11	-	-	-	-	-	-	17
Ailerons Early	-	-	-	-	-	-	6	-	-	-	29
Ailerons Late	-	-	-	-	-	-	-	-	12	-	-
Too Much Aileron	-	12	4	2	2	60	6	6	6	-	8
Too Little Aileron	-	-	9	4	-	-	6	-	6	6	4
Elevator Early	-	16	2	7	-	-	-	-	12	-	8
Elevator Late	-	4	11	-	-	-	-	-	-	-	-
Too Much Elevator	-	40	12	35	7	-	-	35	41	17	54
Too Little Elevator	-	36	14	14	7	-	6	24	24	28	8
Degree of Bank Varies	57	92	39	33	10	10	36	24	18	89	92
Nose High	46	24	23	37	5	-	18	41	53	11	50
Nose Low	41	36	35	16	5	-	15	18	12	44	8
Nose Wanders	-	8	30	12	5	20	21	29	24	28	58
Entry & Rec. Abrupt	-	-	-	-	-	-	3	18	-	6	17

90° CLIMB TURN RIGHT 45° BANK (Maneuver 10)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Slips	59	76	42	70	39	-	33	65	59	28	63
Skids	41	32	23	18	-	20	30	-	35	50	17
Rudder Early	-	8	4	4	-	-	3	-	6	6	8
Rudder Late	-	16	47	56	2	-	3	35	41	17	42
Too Much Rudder	3	8	-	12	10	-	21	-	35	22	4
Too Little Rudder	5	28	32	39	24	30	6	47	35	11	4
Walks Rudder	-	-	-	2	-	-	-	-	-	-	-
Ailerons Early	-	-	-	-	-	-	6	-	6	-	33
Ailerons Late	-	-	-	-	-	-	6	6	-	-	4
Too Much Aileron	-	20	2	2	-	30	15	6	12	6	8
Too Little Aileron	-	4	5	10	-	-	6	12	24	6	4
Elevator Early	-	16	2	7	-	-	-	-	29	-	4
Elevator Late	-	12	12	12	-	-	-	6	6	-	-
Too Much Elevator	-	36	7	30	10	-	3	29	53	6	42
Too Little Elevator	-	32	26	23	7	-	6	12	47	28	4
Degree of Bank Varies	54	72	2	40	7	-	36	24	53	83	67
Nose High	43	32	19	30	10	-	24	29	59	22	58
Nose Low	5	16	21	14	5	-	12	6	18	39	-
Nose Wanders	3	4	32	5	7	10	24	24	6	22	42
Entry & Rec. Abrupt	3	4	2	2	5	-	24	12	-	22	33

[illegible] (Concluded)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	37	37	41	10	33	17	17	18	24
Slips	54	60	39	32	17	-	12	6	47	33	46
Skids	54	44	40	22	5	20	21	12	35	50	46
Rudder Early	-	8	2	8	-	-	6	6	12	11	17
Rudder Late	-	12	56	49	2	-	3	-	24	22	29
Too Much Rudder	3	8	11	26	7	30	18	6	35	22	4
Too Little Rudder	5	24	35	16	7	10	3	-	35	22	4
Walks Rudder	-	-	-	12	-	-	-	6	-	-	-
Ailerons Early	-	4	-	-	-	-	6	-	24	-	50
Ailerons Late	-	-	-	-	-	-	3	-	-	-	8
Too Much Aileron	-	16	7	-	2	30	6	12	6	11	13
Too Little Aileron	-	-	5	7	-	-	9	18	24	6	4
Elevator Early	-	24	4	5	-	-	-	-	-	-	-
Elevator Late	-	24	9	4	-	-	-	-	-	-	
Too Much Elevator	-	36	14	21	10	-	9	29	59	-	50
Too Little Elevator	-	40	14	38	10	-	9	24	29	33	-
Degree of Bank Varies	46	60	44	47	12	-	18	24	53	100	75
Nose High	41	32	23	21	12	-	33	29	47	17	42
Nose Low	54	44	35	23	10	-	12	24	24	33	-
Nose Wanders	5	12	33	11	12	20	21	53	6	22	42
Entry & Rec. Abrupt	8	4	4	11	2	-	12	29	-	22	42

90° TURN LEFT 15° BANK (Maneuver 12)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Slips	46	48	9	35	2	-	18	24	18	39	42
Skids	46	48	32	61	7	10	21	6	18	61	8
Rudder Early	-	16	7	-	5	-	3	-	-	6	-
Rudder Late	-	44	16	54	2	-	9	12	29	22	25
Too Much Rudder	5	12	14	40	-	10	12	6	12	22	4
Too Little Rudder	3	20	25	19	2	20	15	24	59	22	8
Walks Rudder	-	-	-	5	-	-	-	6	-	-	-
Ailerons Early	-	4	-	-	-	-	3	-	12	6	33
Ailerons Late	-	-	-	-	-	-	3	-	-	6	4
Too Much Aileron	-	12	11	4	-	30	9	24	12	11	4
Too Little Aileron	-	4	9	2	-	10	3	12	6	-	4
Elevator Early		12	-	5	2	-	-	-	12	-	-
Elevator Late	-	4	-	-		-	-	-	6	-	-
Too Much Elevator	-	44	12	16	5	-	-	18	12	11	21
Too Little Elevator	-	8	-	14	2	-		24	29	6	-
Degree of Bank Varies	59	76	46	50	22	-	36	53	29	33	63
Nose High	43	28	44	11	2	-	3	24	6	6	25
Nose Low	11	-	9	18	2	10	-	18	18	-	-
Nose Wanders	-	-	18	11	7	10	30	24	29	33	42
Entry & Rec. Abrupt	-	4	-	-	-	-	9	18	6	6	13

90° TURN RIGHT 15° BANK Maneuver 2%

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
E	37	25	57	57	41	10	33	17	17	18	24
Slips	41	36	37	35	20	-	15	71	41	28	63
Skids	43	32	23	26	-	20	12	6	35	67	8
Rudder Early	-	4	4	2	2	-	6	-	6	-	-
Rudder Late	-	20	25	37	-	-	6	24	24	22	50
Too Much Rudder	3	-	4	21	-	20	-	-	18	44	-
Too Little Rudder	5	20	32	33	10	20	3	59	53	22	17
Yaws Rudder	-	-	-	4	-	-	-	6	-	-	-
Ailerons Early	-	-	-	-	-	-	3	-	6	6	21
Ailerons Late	-	-	-	-	-	-	3	-	-	6	-
Too Much Aileron	-	4	7	9	-	50	3	6	6	6	4
Too Little Aileron	3	-	7	4	-	10	3	6	6	-	-
Elevator Early	-	12	-	7	5	-	-	-	12	-	-
Elevator Late	-	-	-	2	-	-	-	-	-	-	4
Too Much Elevator	-	32	12	18	2	10	-	12	18	6	29
Too Little Elevator	-	4	-	12	2	-	-	24	41	6	8
Degree of Bank Varies	70	84	39	42	20	-	24	35	6	72	58
Nose High	49	32	42	25	5	-	3	12	29	6	33
Nose Low	8	8	9	7	2	-	3	41	41	6	-
Nose Wanders	3	-	25	5	5	20	15	18	18	22	42
Entry & Rec. Abrupt	-	4	-	2	-	-	6	18	6	-	13

180° TURN LEFT 45° BANK (Maneuver 14)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Slips	59	52	26	19	7	-	27	12	41	28	58
Skids	49	52	40	37	10	10	30	12	24	33	8
Rudder Early	-	8	4	2	2	-	-	-	12	-	-
Rudder Late	-	44	46	47	-	-	12	-	29	6	29
Too Much Rudder	3	20	4	28	5	10	12	-	18	17	8
Too Little Rudder	-	28	35	7	5	10	12	12	53	6	8
Walks Rudder	-	-	-	-	-	-	-	-	-	-	4
Ailerons Early	3	4	-	-	-	-	9	-	-	6	38
Ailerons Late	-	-	2	-	-	-	-	-	6	6	-
Too Much Aileron	-	8	7	2	-	20	12	6	6	-	8
Too Little Aileron	-	-	5	4	-	-	3	41	29	-	8
Elevator Early	-	8	-	4	-	-	-	6	6	-	4
Elevator Late	-	24	12	53	-	-	-	18	24	6	8
Too Much Elevator	-	24	7	11	5	-	-	6	6	17	13
Too Little Elevator	-	32	12	53	39	20	-	47	47	11	13
Degree of Bank Varies	43	76	25	40	12	-	12	41	24	94	67
Nose High	46	48	35	16	-	-	3	18	6	22	17
Nose Low	41	36	19	56	-	-	6	47	41	28	25
Nose Wanders	3	-	10	11	7	20	21	12	24	11	38
Entry & Rec. Abrupt	-	8	2	9	2	-	9	29	6	6	29

180° TURN RIGHT 45° BANK (Maneuver 19)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Slips	57	64	25	58	32	-	15	47	59	33	54
Skids	57	32	33	14	2	20	21	-	29	72	13
Rudder Early	-	4	4	4	2	-	3	-	-	6	-
Rudder Late	-	28	49	49	-	-	9	18	24	17	25
Too Much Rudder	3	8	-	9	12	10	21	-	6	44	4
Too Little Rudder	3	16	30	28	15	30	9	29	29	11	4
Walks Rudder	-	-	-	2	-	-	-	-	6	-	4
Aileron Early	3	8	-	-	-	-	9	-	12	6	38
Aileron Late	-	-	-	-	-	-	6	-	6	6	-
Too Much Aileron	3	8	5	-	-	40	12	6	-	-	8
Too Little Aileron	-	-	5	4	-	-	12	12	24	-	4
Elevator Early	-	16	5	7	-	-	-	-	12	-	17
Elevator Late	-	4	11	12	-	-	-	12	12	6	17
Too Much Elevator	-	44	16	32	2	10	3	18	41	-	21
Too Little Elevator	-	28	11	26	7	-	-	41	71	11	8
Degree of Bank Varies	43	68	28	51	5	-	9	41	35	83	67
Nose High	57	44	35	32	-	10	3	12	35	6	8
Nose Low	32	32	23	32	2	-	-	41	53	17	29
Nose Wanders	-	-	25	7	5	10	21	24	12	17	58
Entry & Rec. Abrupt	-	4	2	2	5	-	12	18	-	11	33

360° STEEP TURN LEFT 60° BANK (Maneuver 16)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Slips	68	76	32	28	20	-	24	12	59	50	54
Skids	57	56	28	14	12	30	30	12	24	33	21
Rudder Early	-	16	5	2	5	-	3	-	18	-	8
Rudder Late	-	44	39	39	5	10	9	-	12	6	25
Too Much Rudder	3	24	2	12	7	10	27	6	24	22	8
Too Little Rudder	3	44	35	5	5	-	9	-	24	33	4
Walks Rudder	-	-	-	4	-	-	-	6	6	-	-
Ailerons Early	-	16	-	-	-	-	9	-	-	6	21
Ailerons Late	-	-	-	2	-	-	-	-	6	-	-
Too Much Aileron	-	16	2	5	-	30	12	18	6	6	4
Too Little Aileron	-	4	31	7	-	-	12	-	6	-	-
Elevator Early	-	24	4	9	10	-	-	6	29	-	-
Elevator Late	-	48	74	39	15	-	-	18	29	17	63
Too Much Elevator	11	28	7	14	7	40	9	35	41	-	17
Too Little Elevator	3	72	28	53	39	10	9	18	65	11	13
Degree of Bank Varies	24	80	46	39	17	-	12	18	24	100	63
Nose High	27	24	21	19	5	-	27	41	59	11	13
Nose Low	54	84	35	54	15	-	18	53	65	17	46
Nose Wanders	-	8	37	32	15	-	12	53	35	28	42
Entry & Rec, Abrupt	14	-	7	7	5	-	21	59	12	17	46

[illegible]

Percentage of Cases Marked by Each Inspector with Particular Errors

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Slips	76	75	46	49	51	-	18	82	76	67	50
Skids	46	52	42	11	-	30	27	-	29	33	25
Rudder Early	-	4	4	4	2	-	-	-	12	6	4
Rudder Late	-	41	53	37	2	10	12	24	24	17	21
Too Much Rudder	3	16	4	5	5	10	24	6	29	11	17
Too Little Rudder	3	32	47	18	29	20	9	71	29	22	-
Walks Rudder	-	-	-	4	-	-	-	6	-	-	-
Ailerons Early	3	16	-	-	-	-	9	-	12	11	21
Ailerons Late	-	-	-	-	-	-	3	-	-	-	4
Too Much Aileron	-	24	7	4	-	40	9	12	18	17	8
Too Little Aileron	-	8	9	5	-	-	9	-	12	-	-
Elevator Early	-	28	4	25	5	-	3	12	29	11	21
Elevator Late	-	48	14	23	17	-	-	12	6	22	50
Too Much Elevator	5	44	9	22	7	30	12	18	24	6	4
Too Little Elevator	3	68	32	53	37	20	6	24	65	17	17
Degree of Bank Varies	27	84	60	65	22	-	18	29	18	89	46
Nose High	46	52	28	26	7	-	24	41	53	28	29
Nose Low	54	68	21	32	17	-	21	35	59	22	42
Nose Wanders	-	8	39	25	10	10	3	47	6	44	46
Entry & Rec. Abrupt	8	4	7	11	2	10	21	53	12	22	46

SERIES OF TURNS (Maneuver 17a)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Too Fast	8	16	-	2	-	-	-	-	-	11	4
Too Slow	5	16	2	-	-	-	3	-	24	6	8
Altitude Selection Poor	-	28	-	-	2	-	-	-	-	33	38
Area Selection Poor	-	-	-	-	-	-	-	-	-	6	4
Pattern Poor	-	40	-	7	2	20	18	-	-	17	25
Slips	30	96	72	61	54	-	27	59	88	67	83
Skids	30	84	63	61	22	50	33	18	76	67	50
Rough Control Use	-	32	7	7	7	20	6	35	24	17	33
Fans Controls	-	-	15	9	2	60	-	-	-	6	4
Walks Rudder	-	-	4	14	-	-	-	12	6	-	-
Overshoots	-	92	21	23	10	20	18	12	6	-	25
Undershoots	3	80	5	12	5	30	6	-	6	-	42
Nose Variable	32	60	61	51	15	10	15	71	82	44	88
Poor Planning	3	20	21	4	5	50	39	-	-	17	29
Poor Timing	-	84	23	26	10	30	42	12	47	6	54
Poor Throttle Use	5	48	35	18	-	20	12	65	29	56	37
Poor Trimming	-	-	-	-	-	10	6	-	-	-	-
Poor Altitude Control	5	84	39	56	15	20	24	53	41	50	71
Poor Attitude Control	3	56	4	16	15	10	52	18	6	67	46
Poor Directional Control	3	4	5	42	-	20	33	-	-	11	33

NORMAL POWER-OFF STALL (Maneuver 16)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Too Fast	57	16	7	26	10	-	9	6	53	33	38
Too Slow	19	20	39	49	12	-	6	-	47	17	13
Altitude Selection Poor	-	-	2	-	-	-	-	-	-	11	-
Area Selection Poor	-	-	-	-	-	-	-	-	-	6	8
Pattern Poor	-	-	-	-	-	-	-	-	-	-	8
Slips	-	4	4	-	-	-	-	-	12	6	4
Skids	-	-	-	-	-	-	-	-	-	11	-
Rough Control Use	30	12	23	30	20	-	9	35	6	17	25
Fans Controls	3	4	5	5	5	10	-	-	-	6	-
Walks Rudder	-	4	-	11	5	-	-	6	6	-	-
Overshoots	-	4	-	2	-	-	-	-	-	-	8
Undershoots	-	-	-	-	-	-	-	6	-	-	-
Nose Variable	3	16	25	5	2	-	9	-	12	17	29
Poor Planning	3	-	19	5	2	30	52	-	-	28	17
Poor Timing	5	48	32	58	24	-	48	65	65	61	58
Poor Throttle Use	51	60	46	56	2	-	15	65	71	33	46
Poor Trimming	-	-	-	-	-	-	3	-	-	-	-
Poor Altitude Control	-	8	-	4	-	-	-	-	-	6	-
Poor Attitude Control	8	20	5	42	20	-	33	24	6	56	33
Poor Directional Control	27	36	26	25	2	30	15	18	12	17	46

FORWARD SLIP (Maneuver 19)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Too Fast	51	52	51	19	20	-	9	53	41	83	63
Too Slow	14	4	16	16	-	-	-	-	18	6	8
Altitude Selection Poor	-	-	-	-	-	-	-	-	-	-	-
Area Selection Poor	-	-	-	-	-	-	-	-	-	-	-
Pattern Poor	-	-	-	-	-	-	9	-	-	6	13
Slips	-	-	7	-	-	-	3	6	6	-	4
Skids	16	-	5	2	2	10	6	6	12	56	-
Rough Control Use	3	20	19	21	20	-	6	35	6	44	42
Fans Controls	5	4	11	4	2	-	-	35	-	-	4
Walks Rudder	-	-	39	9	2	-	6	24	12	-	4
Overshoots	-	8	-	2	5	-	-	12	-	-	-
Undershoots	-	8	-	-	-	-	-	-	-	-	-
Pose Variable	16	32	53	30	5	-	15	35	12	56	46
Poor Planning	3	-	14	11	2	-	30	-	-	61	-
Poor Timing	3	60	16	37	10	10	27	12	6	56	46
Poor Throttle Use	5	4	21	23	5	-	3	6	6	6	4
Poor Trimming	3	-	-	-	-	-	3	6	-	-	4
Poor Altitude Control	-	-	4	-	-	-	3	-	6	6	-
Poor Attitude Control	62	60	19	60	34	-	39	53	-	61	50
Poor Directional Control	35	56	96	47	12	10	33	53	24	22	33

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Too Fast	76	68	63	77	22	-	-	82	88	94	71
Too Slow	14	-	5	5	2	-	3	-	6	-	8
Altitude Selection Poor	-	-	-	-	-	-	-	-	-	-	-
Area Selection Poor	-	-	-	-	-	-	-	-	-	-	4
Pattern Poor	-	4	-	-	-	-	-	-	-	-	8
Slips	-	4	11	4	-	-	-	6	6	22	4
Skids	3	4	2	2	-	-	-	6	6	-	-
Rough Control Use	-	-	11	11	-	-	3	-	6	6	33
Fans Controls	-	-	4	23	-	-	-	-	-	-	-
Walks Rudder	-	-	-	4	-	-	-	6	6	6	4
Overshoots	-	4	2	-	-	-	-	12	-	-	-
Undershoots	-	4	-	-	-	-	-	-	-	-	
Nose Variable	22	4	12	33	-	-	-	18	6	28	[redacted]
Poor Planning	-	8	5	2	-	-	9	-	-	23	-
Poor Timing	-	8	2	19	-	-	6	6	6	-	3
Poor Throttle Use	5	8	21	25	10	-	3	18	18	11	50
Poor Trimming	3	-	2	4	-	-	-	12	-	-	-
Poor Altitude Control	3	-	2	2	-	-	-	-	-	-	-
Poor Attitude Control	-	4	2	21	7	-	9	47	-	72	33
Poor Directional Control	32	20	7	18	2	-	3	12	29	-	8

90° GLIDE TURN RIGHT 15° BANK (Maneuver 22)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Slips	16	28	32	35	10	-	3	35	12	39	54
Skids	22	28	11	33	2	10	12	-	35	22	17
Rudder Early	-	-	-	-	-	-	6	-	12	-	-
Rudder Late	-	4	16	40	-	-	-	12	6	6	7
Too Much Rudder	3	4	2	19	2	10	6	-	18	17	4
Too Little Rudder	-	8	25	23	5	40	-	18	29	28	4
Welks Rudder	-	-	2	7	-	-	-	-	-	-	-
Ailerons Early	-	4	-	-	-	-	-	-	-	6	33
Ailerons Late	-	-	-	-	-	-	6	-	-	-	-
Too Much Aileron	-	32	2	4	2	80	3	29	41	6	13
Too Little Aileron	-	-	7	-	-	-	6	-	-	-	-
Elevator Early	-	4	-	2	-	-	-	-	-	-	-
Elevator Late	-	24	5	2	-	-	-	6	-	-	8
Too Much Elevator	-	28	9	18	5	-	12	6	18	-	8
Too Little Elevator	-	44	23	21	5	-	3	35	6	56	42
Degree of Bank Varies	76	84	47	56	10	-	33	47	35	72	54
Nose High	32	28	21	9	2	-	33	-	12	-	4
Nose Low	59	40	44	12	10	-	12	24	24	67	46
Nose Wanders	3	4	25	19	3	-	21	18	24	39	38
Entry & Rec. Wrong	-	4	2	2	2	-	12	18	6	6	21

90° GLIDE TURN LEFT 1[illegible] (Maneuver 2)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	F	C	D	E	I	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Slips	35	28	40	25	2	-	3	35	41	33	42
Skids	30	24	21	47	-	-	9	12	18	17	13
Rudder Early	-	4	-	2	2	-	3	-	-	6	-
Rudder Late	-	16	26	28	-	-	3	-	29	-	25
Too Much Rudder	3	4	7	30	2	-	6	-	6	6	8
Too Little Rudder	3	12	26	14	5	30	-	29	29	22	-
Talks Rudder	-	-	2	7	-	-	-	12	6	-	-
Ailerons Early	-	4	-	-	-	-	6	-	-	-	38
Ailerons Late	-	-	-	-	-	-	3	-	-	-	-
Too Much Aileron	-	20	14	4	-	50	3	29	6	-	13
Too Little Aileron	-	-	4	-	-	-	3	12	-	-	-
Elevator Early	-	4	-	-	-	-	-	-	-	-	-
Elevator Late	-	20	2	4	-	-	-	6	-	-	4
Too Much Elevator	-	24	11	16	7	-	6	12	29	-	-
Too Little Elevator	-	36	19	18	2	-	-	18	29	28	33
Degree of Bank Varies	51	84	44	53	12	-	30	35	12	83	42
Nose High	46	32	21	12	2	-	30	6	18	-	-
Nose Low	62	40	33	18	5	-	6	24	41	44	33
Nose Wanders	5	4	30	28	7	-	21	18	24	50	54
Entry & Rec. Abrupt	-	-	4	4	-	-	3	6	-	-	21

CIRCULAR APPROACH (Maneuver 26)

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Too Fast	8	36	47	53	10	-	-	35	41	61	38
Too Slow	-	-	30	28	-	10	-	6	12	-	4
Altitude Selection Poor	16	-	-	12	-	-	-	-	-	6	17
Area Selection Poor	-	-	-	-	-	-	-	-	-	-	-
Pattern Poor	41	28	26	23	12	-	-	18	12	44	50
Slips	70	4	56	39	-	-	-	6	18	11	17
Skids	68	-	30	37	2	-	-	6	47	17	25
Rough Control Use	-	4	2	19	-	-	-	6	-	-	13
Fans Controls	-	-	14	18	-	20	-	-	-	-	-
Walks Rudder	-	-	2	5	-	-	-	-	-	-	-
Overshoots	-	24	32	34	-	-	-	-	-	22	-
Undershoots	-	20	23	15	7	20	-	12	-	11	-
Nose Variable	24	8	30	18	-	-	-	35	6	22	8
Poor Planning	11	40	42	63	20	10	6	29	-	44	33
Poor Timing	-	12	7	16	-	-	-	6	-	-	4
Poor Throttle Use	43	36	47	23	2	-	-	29	6	17	8
Poor Trimming	-	4	-	61	-	-	-	6	-	-	8
Poor Altitude Control	8	-	2	2	-	-	-	-	-	-	4
Poor Attitude Control	-	12	2	14	-	20	3	12	-	28	25
Poor Directional Control	5	12	25	4	2	10	3	-	6	-	13

[illegible] LANDINGS ([illegible])

Percentage of Cases Marked by Each Inspector with Particular Error

Inspector	A	B	C	D	E	F	G	H	J	K	L
N	37	25	57	57	41	10	33	17	17	18	24
Too Fast	43	44	53	19	12	10	6	6	6	11	17
Too Slow	24	-	12	47	-	-	18	-	59	22	13
Altitude Selection Poor	-	32	-	-	-	-	-	-	-	-	63
Area Selection Poor	-	-	-	4	-	-	-	12	-	6	25
Pattern Poor	32	-	4	-	2	20	12	6	6	-	13
Slips	5	-	12	-	-	-	3	-	12	-	4
Skids	11	-	4	2	-	-	3	6	18	-	-
Rough Control Use	-	8	9	35	-	-	3	6	6	6	25
Fans Controls	-	-	7	12	2	10	-	6	-	-	-
Walks Rudder	-	4	12	14	2	-	6	-	12	-	-
Overshoots	11	16	32	28	5	20	18	12	18	17	29
Undershoots	14	4	28	16	12	-	9	12	35	17	54
Nose Variable	19	16	23	14	-	10	9	-	18	-	13
Poor Planning	19	-	35	21	-	-	27	18	12	33	8
Poor Timing	5	44	40	70	-	-	30	41	24	22	21
Poor Throttle Use	24	20	12	49	35	-	49	29	24	-	17
Poor Trimming	3	-	-	7	-	-	-	12	-	-	-
Poor Altitude Control	-	-	4	2	-	-	3	24	-	-	4
Poor Attitude Control	27	24	11	37	2	-	27	35	-	22	21
Poor Directional Control	27	12	47	25	7	20	12	18	24	16	63