

ANALYSIS OF CAA RECORDS ON AIRLINE TRANSPORT PILOTS

by

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A report on research conducted at the American Institute for Research, Incorporated, Pittsburgh, Pennsylvania, under the auspices of the National Research Council Committee on Aviation Psychology, from funds provided by the Civil Aeronautics Administration.

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Committee on Aviation Psychology

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August 22, 1947

Dr. Dean R. Brimhall
Assistant to the Administrator
for Research
Civil Aeronautics Administration
Room 5217, Commerce Building
Washington 25, D. C.

Dear Dr. Brimhall:

The attached report, entitled Analysis of CAA Records on Airline Transport Pilots, by H. O. Preston, is submitted by the Committee on Aviation Psychology with the recommendation that it be included in the series of Technical Reports of the Division of Research, Civil Aeronautics Administration.

The report describes the results of the first step in a large-scale research program designed to survey aspects of pilot behavior which may contribute to accidents during flight, and to develop improved procedures for the upgrading, selection, and certification of airline pilots. Among the interesting results of this initial study is the finding that the relationships between scores on written tests and flight tests administered to applicants seeking certification for various pilot ratings were in general slight. However significant, although low positive relationships were found between written examination scores for private and airline, and commercial and airline certificates, respectively, while the relationship between flight examination scores for private and commercial certificates was low but significantly negative. Of additional interest is the finding that pilots with Army flight experience do not differ significantly, in terms of flight test scores for the airline transport certificate, from pilots without such military experience, although former military pilots obtained somewhat poorer scores on the written test.

The study described in this report, and the over-all research program, represent a significant attack on the problem of safe flying by the airline pilot. It is hoped that the cooperation of other groups, such as the Air Transport Association, the Airline Pilots Association, and individual airlines, with the Civil Aeronautics Administration and the National Research Council Committee on Aviation Psychology will produce basic information and improved procedures useful in increasing the safety of airline operation.

Cordially yours,



Morris S. Viteles, Chairman
Committee on Aviation Psychology
National Research Council

ADDITIONAL FORWARD

Accidents occurring during the past year have focused attention on safety in commercial airline operation. In addition to considering engineering features of airplane construction relating to safety, questions have been raised concerning the characteristics of pilots; methods of training pilots; procedures for certifying pilots; provisions for maintaining pilot morale; and other factors affecting the avoidance of pilot error and the maintenance of safety in airline operation. As a result, the Civil Aeronautics Administration has requested the National Research Council Committee on Aviation Psychology to survey aspects of pilot characteristics and behavior which may contribute to accidents during flight and to develop improved procedures for the upgrading, selection, and certification of airline pilots.

The first aspect of this program includes research of the survey type designed to reveal the special requirements and characteristics of a safe air transport pilot demanded by present-day operations. Data are being obtained through analyses of CAA and Airline Company files, and through interviews with CAA inspectors and examiners of air transport pilots; airline supervisors of flying and flight training (including check pilots); ground personnel (including CAA radio facility and control tower operators and airway traffic controllers); and finally, by means of interviews with airline pilots. The investigation described in this report represents the first step in this program, involving analysis of records on file with the Civil Aeronautics Administration, designed to obtain basic information bearing on the qualifications and performance records of applicants for the airline transport certificate contained in these files.

The second part of the larger research program will include the evaluation of actual flight performance and will center upon the development of practical procedures for evaluating pilots with respect to those requirements found to be most critical for safe flying.

This research program, sponsored by the National Research Council Committee on Aviation Psychology, is being conducted by the American Institute for Research under the direction of Dr. John C. Flanagan. The investigation described in this report has been done under the immediate supervision of Dr. Harley C. Preston.

It should be emphasized that the results of this research program will not be used to eliminate pilots already employed by the airlines. Research is directed towards the improvement of procedures for use in selecting, upgrading, and certifying pilots in the future. It should also be noted that the research program has important implications for airline pilot training.

Acknowledgment is made of the cooperation of a large group of individuals, in particular of individual airline pilots, who have made the survey possible by giving their time, and by exhibiting a helpful and intelligent interest in it.

August 21, 1947

Morris S. Viteles, Chairman
Committee on Aviation Psychology

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SUMMARY

The CAA record files of 1278 pilots who had passed the physical examination for the airline transport certificate were analyzed to obtain factual information on the certification history of pilots who are, or aspire to be, airline pilots. This information included the age of such pilots at the time of their CAA examinations for the several certificates and ratings; the percentage of such a group that qualified for each certificate; the scores made on each flight and written test taken and the statistical relationships among such scores and with the number of flying hours reported; and a classification of the evaluative comments made by CAA examiners on flight test performance of these pilots.

The correlation between scores on the first attempts to pass the written examinations for the private and commercial certificates was small but significantly positive, while no significant correlation was found between written examination scores for the private and airline or for the commercial and airline certificates.

The correlation between scores on the first attempts to pass the flight tests for the private and commercial certificates was negative, while again no correlation was found between scores on flight tests for the private and airline or commercial and airline certificates.

A statistical relationship was established between the scores on the flight test for the airline certificate and the number of flying hours reported at the time of the test. A coefficient of correlation of $-.255$ was found between scores and flying hours on the 863 pilots whose records were complete. It is probable that this negative relationship reflects the practice of most airline companies of keeping pilots on a co-pilot status with a commercial certificate until the company is convinced that the pilot can pass the CAA flight test for the airline certificate, hence building up the flying hours of the poorer pilots. No significant correlation was found between scores on the flight test for the commercial certificate and the number of flying hours reported.

No relationship was found between the passing or failing of the flight test for the airline certificate and military experience during the war. Such experience, however, was associated with significantly lower scores on the written examination. A probable explanation for this poorer performance lies in the stress on the Civil Aeronautics Regulations included in this examination. Non-military pilots who flew as commercial pilots during the war would be more familiar with these regulations than military pilots.

The comments on the flight test performances of these pilots by the CAA examiners vary in their specificity to the pilots' behavior at the controls and in the frequency with which they are recorded on tests for the different certificates. Comments are most frequent on records of the private and instructor flight tests and least frequent on the tests for the airline certificate. The records of the airline flight tests contain, however, the most specific and least stereotypically phrased comments of those found in the files.

ANALYSIS OF CAA RECORDS ON AIRLINE TRANSPORT PILOTS

An integral part of the research on procedures for the selection, certification, and upgrading of airline pilots was a survey and analysis of the official records of the Civil Aeronautics Administration, U. S. Department of Commerce, on pilots who now hold the CAA airline transport certificate or who have taken steps to obtain such a certificate. These records consisted of individual files containing the examination results on all written and flight tests given the pilot by the CAA, copies of all certificates and ratings awarded the pilot throughout his flying career, and memoranda to the Civil Aeronautics Board concerning any violations or accidents in which the pilot may have been involved.

During the months of March and April, 1947, a survey was made of the CAA records of 1278 pilots who had passed the physical examination for the airline transport certificate during 1947¹ to obtain the flying history of each man, together with the official evaluation of his proficiency at the time he qualified for his several ratings and certificates. An analysis of the resultant data was made to determine the existence of any consistent patterns of flying proficiency implicit in the present certification procedures used by the CAA.

The records of pilots in the sample covered periods of time beginning as early as twenty-four years ago. Numerous changes in CAA regulations took place during these unequal spans of time which necessitated a conversion of discontinued certificates to their present day equivalents. Thus, the transport certificate and scheduled airline transport certificate were considered, respectively, as commercial and airline transport certificates in all tabulations although these latter were not issued until 1938. One certificate, the limited commercial available to pilots before 1938, has no equivalent today. This certificate permitted holders of the private license to carry passengers within a stated radius of a particular airport. This discontinued certificate, as well as several of the earlier horsepower ratings, was omitted from consideration although any accidents and violations which occurred during the time a pilot held these licenses were noted.

While certain conversions could be made readily for discontinued certificates, adjustments were more difficult in cases where ratings were awarded automatically to large groups of pilots because of temporary changes in regulations or where examinations were completely or partially waived because of a pilot's special status. These difficulties occurred specifically in the instructor ratings given automatically in 1938 to pilots holding the then-called transport certificate and in the examination waivers given pilots because of military competency or status as CAA inspectors. The procedures for

¹This is approximately one-seventh of the 5810 pilots examined for the airline transport certificate by the CAA Medical Service during last year. The records on every sixth pilot whose name appeared on an alphabetical roster were requested, but a number of the files were not available at the time the study was made.

handling these difficulties varied with the particular statistical analysis made and are explained as they occur.

A final difficulty should be mentioned before the results of the analyses are presented. This difficulty was the incompleteness of some of the permanent records kept during the earlier days of the CAA. Often a copy of a certificate issued to a pilot would show that he held ratings for which there were no records of either applications or examinations for such ratings. From the standpoint of this study, the incompleteness of the records on examination scores was more serious. Among the earlier records, the scores made on examinations were often omitted and the words "passed" or "failed" were written in their stead. While a certain amount of cautious interpolation or extrapolation made the inclusion of many of these cases possible in some tabulations, this was not possible in others. Some of the variation in the total number of cases used in certain analyses can be accounted for by these incomplete records.

The total sample of 1278 was used in tabulating the number of pilots who took the different flight and written examinations for the several certificates and for the instructor and instrument ratings. This was possible by the inclusion of an "examination waiver" category in addition to two residual categories of "failure to date" and "examination pending." The results of such a tabulation are presented in Table I for the flight examinations and in Table II for the written examinations. Both of these tables summarize the number of attempts required to pass each examination. It is probable that the pilots whose records show that examinations are pending for the private and the commercial certificates actually have received these certificates by some waiver provision although such a notation was omitted from the basic records.

Only a rough approximation of the number of certificates or ratings awarded to the pilots in this sample can be made from the results shown in Tables I and II since some pilots who passed the flight examination for one certificate might have failed in the written examination for the same certificate.

In order to determine how many pilots in the sample had held each certificate, the information in Tables I and II was disregarded and counts were made of licenses actually awarded these pilots. The results appear in Table III by the year in which the licenses were received. An exception is the number of instructor ratings received in 1938. In that year, a provisional instructor rating, valid until 1940, was given automatically to pilots holding the equivalent of the commercial certificate. In view of this proviso, only pilots who renewed these ratings in 1940 were counted as receiving them in 1938.

The average age of the pilots in the sample at the time they first received a given rating was calculated by subtracting the mean year of birth for all men obtaining that rating from the mean of the years in which that rating was awarded to those pilots as shown in Table III. Table IV shows these average ages.

The sequence in which licenses were most usually obtained by pilots in recent years corresponded generally to the sequence of average ages shown in the Table IV. An exception is that for the instrument rating which, considering

TABLE I.

FULFILLMENT OF FLIGHT EXAMINATION REQUIREMENT BY CAA CERTIFICATE OR RATING
FOR 1278 MEDICAL EXAMINEES FOR THE AIRLINE TRANSPORT CERTIFICATE

	Private		Commer- cial		Instruc- tor		Instru- ment		Airline	
	N	%	N	%	N	%	N	%	N	%
Passed 1 Attempt	769	60.1	845	66.1	473	37.0	717	56.1	951	74.4
Passed 2 Attempts	35	2.7	107	8.4	32	2.5	71	5.5	27	2.1
Passed 3 Attempts	0	-	13	1.0	9	.7	4	.3	2	.2
Passed 4 Attempts	1	.1	2	.2	1	.1	0	-	0	-
Passed 5 Attempts	0	-	0	-	0	-	0	-	0	-
Failure to date*	1	.1	0	-	7	.5	2	.2	7	.5
Exam. Pending	8	.6	2	.2	58	4.5	11	.9	161	12.6
Exam. Waiver	46	3.6	300	23.5	107	8.4	*283	22.1	5	.4
Did not Apply	<u>418</u>	<u>32.7</u>	<u>9</u>	<u>.7</u>	<u>591</u>	<u>46.2</u>	<u>190</u>	<u>14.7</u>	<u>125</u>	<u>9.8</u>
Totals	1278	100.0	1278	100.0	1278	100.0	1278	100.0	1278	100.0

*Includes one case of failure with subsequent waiving of re-examination because of military competency.

*Failed examination on first attempt and no record of subsequent examinations.

TABLE II

FULFILLMENT OF WRITTEN EXAMINATION REQUIREMENT BY CAA CERTIFICATE OR RATING FOR 1278 MEDICAL EXAMINEES FOR THE AIRLINE TRANSPORT CERTIFICATE

	<u>Private</u>		<u>Commer- cial</u>		<u>Instruc- tor</u>		<u>Instru- ment</u>		<u>Airline</u>	
	N	%	N	%	N	%	N	%	N	%
Passed										
1 Attempt	723	56.6	954	74.6	487	38.1	711	55.6	1007	78.8
Passed										
2 Attempts	59	4.6	151	11.8	69	5.4	96	7.5	88	6.7
Passed										
3 Attempts	3	.2	24	1.9	5	.4	15	1.2	12	.9
Passed										
4 Attempts	1	.1	16	1.3	3	.2	2	.2	3	.2
Passed										
5 Attempts	3*	.2	1	.1	#2	.2	0	-	2	.2
Failure										
to date##	5	.4	0	-	25	2.0	1	.1	19	1.5
Exam.										
Pending	1	.1	1	.1	1	.1	1	.1	3	.2
Exam.										
Waiver	65	5.0	122	9.5	95	7.4	*262	20.5	21	1.6
Did not										
Apply	<u>418</u>	<u>32.7</u>	<u>9</u>	<u>.7</u>	<u>591</u>	<u>46.2</u>	<u>190</u>	<u>14.7</u>	<u>125</u>	<u>9.8</u>
Totals	1278	100.0	1278	100.0	1278	100.0	1278	100.0	1278	100.0

*Includes one case with one failure and one case with two failures with subsequent waiving of re-examination because of military competency.

*Includes one case passed on the 10th attempt.

#Includes one case passed on the 7th attempt.

##Failed examination on first attempt and no record of subsequent examination.

TABLE III

CAA CERTIFICATES AND RATINGS AWARDED 1273 MEDICAL EXAMINEES FOR
AIRLINE TRANSPORT CERTIFICATES BY YEAR FIRST AWARDED

<u>Year</u>	<u>Private</u>	<u>Commercial</u>	<u>Instructor</u>	<u>Instrument</u>	<u>Airline</u>
1947	0	0	1	4	13
1946	2	38	6	91	242
1945	1	157	3	162	176
1944	3	18	6	77	92
1943	7	58	18	163	91
1942	56	203	153	220	101
1941	178	235	159	87	57
1940	252	109	93	88	36
1939	51	77	29	84	11
1938	70	41	47	33	24
1937	51	34	0	7	45
1936	26	28	3	1	14
1935	12	39	1	0	14
1934	13	26	1	0	14
1933	3	31	1	0	18
1932	26	21	3	0	38
1931	27	31	1	0	1
1930	27	33	2	0	1
1929	29	41	4	0	0
1928	10	23	0	0	0
1927	2	28	0	0	0
1926	0	1	0	0	0
Totals	848*	1272	531	1017	988

*Includes two cases not shown: one in 1923; the other in 1924. Since these predate the Air Commerce Act of 1926, the permanent records may be in error.

TABLE IV

MEAN AGE OF PILOTS AT TIME OF APPROVAL FOR SPECIFIED CERTIFICATES

<u>Certificate or Rating</u>	<u>Age (Years)</u>
Private.	22.86
Commercial.	25.08
Instructor.	25.48
Instrument.	26.89
Airline.	29.10

the mean ages for this sample, appears to have been awarded almost two years after the commercial certificate had been received. The reason for this discrepancy can be seen readily by reference to Table III, which shows that the instrument rating was not given until 1936; and hence it was not available to the older men in the sample until they had passed the age at which this rating normally would have been sought.

Of more importance to the larger research on procedures for selecting, certifying, and upgrading of airline pilots was an analysis of the evaluations of the proficiency of these men at the different times in their careers when they were examined for the different certificates. These evaluations took two forms: scores on the different flight and written examinations and the comments recorded by the examining officials on performance during the flight examinations.

Product moment coefficients of correlation were computed between the scores on the first attempt to pass the flight examination for the airline and commercial certificates, the airline and private certificates, and the private and commercial certificates. Since these examinations purported to measure the flying skill of the same men at different times, a positive relationship of statistical significance might have been expected between scores on the different examinations. Not only were the positive relationships found not significant, but the relationship between first attempts on the flying examinations for private and commercial certificates was found to be significantly negative. Summary of this analysis is shown in Table V, while the scatter diagrams are included in Appendix I.

TABLE V

PRODUCT MOMENT CORRELATIONS OF SCORES ON FIRST ATTEMPTS ON
FLIGHT EXAMINATIONS FOR SPECIFIED CERTIFICATES

Variable x	Variable y	N	M_x	M_y	σ_x	σ_y	σ_r	r_{xy}
Airline	Commercial	788	83.64	79.47	5.31	6.12	.035	.03
Airline	Private	620	83.43	81.00	4.94	4.89	.040	.04
Private	Commercial	702	80.08	79.93	4.87	5.88	.037	-.15

Attention should be called to the value assigned all cases of failure in the distributions of scores correlated. According to the CAA practice, a failure on any part of an examination constitutes a failure of the entire examination even though a summation of scores on all parts exceeds the minimum value of 70 required for approval. In the calculations summarized in Table V, the mid-point of the interval 68-70 was assigned as the score for all failures. A more correct statistical procedure would have been to calculate the most probable value for the failures in each distribution by assuming that they were distributed throughout the tail of the distribution. If this more complicated procedure had been followed, the standard deviations

of the distributions correlated could have been increased and the resulting coefficients of correlation would have been lower than those shown in Table V.

Data on the relationships between the different written examinations are given in Table VI.

TABLE VI

PRODUCT MOMENT CORRELATIONS OF SCORES ON FIRST ATTEMPTS ON WRITTEN EXAMINATIONS FOR SPECIFIED CERTIFICATES

Variable x	Variable y	N	M_x	M_y	σ_x	σ_y	σ_r	r_{xy}
Airline	Commercial	977	86.00	84.50	8.00	8.37	.032	.07
Airline	Private	696	86.22	83.08	8.48	7.76	.038	.10
Private	Commercial	734	82.85	81.21	7.93	8.48	.037	.23

Here again the only relationship in which the true correlation may be assumed to differ from zero is that between the scores on the private and commercial examinations. Unlike the relationship on the flight examinations, however, this relationship is positive.

The unexpected lack of correlation between scores on tests designed to measure flying proficiency led to a search for information in these pilots' files which might show some relationship to the scores on any one of these tests. The number of flying hours at time of application for the certificate, presence or absence of military experience, and accidents and violations were all considered.²

The number of flying hours reported on the application for a certificate was correlated to the score made on the flight examination for that certificate.

The accuracy of the number of flying hours reported by pilots on their applications has been questioned often; yet, the amount of negative correlation between the flying hours reported at the time of application for the airline certificate and the scores made on the flight examination is too great to be attributed solely to inaccuracies of reporting.³ One interpretation of this negative relationship might be that the flight test did not measure accurately the proficiency developed by increasing amounts of flying experience and hence that the test possessed questionable validity. A more plausible interpretation, however, can be made if consideration is given to the practice of most airlines

²Unfortunately the need for some of this information was not noted until data from 105 of the 1278 files had been abstracted; consequently, the analyses of flying hours and military experience were made from data contained in 1173 files.

³It is probable that such inaccuracies would take the form of a consistent overestimation. If so, this would not affect the correlation result.

TABLE VII

PRODUCT MOMENT CORRELATIONS ON TOTAL FLYING HOURS AND SCORE OF FIRST ATTEMPT ON FLIGHT EXAMINATION FOR SPECIFIED CERTIFICATES*

Variable x	Variable y	N	\bar{M}_x	\bar{M}_y	σ_x	σ_y	σ_r	r_{xy}
Airline Flight Exam.	Flying Hours	863	81.84	2992.7	5.21	390.0	.034	-.26
Commercial Flight Exam.	Flying Hours	827	79.47	311.7	5.94	264.7	.035	.07

*The range of flying hours reported at time of private certificate was too small to be correlated.

in keeping their pilots flying as co-pilots with commercial certificates only until the check flights of the companies indicate that a co-pilot could pass the CAA flight test for the airline transport certificate necessary for status as an airline captain. Consequently, the poorer pilots remain longer as co-pilots before attempting the flight examination for the airline certificate than do the better pilots.

The possibility exists, however, that increasing amounts of a particular type of flying might bring about the negative relationship found between flying hours and scores on the airline flight test. Military flying was investigated with this possibility in mind since large amounts of flying time were logged by pilots in the recent War. No relationship was found, however, between military experience and the passing or failing of the flight test. The statistical test, summarized in Table VIII, showed that the slight difference found between the pass-fail ratios of pilots grouped according to the presence or absence of military experience could be attributed to chance factors of sampling.

TABLE VIII

TEST OF INDEPENDENCE OF MILITARY EXPERIENCE AND SUCCESS ON FIRST ATTEMPT OF FLIGHT EXAMINATION FOR AIRLINE CERTIFICATE

Military Experience	Result on Flight Examination		Totals
	Passed	Failed	
Present	273	13	286
Absent	612	25	637
Totals	885	38	923

d.f. = 1

$\chi^2 = .093 < .148 = 70\%$ level of significance

Since the test shown in Table VIII included all pilots with military experience regardless of the date of service, only those with service some-time during the years 1940-1946 were considered in the test shown in Table IX. Again, the factor of military experience was found to be unrelated to the passing or failing of the flight examination.

TABLE IX

TEST OF INDEPENDENCE OF MILITARY EXPERIENCE DURING 1940-1946 WITH SUCCESS ON FIRST ATTEMPT ON FLIGHT EXAMINATION FOR AIRLINE TRANSPORT CERTIFICATE

<u>Military Experience</u>	<u>Result on Flight Examination</u>		<u>Totals</u>
	<u>Passed</u>	<u>Failed</u>	
1940-46	165	10	175
Before 1940 or None	<u>720</u>	<u>28</u>	<u>748</u>
<u>Totals</u>	885	38	923

d.f. = 1

$\chi^2 = .9406 < 1.074 = 30\% \text{ level of significance}$

When analyses were made of the passing of the written examination by pilots in these same groupings, the opposite kinds of results were obtained. The tests of independence, summarized in Tables X and XI, show that the difference in the pass-fail performance on the written examination of pilots with military experience and those without such experience can not be attributed to chance factors of sampling.

TABLE X

TEST OF INDEPENDENCE OF MILITARY EXPERIENCE AND SUCCESS ON FIRST ATTEMPT OF WRITTEN EXAMINATION FOR AIRLINE CERTIFICATE

<u>Military Experience</u>	<u>Result on Written Examination</u>		<u>Totals</u>
	<u>Passed</u>	<u>Failed</u>	
Present	304	76	380
Absent	<u>627</u>	<u>29</u>	<u>676</u>
<u>Totals</u>	941	115	1056

d.f. = 1

$\chi^2 = 49.30 > 10.827 = .1\% \text{ level of significance}$

TABLE XI

TEST OF INDEPENDENCE OF MILITARY EXPERIENCE DURING 1940-1946
WITH SUCCESS ON FIRST ATTEMPT ON WRITTEN EXAMINATION
FOR AIRLINE TRANSPORT CERTIFICATE

Military Experience	Result on Written Examination		Totals
	Passed	Failed	
1940-46	198	71	269
Before 1940 or None	<u>743</u>	<u>44</u>	<u>787</u>
Totals	941	115	1056

d.f. = 1

$$\chi^2 = 87.24 > 10.827 = .1\% \text{ level of significance}$$

These results indicated consideration of the actual scores made on the written examination by pilots with military experience. Since the passing or failing of the examination by pilots with military experiences before 1940 did not differ significantly from that of pilots with no military experience,⁴ the frequencies of the scores made by these two groupings were combined. By assigning the value of 69 to all cases of failure, the mean of this combined frequency was compared to the mean of the scores made by pilots with military experience during 1940-1946 on the written examination. The resulting difference between the two means indicates a true difference between these groups as shown in Table XII, and that pilots with military experience, on the average, made lower scores on the CAA written examination for the airline transport certificate.

TABLE XII

COMPARISON OF SCORES ON FIRST ATTEMPTS TO PASS THE WRITTEN EXAMINATION
FOR AIRLINE TRANSPORT CERTIFICATE BY PILOTS CLASSIFIED
BY MILITARY EXPERIENCE

Military Experience	N*	Mean Score	σ	Diff. Means	σ_D
During 1940-46	265	82.25	8.54		
Before 1940 or None	775	87.11	6.35	4.86	.57

*The numbers in the groups compared were slightly less than those used in the tests of independence. This was due to the omissions of scores on certain records which did, however, show passing or failing of the examination.

$4\chi^2 = .0988 < .148 = 70\% \text{ level of significance for total N of 787 cases, 1 degree of freedom, corrected for four-fold table.}$

The relationships that might exist between the scores and the number of accidents and violations reported in the files of these 1278 pilots were not investigated. Eighty-seven percent of the pilots had no accident reports, while 92% had no violation memoranda in their files. An investigation of accidents and violations would properly begin with a classification of these events in terms of their seriousness and the amount of pilot responsibility involved. Such a classification would require information obtainable only in the investigation proceedings of the Civil Aeronautics Board. Once a classification had been made, the scores on the CAA examinations could be related to the result. From the information in the CAA record files, Table XIII was constructed showing merely the number of pilots who were involved in one or more accidents. Similar information on violations is presented in Table XIV, with an appended summary of the types of violations reported.

TABLE XIII

REPORTS OF ACCIDENTS PER PILOT IN CAA RECORD FILES
OF 1278 MEDICAL EXAMINEES

<u>Accident Reports</u>	<u>Number</u>
None.	1112
1	103
2	30
3	20
4	8
5	3
6	1
<u>7</u>	<u>1</u>
Total	1278

TABLE XIV

REPORTS OF VIOLATIONS PER PILOT IN CAA RECORD FILES
OF 1278 MEDICAL EXAMINEES

<u>Violation Reports</u>	<u>Number</u>
None.	1182
1	84
2	10
<u>3</u>	<u>2</u>
Total	1278

The reports classified in Table XIV include the following types of violations:

- Performed acrobatic maneuvers at a height of less than 1500' over a congested area outside limits of flight area.
- Operated unqualified aircraft with commercial license.
- Piloted aircraft after license had expired and before aircraft was reinspected.
- Failed to test elevators prior to take-off.
- Instructed student pilots for hire with private license.
- Navigated aircraft at a height less than 1500' in acrobatic fashion without parachute.
- Navigated in weather below CAR minimum with no instrument rating or flight plan approved.
- Took off on runway against red traffic signal directed from tower without identifying aircraft to be flown and time of arrival.
- Piloted aircraft unairworthy due to leak in right tire.
- Operated aircraft with excess passengers resulting in accident.
- Navigated aircraft without required navigation lights.
- Towed advertising sign without permission from Commerce Department.
- Crossed marker at 3000' instead of 2500' as required by pilot clearance.
- Failed to follow close to right side of radio beam.
- Took off when there was risk of collision with landing aircraft.
- Permitted uncertified airman to navigate aircraft on a solo flight without proper lights and made false statement concerning issue of license to said student.
- Navigated U.S.N.C. in civil airway limit under instrument weather conditions without flight plan or approval.

As mentioned previously, the evaluations of these pilots took two forms in the CAA records: the scores on the written and flight examinations, and the examining official's comments on the quality of the applicant's performance. These comments reflected both the perspicacity and the perspicuity of the examining officials since they would differ in the acuteness of their observations and in their abilities to write their conclusions clearly. Also, since comments on performance were not required by regulation, lack of comments on the records of some pilots could not be interpreted as meaning their performances were neither outstandingly good nor outstandingly bad.

Despite these shortcomings, such comments on performance constituted a source of information on what applicants did or did not do on flight tests for the different CAA certificates, including airline transport. All but the most irrelevant comments by the examiners about these 1278 pilots were abstracted verbatim from the CAA records and cross-classified in categories of approval-disapproval and favorable-unfavorable. This classification appears in Appendix II, by certificate and rating.

More comments were made on the examinations for private and instructor licenses than on the examinations for the other certificates and ratings. Many of these comments consisted of stereotypical expressions of personality factors and contribute little to the research. The unfavorable comments on disapprovals for the airline transport certificate and for the instrument rating were, however, more suggestive of the types of flying behavior which should be investigated fully in a search for the critical requirements of a safe airline pilot.

SUMMARY

The findings of the analysis indicate that the scores made by airline pilots on the different written and flight examinations administered them by the CAA at different stages of their flying careers do not show any consistent pattern of performance. Only two relationships were found which could not be attributed to chance factors: a positive relationship between scores on first attempts to pass the written tests for the private and commercial certificates, and a negative relationship between the scores on the flight tests for these same two certificates. In both cases the degree of relationship found was small.

Although the number of flying hours reported at the time of the flight test for the airline transport certificate and the scores made on that test were negatively related, this relationship appears to be a result of a "selection process" by the airline companies rather than a general negative relationship between flying experience and flying proficiency.

Pilots with military experience were found to pass the flight test for the airline transport certificate as frequently as pilots with no military experience. On the written test for this certificate, however, the military group made significantly lower scores. These lower scores were attributed to a temporary unfamiliarity with civil regulations by pilots recently engaged in military flying. This unfamiliarity should diminish as these pilots accumulate hours as civilian pilots.

APPENDIX I

Scatter Diagrams

COMMERCIAL AND AIRLINE TRANSPORT CERTIFICATIONS
 SUBJECTS ON FIRST ATTEMPTS
 BY AIR FLIGHT EXAMINATION

	Airline															100	TOTALS
	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98		
F	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99		
100									1								1
98-99	1																2
96-97		1															2
94-95										1	1						3
92-93								3	1	1	2						7
90-91				1	1	3	2			2	5				1		22
88-89	1		1		1	4	3	3	2	1	2	1	1				21
86-87			1	3		6	6	5	1	9	3	2	1				40
84-85	6			2	2	4	10	16	21	10	6	9	2	5			93
82-83	1		1		1	4	9	20	20	19	7	7	2	2	1		96
80-81	7	1	1	3	4	12	25	44	38	23	10	13	4	1	1	1	188
78-79	2	1		1	1	4	11	12	16	10	7	5	2				72
76-77	1			1	1		7	6	7	6			1				31
74-75	6	1		4	1	5	9	8	12	10	6	8	4	1	1		76
72-73					1	2	1	4	2	3	4	2		1			20
70-71					1	4	5	3	2	2	1			1			19
F	3		1	5	3	7	13	14	13	5	7	5	1				95
TOTALS	28	4	5	9	17	48	102	143	159	119	57	62	22	14	3	1	788

Commercial = 79 47
 Airline = 83 64
 Comm = 6 12
 Airline = 5 31
 Y = 026
 6Y = 035

Source: 1278 CAA case files.

PRIVATE AND AIRLINE TRANSPORT CERTIFICATES
 SCORES ON FIRST ATTEMPTS
 CAA FLIGHT EXAMINATION

	Airline															TOTALS	
	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98		
F	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	100	
100																	
98-99																	
96-97																	
94-95								1									1
92-93									1								1
90-91			1			4	2		5		1						13
88-89			1			1	1	1	1	2		1					8
86-87	1					5	4	7	5	1	2						26
84-85	2		1	2	9	8	26	18	11	7	3	2	1	1			91
82-83	2		2	3	7	11	17	29	18	8	5	1	3				106
80-81	8	2	5	2	13	27	24	36	27	5	11	5	2	1			168
78-79			2	1	4	8	6	11	7	7	6	2					54
76-77					3	2	9	5	2	1	1						23
74-75	2		1	1	1	7	12	14	8	7	4		1			1	58
72-73	1			1	1	1	7	7	3								21
70-71			1	2	3	3	4	6	5	2	1						27
F	5		1	3		3	3	3	2		1	2					23
TOTALS	21	2	0	15	16	40	80	115	138	95	40	35	13	7	2	1	620

$\bar{x}_{pvt} = 81.0$
 $\bar{x}_{airline} = 83.43$
 $s_{pvt} = 4.89$
 $s_{airline} = 4.94$
 $\bar{y} = 83.035$
 $\bar{c}_y = 1.04$

Source: 1278 CAA case files.

PRIVATE AND COMMERCIAL CREDENTIALS

SCORES ON FIRST ATTEMPT

CAA FLIGHT EXAMINATION

Commercial

	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	TOTALS
F	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99		
100																	
98-99																	
96-97																	
94-95								2									2
92-93								1	1								2
90-91	2	1		2	3			2	1	1		1					14
88-89	1	1		1	1	1		3	1		1						12
86-87	3		2	2	2		6	3	6	1	1	1					30
84-85	13	1	2	8	3	13	29	13	7	3			2				94
82-83	14	3	3	10	3	11	26	18	9	5	2	4	1				118
80-81	31	1	3	20	8	21	47	19	20	11	7	6	2				205
78-79	11	1	3	8	2	5	14	7	2	4	2		1				60
76-77	2	1	1	2	2	4	5	3	1	3							24
74-75	10	2	2	1	3	7	23	5	9	1	2		1	1			68
72-73	1		1	4		4	4	3	2	1							18
70-71	7		1		1	10	5	1		2	1						28
F	3			3	2	5	9	3	2								27
TOTALS	98	11	18	70	30	74	174	87	71	30	17	14	6	1	1		702

$\bar{X}_{pvt} = 80.08$
 $\bar{X}_{comm} = 79.93$
 $\sigma_{pvt} = 4.87$
 $\sigma_{comm} = 5.88$
 $r = -.149$
 $dy = .037$

Source: 1278 CAA case files.

COMMERCIAL AND AIRLINE TRANSPORT CERTIFICATES
 SCORES ON FIRST ATTEMPTS
 CAA WRITTEN EXAMINATION

	Airline																TOTALS	
	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100		
	F	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	100	TOTALS
100									1	1								2
98-99					1				2	1	1	1		1	2			9
96-97	5			1			3	2	1	1	2	5	3	3				26
94-95	1			1			2	4	2	1	5	2	5	5	4			32
92-93	8		1		2		3	6	5	5	6	5	8	5	1			55
90-91	5			1	1	1	1	5	8	6	13	8	12	4				65
88-89	7	3	2	2	1	3	3	4	8	8	5	12	12	3	3	2	4	82
86-87	6				3	3	2	2	5	7	8	14	16	4			2	72
84-85	6				1	1	5	8	11	8	16	19	18	5	3	1	1	103
82-83	4	2		1		5	5	6	10	7	5	20	14	6	7		1	93
80-81	12			1	1	2	4	6	16	8	14	11	12	9	3		1	100
78-79	6					2	3	7	3	4	7	2	7	5	3	1	1	51
76-77	8					1	1	2	3	5	4	4	7	3	2		1	41
74-75	5	1	1	1	1	2	3	1	4	2	7	8	9	1	2			48
72-73	4	1	1			1		2	2	1	1	1	2	2	1			19
70-71						1		2	1	3	1	2	1	1				12
F	27			3	1	5	9	14	13	18	19	21	21	10	5		1	167
TOTALS	104	7	5	11	12	27	44	71	95	86	114	135	147	67	36	4	12	977

\bar{x}_{comm} = 84.5
 \bar{x}_{airline} = 86.0
 σ_{comm} = 8.37
 σ_{airline} = 8.00
 γ = .07
 $\sigma^2 \gamma$ = .032

Source: 1278 CAA case files.

PRIVATE AND AIRLINE TRANSPORT CERTIFICATES
 SCORES ON FIRST ATTEMPTS
 CAA WRITTEN EXAMINATION

	Airline															100	TOTALS	
	70 71	72 73	74 75	76 77	78 79	80 81	82 83	84 85	86 87	88 89	90 91	92 93	94 95	96 97	98 99			
100													2				3	
98-99	1		1							1	3	2					8	
96-97	2						1		1	2	5	4	1	1		1	18	
94-95	5					2	1	2	3	2	10	6	2	1	3		37	
92-93	5		1		1	1	2	2		4	4	6	5	3			34	
90-91	4	1		1	1		5	7	8	5	7	8	10	4		1	59	
88-89	9	1		1	2	3	5	7	3	2	7	12	5	4			61	
86-87	3					2	3	5	7	6	11	16	3	2	1		59	
84-85	5		1		3	6	6	6	6	7	13	9	4	3			69	
82-83	8		1	2	3	5	3	6	5	11	8	9	5	2			68	
80-81	7		1	2		4	5	6	3	5	10	9	4	1	1		58	
78-79	7	1	1	1	3	2	9	2	2	11	9	3	1	1	1		54	
76-77	5	1					5	6	2	8	4	6	1	2			40	
74-75	1				1	2	2	3	7	6	3	4	4	1			34	
72-73	2	1			1	1	1	3	7		3	3	1			1	24	
70-71	2	1		1			1	2	2	1	1	5	2		1	2	21	
F	9		1			3	2	6	7	9	6	4	1	1			49	
TOTALS	75	3	3	7	8	15	31	51	60	63	80	105	106	51	26	4	8	696

Xpvt = 83.08
 Xairline = 86.22
 Spvt = 7.76
 Sairline = 8.48
 Y = .098
 Sy = .037

Source: 1278 CAA case files.

PRIVATE AND COMMERCIAL CERTIFICATES
 SCORES ON FIRST ATTEMPTS
 CAA WRITTEN EXAMINATION

	Commercial															<u>100</u>	<u>TOTALS</u>	
	70 / 71	72 / 73	74 / 75	76 / 77	78 / 79	80 / 81	82 / 83	84 / 85	86 / 87	88 / 89	90 / 91	92 / 93	94 / 95	96 / 97	98 / 99			
100	1					1	1				1						4	
98-99	2					3	1		1	1			1	1			10	
96-97	2				1	1	4	2	1	1	3	2	1				18	
94-95	6				4	3	3	4	3	4	1	5	3	2	2		40	
92-93		3	3	3	3	2	5	1	3	2	5		1	3	1		35	
90-91	10	1	1	1	2	5	7	6	3	6	10	2	2	1	2		59	
88-89	11		2	5	4	3	4	10	3	8	3	8	2				63	
86-87	10		1	2	2	6	6	6	5	9	7	2	3	1			60	
84-85	15	1	2	1	4	2	6	4	11	7	4	4	2	4	2		69	
82-83	15		6	4	1	7	7	8	8	8	2	3	1	1	1		72	
80-81	9	3	2	4	2	5	8	6	6	3	3	4	3	2			61	
78-79	13	1	3	2	6	9	2	4	2	4	5	3		1			55	
76-77	11	1	3	5	3	5	4	3	1	4			1	1			42	
74-75	8	1	5	2	2	2	1	6	2	1	2	1					33	
72-73	10	3	2			3	2	2	2	2		1					27	
70-71	5		1	4	2	2	2	2	2		1	1			1		23	
F	21	1	3	4	4	3	6	5	6	6		2	1			1	63	
TOTALS	149	5	12	33	40	38	66	66	77	55	64	46	37	23	15	7	1	734

$\bar{x}_{pvt} = 82.85$
 $\bar{x}_{comm} = 81.21$
 $\sigma_{pvt} = 7.93$
 $\sigma_{comm} = 8.48$
 $\gamma = .23$
 $\sigma_{\gamma} = .037$

Source: 1278 CAA case files.

FLYING HOURS REPORTED TO AIRLINE ON CASES OF AIRLINE EXAMINATION
FOR AIR CARRIER PILOTS' TEST RESULTS

	Scores															TOTALS		
	70	72	74	75	78	80	82	84	85	88	90	92	94	96	98			
	71	73	72	71	79	81	83	82	87	82	91	93	92	97	99	100		
8500-8749								1							1		2	
8250-8499																		
8000-8249			1					2									3	
7750-7999																		
7500-7749																		
7250-7499						1					1						2	
7000-7249					1												1	
6750-6999					1		1		1				1				4	
6500-6749					1		1				1						3	
6250-6499					1	1		1									3	
6000-6249				1				1	2	2							6	
5750-5999								1	1	1	2						5	
5500-5749						1	1	1			1						7	
5250-5499					1	1	1	1	1	1							4	
5000-5249					1	1	3	2	1	2							10	
4750-4999	1					1	2		1								5	
4500-4749						1	5	2	3	1	1						14	
4250-4499	1	1			1	3	2	2	3	1							14	
4000-4249			2	2	2	3	2	1	3			1					16	
3750-3999	2		2		2	4	5	5	6			2	2				30	
3500-3749	3		1		1	2	9	3	4	2		1	2				28	
3250-3499		1		1	1	5	7	4	5	2	1						27	
3000-3249	1		1	1	2	8	1	8	5	5	3		1				36	
2750-2999			1	1	2	6	6	10	10	2	3	3	1	1			46	
2500-2749	2	1	1	1	1	8	17	6	9	2	3	3	1				56	
2250-2499	2		1	1	1	11	9	16	8	4	5	2	2		1		65	
2000-2249	5		3	2	2	9	13	18	15	3	9			1			82	
1750-1999	3		1	6	1	18	12	19	14	4	10	2					94	
1500-1749	1	1	1	1	4	7	25	30	19	14	15	4	2				126	
1250-1499	2		1	1	3	9	14	28	29	17	11	9			1		131	
1000-1249	3		2		5	4	6	8	5	3		2					43	
TOTALS	26	4	6	24	15	43	109	159	170	132	63	66	24	16	3	1	2	863

Hrs = 2992.75
 Scores = 81.84
 Hrs = 390
 Scores = 5.21
 Y = -.255
 Y = .034

Source: 1173 CAA case files.

FLYING HOURS REPORTED AND SCORES ON FIRST FLIGHT EXAMINATION
FOR COMMERCIAL CERTIFICATE

	Scores															TOTALS	
	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98		
	<u>71</u>	<u>73</u>	<u>75</u>	<u>77</u>	<u>79</u>	<u>81</u>	<u>83</u>	<u>85</u>	<u>87</u>	<u>89</u>	<u>91</u>	<u>93</u>	<u>95</u>	<u>97</u>	<u>99</u>	<u>100</u>	
3000-3090			1				1										2
2900-2999																	
2800-2899																	
2700-2799																	
2600-2699									1								1
2500-2599																	
2400-2499																	
2300-2399																	
2200-2299							1				1						2
2100-2199																	
2000-2099																	
1900-1999																	
1800-1899											1						1
1700-1799																	
1600-1699			1		1			1									3
1500-1599		1									2						3
1400-1499																	
1300-1399																	
1200-1299	1					1			1	1							4
1100-1199																	
1000-1099					1	1								1			3
900-999			1		1	3											5
800-899		1									1						2
700-799				1			1	1									3
600-699	2	1	2			5	1	2			1		1				15
500-599		1	2	1	3	4	2	2	3	1		1					20
400-499	5	2	1		6	13	4	4	5	2	2						44
300-399	20	4	2	7	5	7	27	11	6	7		4					100
200-299	54	11	12	48	21	36	128	61	56	24	15	9	6	2		1	484
100-199	7	6	4	19	7	18	32	15	18	2	4	1					133
0-100													1		1		2
TOTALS	89	24	21	82	35	73	215	96	91	42	23	22	7	4	1	2	<u>827</u>

\bar{X} hrs = 311.7
 \bar{X} scores = 79.47
 S hrs = 264.7
 S scores = 5.94
 γ = .073
 $\rho\gamma$ = .034

Source: 1173 CAA case files.

APPENDIX II

Comments Extracted from the Files of 1278 Pilots

COMMENTS

Favorable comments -- approved

PRIVATE

Good ride--this boy has the makings of an excellent pilot.
Tries to improve his work.
Smooth control feel and above average technique. Air work good in spite of strong gusts of wind. A little weak on judgment.
Level headed and very conscientious; very nice flying; plenty of precision.
Loves to fly; excellent coordination and throttle sense. Keeps alert without signs of being nervous. Very apt student.
Excellent test; very accurate and smooth.
Very smooth; accuracy on turns very good.
Very apt student; slightly tense in flying.
Coordination and speed control good; good flying technique.
A quiet, modest unassuming lad that has a rare combination of the qualities that go to make up an excellent pilot. Flew above par on flight. Would expect him to make one of the best pilots.
Judgment above average.
Above required standard for private; cool and good judgment in all maneuvers.
Headwork quite good. Slightly rough and over controlling. Good planning.
Smooth, careful, progressive--worthy of further training.
Cool, well balanced; uses good judgment. Has no bad faults.
Seems to be smooth pilot although glides are fast.
Student calm; thinks fast; uses good judgment in emergencies. Flying is smooth.
Shows exceptional ability to learn new things and to handle aircraft under adverse conditions; excellent coordination.
Average ability and consistent.
Will make good pilot with time and training.
Coordination generally excellent. Nervous and more tense than usual. Slight errors not on dangerous side, particularly forced landings. Receptive, cool, and conservative.
Uses good judgment and is not cocky; has tendency to show off.
Good general all around ability; coordination above average.
Should make safe and competent pilot.
Made four good landings and figure 8's.
Applicant seemed to be calm, confident, and on the conservative side. Displayed average judgment. Execution for the most part was fair.
No dangerous tendencies. Uses fair judgment in all his flying.
Relaxed, careful; good control touch; good speed sense.
Applicant turned in a better than average test and grades would have been even better had it not been for a tendency to be a little abrupt.
Applicant is cool and deliberate through all maneuvers. Shows unusual judgment and planning.
Executed unusually good flight test; good personal appearance and intelligent.
Well balanced. Will be a good pilot. Very interested in his work--spent plenty of time at the airport. A good advanced student.
Technique average on maneuvers; good coordination; very intelligent; appears good army material.
Steady.
Cautious, understanding; plans well.

COMMENTS

Favorable comments - annotated

PRIVATE

Smooth technique; shows normal aptitude although slow to absorb instruction.

Retains knowledge once he gets it.

Serious, conscientious pilot with good coordination.

Keeps ship in balance. Should do well on advanced training.

Good pilot for amount of time.

A good student all around.

Eager; cooperative.

Accuracy very good; hit slip stream on 720 degree power turns. Good judgment on forced landings.

Very tense, willing, cautious. Should continue flying under good conditions for considerable time.

Has safe flying habits.

Applicant was cool and well balanced; made good flight test and handles ship well; he was appreciative of the instruction given him by his instructor.

Level headed and intelligent; good technique; a little quick on controls but not to excess.

Very much interested in flying; reactions a little slow.

Coordination and general headwork good.

Well qualified; good planning and learns easily.

Cool and well balanced; high average ability.

Alert and confident.

Very cooperative even to trying too hard; intelligent planning of flight.

Good basic coordination and shows no dangerous tendencies.

COMMENTS

Unfavorable comments -- approved

Unfavorable comments -- disapproved

PRIVATE

Lost 100' in first 720° turn to right.
Nervous during test.
Under corrected for drift on steep pylon 8's.
Weak on emergencies.
Timid on ordinary stalls.
A little slow and nervous.
Has slight tendency to overuse the ailerons in rough air and in recovering from banks.
Poor reaction in spins and stalls.
Needs practice on steep turns and stall recoveries.
Forced landings are poorly planned and executed.
Not too good on 360° pattern. Spiral a little uneven.
Accuracy weak.
Weak compensating for drift.
Lacks precision.
Coordination below average.
Inclined to be overcautious.
All maneuvers poor as well as coordination and spaced control.
Has some tendency to skid in turns. Has a little rough on controls.
Nervous disposition; heavy on controls.
Slow on rudder in power stalls; judgment poor selecting field. 180° forced landing under shot 360°
Smooth air work but uses snap judgment which proves bad most of time; poor judgment in landings.
Inclined to have too much confidence in himself.
Also in too much of a hurry.
Planning and headwork indifferent.
Judgment on forced landing barely passing.
Poor altitude control on 8's.
Mentally very lazy. Thinks he is good and rates himself higher than he is.
Poor throttle coordination; poor control coordination--loses altitude.
Taxied fast. Had trouble entering right spin.
Has no idea of the right way to do 8's.
Poor coordination.
Lacks good control touch; inclined to dive in his glides.
Uses too much rudder causing coordination to be below average.
Does not appear to be much at ease.
Timid and erratic temperament.
Glides too fast.

Unable to accomplish any accuracy landings.
On forced landings would have cracked up if landing had been made as he went into field with ditches at right angles to line of flight.
Pattern on pylons very poor on steep ones. Grabbed from one to other and flew with right wing low between pylons.
Had not applied himself on ground studies.
Inherently unfit for a pilot.
Poor execution of maneuvers; poor accuracy.
Unable to spin to right.

COMMENTS

Favorable comments -- approved

COMMERCIAL

Coordination good.
Very good pilot; conservative--all around good man.
Pilot very smooth and well balanced; above average on accuracy landings.
Smooth; coordination and accuracy good; good instructor material.
Very smooth pilot; excellent judgment.
Good pilot ability; not excitable.
Above average ability--smooth, calm, accurate.
Precision and judgment good; coordination generally good.
Very conscientious.
Pilot completely relaxed and light on controls at all times.
Better than average technique and ability.
Pilot was cool, well balanced and well qualified for the rating.
Good flight test--calm and collected.
Coordination and patterns exact.
Cool, confident, well balanced and dependable.
Very apt, steady, sure and definite about all maneuvers; exceptionally smooth on controls.
Coordination and judgment sound.
Clears and locks around very well. Plans ahead of airplane.
Consistently above average.
Young pilot--has had excellent instruction and been barnstorming a lot.
Very good pilot. Has had cotton dusting work.
Very smooth; timing and planning very good.
Consistent and alert.
Fair control and proficiency under gusty conditions.
Alert and attentive to traffic; attitude good.
Calm and definite about all his work.
Accuracy unusual for his limited experience.
Has good background and flew good test; judgment very good; level headed pilot.
Cool, calm, no apprehension.
Flew very good flight test; coordination, accuracy landings, S's above average.
Mental attitude, temperament, personality--excellent.
Plans well--is calm and precise.
Coordination and judgment sound.
Spin recoveries good.
Coordination and execution of maneuvers smooth and satisfactory.

COMMENTSUnfavorable comments--approved

Spin recoveries rough.
Tendency to skid on entry to turns.
Slightly nervous
Not so good. Slow nose high slips.
Spin recoveries abrupt. Spent quite a little time locating pylons for 8's. Landings below average.
Unconscious coordination poor; spin entry not good.
Does not apply himself.
Skids all turns--coordination weak.
Stalls rough. Fights controls. Landing patterns and glides below average.
Nervous and tense.
Overcontrols slightly. Gains some speed in slips.
A little weak on advanced maneuvers.
Poor choice of fields on forced landings; rough recovery on spins; poor pattern on 8's.
Accuracy poor on 8's.
Some discoordination during forced landings and eights.
Has tendency to pump controls; slightly rough.
Excess speed in gliding to simulated forced landings; excess speed in spirals.
Below average planning; weak on forced landings. Slow to sense errors and make appropriate corrections.
Poor rudder action in power stalls; slow glides.
Rough on rudder.
Showed some tension and apprehension. Acts of coordination of pressures below average.
Judgment of distance fair.
Precision fair.
Slow reactions; doesn't plan; gets mixed up too easily.
Failed to control gliding speeds and made several bad choices of fields; weak on forced landings.
Glided too fast on landings; barely acceptable for precision.
Some trouble on 8's--part of which might have been caused by rough and lumpy air.
Slightly tense--overcontrols in rough air.
Has tendency to hasten into maneuvers; works too fast for smoothness.

Unfavorable comments--disapprovedCOMMERCIAL

Unable to make vertical banks.
Overshot and undershot landings.
Spot landing patterns inconsistent; undershot the entire airport; overshot on one 300'.
Does not distinguish difference between spin and spiral--accuracy short on 720 for 2 attempts.
Ground and air accuracy poor; coordination poor; wrong conception of patterns and maneuvers in general.
Shot forced landing downwind.
Needs more practice.
Rough; poor coordination; precision very poor.
Failed in vertical banks.
Too much rudder on all turns. Has flown too much alone. Not enough coordination for commercial.
Poor on 8's, landings, turns, and stalls.
Unable to spin plane. Precision landings, patterns, 8's very poor. Needs additional instruction.
Had most of time solo--coordination and accuracy poor.
Under shot approach; bad landing; poor conception of normal glide. Aircraft stalled because of improper correction on undershot causing tire to blow.
Lacked technique and basic fundamentals. Showed lack of practice and sufficient instruction.
Attempted to maintain altitude in 720 with top rudder resulting in severe slip. Poor judgment and approach in spot landings.
Very poor accuracy on 180 degree approach.
Missed all spots--test discontinued.
Too crude for commercial.
Glides too fast; poor coordination.
Glide not constant. Holds slight amount of rudder in most turns.

COMMENTS

Unfavorable comments--approved

Slight variance in altitude on 720's.
Pattern on forced landings only fair.
Tendency to overcontrol ailerons in steep turns and 90° turns.
Nervous and becomes rattled.
Weak on power stalls.
Precision work slightly below average.
Flying very mechanical. Safe but inclined to be nervous.
Not a very good understanding of maneuvers.
Rough on controls--some tendency toward tenseness.

Unfavorable comments--disapproved

COMMERCIAL

Unable to make precision landings.
Showed very poor judgment. Overshot all spot landings by 200'.
Poor glide controls and patterns.
Did not clear engine at any time on power-off maneuvers. Coordination is marginal. Does not know a forward slip from a side slip. Made spin recoveries with stick full back.
Overshot airport twice on 180° spots.
Unable to taxi in cross wind. Not able to execute stalls.
Chandelles poor. Needs more practice on spiral approaches and on pylons and spot landings.
Extremely poor judgment in all maneuvers incorporating drift correction.
Unable to enter spin--overshot 200'.
Overshot spots--pattern poor.
Constantly over and undershot 180° side approaches.
Shows very poor judgment in planning on spots.
Undershot 2 spiral approaches by 300'; overshot 360 approaches by 500'.
Undershot 180° side approaches.
Unable to hit spot landing.
Needs additional instruction. Missed entire field on 2 precision landings.
Slips in steep turns and gliding turns.
Failed to land within required distance for a commercial pilot.

COMMENTS

Favorable comments -- approved

INSTRUMENT

Methodical; technique is good; accuracy good.
Excellent flying under turbulent air conditions.
Very smooth and deliberate.
Good on beam riding.

Unfavorable comments -- approved

Coordination below average.
Overcontrols elevators.
Tense--will improve with practice.

Unfavorable comments -- disapproved

Turns off 90°. Orientation poor;
brackets too much unnecessarily.
Wanders off his heading when thinking
of other things.
Unable to locate cone and beam;
bracketing very poor.
Lost 200' in turns. Missed cone by
1/4 mile on 3 attempts. Failed to
tune down coming in close. Too
low for safety.
Lacks experience and coordination.
Missed cone entirely; low approach;
missed field by 2 miles; judgment
less than average.
Let altitude vary 350' in steep turns;
could not locate zone of silence;
too far off low approach.
Loses beam right at station on low
approach. Failed to back off from
station far enough after weather
broadcast.
Unable to follow beam.
Misinterpreted signals; could not
locate station.
Appeared too much upset by radio
ATC procedures.
Needs more time to smooth out technique.
Unable to determine leg of beam he was
on after 1/2 hr. of searching.
Range work not consistent.
Very poor bracketing; good initial cone;
undershot and called low cone 1 mile
early seemingly due to fatigue.
Inability to maneuver to low safe
altitude.
Failed orientation; failed to bracket
leg.

COMMENTS

INSTRUMENT

Unfavorable comments -- disapproved

Missed station on 2 passes; no coordination on airspeed; confused on turn around.

Failed to locate cone of silence; poor beam riding--stays too far off course.

Tuned in Dallas range by mistake--too long in finding this out.

On south leg after orientation due to high wind condition.

Needs time on beam bracketing and let down; final approach to range station poor; poor cone.

Unable to make safe and straight low approach. Did not locate cone of silence on low approach.

Unable to locate and identify radio station.

Could not keep on course.

Unable to execute time turns.

COMMENTS

Favorable comments -- approved

INSTRUCTOR

Proficient in maneuvers. Explanations, corrections and instructions are clear and precise.

Very cooperative--willing to learn.

Above average in the execution of most maneuvers. A clean conscientious type of individual.

General ability and judgment good.

Excellent in maneuvers and explanations of them.

Seems willing to learn and adapt to new conditions.

Good personality and attitude. Test showed practice and study and willingness to cooperate.

Appearance and attitude excellent--aptitude good. Ability to execute above average.

Considerably above average. Pleasing personality, excellent oral explanations, flying ability, technique, corrections.

Very cooperative and anxious to learn.

Smooth, steady-planning and timing excellent. Will make good instructor with experience.

Fine example of instructor type who will benefit industry by being serious, thorough.

Learns fast and grasps new ideas easily.

General technique good; willing to cooperate.

Quiet type of person and smooth pilot. Ability on written is better than indicated.

Good coordination.

Technique and attitude very good.

Good interest and attitude.

Average ability; good explanations; very alert.

Test well flown. Most work smooth; good judgment and understanding.

Pleasing personality; ability good as instructor.

Technique and aptitude average. Interest very good. Written good. Above average on oral.

Definite capacity for explaining maneuvers and technique. Intelligent, alert attitude was apparent throughout flight test.

Technique good; attitude excellent.

Good personality and ability for an instructor.

Good pilot--smooth, conscientious.

Very cooperative--should be good instructor with experience.

Neat, clean, pleasing, very studious. Very precise in flying and does good job. Corrections are deliberate and accurate.

Excellent personality; good past record.

All maneuvers satisfactory. Shows good judgment.

Excellent personality, coordination, technique and temperament. Should make an excellent instructor.

Attitude and appearance good. Ability to execute above average.

Serious and ambitious.

Above average intelligence and appearance; judgment and technique good.

Coordination, accuracy, technique good.

Has thorough knowledge of the required maneuvers plus ability to execute and instruct and if correct mental attitude is maintained, should make better than average instructor.

COMMENTS

Favorable comments -- approved

INSTRUCTOR

Aptitude above average. Corrects errors without hesitation and accurately.
Very smooth pilot.
Personality excellent. Coordination better than average.
Good understanding of maneuvers.
Good judgment and precision; very conservative; good coordination; smooth on controls; excellent personality.
Careful pilot--thoughtful and sincere; shows evidence of careful study.
Very good instructor material--alert, conscientious, smooth.
Technique fair; attitude good. Interest excellent. Very sincere and cooperative.
Has good technique and has good knowledge of instructing.
General technique good; retains instructions; explanation of errors good.
Very cooperative. Showed desire to learn.
Above average in corrections of errors and demonstration of maneuvers.
General attitude indicates much study and practice.
Fair ability on all tests. Can detect small errors in pilot technique and explain proper correction.
Very good material--enthusiastic with added practical experience.
Smooth, cool pilot, but not aggressive type. Quiet, slightly timid in oral instruction.
Accuracy, technique, personality very good.
Attitude and interest very good. Technique very good. Absorbs instructions readily.
Very serious at his instructing--has good personality.
Intelligent--cooperative.
Neat, clean, serious and industrious.
Good flying technique.
Good personality; neat appearance; excellent attitude. Interested in improving his instruction technique and flying technique.
Technique good. Smooth pilot--understanding and explanation of maneuvers good.
Technique, attitude and interest good.
Very clear on corrections. Technique very good.
Better than average pilot. Tries hard and is conscientious.
Is able to detect and analyze errors.
Quiet personality. Detection and analysis of errors good.
He is honest, cooperative and anxious to improve his pilot ability.
Seems eager to learn and improve--realizes weak points.
Good instructor and pilot; technique average; aptitude very good.
Attitude and personality good.
Good judgment and technique.
Has good knowledge of instructors' manual.
Very clear in oral exam. While in flight inspires confidence.
Ambitious.
Clear understanding of all maneuvers and explanations.

COMMENTS

Unfavorable comments — Approved

INSTRUCTOR

Very quiet; has trouble explaining. Shows general lack of experience; personality weak point (check list said "gruff"). Little weak in speed control on accuracy landings. Capable of better flight test; temperamental, lacks confidence in his own ability; none too receptive. Slightly nervous disposition--could not make good instructor. Knowledge of basic principles weak. Many principles of procedure neglected. Somewhat weak in error correction. A bit confused due to instruction; spent additional time with him and he corrected faults. Slightly late on rudder pressure and chandelles. Recovery speed slower on left than on right recovery. Pattern varied after key position was established. Slow in explaining but has good knowledge of maneuvers. Is inclined to be rough and overconfident. Tense during flight. Low voice on corrections--hard to hear. Lacks forcefulness. Was excited during explanation of maneuvers, but test continued until he could do a fair job of instruction without being keyed up. Pattern slightly off in precision landings. Has trouble explaining. Tendency to become tense in acrobatic maneuvers. Reaction a little slow. Somewhat mechanical in thought and technique. Lacks initiative. Nervous under strain of flight. Timid and slight inferiority complex. Ability to impart his knowledge to others is questionable.

Unfavorable comments — Disapproved

Overconfident and failed to study. Maneuvers in chandelles, lazy 8's poor--lost altitude badly. All work skidded to right and slipped to left; ability to instruct poor--gropes for words; quiet nature; corrections made were incorrect. Bad teacher; unable to plan ahead. Could not do precision spins and flight test called off. No recognition of errors. No ability to correct the most obvious errors. Appearance and technique not instructor material. No timing or planning excess speed during spirals. Observation poor. Doesn't look around enough. Skids in turns. Altitude selected for pylons eight too high; entry too late; landings poor. Own flying technique below average; poor instructing; unable to analyze students' errors. No experience in instructing so analyses of errors and corrections poor. Own flight technique and judgment below average. Flying is very mechanical and he shows very poor planning in most maneuvers. Exceedingly poor oral; difficulty in expressing himself; very erroneous explanation of many maneuvers. Needs to develop the facility of planning ahead. Maneuvers not quality expected; spins failed to spin even after demonstration. Unable to analyze errors; coordination far from passable. Unable to explain maneuvers. Spins poor; technique and judgment below average; lacks aggressiveness. Lazy 8's, chandelles, 8's on and around poorly executed. Oral instruction weak. Did not look on spins or acrobatic maneuvers.

COMMENTS

INSTRUCTOR

Unfavorable comments -- approved

Tendency to fly too mush with stick--
overcontrols for bumps.
Old "standard" type of pilot not up
to new, improved methods.
Just passable on all maneuvers;
ability to instruct fair.
Rough entry on spins from a steep
turn.
Coordination good but reaction slow;
somewhat mechanical in thought and
technique. Steep turns poor.
Slightly rough in technique.
Weak voice.
Had some erroneous ideas on correction
of errors.
Has tendency toward over instruction.
Weak on oral explanation of maneuvers
and correction of errors.
Weak on analysis and catching errors.
Not forceful enough in oral corrections.
Tries to be excessively light on controls
instead of just flying natural and using
pressure as needed, thereby sacrificing
performance.
Flying is rough; maneuvers fair.
Tendency to glide too near ground.
Understanding of maneuvers fair;
accuracy and technique fair.
A little hasty with his corrections
and ability to exercise them is
not exceptional.
Too quiet--may be o.k. with student.
Lacks confidence, but does good job
flying and on oral.
Ability to instruct on class 1-land
and describe and explain to a
student is somewhat vague.
Is inclined to be noisy.
Appearance below average.
Slow thinker; rough throttle.
Used very abrupt spin recovery which was
corrected; quite tense during test.
Applicant is very quiet--not forceful
in correction of errors.
Inclined to be a little cocky.
Must improve technique in advanced maneuvers.
Planning and judgment below average;
slow thinker.

Unfavorable comments -- disapproved

Spin recovery rough and late; some
recoveries 90° past the point.
Pylon 8's made downwind with no
attempt to change after 3 complete
8's. Glide fast on forced landings
causing applicant to overshoot.
Has difficulty recognizing errors.
Technique poor; inclined to get
nervous.
Failed on spins, stall, pylon 8's.

COMMENTS

Unfavorable comments -- approved

INSTRUCTOR

Slightly rough throughout.

Weak on oral instruction.

Slow reaction and has difficulty in explaining maneuvers.

Became rattled on first test but recheck indicates calmness and improved technique.

COMMENTS

Favorable comments -- approved

AIRLINE

average in ability and attitude.
 Plenty of natural ability--outstanding captain material; smooth operator.
 on precision.
 excellent instrument flight in all respects.
 better than average on smoothness.
 Excellent ability.
 Very calm--seems to realize all maneuvers very well.
 Very smooth in all work.
 Good airline pilot material.

Unfavorable comments -- approved

Pilot could do much better on larger
 equipment.
 turns not as accurate as desirable.
 attentive to details; tendency toward
 over confidence; quite alert while on
 instruments.

Unfavorable comments -- disapproved

Did not check station identification
 and did not find error.
 Went below stipulated altitude several
 times in instrument let-down.
 Procedures performed during radio
 orientation unsatisfactory; low
 altitude maneuvers.
 Failed entire under hood using direction
 finder; 50 miles off track. Failed
 to pass over station accurately on
 predetermined track. Air maneuvers
 bad. Pull up technique bad.
 Failed to locate come on low approach
 and failed to make pull out.
 Single engine on take-off dangerous.
 Pulled wrong propeller back on
 single engine. All below par.
 Thinking too far behind airplane. Low
 approach.
 Loop bearings wrong. Missed cone; missed
 station homing on loop. Not sure of
 procedures, power, settings.
 Test stopped--failed to recognize single
 engine.
 Lacks experience; orientation very poor;
 judgment below average.
 After passing range station on final
 approach, this pilot failed to properly
 time flight, maintain altitude and
 stay on course across airport.
 Failed to locate radio range on final let-
 down; failed to maintain altitude on
 final approach. During single engine
 emergency went down to 500'.
 Confused radio range--started east leg
 instead of west leg on final approach.