THE AIRLINE TRYOUT OF THE STANDARD FLIGHT-CHECK FOR THE AIRLINE TRANSPORT RATING

prepared by

JOHN A. NAGAY

Report of a survey conducted by the American Institute for Research, Incorporated, Pittsburgh, Pennsylvania, under the auspices of the National Research Council Committee on Aviation Psychology, with funds provided by the Civil Aeronautics Administration.

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Committee on Aviation Psychology

Executive Subcommittee

M. S. Viteles, Chairman

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LETTER OF TRANSMITTAL

NATIONAL RESEARCH COUNCIL

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

Committee on Aviation Psychology

December 19, 1949

Dr. Dean R. Brimhall
Coordinator of Research
Civil Aeronautics Administration
Washington 25, D. C.

Dear Dr. Brimhall:

The attached report, entitled The Airline Tryout of the Standard Flight-Check for the Airline Transport Rating, by John A. Nagay, 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 study described in this report represents a crucial step in an extended research program directed towards the improvement of procedures used by the Civil Aeronautics Administration in evaluating the proficiency of applicants for the Airline Transport Rating. The basic research and the development of preliminary versions of the Objective Standard Flight-Check for the Airline Transport Rating have been described in previous reports.[1] Although these earlier versions had undergone extensive field flight tests through the cooperation of Civil Aeronautics Administration, and Air Force personnel, it was considered necessary to undertake a further field try-out of the flight check procedures, revised on the basis of previous experimentation, through the administration of the test to active airline captains and first officers. At the same time it was possible to compare the reliability of the Objective Standard Flight-Check with that of the CAA Flight Test currently in use in certifying for the Airline Transport Rating.

The results of this investigation demonstrate conclusively that the reliability of the Objective Standard Flight-Check is significantly greater than that of procedures currently used in examining candidates for the Airline Transport Rating. This is true in spite of the fact that check

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[1]Preston, H. O. Analysis of CAA records on airline transport pilots. Washington, D.C.: CAA Division of Research, Report No. 72, August 1947. Gordon, Thomas. The airline pilot: A survey of the critical requirements of his job and of pilot evaluation and selection procedures. Washington, D.C.: CAA Division of Research, Report No. 73, November 1947. Gordon, Thomas. The development of a standard flight-check for the Airline Transport Rating based on the critical requirements of the airline pilot's job. Washington, D.C.: CAA Division of Research, Report No. 85, April 1949.

pilots were using the Objective Flight-Check form for the first time, and were therefore less familiar with it than with other procedures subjected to evaluation in this study. Experience with the new evaluation procedure has shown that it can be readily administered, and that it is a practical instrument for everyday use in the field.

It will be recalled that a study was made of the critical requirements for airline pilots as the first step in selecting items for the new Objective Flight-Check. Moreover, there were extended discussions with CAA personnel, airline officials and experienced pilots, including a Committee of the Air Line Pilots Association, designed to make certain that the items included in the flight examination were critical in terms of efficiency and safety of operation. The steps taken and the care used in developing the content of the Objective Flight-Check provide a basis for the judgment that it measures performance in aspects of the airline pilot's job which are actually critical for the evaluation of pilot proficiency.

There are a few revisions to be made in the Objective Flight-Check on the basis of the specific findings of this investigation. Steps are also being taken towards the preparation of a manual and an instruction outline to be used in providing systematic training for CAA personnel and others who will use the new Objective Flight-Check. However, on the basis of available findings the Executive Subcommittee of the Committee on Aviation Psychology has approved the standard Objective Flight-Check as a practical instrument which can be used in obtaining reliable measures of the performance of airline pilots during a test flight conducted for the purpose of certification for the Airline Transport Rating.

Cordially yours,

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

MSV:maf

EDITORIAL FOREWORD

Research directed towards the development of an improved, objective flight-test, conducted by the American Institute for Research, under the auspices of the National Research Council Committee on Aviation Psychology, at the request of the Civil Aeronautics Administration, has been described in previous reports. The first two of these reports described the outcomes of an investigation of the certification history of applicants for the Airline Transport Rating,[1] and of a survey designed to reveal the specific requirements and characteristics demanded of a safe air transport pilot, and the critical elements of his job.[2] This latter survey involved the analysis of data gathered from interviews with over 250 airline pilots; from CAA and company records, and from other sources.

The second major phase of this long-range program involved the development of preliminary forms of an Objective Flight-Check for the Airline Transport Rating. This check-flight, designed to yield information on flight performance in areas most critical for safe flying, was developed on the basis of extensive field research. Not only were CAA personnel, airline officials, and experienced airline pilots consulted in the construction of the flight test, but great benefit was gained from extensive flight testing conducted at the CAA Aeronautical Center, Oklahoma City, through the cooperation of the Civil Aeronautics Administration, and at Barksdale Air Force Base, Shreveport, Louisiana, through the cooperation of the USAF Training Command.

The results of work in this phase of the program are described in a report by Gordon.[3] It was found that the Objective Flight-Check submitted to field try-outs (1) was markedly more reliable than other methods of evaluating the proficiency of airline pilots; (2) by the nature of its development measured skills relevant to success as an airline pilot; and (3) represented a practical and efficient device from an administrative standpoint. Of particular interest was the fact that high agreement was evident between check-flight scores yielded by different examiners flying given pilots on <u>different days</u> and in <u>different airplanes</u>.

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[1] Preston, H. O. <u>Analysis of CAA records on airline transport pilots</u>. Washington, D.C.: CAA Division of Research, Report No. 72, August 1947.

[2] Gordon, Thomas. <u>The airline pilot: A survey of the critical requirements of his job and of pilot evaluation and selection procedures</u>. Washington, D.C.: CAA Division of Research, Report No. 73, November 1947.

[3] Gordon, Thomas. <u>The development of a standard flight-check for the Airline Transport Rating based on the critical requirements of the airline pilot's job</u>. Washington, D.C.: CAA Division of Research, Report No. 83, April 1949.

On the basis of findings in this phase of the study, and of discussions with the Air Line Pilots Association on content and scoring procedures, further revisions were made in the Objective Flight-Check. The latter was then submitted to field try-out on active airline captains and first officers. The results of this try-out are described in this report. The findings of the investigation show marked agreement between independent flight examiners in evaluating the performance of a pilot on different rides. The reliability of the Objective Flight-Check, reflected in the extent of agreement between independent check pilots, is considerably higher than the reliability of evaluation procedures currently used by CAA in certification for the Airline Transport Rating. It is of interest to note that disagreements in estimates obtained through the simultaneous use of the current and of the improved check-flights in general apply only to the evaluation of co-pilots, and not to that of captains. At the same time, independent check pilots show more agreement in the assessment of co-pilots when they use the Objective Flight-Check than when they use the current CAA Flight Test.

The investigation described in this report was carried out under the auspices of the National Research Council Committee on Aviation Psychology by the American Institute for Research. The work was supervised by Mr. John A. Nagay under the general direction of Dr. John C. Flanagan. Acknowledgments to individuals and agencies who cooperated in the investigation are given on page vii of this report. It should be emphasized again, however, that this research was made possible only through the cooperation given by the Civil Aeronautics Administration, the Air Transport Association, and the Air Line Pilots Association.

December 19, 1949

Morris S. Viteles, Chairman
Committee on Aviation Psychology

ACKNOWLEDGMENTS

Acknowledgment is due many individuals who participated in this project in various capacities. The entire project was conducted under the direction of Dr. John C. Flanagan, Director of Research of the American Institute for Research, who in addition to the guidance he gave throughout, participated actively in the project in the period during which the initial airline contacts were made. Valuable advice and support were offered by the Committee on Aviation Psychology, National Research Council, especially by its Chairman, Dr. Morris S. Viteles. Many of the staff members of the American Institute for Research contributed to the completion of the project. Acknowledgment is due Dr. Elmer D. West and Miss Geraldine Spaulding for professional and editorial assistance; to those consultants who contacted airlines or monitored flights; to Mrs. Sally B. Webster who has worked on the flight-check project throughout both its developmental and tryout phases; to Miss Roni Turocy for loyal stenographic assistance; and especially to Mr. Robert Fitzpatrick whose assistance with the design, the analysis of results, and in monitoring flights was invaluable.

The project could not have been completed without the close cooperation of the Civil Aeronautics Administration. Dr. Dean R. Brimhall's leadership and assistance have been of great value throughout the project. Grateful acknowledgment is also made of the contributions of Mr. F. B. Lee, Mr. W. W. Jarrell, Jr., Mr. W. B. Barnes, Mr. Fred Lanter, and the many field representatives and agents who assisted in arranging and flying check flights. Mention must also be made of the contribution of Mr. David L. Behncke, President of the Air Line Pilots Association, and the pilot members of his organization who made valuable suggestions and helped to facilitate the tryout. General Milton W. Arnold of the Air Transport Association of America has provided valuable guidance and support throughout the various phases of the development of this check.

Finally, to the most fundamental participants -- to the airlines' personnel, operations executives, chief pilots, check pilots, and pilot "applicants" of the following airlines, grateful acknowledgment is due:

American Airlines
Chicago & Southern Air Lines
Eastern Airlines
Mid-Continent Airlines
Northeast Airlines
Trans World Airline
Colonial Airlines
Delta Air Lines
Northwest Airlines

John A. Nagay
Project Director
American Institute for Research

December 17, 1949

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SUMMARY

The objectives of the study were to determine the ride-ride reliability of the Objective Flight-Check when used with airline pilots and for purposes of comparison, the reliability of the Civil Aeronautics Administration Flight Test Report, Form ACA-342A.

A third revision of the Objective Flight-Check was prepared, the revisions being based on two intensive reviews by qualified pilot groups and on the basis of the findings of previous tryouts. The experimental design involved the flying of 2 successive flights by each pilot subject or "applicant." On each flight applicants were observed by 3 check pilots; on the first, 2 used the Objective Flight-Check, and 1 the CAA Flight Test Report, while on the second, 3 different observers flew with the applicant, 2 using the CAA form and 1 the objective check. In some cases only 2 check pilots observed on each flight.

Nine airlines participated in the tryout, providing 17 captains and 15 first officers who flew a total of 63 flights. All flights except 4 were monitored by qualified research personnel. Thirty-three airline check pilots and 30 CAA agents did the actual flight-checking. Four types of transport aircraft were used: DC-3's, DC-6's, Convairs, and a Constellation. Ride-ride reliability coefficients for the Objective Flight-Check were found to be .89 (N = 40) for total "Qualified-Not Qualified" scores and .71 (N = 40) for total numerical scores. For the CAA Flight Test Report, ride-ride reliability coefficients of .35 (N = 43), .49 (N = 43), and .50 (N = 29) were found for "Qualified-Not Qualified," Mean Maneuver, and Percentage total scores, respectively.

The flight-check has been demonstrated to be a practical, acceptable, and reliable instrument measuring those skills most relevant to the success or failure of the airline pilot on the job. Several advantages would accrue with the adoption of this form by the Civil Aeronautics Administration as the flight-check for the Airline Transport Rating. It was therefore recommended that the new Objective Flight-Check, as revised on the basis of the findings of this experiment, be adopted for use in examining applicants for the Airline Transport Rating as revised on the basis of the comments and findings of this tryout.

THE AIRLINE TRYOUT OF THE STANDARD FLIGHT-CHECK FOR THE AIRLINE TRANSPORT RATING

I INTRODUCTION AND OBJECTIVES

Summary of the Development of the Flight-Check. The "standard flight-check" to which the title refers is the product of more than two years of research. It was developed by the American Institute for Research under the auspices of the Committee on Aviation Psychology of the National Research Council and with funds from the Civil Aeronautics Administration. The entire project has been conducted under the general direction of Dr. John C. Flanagan and the developmental phases under the immediate supervision of Dr. Thomas Gordon.[1]

The principal objective of the project was to develop an instrument which would provide improved consistency, that is, better agreement, among different check pilots in evaluating flying proficiency. In addition to increasing the reliability, i.e., the consistency, of check pilots in evaluating the same pilots, the flight-check was designed to measure those skills relevant to the success or failure of airline pilots on the job. To accomplish this objective, the critical requirements of the airline pilot's job were determined. Statements of what pilots did that resulted in accidents or near accidents were extracted from accident reports and from interviews with experienced pilots and check pilots. These data were then analyzed, and from the analysis there emerged a list of the critical components of the pilot's job -- critical in the sense that serious errors occur most frequently in these areas. These are shown in Table 1.[2]

It was around these critical components of the job that the flight-check was constructed. An attempt was made to keep the items as objective as possible although in some instances items of a more subjective type were included when necessary for relevance and practicality. Graphic and pictorial items were provided and every effort was made to minimize the difficulty of recording since it was intended that the form be filled out by the check pilot in flight. It was felt that the possibilities for check pilot agreement would be considerably enhanced by providing a check which would reduce the necessity of a check pilot's having to rely on his memory of what occurred during the flight.

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[1]For a discussion of the original development and first tryouts of the standard flight-check, see: Gordon, T. The Development of a Standard Flight-Check for the Airline Transport Rating Based on the Critical Requirements of the Airline Pilot's Job. Washington: CAA Division of Research, Report No. 85, April 1949.

[2]Gordon, T. Ibid. p. 48.

TABLE 1

CRITICAL COMPONENTS OF THE JOB OF AIRLINE PILOT AS DETERMINED FROM INEFFECTIVE ACTS EXTRACTED FROM ACCIDENT REPORTS, PILOT INCIDENTS AND FLIGHT-CHECK INCIDENTS

Critical Job Components	Frequency of Ineffective Acts in: Accidents	Pilot Incidents	Flight-Check Incidents	TOTAL
1. Establishing and maintaining angle of glide, rate of descent, and gliding speed on approach to landing	47	41	11	99
2. Operating controls and switches	15	44	33	92
3. Navigating and orienting	4	39	19	62
4. Maintaining safe airspeed and attitude, recovering from stalls and spins	11	28	18	57
5. Following instrument flight procedures and observing instrument flight regulations	5	27	13	45
6. Carrying out cockpit procedures and routines	7	31	4	42
7. Establishing and maintaining alignment with runway on approach or takeoff climb	3	31	5	39
8. Attending, remaining alert, maintaining lookout	14	23	1	38
9. Utilizing and applying essential pilot information	0	19	18	37
10. Reading, checking and observing instruments, dials and guages	1	26	7	34
11. Preparing and planning of flight	2	27	3	32
12. Judging type of landing or recovering from missed or poor landing	1	23	8	32
13. Breaking angle of glide on landing	1	25	5	31
14. Obtaining and utilizing instructions and information from control personnel	3	21	0	24
15. Reacting in an organized manner to unusual or emergency situations	0	17	7	24
16. Operating plane safely on ground	7	15	1	23
17. Flying with precision and accuracy	0	7	15	22
18. Operating and attending to radio	0	7	10	17
19. Handling of controls smoothly and with coordination	0	6	8	14
20. Preventing plane from undue stress	0	5	7	12
21. Taking safety precautions	2	5	4	11
TOTAL	123	467	197	787

To test the reliability of the flight-check and to determine the degree to which it was acceptable and practical to those whose job it would be to use it, two tryouts were conducted. The first involved the administration of the check to Air Force pilots at Barksdale Field. Twenty-seven pilots flew the check flight twice and were observed on each flight by two check pilots. The pair of check pilots who flew the second flight were not the same individuals who flew the first. The combined ride-ride reliability coefficient for the total flight-check was .58 and the combined observer-observer reliability coefficient was .85 using the z -- transformation technique. The total scores on the flight-check and the experience level of pilots showed a positive correlation of .49, indicating a significant degree of agreement.

The check was revised on the basis of the findings of the first tryout and repeated with the same design on Civil Aeronautics Administration examiners and instructors at Oklahoma City. Here the combined observer-observer reliability coefficient for the total flight-check was .86 and the ride-ride reliability coefficient was .76. These were considerably higher than those reported in previous studies of earlier types of flight-check procedures.

An analysis was made of comments regarding the new flight-check reported by the Civil Aeronautics Administration personnel participating in the tryout. Some of the participants felt that the flight-check limited the exercise of the check pilot's judgment; that the check made pilot evaluation too mechanical; that too much of the check pilot's attention was occupied with filling in the form at the expense of the time that should be spent watching for other aircraft; or that the examinee could anticipate and be prepared for "emergency" maneuvers. On the other hand, it was felt that the flight-check provided a record of what the pilot did on the flight and that check pilots did not have to rely on their memories; the measurement of the examinee's ability to prepare for the flight was a new and desirable feature as were the graphic and pictorial items; the check provided a standardized test for uniform administration to all examinees; it permitted quick grading; it directed the examiner's attention to the examinee's performance on critical aspects of the job; decreased the effect of check pilot bias; and enabled the applicant to know what was expected of him.

Dr. Gordon[3] reports his "most significant conclusions" as follows:

1. The flight-check developed in this study is a reliable procedure for recording the performance of pilots having the training and experience similar to typical applicants for the Airline Transport Rating certificate.

2. Using a scoring procedure substantially similar to the one used in this study for arriving at an over-all meas-

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[3]Gordon, T. Ibid. p. 18.

ure of pilot proficiency, different check pilots independently observing the performance of a group of pilots of similar experience to those used in this study will assign scores which are in substantial agreement.

3. The flight-check developed in this study appears relevant to the requirements of the job of airline pilot on the basis of two types of evidence. First, it was devised to measure those requirements found critical for successful functioning as an airline pilot. Secondly, the scores on the flight-check and the experience level of pilots shows a positive correlation significantly greater than zero.

4. Although Civil Aeronautics Administration check pilots see both certain advantages and disadvantages of this flight-check, the majority are either in favor of adopting it as the Airline Transport Rating flight-examination or in favor of continuing its tryout after some revisions.

The Present Project. Since the flight-check was originally designed to determine the eligibility of applicants for the Airline Transport Rating, the logical next step in the research appeared to be to conduct a tryout on regularly-scheduled airline pilots. Consequently, in January 1949, the National Research Council Committee on Aviation Psychology authorized the American Institute for Research to conduct such a project again with funds supplied by the Civil Aeronautics Administration. It is the purpose of this report to describe the completed research.

Objectives of the Present Study. The principal objective of the present study was to determine the reliability of the procedure when used by regularly-scheduled airline pilots. The primary problem was to study the ride-ride, or test-retest reliability -- the consistency with which the flight-check measured pilots' performance from one flight to the next.

Since the flight-check was designed for ultimate use by the Civil Aeronautics Administration as the flight-check for the Airline Transport Rating, representatives of the Office of Aviation Safety suggested that studies of the reliability of the flight-check presently used (ACA-342A Pilot Flight Test Report) be conducted concurrently with those on the new objective check. This too, then, became an objective of the study -- to determine, for comparison with the objective flight-check, the reliability of the Civil Aeronautics Administration Flight Test Report.

II CONDUCT OF THE STUDY

Preliminary Steps

Revisions of the Form. The present form of the flight-check (Appendix A) represents its third revision [4] Before being used in the present study, the form was given an intensive review by two agencies, both deeply interested in the problem of pilot evaluation and well-qualified to make recommendations or offer suggestions.

The first of these reviews of the check was accomplished in early February by the members of the Special Pilots Advisory Committee[5] of the Air Line Pilots Association and Mr. David L. Behncke, President of the Association, in conference with representatives of the American Institute for Research. Each item of the check was carefully scrutinized. The changes recommended usually involved slight increases in the allowable limits of airspeed and altitude on maneuvers where tolerances for these factors were set up.

It was also at this meeting that the scoring system acceptable to this group was devised. In previous tryouts, the flight-check had been scored numerically, with critical items receiving higher weights than those less critical. It was decided that for future scoring, three types of "boxes" be provided: (1) heavy-lined boxes denoting critical items, which when marked by check pilots disqualify examinees on the maneuver; (2) lighter-lined boxes denoting less critical items, one or sometimes more of which may be marked without disqualifying the applicant; and (3) dotted-line boxes which indicate either satisfactory performance or which are retained for their informational or diagnostic value and do not affect the applicant's final rating. A "Qualified-Not Qualified" score is obtained for each maneuver; to be eligible for the Airline Transport Rating, the applicant must have been "Qualified" on all. Similarly, the final over-all rating is not numerical, the applicant simply being either "Qualified" or "Not Qualified." In cases, however, where an applicant has failed to qualify on a maneuver and the check pilot judges that special conditions such as weather, traffic, or condition of equipment were chiefly responsible for the applicant's poor showing, he may waive the performance on that maneuver and the applicant will still qualify. In such cases the check

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[4] For an earlier form of the flight-check, see: Gordon, T., Ibid. p. 154 ff.

[5] Mr. W. Anderson, Mr. W. Feucht, Capt. R. Stone, Capt. L. Treece, Capt. C. Tschirgi, and Mr. V. Williams.

pilot writes the explanation for his decision in the space provided for "Comments" on the page of the flight-check on which the maneuver appears. A complete description of the scoring method, titled, "A Check Pilot's Guide for Evaluating Performance on the Objective Flight-Check," may be found in Appendix B.

Shortly after the meeting with the pilots of the Air Line Pilots Association, the flight-check was again subjected to an item-by-item review, this time by representatives of the Civil Aeronautics Administration.[6] At this conference, several additional changes were suggested involving, briefly:

(1) Changes in the presentation of instructions
(2) Some rearrangement of maneuvers
(3) A few changes in the weight of items
(4) The addition of a new maneuver for emergency procedures
(5) A recommendation that the examiner be relieved of copilot duties by adding a safety pilot in planes of the DC-3 class or larger
(6) A recommendation that the page size of the booklet be reduced for easier handling in the air.

Letters of Endorsement. With the flight-check now in a form acceptable for tryout, letters endorsing the use of the check in a tryout on airline pilots were secured from the Airline Pilots Association, the Air Transport Association of America, and the Civil Aeronautics Administration. It was believed (and this belief was later justified) that the progress of the research would be considerably enhanced if such letters preceded requests to the airlines for participation in the tryout. Copies of these letters are attached as Appendix C.

Data Collection

Experimental Design. Twenty of the country's major scheduled air carriers were approached with requests for their participation in the tryout. Covering letters, inclosing the three letters of endorsement were sent to the operations executives of the twenty airlines arranging appointments for staff members or consultants of the American Institute for Research, who then visited the airlines and outlined the plans for the tryout personally.

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[6] Mr. S. B. Chandler, Mr. L. J. Forsey, Mr. J. Quilmartin, Mr. H. P. Hill, Mr. W. W. Jarrell, Jr.

The following excerpts from a form prepared for whomever the airline designated to administer the tryout flights (usually the chief pilot) describes the experimental design:*

> To test the reliability of the Flight-Check, each of a number of pilots will take two check rides, preferably on successive days. On the first flight for each pilot, two check pilots will observe his performance and fill out the Objective Flight-Check Form. Thus, on analysis, we can determine how well the Form attains its aim of helping to increase check pilot agreement.
>
> On his second flight the same pilot will again be observed by a third check pilot who will use the Objective Flight-Check. We can then compare his ratings with the ratings of the other check pilots on the previous day. Analysis will show whether the new form enables check pilots to be more consistent in their judgments of proficiency from flight to flight.
>
> As a basis of comparison, essentially the same procedures are to be followed with the regular CAA Airline Transport Rating flight-check. On the first flight a CAA inspector or designee will act as a third check pilot. Similarly, two CAA agents or designees will observe the pilot's flying skill on the second flight. Measures of reliability will then be available for the CAA flight-check. We can compare these figures for the two flight-checks and evaluate their relative merits.
>
> Here, then, is the situation. Two check pilots on the first flight use the Objective Flight-Check Form, while the third uses the CAA form. On the second flight one check pilot completes one Objective Flight-Check form and two the CAA form. No check pilot who participates in the first flight will also participate in the second flight for this same pilot.
>
> To provide a broad range of experience, half of all the pilots taking the experimental check rides will be captains and the other half will be first officers. Each pilot gets two check rides; but these pairs of check rides are to be divided equally among captains and first officers.
>
> Experimental Tryout Procedures. The results of this tryout study will be used by the CAA, and possibly by your airline, to determine what course should be followed in future checks of flying proficiency. The study is of considerable importance in determining not only the future of the Objective Flight-Check but also the general procedures to be used in any flight-check.
>
> It is essential that all steps in the tryout be taken with care and accuracy. The tryout will be useful only insofar as standard

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*Editor's note. The material in the report from this point to the end of page 10 is taken directly from the directions for the administration of the check-flight.

procedures are adhered to. All the participants must know what to do and be prepared in advance to do it.

Below are detailed instructions for the administration of this experimental tryout of the Objective Flight-Check. It is strongly recommended that the procedure be followed as closely as possible. Our experience in preliminary tryouts has shown that the results are best and the administration easiest if this done. Individual circumstances, of course, may necessitate minor changes in the procedure. Several points are indicated below where minor variations are feasible. If, however, you find it necessary to make any important changes in the procedure, please do not go ahead until you have consulted _____, (or you may telephone collect the American Institute for Research, Pittsburgh, Pa., Mayflower 1-3500, Extension 580.)[7]

Organizing Flights and Personnel. The pilots who are to take the check rides should not be "chosen" for the job, either because they are especially good or for any other reason. The pilots for the tryout should be those who are most conveniently available. If these tryout flights can be fitted into your regular training or maintenance procedures, so much the better. Try not to use any pilots who are "special cases," such as someone taking his first flight in an aircraft type. Otherwise, the only instruction in the choice of pilots should be that half are captains and half are first officers.

Check pilots should have as little previous knowledge of the pilot's ability as possible. In no case should a check pilot have recently administered a flight-check to the particular pilot, since he might then rate the pilot partly on the basis of previous impressions.

The aircraft used for the check must obviously be determined on the basis of availability. The only stipulation is that the same aircraft type should be used for the two rides. If feasible, it would also be desirable to use the same aircraft.

The seating of the three check pilots in each flight should be standard, as follows:

First Flight

Right-hand seat -- Senior of the two check pilots using the Objective Flight-Check Form
First Jump seat -- Junior of the two check pilots using the Objective Flight-Check Form
#3 position -- Check pilot using CAA flight-check form.

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[7]Later in the course of the study, at the suggestion of Dr. Morris S. Viteles, Chairman of the Committee on Aviation Psychology, qualified "technical experts" were provided to assist with the scheduling of the flights and to monitor all procedures in order to insure that the data be acceptable.

Second Flight

Right-hand seat -- Senior of the two check pilots using CAA Flight-Check Form
First Jump seat -- Junior of the two check pilots using CAA Flight-Check Form
#3 position -- Check pilot using Objective Flight-Check Form.

All the people participating in the tryout should be informed a day or two in advance. Each man should be given the materials provided for his job in the check ride. Specifically these materials are as follows:

A. For check pilots who are to use the Objective Flight-Check Form,

1. Booklets (one for each ride) -- "A Standardized Form for the Airline Transport Rating Flight-Check."

2. "Check Pilot's Guide for Evaluating Performance on the Objective Flight-Check."

3. Form B -- "Notes to Check Pilots for the Experimental Tryout of the Objective Flight-Check Form."[8]

B. For check pilots who are to use the CAA flight-check,

1. CAA forms ACA-342A (One for each ride) -- "Pilot Flight Test Report."

2. Form C -- "Notes to CAA examiners or Designees for the Experimental Tryout of the Objective Flight-Check Form."[8]

C. For pilots,

1. Form D -- "Notes to pilots for the Experimental Tryout of the Objective Flight-Check Form."[8]

Make sure that all participants understand the purpose of the tryout and the procedures to be used.

It is especially important that the check-pilots who are to use the Objective Flight-Check Form become familiar with its contents. The form is designed to make the check-pilot's job easier. After one check-ride with the form, a check-pilot will know all the procedures to be followed. But remember that this will be his first experience with the form, which is considerably different from most forms he is likely to have used. Therefore, it is essential that the check pilot at least read through the booklet.

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[8]These were mimeographed sheets explaining in brief the purpose and plan of the tryout; assuring the pilots who acted as subjects of anonymity; and repeating the need for cooperation if the evaluation of the check was to be accurate and fair. Copies of these materials are presented in Appendix D.

Pre-Flight Procedure. Immediately before the flight, you should check to see that each participant knows what he is to do. Each participant should understand that the tryout is experimental in nature and that the validity of the results depends on his co-operation. However, both pilot and check pilots should be made to feel that the procedure is in no way extraordinary. They should consider the ride just as they would their regular check rides. It should be emphasized that the results of the tryout will not form a part of the company's records.

The whole group should discuss the check ride before flight. As an integral part of both check flights, the examinee should be told what maneuver he is to perform and how he is to be graded on his performance.

Finally, the check pilots using the Objective Flight-Check Form should be urged to follow closely the recommended procedures for completing the form. It is particularly important that all but the final evaluation be completed in the air at the time of the maneuver. In addition, all check pilots should be cautioned not to discuss their ratings with one another or with the examinee.

Post-Flight Procedures. After the flight, the check pilots should first complete the scoring of the flight-checks, make their evaluations, and fill in the factual information requested on the forms. Check pilots using the Objective Flight-Check should not change any of the ratings made during the flight. The evaluation procedure allows for the exercise of the check pilot's judgment; he should indicate by comments when he feels a particular set of circumstances warrant a different interpretation of the results.

At the same time, the comment sheets should be distributed to the check pilots who used the Objective Flight-Check Form. When each check pilot has completed the Flight-Check Form and the comment sheet if applicable, all forms should be placed in the envelope provided. The envelope should be sealed at this time.

In the case of the first flight, the check pilots should not communicate with the pilot. (A later date might well be set for discussion of the pilot's errors.) Check pilots should also be urged not to discuss the results of the ride with other check pilots until the second ride has been completed. After the second flight, discussion of the ride is probably desirable, but not until all the flight-check forms have been turned in.

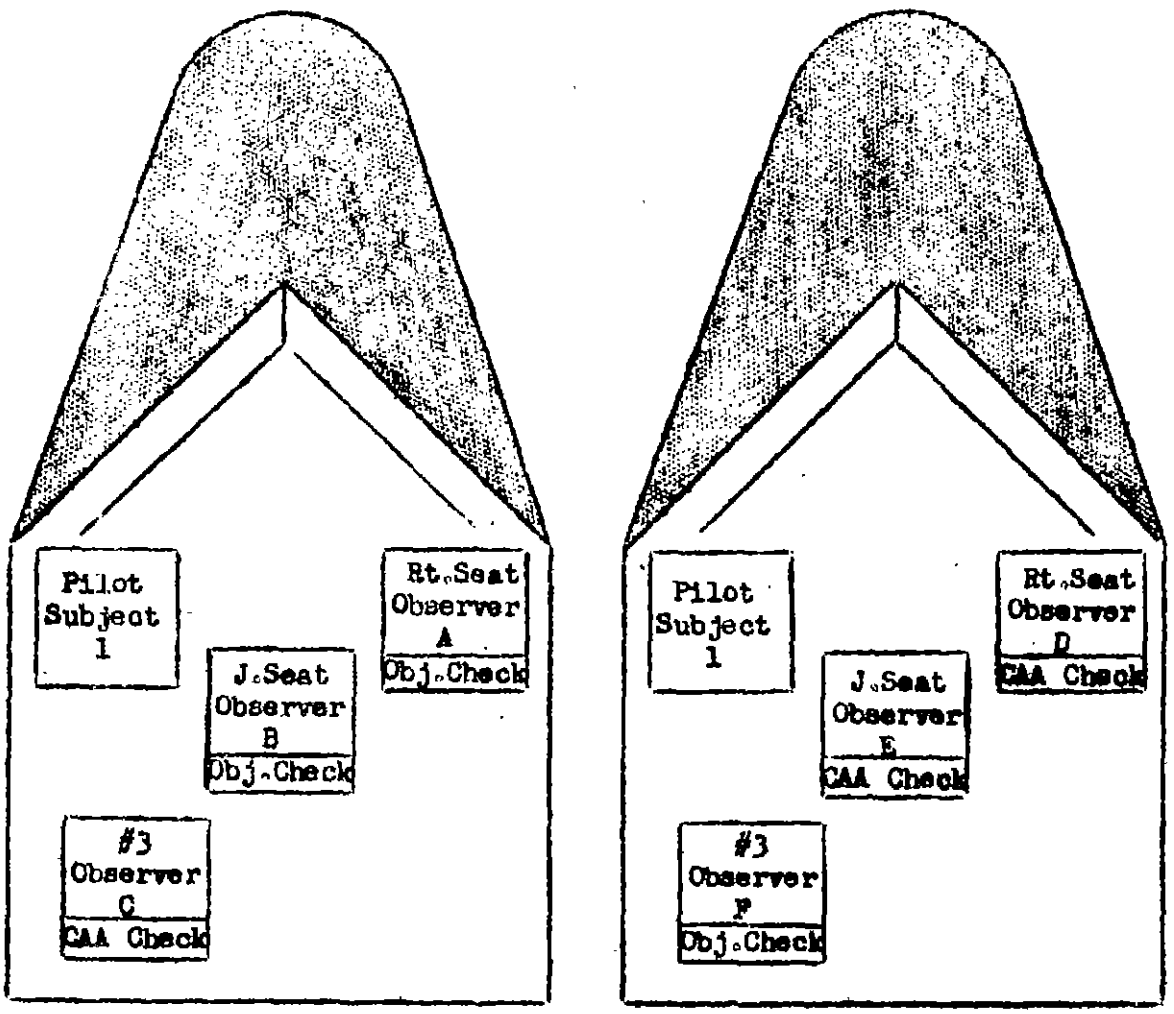
Figure 1 is a diagrammatic sketch of the design of the experimental flights.

Figure 1.

DESIGN OF FLIGHTS

The Arrangement of Observers for the First and Second Flight of a Typical Set of Experimental Flights

Note that no observers who flew on the first flight flew on the second. The table at the bottom of the diagram shows how cases were paired for the determination of ride-ride and observer-observer reliability.



FIRST FLIGHT

SECOND FLIGHT

Objective Flight-check Comparisons

Ride-Ride	Observer-Obs.
Obs. A - Obs. F	Obs. A - Obs. B
Obs. B - Obs. F	

CAA Flight-check Comparisons

Ride-Ride	Observer-Obs.
Obs. D - Obs. C	Obs. D - Obs. E
Obs. E - Obs. C	

Airline Response. The twenty airlines originally contacted in May were as follows:

1. All-American Airways
2. American Airlines
3. American Overseas Airlines
4. Braniff Airways
5. Capital Airlines
6. Chicago & Southern Air Lines
7. Colonial Airlines
8. Continental Air Lines
9. Delta Air Lines
10. Eastern Airlines
11. Inland Air Lines
12. National Airlines
13. Mid-Continent Airlines
14. Monarch Air Lines
15. Northeast Airlines
16. Northwest Airlines
17. Pan-American Airways
18. Transcontinental & Western Air
19. United Air Lines
20. Western Air Lines

In general the response of the airline companies to requests for their participation in the tryout was quite gratifying. However serious obstacles to the early completion of the project soon became apparent. The principal difficulty was financial in nature; many companies found it impossible to participate because of the expense involved in flying the second flight. Expenses on the first flight were minimal because arrangements had been made to combine the experimental flights with official ATR checks or regular semi-annual checks; i.e., a check pilot could complete the semi-annual check form on the basis of the observations he made on the experimental flight — but without reference to the experimental forms. However, no way could be found to combine the second flight with any regular operations to reduce direct outlay entirely for experimental purposes. Equipment and personnel shortages aggravated by summer peak load conditions also added to the delay. It was at this point in the research that several new procedures were instituted.

As a result of the efforts of Dr. Dean R. Brimhall, Coordinator of Research, Civil Aeronautics Administration and Dr. Morris S. Viteles, Chairman of the Committee on Aviation Psychology, National Research Council, additional funds were secured to make it possible to use the technical experts mentioned earlier in the report and to provide a DC-3 to assist in some of the flights for the tryout from the Civil Aeronautics Administration Aeronautical Center at Oklahoma City. A letter signed by the Deputy Administrator of the Civil Aeronautics Administration, urging the airlines' cooperation and notifying them of the assignment of a "technical assistant" was sent at this time.

It was also at this point that the decision was made to concentrate upon those cases which would provide data for the determination of the flight-check's ride-ride reliability. In those situations where conditions would not permit the use of three observers per flight as specified in the original design, the design was altered to provide for only two observers per flight. No measurements of the agreement between check pilots observing the same pilot on the same flight (observer-observer reliability) were, of course, possible under this arrangement since each observer used a different flight-check. However, the data providing the basis for the calculation of ride-ride reliability, or consistency of measurement between flights, were still intact.[9]

Five airlines contributed a number of flights. These were:

1. American Airlines
2. Chicago & Southern Air Lines
3. Eastern Airlines
4. Mid-Continent Airlines
5. Trans World Airlines

Four others contributed data on a smaller scale:

1. Colonial Airlines
2. Delta Air Lines
3. Northeast Airlines
4. Northwest Airlines

Table 2 below, shows details concerning the cases obtained. Parentheses around the symbol designation observers indicate that the observer's flight-check was omitted from the data analysis for one of the reasons indicated in the footnotes. Company check pilots are designated by the initial of the airline name followed by a number. All Civil Aeronautics Administration agents are prefixed by the letter "C" followed by a number.

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[9]The observer-observer cases that were obtained will be added to the data of a new project recently authorized by the National Research Council Committee on Aviation Psychology (with funds from the Civil Aeronautics Administration) designed to follow-up the contacts made with airlines who indicated a willingness to cooperate on a one ride basis.

TABLE 2

OUTLINE OF FLIGHTS

Airline	Pilot Code	First Flight Observers			Second Flight Observers			Aoft Type	Monitor
		Obj. Check		CAA Check	Obj. Check		CAA Check		
		1st O	2nd O	1st O	3rd O	2nd O	3rd O		
Delta	A	D1	D2	C1	D3	C2	C3	3	J.Moore
American	A	(A1)*	A2	C4	A3	C5	C6	6	R.Fitz-
"	B	(A1)*	A2	C4	A3	C5	C6	Conv	patrick
"	C	(A1)*	A3	C5	A4	C4	C6	6	"
"	D	(A1)*	A3	C7	A4	C4	C6	Conv	R.F.(1f1) R.Y.(1f1)
"	E	A5	A6	-	-	-	-	Conv	-
TWA	A	T1	-	C8	T2	C9	-	3CAA	H.Speer
"	B	T1	-	C8	T2	C9	-	"	"
"	C	T2	-	C8	T1	C10	-	"	"
"	D	T2	-	C11	T1	C12	-	"	"
"	E	T2	-	C8	T3	T1	-	"	"
"	F	T2	-	C11	T1	C12	-	"	"
"	G	T2	-	C12	T1	C10	-	"	"
"	H	T2	-	C12	T1	C9	-	"	"
"	I	T1	-	C11	T2	C10	-	"	"
"	J	T1	-	C9	T2	C10	-	"	"
Eastern	A	E1	E2	C13	C14	E3	C15	L649	G.Fisher*
"	B	E3	E4	C14	E5	E6	C16	3	" (1f1)
"	C	E4	E3	C14	E5	E6	C16	3	"
"	D	E4	C15	C14	E3	E5	C17	3	"
"	E	E7	C14	C15	E8	E1	C18	3	"
"	F	E7	C14	C15	E8	E1	C18	3	"
C&S	A	S1	(S2)**	C19	S3	C20	C21	3CAA	R.Fitz-
"	B	S1	(S3)**	C20	S2	C19	C21	"	patrick
"	C	S2	(S4)**	C21	S3	C20	-	"	"
NWA	A	N1	-	C22	N2	C23	-	3	-
Mid-Cont.	A	M1	-	C24	M2	C25	-	3CAA	H.Speer
"	B	M1	-	C24	M3	C26	-	"	"
"	C	M4	-	(C24)♭	M5	(C24)	-	"	"
"	D	M3	-	C26	M4	C27	-	"	"
NEA	A	NE1	NE2	C28	NE3	C29	C30	Conv	R.F.
"	B	NE2	NE3	C28	NE1	C29	C30	"	R.F.(1f1) L.Ward (1f1)

*Omitted from data analysis - Obj. Flight-check booklet not completed in air.
**Omitted from data analysis - Observers in #3 position could not see.
♭Omitted from data analysis - Same check pilot on both rides.

III Results

The Sample. Thirty-two airline pilots, 17 captains and 15 first officers, acted as subjects, or "applicants", for the tryout, flying a total of 63 flights. Thirty-three airline check pilots and 30 CAA agents rated their performance on the 2 flight-checks being tested: the Objective Flight-Check and the CAA Flight Test Report. In addition, monitors were on hand for all except 1 of the flights, checking to see that the procedures were followed as specified and assisting in the scheduling of the flights. As Table 2 shows, 9 flight-check forms were omitted from the data analysis: 4 because the objective flight check was not completed in the air; 3 because the observers complained that they could not see the instruments well enough to complete their forms accurately; and 2 because the same observer rode along on both flights. The omission of these cases from the data analysis as well as occasional instances of incomplete recording on the part of a few check pilots caused fluctuations in the number of cases on which the correlations were based. Thus, when later in the report, N's of 36, 43, etc., are reported, these are the number of satisfactory cases available for that statistical analysis.

Scoring. Two scoring methods were applied to the Objective Flight-Check and 3 to the CAA form. For the objective check these were:

1. Pass-Fail or "Qualified-Not Qualified" scores for each maneuver and for the over-all flight check.

2. A numerical score for research purposes. This was obtained by assigning a numerical score of 3 to heavy-lined boxes, 1 to lighter lined, and 0 to dotted line boxes. The sum of the scores for the elements included provides a numerical score for each maneuver and a total score for the flight-check.[10]

For the CAA form:

1. The over-all percent score as specified on Form 342A.

2. Individual maneuver scores ranging from 1 through 5, 5 being indicative of the poorest performance.

3. An over-all mean of the five point maneuver scores. (This was calculated to supplement the analysis of the over-all results in terms of the percent scoreswhich are arrived at by agents more or less independently of the maneuver scores.)

Reliabilities. Of the 29 pilots who passed the objective flight-check on the first flight, 27 passed on the second and 2 failed on the second. Of the 11 pilots who failed on the first flight, 8 failed on the second and 3

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[10] In items where limits of altitude or airspeed were specified and the boxes for going above or below these limits were both light-lined, the pilot was scored two if the check pilot checked both the above and below limit boxes.

passed on the second. For the CAA check, of the 26 who passed on the first flight, 18 passed on the second and 8 failed on the second. Of the 17 pilots who failed the CAA check on the first flight, 9 failed on the second and 8 passed on the second. This is shown in Table 3.

TABLE 3

AGREEMENT OF PAIRS OF EVALUATIONS OF THE SAME PILOT FROM RIDE TO RIDE

Objective Flight Check — First Ride

Second Ride	Pass	Fail
Pass	27	3
Fail	2	8

CAA Flight Test Report — First Ride

Second Ride	Pass	Fail
Pass	18	8
Fail	8	9

The ride-ride reliability coefficients for the "Qualified-Not Qualified" total scores for both flight-checks are as follows:

Objective Flight Check, $r_t = .89$, N=40

CAA Flight Test Report, $r_t = .35$, N=43

The coefficient for the objective check in these terms is higher than any other check on which data are available. In terms of percent, this means that for the objective check, 88% of the check pilots (on different flights with the same pilot) agreed in their ratings of the pilot's performance, while check pilots using the CAA form agreed to the extent of 63%. By chance one could expect 52 percent agreement for the proportion of pass-fails which occurred on the CAA Flight Test Report. The corresponding figure for the Objective Flight-Check is 61 percent. The agreement in terms of percent is shown for both flight-checks in Figure 2.

It should be emphasized that the sampling unit in these comparisons is "evaluations," rather than "pilots" in the strict sense. For example, with reference to Table 10 in Appendix F, the evaluations of Subject 1, on Ride 1, by check pilots 1 and 2 were compared separately with the evaluation of check pilot 3 on Ride 2. Thus some observations were used twice in determining the correlations. The stability of the sample is to some extent a function of the number of different pilots observed on successive rides, namely 31. However, the use of the additional observations in no way appears to bias the value of the correlation coefficients.

Figure 2

AGREEMENT OF PAIRS OF EVALUATIONS FOR SUCCESSIVE DAYS

OBJECTIVE FLIGHT-CHECK

CAA FLIGHT TEST REPORT

Other total score reliabilities were found to be:

1. CAA Flight Test Report Percentage Scores, product moment r = .50, N = 29

2. CAA Flight Test Report Mean Maneuver Scores product moment r = .49, N = 43

3. Objective Flight-Check Numerical Total Score, product moment r = .68, N = 40

Here again, although not as high as in the case of the "Qualified-Not Qualified" scores, the reliability of the Objective Flight-Check is clearly better than form 342A. These results indicate a very marked superiority for the more objective procedures.

There are several reasons which may account in part for the lower coefficients for the CAA form. Since percentage scores are arrived at independently of the maneuver scores, agents cannot be expected to demonstrate high degrees of agreement. On the Mean Maneuver Scores, it seems quite possible that "halo effect" may have been operative. Halo effect is the tendency for raters to rate an individual either high or low in a number of traits because the rater believes him to be either high or low in one particular trait.[11] CAA agents also flew the maneuvers listed in the

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[11] Thorndike, E. L. "A Constant Error in Psychological Ratings." Journal of Applied Psychology, IV, 1920, p. 25-29.

objective check and had to adjust the form they ordinarily use to a different order of maneuvers. The lower reliability of the CAA flight check cannot reasonably be attributed to this fact alone. Other factors undoubtedly contribute to the lower reliability of estimates of flying proficiency obtained through the use of the CAA flight-check.

Table 4 shows how captains and first officers compared in regard to their scores on the flight-checks. As might reasonably be expected in view of their greater experience, captains qualified more frequently than did first officers.

TABLE 4

RELATIVE FREQUENCY OF QUALIFYING AND FAILING SCORES ASSIGNED TO AIRLINE CAPTAINS AND FIRST OFFICERS BY CHECK PILOTS ON THE OBJECTIVE AND CAA FLIGHT-CHECKS

	Captains		First Officers	
	No. Times Qualified	No. Times NOT Qualified	No. Times Qualified	No. Times NOT Qualified
Objective Flight-Check	37	2	17	17
CAA Flight Test Report	28	12	15	18

Tables 5 and 6 show how the pairs of numerical scores for successive rides were distributed for each maneuver of both flight-checks. For example, in Table 5 on Maneuver 7, "Instrument Takeoff," of the 37 observations recorded for successive rides, 19 received "0" scores on both and 2 received scores of 1 or 2 on both. For the other 16 pilots there was some disagreement, though in only 2 cases was the magnitude of the disagreement greater than 2 points. In Table 6, where the agreement on the CAA check is shown, consider Maneuver 3, "Pre-Flight Check." Agreement from ride to ride was complete in 9 cases: 1 pilot received "2's" on both rides and 8 pilots received "3's". For the remaining 15 pilots who were graded on this maneuver there were varying degrees of disagreement. Correlation coefficients indicating the ride-ride reliabilities of the separate maneuvers of both checks are shown in the tables in Appendix E.

Agreement of the Two Flight-Checks. It is of interest to consider whether check pilots using the Objective Flight-Check and check pilots using CAA Form 342A agreed in their ratings of pilots. Data regarding the two checks appear in Table 3 and in Appendix F, Tables 9 and 10. It is apparent, particularly from Part A of Table 11, that agreement between the two checks is fairly good.

It may be seen that pilots - when both captains and first officers are included - were rated as qualified for the Airline Transport Rating more often

DISTRIBUTIONS OF NUMERICAL SCORES
FOR MANEUVERS OF THE OBJECTIVE FLIGHT-CHECK

1 Preparation for Flight

Ride 2 \ Ride 1	0	1&2	3&up
0	31	-	1
1&2	-	-	-
3&up	-	-	-

2. Equipment Familiarization Check

Ride 2 \ Ride 1	0	1&2	3&up
0	26	-	1
1&2	-	-	-
3&up	-	-	-

3. Cockpit Familiarization Check

Ride 2 \ Ride 1	0	1&2	3&up
0	34	-	-
1&2	-	-	-
3&up	-	-	-

4. Starting Procedure

Ride 2 \ Ride 1	0	1&2	3&up
0	38	-	2
1&2	-	-	-
3&up	-	-	-

5 Taxiing

Ride 2 \ Ride 1	0	1&2	3&up
0	33	-	1
1&2	-	-	-
3&up	-	-	-

6 Before Takeoff Procedures

Ride 2 \ Ride 1	0	1&2	3&up
0	34	1	-
1&2	2	-	-
3&up	-	-	1

7. Instrument Takeoff

Ride 2 \ Ride 1	0	1&2	3&up
0	39	9	2
1&2	5	2	-
3&up	-	-	-

8. Intercepting a Predetermined track, etc.

Ride 2 \ Ride 1	0	1&2	3&up
0	34	2	1
1&2	-	-	-
3&up	-	-	-

9. Minimum Speed Maneuvering, Approach Stall

Ride 2 \ Ride 1	0	1&2	3&up
0	28	3	1
1&2	7	1	-
3&up	-	-	-

10. Steep Turns

Ride 2	Ride 1: 0	1&2	3&up
0	27	4	-
1&2	5	3	1
3&up	-	-	-

11. Rapid Descent and Pull-Up

Ride 2	Ride 1: 0	1&2	3&up
0	28	3	5
1&2	2	-	-
3&up	2	-	-

12. Manual Loop Orientation & Tracking

Ride 2	Ride 1: 0	1&2	3&up
0	20	6	2
1&2	3	0	2
3&up	1	1	2

13. Approved Approach Procedure

Ride 2	Ride 1: 0	1&2	3&up
0	25	1	-
1&2	4	4	-
3&up	-	-	-

14. Approach Under Simulated 400 & 1 Cond.

Ride 2	Ride 1: 0	1&2	3&up
0	19	2	1
1&2	3	1	1
3&up	1	-	-

15. ILS Approach

Ride 2	Ride 1: 0	1&2	3&up
0	22	-	4
1&2	2	-	-
3&up	3	1	2

16. Cross-Wind Landing

Ride 2	Ride 1: 0	1&2	3&up
0	23	2	-
1&2	7	-	-
3&up	-	-	-

17. Cross-Wind TO & Eng. Fail after TO

Ride 2	Ride 1: 0	1&2	3&up
0	25	-	5
1&2	-	-	-
3&up	-	-	-

18. Engine-Out Landing

Ride 2	Ride 1: 0	1&2	3&up
0	21	3	1
1&2	2	4	-
3&up	-	1	-

19. Emergency Procedures

Ride 2	Ride 1: 0	1&2	3&up
0	26	3	2
1&2	4	-	1
3&up	1	1	-

TABLE 6

DISTRIBUTIONS OF NUMERICAL SCORES FOR MANEUVERS OF THE CAA FLIGHT TEST REPORT

2. Equipment Exam

Ride 1 \ Ride 2	1	2	3	4	5
1	-	-	-	-	-
2	2	-	2	-	-
3	1	-	2	-	-
4	-	-	-	-	-
5	-	-	-	-	-

3. Pre-flight Check

Ride 1 \ Ride 2	1	2	3	4	5
1	-	-	-	-	-
2	2	1	4	1	-
3	3	3	8	1	-
4	-	-	-	-	-
5	-	-	-	1	-

4. Taxiing

Ride 1 \ Ride 2	1	2	3	4	5
1	1	-	-	-	-
2	1	3	6	-	-
3	1	8	13	2	-
4	-	-	1	1	-
5	-	-	-	-	-

5. Run-up

Ride 1 \ Ride 2	1	2	3	4
1	-	-	-	-
2	2	1	3	-
3	2	10	19	2
4	-	-	-	1
5	-	-	-	1

6. Takeoff

Ride 1 \ Ride 2	1	2	3	4	5
1	-	1	-	-	-
2	3	6	5	-	-
3	-	7	10	3	-
4	2	1	1	1	-
5	-	-	-	1	-

9. Steep Turns

Ride 1 \ Ride 2	1	2	3	4	5
1	1	-	1	1	1
2	1	-	2	1	-
3	-	4	6	5	-
4	-	3	1	7	1
5	1	-	2	-	3

11. Maneuvering (min. speed)

Ride 1 \ Ride 2	1	2	3	4	5
1	-	1	2	-	-
2	3	4	2	1	-
3	-	13	4	7	-
4	-	1	-	1	-
5	-	1	1	-	1

12. Stalls

Ride 1 \ Ride 2	1	2	3	4
1	1	1	1	-
2	1	7	3	-
3	3	5	9	1
4	-	1	3	2
5	-	-	2	-

16. Propeller Feathering

Ride 1 \ Ride 2	1	2	3	4	5
1	-	-	-	-	-
2	2	-	1	3	-
3	1	2	5	9	-
4	-	1	2	-	1
5	1	-	2	1	-

17. Maneuvering (engine out)

Ride 1 \ Ride 2	1	2	3	4	5
1	-	2	-	-	-
2	1	2	2	2	-
3	-	3	7	1	2
4	1	1	1	2	1
5		1	-	-	

18. Exceeding Normal Limits

Ride 1 \ Ride 2	1	2	3	4	5
1	-	-	-	-	-
2	1	1	-	2	-
3	-	5	7	5	-
4	-	1	2	3	-
5		1		2	1

19. Recovery f Unusual Att

Ride 1 \ Ride 2	1	2	3	4
1	-	-	-	-
2		-	1	-
3		2	3	2
4				

(Table 6 Cont'd)

21. Pattern Flying

Ride 1	1	2	3	4	5
1	-	-	-	-	-
2	-	2	1	-	-
3	-	2	2	-	-
4	-	-	1	-	-
5	-	-	-	-	-

26. Orientation

Ride 1	1	2	3	4	5
1	-	-	-	-	-
2	1	-	1	-	-
3	1	1	3	2	-
4	-	-	1	-	-
5	1	-	1	-	-

29. Approach Procedures

Ride 1	1	2	3	4	5
1	-	1	-	-	-
2	-	5	7	1	-
3	1	4	9	3	1
4	-	-	1	1	-
5	-	-	2	-	1

30. Missed Approach Procedures

Ride 1	1	2	3	4	5
1	-	-	1	-	-
2	4	4	1	1	-
3	-	5	6	2	-
4	-	-	-	1	-
5	-	-	-	-	-

31. Loop Orientation

Ride 1	1	2	3	4	5
1	-	-	1	-	-
2	1	1	3	1	1
3	1	-	2	2	2
4	-	1	2	2	1
5	-	2	4	1	3

33. Accuracy Landings

Ride 1	1	2	3	4	5
1	-	-	-	-	-
2	2	-	-	-	-
3	-	1	4	-	2
4	-	-	1	-	-
5	-	-	-	1	-

34. Landings (No Flaps)

Ride 1	1	2	3	4	5
1	-	-	-	-	-
2	-	-	-	-	-
3	-	-	-	-	-
4	-	-	-	-	-
5	-	-	-	-	-

35. X-Wind Landings

Ride 1	1	2	3	4	5
1	-	1	-	-	-
2	1	1	2	1	-
3	2	8	6	2	1
4	-	2	-	1	-
5	-	-	1	-	1

37. TO & Landing (400 & 1)

Ride 1	1	2	3	4	5
1	-	-	-	-	-
2	-	3	4	2	1
3	1	5	7	1	-
4	-	-	1	-	1
5	-	-	-	-	3

38. TO & Landing (Engine Fail.)

Ride 1	1	2	3	4	5
1	-	-	-	-	-
2	3	4	3	-	2
3	1	4	6	2	-
4	-	-	4	-	2
5	-	1	2	-	-

39. Judgment

Ride 1	1	2	3	4	5
1	-	1	-	-	-
2	3	7	3	1	-
3	1	4	10	2	-
4	-	-	3	2	-
5	-	-	2	-	-

40. Smoothness and Coordination

Ride 1	1	2	3	4	5
1	-	-	-	-	-
2	4	6	6	-	-
3	1	2	9	3	-
4	-	2	3	1	-
5	-	-	1	-	-

with the Objective Flight-Check than with Form 342A. At first glance, it might appear that the differences in the results for the two checks are due primarily to differences in standards or numbers passed. That this is not the case is clearly demonstrated by an analysis of first officers alone. Reference to Table 4 shows that captains were rated qualified considerably more often with the new check; but the proportions of first officers passed and failed were approximately equal for the two checks. Thus, differences in standards should not affect the results for the first officers; these are shown in Figure 3.

Figure 3

AGREEMENT OF PAIRS OF EVALUATIONS FOR FIRST OFFICERS ONLY

A. OBJECTIVE FLIGHT-CHECK

Pass Both Rides	Pass once Fail once	Fail Both Rides
8 (42%)	4 (21%)	7 (37%)

B. FLIGHT TEST REPORT

Pass Both Rides	Pass One Ride Fail One Ride	Fail Both Rides
5 (26%)	8 (42%)	6 (32%)

Note that two check pilots using the Objective Flight-Check on succeeding days agree more often that a first officer should pass, and also agree more often that a first officer should fail. With the new check, there are only half as many disagreements about first officers' evaluations as with the Flight Test Report. Thus it is seen:

(1) The Objective Flight-Check fails very few captains as compared with Form 342A.
(2) Both checks fail about the same proportion of first officers. However, there is higher agreement from ride to ride on those First Officers who should pass and those First Officers who should fail with the objective check.

Evaluation by Participants. Twenty-one comment sheets were returned by participants. These varied in length from single sentences to comprehensive reviews of all the maneuvers.[12] The comments relating to specific items or maneuvers, or the order of maneuvers are too numerous for reproduction in this report as well as being contradictory in many instances or occurring only once. A table listing the types of general comments made by pilots may be found in Appendix G. A number of the pilots felt that the form was an improvement over the present CAA form. The most frequently mentioned criticism was that the in-flight recording took too much of the check pilot's attention away from his duties as a safety pilot. On the basis of previous reports, the CAA officials concerned and the project staff had already agreed that a separate safety pilot is necessary.

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[12] This was particularly true of the exhaustive review of the check accomplished by Captain M.A.C. Johnson, Director Pilot Training, Eastern Airlines. Captain Johnson's detailed evaluation of the check should receive special acknowledgement.

IV SUMMARY AND CONCLUSIONS

The objectives of the study were (1) to determine the ride-ride reliability of the Objective Flight-Check when used with airline pilots and (2) for purposes of comparison, to determine the reliability of the Civil Aeronautics Administration Flight Test Report, Form ACA-342A.

Before the airlines were approached with requests for their cooperation in the tryout, two intensive reviews of the form were accomplished; one by the Special Pilots Advisory Committee of the Air Line Pilots Association, and another by representatives of the Civil Aeronautics Administration. The recommendations of these groups were incorporated into the third revision of the form, the one used in the present study. Letters endorsing the tryout were obtained from the Air Line Pilots Association, the Civil Aeronautics Administration and the Air Transport Association of America.

The experimental design involved the flying of two successive flights by the same "applicant", or subject. On each flight he was observed by 3 check pilots. On the first flight, 2 check pilots rated his performance on the new Objective Flight-Check and 1 used the CAA Flight Test Report. On the second flight, three different check pilots observed the "applicant", 1 using the objective check and 2 the CAA form. In some cases, only 2 check pilots observed on each flight, using in these cases, 1 objective and 1 CAA form.

Twenty of the country's major airlines were contacted, and of these nine participated in the tryout. Seventeen airline captains and 15 first officers flew a total of 63 flights. All flights except 4 were monitored by a representative of the American Institute for Research who checked the procedures used and assisted in the scheduling. Thirty-three airline check pilots and 30 CAA agents did the actual flight-checking. Four types of aircraft were used: DC-3's, Convairs, DC-6's, and a Constellation. Several of the flights were completed in a DC-3 obtained for the tryout through the cooperation of the Civil Aeronautics Administration Aeronautical Center at Oklahoma City.

The ride-ride reliability obtained for the Objective Flight-Check based on "Qualified-Not Qualified" total scores was higher than for any other check on which data are available. This corroborates Gordon's[13] finding that flight-checks of this type measure skills that are relatively permanent and unchanging. The conclusion, previously established for Air Force and CAA pilots, that the flight-check is a reliable measuring instrument is thus extended to include airline pilots.

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[13] Gordon, T., op. cit., p. 86.

Advantages. The Objective Flight-Check was shown to be more reliable than the check presently used by the Civil Aeronautics Administration. Several advantages would accrue with the adoption of this form by the Civil Aeronautics Administration as the flight-check for the Airline Transport Rating.

1. The flight-check provides a uniform basis for evaluating the proficiency of applicants for the Airline Transport Rating.

2. The flight-check is adaptable to different multi-engine aircraft types. Four different transport types were used in this study and one military type (B-25) in a previous tryout.

3. A uniform flight-check of this type would eliminate the danger of an examiner requiring an unsafe maneuver. It is specifically recommended that the examiner check the applicant from the jump seat position and that a safety pilot fly in the right-hand seat to further insure safety on the flights.

4. The maneuvers included in the check are those that were shown by extensive research to be most important in discriminating safe and effective flying from dangerous flying leading to accidents or near accidents.

5. The effects of the differences in viewpoint among individual examiners are greatly reduced by using a standard record form which provides an accurate report of just what the pilot and the plane did. In other words whether a pilot is rated as "qualified" or "not qualified" becomes more a function of performance on the flight-check and less a function of the check pilot to whom he happens to be assigned for the flight test.

6. The standards of performance on the maneuvers have been carefully set and are the same for all pilots and examiners. Everyone has to meet the same requirements.

7. The objective flight-check provides a factual framework within which the experienced examiner can more accurately make the proper allowances for weather factors, traffic, unusual conditions of the equipment, or other special conditions which must be considered in evaluating the flight performance in relation to the tolerances set.

8. On-the-spot records of the examinee's performance on the various maneuvers are made <u>in flight</u> -- the check pilot does not have to rely on his memory of how the examinee flew but bases his recommendations on a careful consideration of the record of the flight.

9. The objective flight-check, by providing a detailed record, informs the applicant of the tasks where practice and training can help him remove flaws and attain high proficiency.

Recommendations. It is recommended that the new Objective Flight-Check, as revised on the basis of the comments and findings of this tryout, be adopted for use in examining applicants for the Airline Transport Rating. The flight-check has been demonstrated to be a practical, acceptable, and reliable instrument measuring those skills most relevant to the success or failure of the airline pilot on the job.

APPENDIX A

A STANDARDIZED FORM FOR THE AIRLINE TRANSPORT RATING FLIGHT CHECK

A STANDARDIZED FORM
FOR THE
AIRLINE TRANSPORT RATING
FLIGHT CHECK

devised for

The Civil Aeronautics Administration

by

The American Institute for Research

A RESEARCH PROJECT

sponsored by

THE NATIONAL RESEARCH COUNCIL

COMMITTEE ON AVIATION PSYCHOLOGY

AMERICAN INSTITUTE FOR RESEARCH

PITTSBURGH 13, PENNSYLVANIA

CHECKLIST OF EQUIPMENT
FOR
COCKPIT FAMILIARIZATION CHECK

Landing gear handle or switch
Flap handle or switch
Tank selector valve
Mixture controls
Cowl flap control
Feathering buttons or switches
Rudder trim tab control
Elevator trim tab control
Cross-feed valve
Emergency brake handle
Engine selector fuel valve (any engine)
Emergency landing gear extension control
Engine fire warning light (any engine)
Fuel pressure gauge (any engine)
Oil pressure gauge (any engine)
Fuel quantity gauges
Landing gear warning lights
Oil pressure warning light
Clock
Pressure altimeter
Landing gear position indicator
Ignition switch (any engine)
Master battery switch
Booster pump switch (any engine)
Carburetor temperature gauge (any engine)

.....
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.....

HOW THIS FLIGHT-CHECK WAS DEVISED

This is not just one pilot's idea of what a flight-check should be or what should be in one. Rather it is based upon over a year's careful research into the nature of airline flying. During this period approximately 500 airline pilots and Civil Aeronautics Administration agents have contributed their ideas.

Step by step, here is how this flight-check was developed:

(1) The Civil Aeronautics Administration furnished funds to the National Research Council Committee on Aviation Psychology to do research aimed at determining the job requirements of the airline pilot's job and developing a more standardized method of evaluating flying proficiency. This committee contracted with an independent research organization to conduct this project, in order to insure complete impartiality in gathering the research data.

(2) First, all scheduled airline accidents in the last nine years were carefully analyzed. This was for the purpose of determining the critical situations which airline pilots encounter.

(3) Then over 500 airline pilots were interviewed to obtain additional examples of critical situations they personally had encountered.

(4) All flight-checks being used by the Civil Aeronautics Administration and airline companies were studied to learn what kinds of things they were requiring of airline pilots.

(5) On the basis of the findings of this research and the judgments of airline pilots and Civil Aeronautics Administration agents, a list of maneuvers was prepared and submitted to all Civil Aeronautics Administration agents and airline company check pilots who at present are authorized to give the Airline Transport Rating flight-check.

(6) These pilots filled out forms which, when analyzed, showed in which components of each maneuver applicants for this rating most frequently have difficulties.

(7) Finally, for each maneuver we devised the best ways to record an applicant's performance on these critical components. Those ways of recording were selected which minimized writing on the part of a check pilot, yet reduced differences in the judgment of different check pilots.

In general, all this means that the things the check pilot is asked to observe and record in this flight-check form are those components of airline flying which have been determined to be the most critical and difficult. This does not mean that he will not observe other aspects of the applicant's performance, for there is room on each maneuver for writing in additional errors or comments.

WHAT THIS STANDARDIZED FORM IS *NOT*

It is not a substitute for the experience of the check pilot. No "form" or "blank" can take the place of the judgment and skill required of a check pilot in evaluating flying proficiency. The form is really a device to help the check pilot—a tool to help him record what he observes. The pictures and graphic representations throughout the form are intended as aids for the check pilot in making judgments. They make it possible for him to make a judgment more quickly, and they help to define the limits of the various alternatives from which he must choose. The check pilot should always select the picture which comes closest to representing the plane's actual attitude, flight path or ground path.

HOW YOU CAN USE THIS FORM

This form can be used to the best advantage by following these suggestions:

(1) Before the flight, the check pilot should go through the form and fill in all the blanks between parentheses, (.....), which call for prescribed airspeeds, altitudes, headings, etc. These have been left blank so that this form can be used for different airplanes and under different conditions.

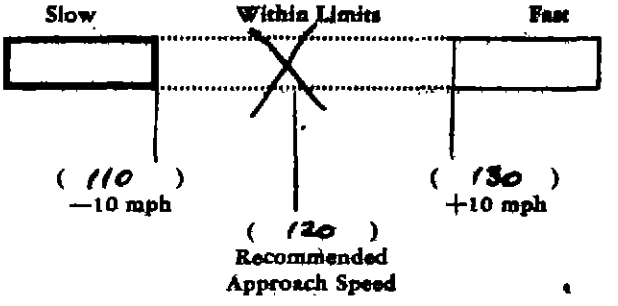
(2) Then the check pilot should turn the form over to the applicant, so that he will know what is required of him. He should know what standards he is required to meet on each maneuver. The check pilot should make certain before the flight that the applicant is familiar with the recommended climb, descent and engine-out airspeeds minimum altitudes, etc., for the particular type of airplane in which the check is flown. The applicant should be informed before each maneuver how far his airspeed or altitude may vary above or below the recommended but should not be again told what the recommended speed or altitude is.

(3) The check pilot should take the form with him on the flight-check, of course. Pilots who have already tried out the form have found that it takes less than a minute to record an applicant's performance on a maneuver.

(4) Before each maneuver, give your instructions to the applicant, covering the points listed at the top of each page.

(5) Try to record as the applicant flies through a maneuver. When this is not practical, record immediately afterwards and always before the applicant is given the next maneuver.

(6) Place an "X" in the appropriate box, ☐. For those items where limits are prescribed, place your "X" inside one of the three spaces within the box..



(7) Record errors for which there are no items on the flight-check form under "COMMENTS." Also, you may need to explain a rating or make a record of some condition which you felt affected your rating. If the applicant is disqualified on one or more maneuvers and you feel that special conditions such as weather, traffic, or condition of equipment were chiefly responsible for his poor showing, you may give him a waiver on this maneuver and he will still qualify. In such cases, indicate the reasons for your decision in the space provided for "Comments" on the page of the flight-check on which the maneuver appears.

In addition, if you have marked the applicant as being "Inadequate" on any item where the reason for his inadequacy is not clearly shown in the item itself, indicate in the space reserved for "Comments" the reason for your judgment.

1. PREPARATION FOR FLIGHT

In order to evaluate the applicant's competence in planning and preparing for a typical flight, you should select at random some city to which a flight might be made. In selecting a city, try to find one which would require the applicant to fly through some weather en route. In your directions to the applicant, cover the following points.

Instruct him to:

(1) Go through the procedures used if a flight to (.....) were actually being planned.

Inform him that:

(1) Questions will be asked from time to time about the procedures used.

	Adequate	*Inadequate*
WEATHER		
(1) Comprehension of Weather Map (Demonstrating ability to read and interpret weather map information for the over-all picture of air masses, fronts, and pressure systems)	☐	☐
(2) Analysis of Sequence Reports (Demonstrating ability to relate recent weather reports to weather map information)	☐	☐
(3) Use of Pilot Reports (Utilizing all pilot reports of weather along route)	☐	☐
(4) Use of Forecasts (Comprehending forecasts for route, destination and alternate; checking against own analysis of weather)	☐	☐
(5) Analysis of Winds Aloft (Checking strength and direction of winds aloft and analyzing trends of wind changes)	☐	☐
ROUTE FACILITIES		
(1) Use of Reports of Airport Conditions (Obtaining all available information as to conditions of airports en route)	☐	☐
(2) Use of Reports of Airways Facilities (Obtaining all available information as to status of airways facilities, paying particular attention to recent changes)	☐	☐
OTHER		
(1) Preparation of Flight Plan (Utilizing and integrating all available information to arrive at a flight plan that is appropriate to the particular conditions under which the flight must be made)	☐	☐
(2) Check on Airplane Forms (Assuring adequacy of load manifest and completion of ramp maintenance; assuring that plane has been adequately inspected and is in condition for flight; checking for presence of airworthiness certificate and airplane flight manual)	☐	☐

COMMENTS

Qualified ☐

Not Qualified ☐

2. EQUIPMENT FAMILIARIZATION CHECK

The purpose of this part of the flight-check is to provide an evaluation of the applicant's familiarity with the airplane and its equipment. The applicant is to carry out an inspection of the airplane, both outside and inside, during which the examiner will ask questions to determine the applicant's familiarity with the aircraft. The applicant may use a written checklist of items to be inspected on a visual check, or he may rely upon his memory. He is not to be evaluated on the thoroughness of the inspection. The inspecting is simply to enable the examiner to make judgments about his knowledge of the airplane. In your directions to the applicant, cover the following points.

Instruct him to:

(1) Carry out an outside and inside visual inspection of the plane, checking things that should be checked before a flight, assuming no ground crew is available to make this inspection and the responsibility for it rests solely on the pilot.

(2) Use a written checklist if desired.

(3) Call out each item as it is inspected and indicate what is being looked for or checked.

Inform him that:

(1) Questions will be asked to determine familiarity with the plane and its equipment.

(2) Evaluations will not be made on the thoroughness of the inspection as much as on how well a knowledge of what is being checked is demonstrated.

(1) FAMILIARITY SHOWN ON OUTSIDE INSPECTION	Adequate ☐	Inadequate ☐
(2) FAMILIARITY SHOWN ON INSIDE INSPECTION	Adequate ☐	Inadequate ☐

COMMENTS

Qualified ☐

Not Qualified ☐

3. COCKPIT FAMILIARIZATION CHECK

If any of the items on the following checklist are not on the airplane you are using, go through the list and cross off the items the plane does not have. Then write in as many additional items as will make 25 items in the list. If more convenient, the copilot or applicant may read the items off the extra checklist provided while you check errors. When the applicant is seated on the pilot's side, cover the following points in your directions for this maneuver.

Instruct him to:

(1) Demonstrate familiarity with the cockpit of the airplane by touching as rapidly as possible the 25 items which will be read off.

(2) Work rapidly but do not make errors. Do not correct errors if made because the next item will be read as soon as something is touched.

Inform him that:

(1) Evaluations will be made mostly on accuracy but the speed of location of items is also an indication of familiarity with the plane.

(2) A good showing will be made, however, if the race of speed used will assure that the correct control, valve or switch is touched first.

Consider an item correct only if the applicant touches it before touching anything else. Begin timing as you call off the first item and end the timing when the applicant touches the 25th item. *IMPORTANT:* So that you don't forget what time it was when you started timing, just before you call off the first item write down the exact time you plan to begin timing.

Call off each of the following items. Be sure you call off the next item immediately after the applicant has touched something in response to the previous item. Check all *incorrect* items in the space to the left of each item.

Check	*Errors*	*Check*	*Errors*
.....	Landing gear handle or switch	.....	Engine fire warning light (any engine)
.....	Flap handle or switch	.....	Fuel pressure gauge (any engine)
.....	Tank selector valve	.....	Oil pressure gauge (any engine)
.....	Mixture controls	.....	Fuel quantity gauges
.....	Cowl flap control	.....	Landing gear warning lights
.....	Feathering buttons or switches	.....	Oil pressure warning light
.....	Rudder trim tab control	.....	Clock
.....	Elevator trim tab control	.....	Pressure altimeter
.....	Cross-feed valve	.....	Landing gear position indicator
.....	Emergency brake handle	.....	Ignition switch (any engine)
.....	Engine selector fuel valve (any engine)	.....	Master battery switch
.....	Emergency landing gear extension control	.....	Booster pump switch (any engine)
.....	.....	.....	Carburetor temperature gauge (any engine)
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

(1) TIME TO COMPLETE ITEMS	Pointed out 25 items in a reasonable length of time	☐
	Took an excessively long time to identify the items	☐

(2) NUMBER OF ITEMS CORRECT — (Place an X to indicate total items correct)

25	24	23	22	21	20	19	18	17	16	15	Less than 15
☐	☐	☐	☐								

COMMENTS

Qualified ☐ Not Qualified ☐

4. STARTING PROCEDURE

After completing the familiarization check, cover the following points in your directions to the applicant.

Instruct him to:

(1) Take charge of the plane and go through the procedures used for preparing the plane for starting.

(2) Start the engines and get ready for taxiing away from the ramp.

(3) Taxi out to takeoff position when ready.

(1) USE OF PRE-STARTING CHECKLIST	Used written checklist ☐		Did not use written checklist ☐
(2) COMPLETENESS OF PRE-STARTING CHECK	Checked all items on checklist ☐		Missed one or more items ☐
(3) MANNER OF CHECKING	Careful and sure ☐	Hesitating and unsure ☐	Careless and hurried ☐
(4) STARTING PROCEDURE	Used prescribed procedure ☐	Deviated somewhat from prescribed procedure ☐	Used poor procedure ☐
(5) HANDLING OF ENGINES	Smooth ☐	Somewhat rough ☐	Very rough ☐
(6) TUNING AND CHECKING RADIO	Made ground check and tuned properly ☐		Failed to make ground check *or* tuned improperly ☐

COMMENTS

Qualified ☐

Not Qualified ☐

5. TAXIING

(1) CLEARANCE TO TAXI	Obtained clearance to taxi ☐		Failed to obtain clearance to taxi ☐	
(2) SPEED OF TAXIING	Consider the existing conditions for taxiing	Slow ☐	Somewhat fast ☐	Definitely fast ☐
(3) APPLICATION OF BRAKES	Smooth and gentle ☐	Somewhat rough ☐	Definitely too rough ☐	
(4) USE OF BRAKE	Used only when necessary ☐		Used somewhat too frequently ☐	
(5) ATTENTION AND ALERTNESS	Kept adequate lookout for other traffic ☐	Did not always keep adequate lookout ☐	Seldom kept adequate lookout ☐	
(6) USE OF THROTTLES	Always smooth ☐	At times somewhat rough and jerky ☐	At times very rough and jerky ☐	
(7) CAUTION	Never had to come close to other airplanes ☐	Was very cautious when close to other airplanes ☐	Was not cautious enough when close to other airplanes ☐	

COMMENTS

Qualified ☐

Not Qualified ☐

6. BEFORE TAKEOFF PROCEDURES

Includes run-up and pre-takeoff check. In your directions to the applicant, cover the following points.

Instruct him to:

(1) Go through the run-up and pre-takeoff check when ready.

Inform him that:

(1) The next maneuver will be an instrument takeoff followed by a maneuver involving tracking away from (.....) station.

(1) POSITIONING PLANE FOR RUN-UP	Positioned plane properly ☐	Positioned plane improperly ☐	*With respect to:* Keeping engines cool ..... Preventing blasting ..... Observing other planes.....
(2) CHECK OF ENGINE AND FLIGHT INSTRUMENTS DURING RUN-UP	Checked all important instruments ☐		Missed one or more important instruments ☐
(3) CHECK OF INSTRUMENTS DURING RUN-UP	Careful, sure ☐	Hesitating, unsure ☐	Careless or hurried ☐
(4) HANDLING OF ENGINES IN RUN UP	Smooth, unhurried ☐		Rough, hurried ☐
(5) PRE-TAKEOFF CHECK	Checked every item on written checklist ☐	Missed one or more items on written checklist ☐	Did not use written checklist ☐
(6) MANNER OF EXECUTING PRE-TAKEOFF CHECK	Careful, sure ☐	Hesitating, unsure ☐	Careless or hurried ☐

COMMENTS

Qualified ☐

Not Qualified ☐

7. INSTRUMENT TAKEOFF

In your directions to the applicant, cover the following points.

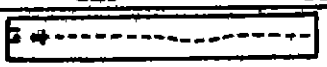
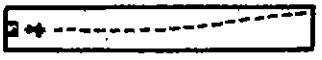
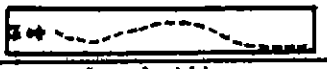
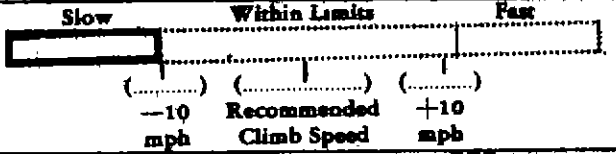
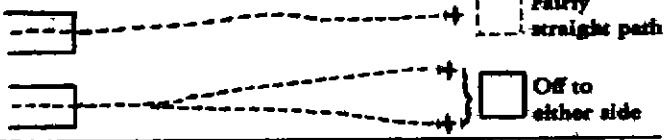
Instruct him to:

(1) Line the plane up with the runway.

(2) Hold the plane with the brakes when its position is satisfactory until the signal for takeoff is given.

Inform him that:

(1) Performance on this item is considered satisfactory if airspeed in climb does not vary more than 10 mph above or below recommended climb speed.

(1) POWER APPLICATION	Smooth and positive ☐	Jerky or hesitant ☐	Excessively rapid ☐
(2) HEADING ON RUN		☐	Straight path, only slight deviations, stayed in center
		☐	Large deviations, yet stayed in center of runway
		☐	Off toward edge of runway, yet fairly straight path
		☐	Off toward edge of runway, plus large deviations
(3) AIRSPEED AND ATTITUDE CONTROL AFTER AIRBORNE UNTIL CLIMB IS ESTABLISHED	Stayed within recommended limits* ☐		Did not stay within recommended limits* ☐
	*As prescribed in the approved airplane flight manual.		
(4) AIRSPEED IN CLIMB			
	Slow	Within Limits	Fast
	(.....) −10 mph	(.....) Recommended Climb Speed	(.....) +10 mph
(5) HEADING IN CLIMB			Fairly straight path ☐
			Off to either side ☐
(6) CHECK-PILOT ASSISTANCE	Assistance not necessary ☐		Assistance necessary ☐

COMMENTS

Qualified ☐

Not Qualified ☐

8. INTERCEPTING A PREDETERMINED TRACK AND TRACKING AWAY FROM STATION IN CLIMB

Cover the following points in your directions to the applicant.

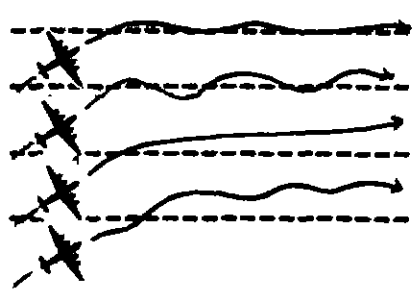
Instruct him to:

(1) Turn to intercept a track of (.....)° away from station (.....) as soon as the climb has been established.

(2) Continue the climb holding a constant airspeed.

Inform him that:

(1) To achieve satisfactory performance on this maneuver the airspeed in climb must not vary more than 10 mph above or below the recommended climb speed.

(1) SETTING GYRO OR AZIMUTH	Set gyro and/or azimuth with magnetic compass ☐	Did not set gyro and/or azimuth with magnetic compass ☐
(2) DIRECTION OF TURN TO INTERCEPT TRACK	Turned right direction to intercept track quickest ☐	Turned opposite direction to intercept track quickest ☐
(3) LEADING TRACK AT INTERCEPTION	 ☐ Led track proper amount ☐ Overshot track ☐ Undershot track	
(4) ACCURACY OF TRACKING	 ☐ Held track well ☐ Erratic, but close to track ☐ Drifted off track; made no corrections ☐ Drifted off plus erratic ☐ Couldn't track at all	
(5) AIRSPEED IN CLIMB	Slow ☐ Within Limits ..... Fast ☐ (.....) —10 mph (.....) Recommended Climb Speed (.....) +10 mph	

COMMENTS

Qualified ☐

Not Qualified ☐

9. MINIMUM SPEED MANEUVERING AND APPROACH TO STALL

In your directions to the applicant, cover the following points.

Instruct him to:

(1) Slow the plane down to recommended minimum maneuvering speed or about 15-20 mph above wheels-up, flaps-up stalling speed.

(2) Make shallow turns alternating 180° to the right and left when this speed is reached.

(3) Make two turns to the right and two to the left, maintaining the recommended minimum maneuvering speed.

(4) Maintain the starting altitude during maneuvering.

(5) Pull the plane up slowly when the signal is given until it approaches a stall. Approach a stall first while in a wing-level position and then while in a turn without change of power settings.

(6) Recover in each case as soon as buffeting is noticeable.

Inform him that:

(1) Airspeed must be maintained to within ± 10 mph of the recommended minimum maneuvering speed for satisfactory performance on this maneuver.

(2) Performance on this maneuver is considered satisfactory if the altitude is maintained within 100 feet above or below starting altitude.

(1) AIRSPEED DURING MANEUVERING	Slow ..... Within Limits ..... Fast (.....) (.....) (.....) −10 mph — Recommended Minimum Maneuvering Speed — +10 mph
(2) ALTITUDE DURING MANEUVERING	Above ☐ (.....) + 100 ft. Within Limits ☐ (.....) Starting altitude Below ☐ (.....) — 100 ft.
(3) ATTITUDE DURING APPROACH TO WING-LEVEL STALL	Kept wing-level attitude throughout maneuver ☐ — Let plane get in wing-low attitude ☐
(4) RECOGNITION OF STALLING POINT	Recovered just before nose would have dropped: wing-level ☐ turn ☐ — Recovered after nose had dropped: wing-level ☐ turn ☐ — Recovered long before nose would have dropped: wing-level ☐ turn ☐
(5) RECOVERY	 wing-level ☐ turn ☐ wing-level ☐ turn ☐ wing-level ☐ turn ☐ wing-level ☐ turn ☐ wing-level ☐ turn ☐
(6) POWER IN RECOVERY	Correct amount — Insufficient — Excessive wing-level ☐ turn ☐ wing-level ☐ turn ☐ wing-level ☐ turn ☐
(7) USE OF AILERON IN RECOVERY	Did not use too much aileron: wing-level ☐ turn ☐ — Used too much aileron: wing-level ☐ turn ☐

Qualified ☐
Not Qualified ☐

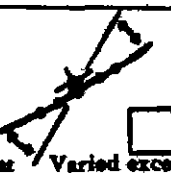
COMMENTS

10. STEEP TURNS

Cover the following points in your directions to the applicant.

Instruct him to:

(1) Make three 180° steep turns (45° bank) alternating to the right and left.

(1) HOLDING ALTITUDE IN TURNS	Above ☐	(.....) + 100 ft.
	Within Limits ☐	(.....) Prescribed altitude
	Below ☐	(.....) — 100 ft.
(2) CONSTANCY OF DEGREE OF BANK	 ☐ Fairly constant	 ☐ Varied somewhat
	 ☐ Varied excessively	

COMMENTS

Qualified ☐

Not Qualified ☐

11. RAPID DESCENT AND PULL-UP

This maneuver is to be given at altitude rather than on an actual instrument approach. Have the applicant begin the maneuver at an altitude of 5300, 4300, or 3300 feet indicated altitude. In your directions to the applicant, cover the following points.

Instruct him to:

(1) Make an instrument approach inbound towards the station assuming that the present altitude is 1300 feet above field elevation.

(2) Make a rapid descent at 1000 feet per minute when the signal is given that the station has been passed.

(3) Stop the descent at 300 feet above field elevation.

(4) Begin a missed approach procedure two minutes after passing station, descending at the recommended instrument approach speed and maintaining a constant heading.

(5) Climb away at the recommended climb speed.

Inform him that:

(1) Airspeed in the approach and climb-out must not vary more than 10 mph above or below the recommended speeds for satisfactory performance on this maneuver.

(2) A leeway of ± 15 seconds is allowed on the time for application of power for the pull-up.

(3) Altitude at minimum altitude must be held to within ± 50 feet.

Instruct him to:

(1) Begin the descent as soon as the second hand on the clock is at the 60 sec. mark.

(1) AIRSPEED IN DESCENT	Slow ☐ Within Limits ..... Fast ☐ (.....) (.....) (.....) −10 mph Recommended Instr. App.. Speed +10 mph
(2) HEADING IN DESCENT	Within Limits ☐ Beyond Limits ☐ (.....) Heading at start of descent (.....) ±5°
(3) HOLDING ALTITUDE AT MINIMUM ALTITUDE	Above ☐ (..... .....) + 50 ft. Within Limits (.....) Minimum altitude Below ☐ (. . ...) — 50 ft.
(4) ACCURACY OF TIMING	Applied power for pull-up: ☐ Too soon ☐ On time (2 min. ± 15 sec. after passing station) ☐ Too late
(5) USE OF POWER	Prescribed power settings are: (.....) in. & (... .....) rpm Correct settings ☐ Incorrect ☐
(6) AIRSPEED IN CLIMB	Slow ☐ Within Limits ..... Fast (.....) (.....) (.....) −10 mph Recommended Climb Speed +10 mph

COMMENTS

Qualified ☐

Not Qualified ☐

12. MANUAL LOOP ORIENTATION AND TRACKING

Be sure that applicant is disoriented. If he is not, take over long enough to disorient him. Have him take over when you are somewhere within 10 minutes from the station. Then cover the following points in your directions to him.

Instruct him to:

(1) Use the manual loop to locate the position of the airplane relative to (.....) radio station.
(2) Calculate how far away the station is in minutes and report this.
(3) Then immediately track to the station using only the manual loop.
(4) Maintain a constant altitude throughout.

Inform him that:

(1) To qualify, the altitude may not vary more than 100 feet above or below the altitude at the start of the orientation.

(1) TUNING FOR NULL	Tuned for good null width ☐	Did not tune for good null width ☐
(2) KNOWLEDGE OF MANUAL LOOP PROCEDURE	Demonstrated adequate knowledge of procedure ☐	Demonstrated inadequate knowledge of procedure ☐
(3) ALTITUDE DURING ORIENTATION	Above ☐ (.....) + 100 ft. Within Limits ☐ (.....) Altitude at start or orientation Below ☐ (.....) — 100 ft.	
(4) ACCURACY OF TRACKING	Held track well ☐ Erratic, but close to track ☐ Drifted off track; made no corrections ☐ Drifted off plus erratic ☐ Couldn't track at all ☐	
(5) RECOGNITION OF STATION	Recognized when station passed ☐	Did not recognize when station passed ☐

COMMENTS

Qualified ☐

Not Qualified ☐

13. APPROVED APPROACH PROCEDURE

(At examiner's discretion, use omni-directional range, aural-visual range, or low frequency range facility available.)

When the applicant has crossed the station after tracking with manual loop, cover the following points in your directions to him.

Instruct him to:

(1) Turn on the ADF equipment and make a standard instrument approach, using only the (.....).

(2) Begin the letdown from the station and hold the recommended approach speed constant.

(3) Stop the descent when the minimum altitude is reached.

Inform him that:

(1) Airspeed on letdown from station must remain within 10 mph faster or slower than the recommended speed for satisfactory performance.

(2) Altitude at minimum altitude must not vary more than ± 50 feet from the minimum altitude.

(3) The heading from the station to field must be held to within ± 5°.

(1) AIRSPEED ON LETDOWN FROM STATION	**Slow** — **Within Limits** — **Fast** (.....) —10 mph (.....) Recommended Approach Speed (.....) +10 mph
(2) HEADING FROM STATION TO FIELD	**Within Limits** — **Beyond Limits** (.....) Heading towards field (.....) ±5°
(3) HOLDING ALTITUDE AT MINIMUM ALTITUDE	**Above** (.....) + 50 ft. **Within Limits** (.....) Minimum altitude **Below** (.....) —50 ft.

COMMENTS

Qualified ☐

Not Qualified ☐

14. APPROACH UNDER SIMULATED 400 AND 1 CONDITIONS (CONTACT)

Cover the following points in your directions to the applicant.

Instruct him to:

(1) Drop down to an altitude of 400 ft. above field elevation.

(2) Make a straight-in approach to the (.....) runway, holding this altitude and assuming there is a 400 foot ceiling and one mile visibility.

(3) Make another approach to the same runway when notified that the field is one mile away, assuming that instructions have been given not to land straight ahead.

Inform him that:

(1) The task in this maneuver is to circle back in such a way that the plane is never more than one mile from the field so that the field can be kept in sight.

(2) An altitude of no higher than 400 feet and no lower than 300 feet must be maintained until the final approach is started.

(1) REMAINING WITHIN 1 MILE OF FIELD	☐ Remained within 1 mile at all times ☐ Went beyond 1 mile from field
(2) ADEQUACY OF PATTERN	☐ Well planned pattern with the necessity of quickly steep turns ☐ Poorly planned pattern necessitating excessively steep turns or going beyond 1 mile from field.
(3) MAINTAINING ALTITUDE UNTIL FINAL APPROACH	Above ☐ (.....) 400 ft. above field elevation Within Limits Below ☐ (.....) 300 ft. above field elevation
(4) APPROACH TO RUNWAY	Too steep ☐ Normal ☐ Too flat ☐ Erratic ☐
(5) AIRSPEED CONTROL	Slow — Within Limits — Fast (.....) (.....) (.....) —10 mph (.....) +10 mph Recommended Airspeed
(6) TOUCH DOWN	Touched down in first third ☐ Touched down beyond first third ☐ Made go-around because of overshooting. ☐

COMMENTS

Qualified ☐

Not Qualified ☐

15. ILS APPROACH

Have the applicant make a normal takeoff in preparation for an ILS approach. In your directions to him, cover the following points.

Instruct him to:

(1) Take off and climb to the prescribed altitude for beginning an ILS approach.

(2) Use the prescribed procedure for this station holding the airspeed constant at the recommended ILS approach speed.

(3) After the minimum altitude is reached, go on contact and make a cross-wind landing on runway No. (. . . . .).*

Inform him that:

(1) The airspeed during approach must be held within ± 10 mph of the recommended ILS approach speed for satisfactory performance.

*Choose a runway which is at least 30° from the direction of the wind for the cross-wind landing.

(1) PRE-LANDING CHECK	Checked every item on written checklist ☐	Missed one or more items on written checklist ☐	Did not use written checklist ■
(2) HITTING LOCALIZER AFTER PROCEDURE TURN	☐ Led localizer proper amount	☐ Overshot localizer	☐ Undershot localizer
(3) AIRSPEED DURING APPROACH	Slow ■	Within Limits	Fast ■
	(.....) −10 mph	(.....) Recommended ILS Approach Speed	(.....) +10 mph
(4) MAINTAINING LOCALIZER PATH	☐ Held path well ☐ Erratic, but close to path ■ Off to side, made no corrections ■ Off to side plus erratic		
(5) MAINTAINING GLIDE PATH	☐ Held path well ☐ Erratic, but close to path ■ Either too far above or too far below ■ Either above or below plus erratic		

COMMENTS

Qualified ☐

Not Qualified ☐

16. CROSS-WIND LANDING

When the applicant has reached minimum altitude after ILS approach, cover the following points in your instructions to him.

Instruct him to:

(1) Make a cross-wind landing on runway No. (.....).

Inform him that:

(1) "Over-the-fence" airspeed must be maintained to within 10 mph faster or slower than the recommended over-the-fence speed for satisfactory performance on this maneuver.

(1) "OVER-THE-FENCE" AIRSPEED	Slow ..... Within Limits ..... Fast (.....) (.....) (.....) −10 mph Recommended +10 mph "Over-the-Fence" Speed
(2) ALIGNMENT WITH RUNWAY ON FINAL APPROACH IN CLOSE	☐ Kept within width of runway ☐ Did not keep within width of runway
(3) STARTING FLAREOUT OR LEVEL-OUT	☐ Began too soon, too high ☐ Began at normal height ☐ Began too late, too low
(4) ATTITUDE AT TOUCHDOWN	☐ Too tail-high ☐ Normal ☐ Too tail-low
(5) TAKING OFF CRAB BEFORE TOUCH-DOWN	☐ No crab ☐ Landed in crab
(6) ALIGNMENT ABOVE RUNWAY	Plane was not drifting when wheels hit ☐ Plane was drifting slightly when wheels hit ☐ Plane was drifting excessively when wheels hit ☐
(7) HEADING ON ROLL	☐ Fairly straight path ☐ Rolled to side

COMMENTS

Qualified ☐

Not Qualified ☐

17. CROSS-WIND TAKEOFF AND ENGINE FAILURE AFTER TAKEOFF

Select a runway which is at least 30° from the direction of the wind. In your instructions to the applicant, cover the following points.

Instruct him to:

(1) Obtain clearance from the tower to take off on runway No. (.....).

Inform him that:

(1) An engine will be cut some time after takeoff.

Instruct him to:

(1) Complete the procedure and make an approach for landing.

(1) HEADING ON ROLL	☐ Straight path	☐ Varied heading or rolled to side	
(2) LENGTH OF ROLL	☐ Pulled plane off too soon and at too low airspeed	☐ Correct	☐ Held plane on ground too long
(3) ENGINE-OUT PROCEDURE	☐ Followed prescribed procedure	☐ Varied procedure but accomplished every item	☐ Did not follow prescribed procedure
(4) RECOGNITION OF BAD ENGINE	☐ Recognized immediately	☐ Slow to recognize	☐ Demonstrated confusion of good and bad engine
(5) GETTING ENGINE-OUT CLIMB SPEED	Recommended Engine-out Climb Speed for Plane (.....) mph	☐ Had this speed when engine was cut and stayed there or above ☐ Got this speed as quickly as possible ☐ Did not get this speed quickly enough ☐ Went below this speed after engine was cut	
(6) HEADING IN CLIMB	☐ Fairly straight path	☐ Off to either side	

COMMENTS

☐ Qualified

☐ Not Qualified

18. ENGINE-OUT LANDING

(Engine throttled to 15 MP)

In your directions to the applicant for this maneuver, cover the following points.

Inform him that:

(1) For satisfactory performance, the engine-out airspeed should not vary more than ± 10 mph from the recommended engine-out airspeed.

(1) PLAN OF APPROACH	Normal ☐ Too wide ☐ Lowered gear and flaps too soon or too late ☐
(2) GLIDE ANGLE	Too steep ☐ Normal ☐ Too flat ☐ Erratic ☐
(3) ALIGNMENT WITH RUNWAY IN CLOSE	Kept within width of runway ☐ Went beyond width of runway in close ☐
(4) AIRSPEED CONTROL	Slow ..... Within Limits ..... Fast (.....) −10 mph (.....) Recommended Engine-Out Airspeed (.....) +10 mph
(5) BEGINNING FLARE-OUT	Began too soon, too high ☐ Began at normal height ☐ Began too late, too low ☐
(6) TOUCH-DOWN	Needed power from bad engine to make runway ☐ Touched down in first third ☐ Touched down beyond first third ☐ Made go-around because of over-shooting ☐
(7) LANDING	Smooth ☐ Somewhat hard ☐ Very hard ☐

COMMENTS

Qualified ☐

Not Qualified ☐

19. EMERGENCY PROCEDURES

Cut an engine at some time during a turn.

(1) SPEED OF RECOVERY AFTER ENGINE FAILURE	Recovered to level flight immediately ☐		Too slow in recovering to level flight ☐
(2) ENGINE-OUT PROCEDURE	Followed prescribed procedure ☐	Varied procedure but accomplished every item ☐	Forgot important item in procedure ☐
(3) ALTITUDE DURING ENGINE-OUT PROCEDURE	Above ☐ (.....) + 100 ft. Within Limits ☐ (.....) Altitude when engine was cut Below ☐ (.....) — 100 ft.		
(4) AIRSPEED DURING ENGINE-OUT PROCEDURE	Slow ☐ (.....) —10 mph	Within Limits ..... (.....) Recommended Engine-Out-Speed	Fast ☐ (*To the point of engine stops*)
(5) HEADING DURING ENGINE-OUT PROCEDURE	Fairly constant ☐	Varied somewhat ☐	Varied excessively ☐

COMMENTS

Qualified ☐

Not Qualified ☐

FILL IN AFTER THE FLIGHT

Name of examinee:.....

Examinee is: ..... **Employed by an airline:**.....
(Name of Airline)

..... **Not employed by an airline**

First Flight..... .....
(Examinee's Job Title)

Second Flight.....

Check-pilots: #1 Right seat.....
(Name)

#2 Jump seat.....
(Name)

#3 ———.....
(Name)

Check-pilot completing this form:.....**Right seat**

.....**Jump seat**

..... **#3**

Check-pilot #1 is:.....**Airline check-pilot:**.....
(Name of Airline)

.....**CAA Agent**

Check-pilot #2 is:.....**Airline check-pilot:**.....
(Name of Airline)

.....**CAA Agent**

Check-pilot #3 is:.....**Airline check-pilot**.....
(Name of Airline)

.....**CAA Agent**

Flight-check administered at:.....
(City) **(State)**

Plane in which flight-check was given: Type.....**Plane No.**.....

Length of time taken for flight-check:.....**to**.....

Results of the flight-check:

Examinee { ☐ **Recommended** / ☐ **Not recommended** } **for the Airline Transport Rating**

APPENDIX B

CHECK PILOT'S GUIDE FOR EVALUATING PERFORMANCE ON THE OBJECTIVE FLIGHT-CHECK

30 April 1949

CHECK PILOT'S GUIDE FOR EVALUATING PERFORMANCE ON THE OBJECTIVE FLIGHT-CHECK

Flying is an art, a complex skill, and to evaluate a pilot's flying proficiency, the check pilot must exercise a great deal of judgment. As has been indicated before, the flight-check is not a substitute for the experience of the check pilot, upon which his judgments are based. It is intended to provide a framework within which these judgments can be made; to reduce the effect of prejudice upon pilot evaluation; and to provide a fair and uniform means by which check pilots can achieve agreement as to the degree of flying skill possessed by the pilot being examined.

The following materials have been prepared to serve as a basis for evaluating the applicant's performance on the flight-check - in determining whether or not he has qualified for the Airline Transport Rating.

Applicants for the ATR must qualify on all maneuvers to receive the rating. However, if the applicant is disqualified on one or more maneuvers and you feel that special conditions such as weather, traffic, or condition of equipment were chiefly responsible for his poor showing, you may give him a waiver on this maneuver and he will still qualify. In such cases, indicate the reasons for your decision in the space provided for "Comments" on the page of the flight-check on which the maneuver appears.

In addition, if you have marked the applicant as being "Inadequate" on any item where the reason for his inadequacy is not clearly shown in the item itself, indicate in the space provided for "Comments" the reason for your judgment. The first five items on page 3 are examples of items of this type.

There are three types of check boxes to be used in checking performance. A heavy-lined check box(▬) within an item indicates that inadequate performance on that item is critical because it was shown in the research that went into the development of the flight-check that performance of the type indicated by these items frequently got pilots into serious trouble. If you have put a check mark in one of these heavy-lined boxes within an item, it will disqualify an applicant on that maneuver. A lighter-lined box(☐) within an item is also important and should be considered in the evaluation of performance on the maneuver. However, for the applicant to be disqualified on the basis of checks in these lighter-lined boxes, at least two or three must have been checked. The dotted-line boxes(⬚) are included for their informational or diagnostic value; i.e., although they are not considered as important in the evaluation performance, they can still be used to point out areas of performance where practice and training may or may not be necessary. Dotted line boxes are also used to indicate satisfactory performance.

1. PREPARATION FOR FLIGHT

Here the two items listed under the heading, "OTHER," are the most important. The applicant should be disqualified if you have checked his performance as "Inadequate" on either of these two items. Two or more of the lighter-lined items must be marked "Inadequate" to disqualify him.

2. EQUIPMENT FAMILIARIZATION CHECK

If you have checked the box marked "Inadequate" in either of the two items of this maneuver, the applicant should be disqualified.

3. COCKPIT FAMILIARIZATION CHECK

If the applicant has received an "X" in the heavy-lined box of item 1 or if he has made less than 23 correct identifications in item 2, he should be disqualified on this maneuver.

4. STARTING PROCEDURE

If the applicant fails to use the pre-starting checklist at all or misses one or more of the items on the checklist, he cannot be considered to have qualified on this maneuver. This is also the case if he fails to ground check and tune the radio or fails to tune it properly. He may, however, have received a check in the third box of any two of the three remaining items (3, 4, or 5) without being disqualified. In other words, if "X's" appear in any heavy-lined box or in more than two of the lighter-lined boxes, the applicant is disqualified.

5. TAXIING

If you have "X'ed" any of the heavy-lined boxes of this maneuver, the applicant is disqualified.

6. BEFORE TAKEOFF PROCEDURES

An "X" in any heavy-lined box or in more than three lighter-lined boxes disqualifies the applicant on this maneuver.

7. INSTRUMENT TAKEOFF

Here, as in all the maneuvers, the applicant is disqualified if you have marked a heavy-lined box. If no "X's" appear in any of the heavy-lined boxes, but if you have more than two lighter-lined boxes "X'ed," he is disqualified on this maneuver.

8. INTERCEPTING A PREDETERMINED TRACK AND TRACKING AWAY FROM STATION IN CLIMB

The applicant disqualifies on this maneuver if an "X" appears in any of the heavy-lined boxes or in more than one of the lighter-lined boxes.

9. MINIMUM SPEED MANEUVERING AND APPROACH TO STALL

First consider the applicant's performance on items 1 and 2. "X's" in the heavy-lined box or any two lighter-lined boxes disqualify the applicant on the entire maneuver.

Let us consider the remaining five items. In items 3-7 "X's" in any one heavy-lined box disqualify the applicant on the maneuver. To be disqualified on the basis of "X's" in the lighter-lined boxes of these items, however, he must have been checked in two or more applying to the wing-level stall or in two or more applying to the turn stall.

10. STEEP TURNS

"X's" in more than one lighter-lined box disqualify the applicant on this maneuver.

11. RAPID DESCENT AND PULL-UP

"X's" in any one heavy-lined or more than one lighter-lined box disqualify the applicant on this maneuver.

12. MANUAL LOOP ORIENTATION AND TRACKING

"X's" in any heavy-lined or in more than two lighter-lined boxes disqualify the applicant on this maneuver.

13. APPROVED APPROACH PROCEDURE

If "X's" appear in any heavy-lined box or in two lighter-lined boxes, the applicant disqualifies on this maneuver.

14. APPROACH UNDER SIMULATED LOC AND I EXECUTIONS (CONTACT)

The applicant is disqualified on this maneuver if any one heavy-lined or more than two lighter-lined boxes are "X'ed".

15. ILS APPROACH

"X's" in one heavy-lined or more than one lighter-lined box are indicative of disqualifying performance on this maneuver.

16. CROSSWIND LANDING

"X's" in any one of the three heavy-lined critical items disqualify the applicant on this crosswind landing. If two or more lighter-lined boxes are "X'ed", he should be marked "not qualified" on this maneuver.

17. CROSSWIND TAKEOFF AND ENGINE FAILURE AFTER LIFTOFF

Here again "X's" in any one heavy-lined or in more than two lighter-lined boxes disqualify the applicant.

18. ENGINE-CUT APPROACH

"X's" in any one heavy-lined box or more than two lighter-lined boxes disqualify the applicant on this maneuver.

19. EMERGENCY [illegible]

"X's" in any heavy-lined [illegible] qualified the applicant.

APPENDIX C

LETTERS OF ENDORSEMENT

DEPARTMENT OF COMMERCE
CIVIL AERONAUTICS ADMINISTRATION
Washington 25

(COPY) April 8 1949

Mr. John C. Flanagan, President
American Institute for Research
Pittsburgh 13, Pennsylvania

Dear Mr. Flanagan:

This is in reply to your letter dated March 25, 1949 relating to the service test of the Airline Transport Rating Flight Check.

The Civil Aeronautics Administration is in accord with your proposal to give this flight check a service test with the scheduled air carriers. It is pleasing to note that the Air Line Pilots Association also agrees to this proposal, and it is hoped that you will have no difficulty in securing the cooperation of the scheduled air carriers in this undertaking.

In the event that this office can be of assistance to you in the further development of the objective Airline Transport Rating Flight Check, please do not hesitate to call on us.

Very truly yours,

/s/ John F. Warlick

for E. S. Hensley
Acting Director
Office of Aviation Safety

AIR LINE PILOTS ASSOCIATION

International
3145 West Sixty-Third Street
Chicago 29

(COPY) March 21, 1949

Mr. John C. Flanagan, President
American Institute for Research
Pittsburgh 13, Penn.

Dear Mr. Flanagan:

I have your letter of February 7 and I am sorry I have not been able to answer sooner. It so happened that I again became involved in numerous representing problems and one arbitration which in itself consumed about five weeks of my time, ten days of which I was hardly able to go to bed at all.

I have examined your letter carefully and see nothing wrong with your understanding of the position of the Air Line Pilots Association regarding a tryout of the flight check on regularly scheduled air line pilots.

> "That the Air Line Pilots Association approves the use of the objective flight-check as an experimental form for a tryout on airline pilots with the provisions (1) that the evaluation system discussed at the February 1st meeting be used, (2) that the results made by the specific pilots who act as subjects for the check are not incorporated into the personnel records of the airline companies, and (3) that in the choice of groups of greater and less flight experience for the experimental design, no differentiation is made within a status; i.e., a group made up of Captains, for example, would not be subdivided on the basis of any other criterion."

I have nothing to add to this except that as far as the Association is concerned the entire project is experimental until we have had a chance to see how it functions in actual operation.

When the point is reached of being ready to carry on the service tests of this proposed flight check form, please let me know where and when it will be done and I will contact the pilots and let them know that the project has the approval of the association.

John C. Flanagan - 2 March 22, 1962

I am very happy to learn that you had an interesting trip to Cuba on the U.S.S. Saipan. I would have given a great deal to have been with you but on a job such as mine a man's time isn't his own -- it belongs to the men he represents, and particularly when they are in trouble.

With kind regards, I am

Sincerely yours,

AIR LINE PILOTS ASSOCIATION

/s/ David L. Behncke

David L. Behncke, President

dlb/vjf

AIR TRANSPORT ASSOCIATION

1107 Sixteenth Street, N. W. Telephone

Washington

(COPY)

April 27, 1947

TO: Chief Operations Executives

SUBJECT: Experimental Tryout of New Flight Check for Airline Transport Rating

The American Institute for Research, Pittsburgh, Pa., will transmit to you in the near future a letter requesting your cooperation in an experimental tryout of a new flight check for Airline Transport Rating, developed by the Institute.

We have examined the present form of the check and the results of previous tryouts on Air Force and Civil Aeronautics Administration personnel, and it is felt that further checking and experimentation with the transport group may be beneficial in enhancing safety. A tryout of the form on airline pilots will provide the investigators with the data they need to add the finishing touches to make the flight check a valuable tool to both the airlines and the Civil Aeronautics Administration.

Dr. John C. Flanagan, President of the Institute for Research, has received CAA endorsement of his experimental plan. Also, the Air Line Pilots Association has expressed its approval, with the following stipulation:

> "That the Air Line Pilots Association approves the use of the objective flight-check as an experimental form for a tryout on airline pilots with the provisions (1) that the evaluation system discussed at the February [illegible] meeting be used, (2) that the results made by the specific [illegible] who act as subjects for the check are not incorporated into the personnel records of the airline companies, and (3) that in the choice of groups of greater and less flight experience for the experimental design no differentiation is made within a status; i.e., a group made up of captains, for example, would not be subdivided on the basis of any other criterion."

For your information, the American Institute for Research is a non-profit organization, much of whose work has been sponsored by the National Research Council (Committee on Aviation Psychology). Dr. Flanagan was a Lieutenant Colonel in the Air Surgeon's Office of the Air Forces during World War II and was in charge of the Psychological Division, responsible for the preparation of [illegible] tests and aptitude examinations which were utilized by the Air Forces in the determination of individuals' qualificati[ons] for bombardiers, gunners, pilots and navigators. My personal experience w[ith] Dr. Flanagan substantiates his outstanding technical background and his ver[...]

practical approach to the problem. This Institute probably is better fitted for this type of work than any other organization in the country today.

Any consideration and assistance you can give to Dr. Flanagan and his group probably will be very helpful in the advancement of aviation.

Milton W. Arnold
Vice President-Operations & Engineering

APPENDIX D

EXPLANATORY MATERIALS DISTRIBUTED TO SUBJECTS AND CHECK PILOTS

American Institute for Research
A-14, Form B
11 May 1949

NOTES TO CHECK PILOTS FOR THE EXPERIMENTAL TRYOUT OF THE OBJECTIVE FLIGHT-CHECK FORM

The steps in the development of the Objective Flight-Check Form are given in some detail on page 1 of the flight-check booklet. Preliminary tryouts in the Air Force and CAA have indicated that this new flight-check has considerable merit. Many individuals and organizations, including especially the Air Transport Association, the Air Line Pilots Association and operations personnel of the airlines have given considerable assistance in the preparation of the final form. We are asking you to act as a check pilot in a final experimental tryout of the flight-check.

To determine how well the new Form aids check pilots in making consistent judgments, each of a number of pilots from several airlines will take two check rides. On the check rides, each of three check pilots will evaluate the pilot's performance with either the Objective Flight-Check Form or the regular CAA ATR flight-check.

In order to obtain accurate and valuable data, the procedure for the tryout has been set up in a standardized way. Each check pilot is assigned to a particular position.

With three check pilots, it is necessary to designate one person to give the instructions to the examinee. In all cases, this will be the senior of the check pilots using the Objective Flight-Check Form. Also, in all cases, the check pilot in the right-hand seat will act as safety pilot.

Since this will be your first check ride with this flight-check, we strongly recommend that you spend some time beforehand looking over the whole form. Note, especially, that all recording except for the final evaluation is done in the air during or immediately after each maneuver. Detailed notes on procedure appear on page 2 of the flight-check booklet.

You should become familiar with the flight-check booklet, so that you can follow the procedure without undue hesitation. Of course, you will also want to go through the booklet with the examinee before the flight. At this time, you can conveniently fill in prescribed airspeeds and other data called for.

It is particularly important in this experimental tryout that evaluations be arrived at independently by the check pilots. Please do not discuss the flight-check with the other check pilots until all forms have been completed and turned in. After you have evaluated a pilot on the

first of his two rides, don't discuss the pilot's performance with anyone who might act as check pilot on the second ride. Finally, do not talk to the examinee about the ride until after his second flight.

So that there is no possibility of confusion in analysis of the results, detailed information about the flight is requested. After the flight, be sure that you have provided all the information requested on page 22 of the booklet. This information is for research purposes only; no records of the check ride will be retained for company files. This tryout is a test of the flight-check form, and not of the pilot or check pilots.

It is important that these precautions and procedures be observed so that the results of this tryout will be strictly accurate. You will be asked to comment afterwards on all aspects of the flight-check. Your cooperation is necessary for a fair and unbiased evaluation of the Objective Flight-Check Form.

American Institute for Research
A-14, Form C
11 May 1949

NOTES TO CAA EXAMINERS OR DESIGNEES
FOR THE EXPERIMENTAL TRYOUT OF THE
OBJECTIVE FLIGHT-CHECK FORM

In the development of the Objective Flight-Check Form, over 500 airline pilots and CAA agents contributed their ideas. This research has been supported by the CAA through the National Research Council. Preliminary tryouts in the Air Force and CAA have indicated that this new flight-check has considerable merit. Many individuals and organizations, including especially the Air Transport Association, the Air Line Pilots Association, the Civil Aeronautics Administration, and operations personnel of the airlines have given considerable assistance in the preparation of the final form.

To determine how well the new form aids check pilots in making consistent judgments, each of a number of pilots will take two check rides. On the check rides, each of three check pilots will evaluate the pilot's performance with either the Objective Flight-Check Form or, for purposes of comparison, the regular CAA ATR flight-check.

We are asking you to record the pilot's performance on the regular CAA ATR flight-check report, form 342A. These reports will not form a part of either company or CAA personnel records. For the tryout, form 342A has been modified by stapling a mimeographed sheet to the front. Please fill in the information requested with some care, so that no confusion will be encountered in analyzing results. It is not necessary to complete the regular front page of form 342A.

It is felt that you will experience no difficulty in evaluating the pilot's performance, since the maneuvers in the new flight-check do not differ considerably from those in the standard ATR check.

In order to assure independent evaluation of performance, please do not discuss the check ride with the other check pilots or with the examinee, until the second ride for each pilot has been completed and the forms turned in.

Your cooperation in this tryout is necessary for a fair and accurate evaluation of the Objective Flight-Check Form.

American Institute for Research
A-14 Form D
11 May 1949

NOTES TO PILOTS FOR THE EXPERIMENTAL TRYOUT
OF THE OBJECTIVE FLIGHT-CHECK

The flight-check which you are helping to test in this experimental tryout is the result of over a year's careful research into the nature of airline flying. During this period approximately 500 airline pilots and CAA agents have contributed their ideas. (For a detailed description of how the flight-check was developed, see page 1 of the "Standardized Form for the Airline Transport Rating Flight-Check.")

The development of the flight-check to its present form owes much to what was learned in previous tryouts with Air Force pilots and CAA personnel and to valuable suggestions received from the Special Pilots Advisory Committee (ALPA), the Civil Aeronautics Administration, and the Air Transport Association. These three latter organizations have all endorsed its use in a final experimental tryout on airline pilots -- the one in which you are now participating.

We are particularly interested in this tryout in finding out how consistently the check measures flying skill and how closely check pilots agree in their estimates of the flying proficiency of the pilots who fly the check rides. For purposes of comparison, the present CAA ATR check will also be used. You will be asked to fly two check flights, separated by a one day interval if this can be arranged. On each flight you will be observed by three check pilots or "examiners," some of whom will be rating you on the new form and others with the present CAA check. The results of your performance on these flights are for research purposes only and will not become a part of your company's personnel records.

Remember that this is a test of the flight-check, not of you or the check pilots. Your cooperation in this tryout is necessary for a fair and accurate evaluation of the new flight-check.

APPENDIX E

INDIVIDUAL MANOEUVRABILITY COEFFICIENTS FOR BOTH FLIGHT-CHECKS

Maneuver	Product-moment r	N
1. Preparation for Flight	*	12
2. Equipment Familiarization Check	*	27
3. Cockpit Familiarization Check	*	34
4. Starting Procedure	*	40
5. Taxiing	*	39
6. Before Takeoff Procedures	.87	38
7. Instrument Takeoff	-.15	37
8. Intercepting a Predetermined Track and Tracking away from Station in Climb	.91	37
9. Minimum Speed Maneuvering and Approach to Stall	-.09	40
10. Steep Turns	.33	40
11. Rapid Descent and Pull-Up	-.13	40
12. Manual Loop Orientation and Tracking	.54	37
13. Approved Approach Procedure	.00	36
14. Approach Under Simulated 400 and 1 Conditions (Contact)	.05	30
15. ILS Approach	.36	34
16. Cross-Wind Landing	-.13	32
17. Cross-Wind Takeoff and Engine Failure After Takeoff	*	31
18. Engine-Out Landing	.49	32
19. Emergency Procedures	.05	38

* For these maneuvers, all check-pilots on one ride (and in one case both rides) gave all pilots the same score. Thus, with no variability in one array, the coefficient could not be computed.

TABLE 8

RIDE-RIDE RELIABILITY COEFFICIENTS FOR ASSIGNED NUMERICAL SCORES ON INDIVIDUAL MANEUVERS OF THE CAA FLIGHT TEST REPORT

Maneuver	Product-moment r	N
2. Equipment Exam (Oral)	.17	7
3. Pre-Flight Check	.21	24
4. Taxiing	.37	37
5. Run-Up(S)	.05	41
6. Take-Off	.28	41
9. Steep Turns	.19	41
11. Maneuvering (Minimum Speed)	.27	42
12. Stalls	.48	43
16. Propeller Feathering	.04	31
17. Maneuvering (1 or More Engines Out)	.23	29
18. Exceeding Normal Limits	.26	31
19. Recovery From Unusual Attitudes	.00	8
21. Pattern Flying	.38	8
26. Orientation	-.07	12
29. Approach Procedures	.38	37
30. Missed Approach Procedures	.42	25
31. Loop Orientation	.10	31
33. Accuracy Landings	.54	11
34. Landings (No Flaps)	*	0
35. X-Wind Landings	.27	30

* No CAA agent graded this maneuver.

TABLE 3 (cont.)

Maneuver	Product-moment r	N
37. Take-Off & Landing (400 & 1 Condition)	.46	29
38. Take-Off & Landing (W/Engine(S) Failure)	.23	34
39. Judgment	.47	39
40. Smoothness and Coordination	.43	38

APPENDIX F

DISTRIBUTIONS OF SCORES ON THE OBJECTIVE FLIGHT-CHECK AND THE FLIGHT TEST REPORT

TABLE 9

OVER-ALL SCORES FOR EACH PILOT IN THE AIRLINE TRYOUT OF THE OBJECTIVE FLIGHT-CHE

KEY

Q-NQ = Qualified-Not Qualified Score
(+ = Qual.; - = Not Qual.)
NS = "3-1-0" Numerical Score
MMS = Mean Maneuver Score
% S = Over-all Percent Score

OBJECTIVE FLIGHT-CHECK FLIGHT TEST REPORT (342A)

PILOT	RIDE ONE Check Pilot 1		RIDE TWO Check Pilot 2		RIDE TWO Check Pilot 3		RIDE ONE Check Pilot 4			RIDE ONE Check Pilot 5			RIDE TWO Check Pilo	
NUMBER	Q-NQ	NS	Q-NQ	NS	Q-NQ	NS	Q-NQ	MMS	%S	Q-NQ	MMS	%S	Q-NQ	MMS
1	+	8	+	13	+	3	-	2.9		-	3.2	67	+	3.2
2			+	3	+	1	+	2.2	93	+	2.6	90	+	2.8
3			+	0	+	1	+	2.3	90	+	2.6	87	+	2.7
4			+	3	+	10	+	3.6	70	-	2.9	70	+	3.1
5			+	1	-	7	+	2.9	78	-	3.3	60	-	3.2
6	+	1	+	1										
7	+	0			+	2	+	1.6	90	+	3.0	85		
8	+	0			+	0	+	2.1	88	+	2.6	87		
9	+	0			+	1	+	2.0		-	2.8	69		
10	+	1			+	4	-	2.7	68	-	3.3	65		
11	+	3			+	0	+	1.4	95	-	2.3	68		
12	+	1			+	0	-	3.1	65	+	2.6	82		
13	+	4			+	1	+	3.1	75	-	3.1	69		
14	-	13			+	1	-	3.5	65	+	2.9	69		
15	-	5			-	7	-	3.5	60	-	4.5	60		
16	+	1			+	0	+	3.2	80	+	2.5	85		
17	+	5	+	4	+	4	+	2.8	85	+	2.7	87	+	3.2
18	+	0	+	2	+	0	+	2.7	85	+	2.9		+	2.3
19	+	0	+	0	+	1	+	2.7	85	+	2.4		+	2.5
20	+	10	-	14	+	1	-	2.9	68	+	2.9	84	+	3.0
21	+	9	-	21	-	5	-	3.5		-	3.1		-	3.9
22	+	1	+	2	+	2	+	3.0		+	2.8		+	3.3
23	+	0			+	3	+	1.7	87	-	2.9	69		
24	+	6			+	3	-	2.9	85	+	1.4	87		
25	+	4			+	2	+	2.8	85	-	2.9	69		
26	-	34			-	31	-	3.6	68	-	3.8			
27	-	8			+	0	-	3.6	65	+	3.2	60		
28	-	5			-	8	-	3.2		-	3.5	68		
29	-	23			-	12			68					
30	-	23			-	13	-	3.7	69	+	2.5	87		
31	-	6		14	-	8	-	3.9		-	3.4	60	-	3.3
32	+	0	+	1	+	1	+	1.2	92	+	2.3	89	+	2.3

TABLE 10

DISTRIBUTIONS OF SCORES ON FIRST AND SECOND RIDES FOR THE OBJECTIVE FLIGHT-CHECK (OFC) AND THE FLIGHT TEST REPORT (FTR)

A. Qualified-Not Qualified Scores

Same Ride

	FTR Pass	FTR Fail
OFC Pass	47	15
OFC Fail	1	19

(80% Agreement)

Different Rides

	FTR Pass	FTR Fail
OFC Pass	50	20
OFC Fail	6	15

(71% Agreement)

B. Numerical Scores

	Ride 1 Mean	Ride 1 SD	Ride 1 N	Ride 2 Mean	Ride 2 SD	Ride 2 N	Both Mean	Both SD	Both N
1. OFC "3-1-0" Scores	6.2	7.74	40	4.0	5.46	31	5.2	6.93	71
2. FTR Percent Scores	75.3	18.31	26	76.1	9.93	36	75.8	14.07	62
3. FTR Mean Maneuver Scores	2.82	0.694	30	2.89	0.549	43	2.86	0.614	73

APPENDIX G

GENERAL COMMENTS ON THE OBJECTIVE FLIGHT-CHECK

TABLE 31

GENERAL COMMENTS ON THE OBJECTIVE FLIGHT-CHECK

A. **Favorable**

		Frequency
1.	Adequate for ATR, needs revision for rated pilots	7
2.	Principle of form is good	3
3.	Increases standardization	2
4.	An improvement over 3428, favorably impressed	2
5.	Provides a diagnostic record	1
6.	Breaks down and lists some of the many factors to be considered	1
	TOTAL	16

B. **Unfavorable**

		Frequency
1.	Hazardous, head in cockpit too much	6
2.	Too detailed, time consuming, cumbersome	3
3.	Need for more flexibility, cut and dried	3
4.	Not as objective as CAA form	3
5.	Simplifies flight-check for applicant; adds to the check pilot's work-load	1
6.	Gives inadequate coverage	1
7.	Not apropos to heavy equipment where piloting is split-up	1
8.	Fatiguing for applicant	1
9.	Vague, inconclusive, and dangerous	1
10.	Check pilot will decide that applicant is qualified or not regardless of notes made in flight	1
11.	Pictorial items are not always clear, sometimes difficult to judge	1
	TOTAL	22