REVISIONS OF THE STANDARD FLIGHT-CHECK FOR THE AIRLINE TRANSPORT RATING BASED ON THE AIRLINE TRYOUT

prepared by

JOHN A. NAGAY

Report on a project 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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CIVIL AERONAUTICS ADMINISTRATION
DIVISION OF RESEARCH
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Committee on Aviation Psychology

Executive Subcommittee

M. S. Viteles, Chairman

N. L. Barr	F. A. Geldard
D. R. Brimhall	W. E. Kellum
Glen Finch	S. Smith Stevens
Eric Gardner	

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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

May 15, 1950

Dr. Dean R. Brimhall
Civil Aeronautics Administration, W-2B
Department of Commerce
Washington 25, D. C.

Dear Dr. Brimhall:

The attached report, entitled Revisions of the Standard Flight-Check for the Airline Transport Rating Based on the Airline Tryout, prepared 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 work described in this report represents the culmination of an extensive and long range program begun late in 1946. The request, by the Civil Aeronautics Administration, that this broad program of research and development be undertaken by the Committee on Aviation Psychology resulted from the focusing of attention on problems of safety in commercial airline transportation. It will be recalled that this led to the appointment by the President of the United States, on June 15, 1947, of a Special Board of Inquiry on Air Safety to "study the pertinent data and information relating to the program for safety in air transportation and the factors, both mechanical and human, which enter into safe operation." In the report made by this Board on December 29, 1947, it is stated that:

> "Proficiency of pilots is of major consequence today in commercial aviation. Persons of only moderate or average competency cannot be entrusted with the responsibility of controlling modern airplanes in flight. Newer and more modern types of airplanes have intensified this responsibility. To date airplane design has not succeeded in reducing significantly the degree of proficiency needed in the pilot. Moreover, both as a matter of operation and as a matter of administrative regulation, the ultimate judgment on the safety of any operation rests with the pilot. The initiation of flight in many instances requires the concurrence of others but, once begun, its successful completion depends on the pilot."

The importance of improved proficiency measures in increasing air transport safety had been indicated by earlier developments in connection with the work of the Committee on Aviation Psychology. Reference to the research program undertaken by the National Research Council Committee on

Aviation Psychology is found in the report by the President's Special Board of Inquiry on Air Safety which mentions the steps taken by the Board to utilize the services of the National Research Council in conducting such research.

Successful completion of this research program has involved not only the utilization of extensive research facilities, but also cooperation and close contact with individual airlines; the Air Transport Association; the Civil Aeronautics Administration; the United States Air Force; and with a large number of experienced airline pilots, through the cooperation of the Air Line Pilots Association.

As a result of this series of investigations, and on the basis of extensive flight tests and revisions of preliminary versions, the final version of the objective Standard Flight-Check for the Airline Transport Rating has been developed. These extensive flight tests have demonstrated that the Standard Flight-Check yields more consistent evaluations (that is, is more reliable) than procedures currently used for the examination of candidates for the Airline Transport Rating. Moreover, by reason of the nature of its development, and close contact with pilots and operating agencies during its development, it is evident that the Flight-Check measures performance critical to the job of the airline pilot. In addition, it appears administratively practical and acceptable to those who will use it. The day to day use of the flight-check procedures will be facilitated by the manual included with the report, prepared as a guide for inspectors and Civil Aeronautics Administration agents in administering the examination for the Air Transport Rating.

The Executive Subcommittee of the Committee on Aviation Psychology has approved the Standard Flight-Check as a practical instrument which can be used in obtaining reliable measures of the performance of airline pilots during a flight test 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:eag

EDITORIAL FOREWORD

The report entitled "Revisions of the Standard Flight-Check for the Airline Transport Rating Based on the Airline Tryout" represents the fifth in a series dealing with the development and field tryout of an objective standard flight-check for use in certification for the Airline Transport Rating. The various steps in this program have been described in earlier reports. These cover:

(1) a review of the certification history of applicants for the Airline Transport Rating;[1]

(2) 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]

(3) development of preliminary forms of the objective standard flight-check, and flight testing on (a) a group of military pilots, and (b) a group of Civil Aeronautics Administration representatives;[3] and

(4) revision and final flight test utilizing a group of airline captains and first officers.[4]

The final developmental step in this program has taken the form of a revision of the flight-check on the basis of experience in the airline tryout, and preparation of a manual and outline of procedures for indoctrinating inspectors and examiners in the use of the flight-check form. With the completion of these steps, as described in this report, the National Research Council Committee on Aviation Psychology is submitting the current form of the objective standard flight-check and an accompanying manual, to the Civil Aeronautics Administration with the recommendation that Civil Aeronautics Administration inspectors and agents be trained in the use of this instrument before it is placed into use in certifying pilots for the Airline Transport Rating.

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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.

[2]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.

[3]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.

[4]Nagay, John A. The airline tryout of the standard flight-check for the Airline Transport Rating. Washington, D.C.: CAA Division of Research Report No. 88, December 1949.

It should be emphasized that this extensive developmental program, covering a period of over three years and culminating in this last revision represented in no sense an "arm chair" endeavor. On the contrary, close and continuous contact was maintained with personnel in the field who played an extremely important part in the successful outcome of the project. Particular mention should be made of the cooperation of the more than 250 airline pilots who were interviewed during the early stages of the work. From data yielded by these interviews, and from data gathered from airline company and Civil Aeronautics Administration personnel, the critical requirements of the job of airline pilot were established. It was on these critical requirements that the flight-check has been based.

Moreover, the development of flight-check elements was carried out in close cooperation with Civil Aeronautics Administration and operating personnel and other interested groups. The preliminary versions of the flight-check form were reviewed with airline company representatives, Civil Aeronautics Administration personnel, and a special Advisory Committee of the Air Line Pilots Association.

It is believed that the objective Standard Flight-Check for the Airline Transport Rating, yielded by this extensive program of research and development, has achieved the goals which were set at the inception of the work, namely the development of flight-check procedures (1) more reliable (i.e., yielding more consistent results) than currently used methods of evaluating flying proficiency (2) measuring elements of the job most critical to the success or failure of the airline pilot (3) practical in an administrative sense, and (4) acceptable to those whose job it would be to administer the flight test.

This project was carried out, under the auspices of the National Research Council Committee on Aviation Psychology, by the American Institute for Research. The work described in this report was conducted by Mr. John A. Nagay under the general direction of Dr. John C. Flanagan. Acknowledgment to individuals and agencies cooperating in this phase of the investigation are presented on page ix of this report. It should be stressed again, however, that the success of this project has been due to the cooperation of many individuals, in particular personnel associated with the Civil Aeronautics Administration, the Air Line Pilots Association, the Air Transport Association, and individual Airline companies.

Morris S. Viteles, Chairman
Committee on Aviation Psychology

May 15, 1950

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ACKNOWLEDGMENTS

Most of the individuals to whom special acknowledgment is due for their participation in this project in various capacities are listed in footnotes in the body of the report.

The entire series of flight-check projects was conducted under the general direction of Dr. John C. Flanagan, Director of Research of the American Institute for Research. Other staff members assisted at various stages, notably Dr. Elmer D. West, Miss Geraldine Spaulding, Mr. Robert Fitzpatrick, Mrs. Sally B. Webster, and Miss Virginia Edmonds.

Dr. Morris S. Viteles, Chairman of the Committee on Aviation Psychology, and the members of that committee gave valuable advice and support throughout.

The flight-check could not have been developed without the continuous support of Dr. Dean R. Brimhall, and other Civil Aeronautics Administration officials and their staffs, particularly Mr. F. B. Lee, Mr. W. T. Jarrell, Jr., Mr. W. B. Barnes, and Mr. F. M. Lanter.

Mr. David L. Behncke, and the pilots of the Air Line Pilots Association's Special Pilots Advisory Committee have offered valuable assistance and suggestions.

General Milton W. Arnold and the Air Transport Association of America facilitated the completion of the tryout phases and assisted with the distribution of informative materials to their member airlines.

John A. Nagay
Project Director
American Institute for Research

26 April 1950

SUMMARY

This report is the last of a series describing the development of an improved procedure for certifying pilots for the Civil Aeronautics Administration Airline Transport Rating.

Previous reports have covered the development of the flight-check and its tryout with Air Force, CAA, and commercial airline pilots. Following the tryout with the latter group, additional funds were obtained for the purpose of revising the check on the basis of the suggestions made by the Civil Aeronautics Administration agents, airline check pilots, and the airline pilots who acted as "applicants" for the ATR, and for the preparation of a manual to accompany the new procedure.

The check, in its present final form, incorporates many of the suggestions offered by the participants in the airline tryout. Before changes in the form were actually made, however, the suggestions were reviewed and evaluated by two agencies, both well-qualified to appraise them. These were the Special Pilots Advisory Committee of the Air Line Pilots Association and representatives of the Civil Aeronautics Administration Office of Aviation Safety. The manual was developed with the assistance of personnel of the Civil Aeronautics Administration Aeronautical Center.

The flight-check is ready for official use. It has been shown to be important in the accurate evaluation of the high-level skills essential in transport flying and its use should contribute to the attaining of one of the major objectives of the Civil Aeronautics Administration -- safe flight.

REVISIONS OF THE STANDARD FLIGHT-CHECK FOR THE AIRLINE TRANSPORT RATING BASED ON THE AIRLINE TRYOUT

I INTRODUCTION

This report covers the final developmental steps in a research project designed to produce an objective, reliable procedure for evaluating the proficiency of airline pilots. Three previous reports, published by the Division of Research, Civil Aeronautics Administration, covered earlier developmental and tryout phases.[1,2,3] A fourth brief report, prepared for distribution to the airline and Civil Aeronautics Administration personnel participating in the final tryout and emphasizing the results of that tryout, is attached as Appendix A.

The entire series of flight-check studies was conducted by the American Institute for Research under the auspices of the National Research Council Committee on Aviation Psychology and with funds supplied by the Division of Research, Civil Aeronautics Administration.

The project was begun early in 1947. Its first phases consisted of surveying currently used methods of measuring pilot proficiency and reviewing previous research aimed at developing improved measures. The critical skills required of the airline pilot were then determined and procedures developed for measuring these critical skills. The level of flying proficiency chosen to be measured was that required of pilots who apply for the Airline Transport Rating. Following the development of these procedures, the new flight-check was given a tryout on three groups of pilots: Air Force pilots at Barksdale Field, Civil Aeronautics Administration flight safety agents at Oklahoma City, and finally, regularly-scheduled airline pilots at various centers throughout the country. It is with the final developmental steps that this report is concerned; i.e., the revisions made in the form as a result of the suggestions of the participants in the airline tryout and the development of a training manual for those whose job it will be to use the flight-check in the field.

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[1] Gordon, Thomas The Airline Pilot: A Survey of the Critical Requirements of His Job and of Pilot Evaluation and Selection Procedures. Washington: CAA Division of Research, Report No. 73, 1947.

[2] 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: CAA Division of Research, Report No. 85, 1949.

[3] Nagay, John A. The Airline Tryout of the Standard Flight-Check for the Airline Transport Rating. Washington: CAA Division of Research, Report No. 88, 1949.

II REVISIONS OF THE FLIGHT-CHECK

Revisions based on the comments of qualified pilots and the results of item analyses followed each tryout of the flight-check. These changes were usually minor in nature, however, and involved the deletion or addition of new items, changes in wording and allowable tolerances, or the rearrangement of the sequence of maneuvers. The characteristics of the check which are relatively new among flight checking procedures and which contribute to its high reliability have remained intact. Two such "new" characteristics or techniques are, for example, the use of pictorial or diagrammatic aids and the policy of recording pilot performance in the air immediately after it is observed rather than on the ground after the flight.

Before being used in the airline tryout, the flight-check was given an exhaustive review by two agencies, both interested in the problem of pilot evaluation and well-qualified to make recommendations or offer suggestions. The form was first reviewed by the Special Pilots Advisory Committee of the Air Line Pilots Association and then by representatives of the Airman Service and Scheduled Air Carrier Division, Civil Aeronautics Administration.[4]

Revisions Following The Airline Tryout

Following the recommendations of the two agencies mentioned above, the flight-check was revised, reprinted, and the airline tryout carried out. Nine airlines[5] participated in the tryout, providing 17 captains and 15 first officers who flew a total of 63 flights. Thirty-three airline check pilots and 30 Civil Aeronautics Administration agents did the actual flight-checking. Throughout the tryout, the comments and suggestions of all participants — Civil Aeronautics Administration personnel, airline check pilots, and the pilots who acted as subjects, were solicited and recorded.

Following the airline tryout, additional funds were obtained for the purpose of preparing a final draft of the flight-check incorporating the suggestions of the tryout participants and preparing a training manual.[6]

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[4] Nagay, John A., ibid, p. 5ff.

[5] American Airlines, Chicago and Southern Air Lines, Eastern Airlines, Mid-Continent Airlines, Northeast Airlines, Trans World Airlines, Colonial Airlines, Delta Air Lines, and Northwest Airlines.

[6] "Final" in this case means final as far as an independent research organization is concerned. A period of service testing is planned for the flight-check by the CAA after the form is turned over to them, and this may suggest further modifications.

The first review was carried out with the cooperation of the Special Pilots Advisory Committee.

Review of Participants' Suggestions by Representatives of the Air Line Pilots Association

The specific suggestions of the Civil Aeronautics Administration agents and airline pilots participating in the airline tryout of the flight-check were assembled into booklet form (Appendix B). In a conference in December with representatives of the American Institute for Research, the comments of the Special Pilots Advisory Committee[7] and Mr. David L. Behncke, President of the Air Line Pilots Association were obtained.

The group went over the flight-check item-by-item and considered both the suggestions of the participants and "new" suggestions which arose out of comments by the group. The opinions and comments on each of the questions raised by the participants were added to the booklet of participants' suggestions. These combined comments were presented to representatives of the Civil Aeronautics Administration in Washington on Jan. 13, 1950.[8]

Review of Combined Participant and ALPA Suggestions by CAA Representatives

Here again the flight-check was reviewed item-by-item and the suggestions of the participants and the pilot committee's suggestions were carefully considered and revisions made. A final form of the flight-check was prepared. In general, the changes incorporated were concerned with specific details, the most extensive being a rearrangement of the "radio work" maneuvers. The Air Line Pilots Association was given an opportunity to examine the form before it was printed and the comments of the Association on this draft are attached as Appendix C.

A few very minor changes in wording also came about as a result of an examination of the check by personnel of the Civil Aeronautics Administration Aeronautical Center at Oklahoma City and it was finally sent off to be printed in March 1950. This latest edition, titled "Pilot Flight Test Report for the Airline Transport Rating Flight Examination", may be found as Exhibit 1 in the front cover pocket of this report.

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[7] Mr. W. W. Anderson, Capt. D. Nichols, Capt. L. L. Treece, Capt. R. G. Strait, and Mr. C. N. Sayen.

[8] Mr. W. B. Barnes, Mr. H. W. Clapsaddle, Mr. W. W. Jarrell, Jr., Mr. R. F. Nicholson, and Mr. C. G. Noeller.

III THE DEVELOPMENT OF A MANUAL TO ACCOMPANY THE FLIGHT-CHECK

Shortly after the completion of the airline tryout of the flight-check, work was begun on the development of a manual to accompany the form. The manual was suggested by Dr. Dean R. Brimhall, CAA Coordinator of Research, and was designed for the use of the personnel of the Civil Aeronautics Administration Aeronautical Center at Oklahoma City and the agents and designees who do flight-checking in the field.

Several individuals familiar with the flight-check reviewed the first draft of the manual and on March 22, 1950, it was taken to Oklahoma City for review by the personnel of the Civil Aeronautics Administration Aeronautical Center. The function of the Center is to indoctrinate newly inducted trainees in Civil Aeronautics Administration procedures and to conduct refresher and standardization courses for established agents. Approximately 20 courses are offered of which 3 apply directly to flight-checking: a refresher course, a course in which the trainee himself qualifies for the Airline Transport Rating, and a course in flight test standardization which is combined in the other two. Combined, these courses comprise some 6 weeks of the curriculum. Since the Center is the main source of agent indoctrination and Center personnel are experts in this field, it was, of course, essential that they be consulted concerning the development of the manual.

Several of the Center's staff offered suggestions for the revision of the first draft[9] and an intensive review of the entire form was conducted on March 23. It was the feeling of the group that the manual should be small in size and considerably shorter than the first draft. The final draft, incorporating the suggestions of the group, became a small booklet, approximately the same size as the flight-check booklet, of 24 pages and covered four main areas:

a. The Development of the Flight-Check
b. Basic Principles of Flight-Check Standardization
c. Using This Flight-Check
d. Interpreting and Reporting Performance

The rationale of the manual is that the check pilots who use the flight-check should understand the basic principles upon which it was constructed. The unindoctrinated check pilot might possibly use this form in the same way that he uses any other, with consequent loss to the new procedure's effectiveness. He will also be more sympathetic to the use of this form if he is told why it is the way it is.

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[9] Mr. T. K. Archer, Mr. A. C. Barnard, Mr. L. G. Covert, Mr. V. Holden, Mr. W. D. Jones, Mr. F. M. Lanter, Mr. M. C. Morgan, Mr. W. J. Smith, and Mr. H. C. Wescott.

In addition the manual provides supplementary information where necessary and detailed information for the over-all evaluation of flying proficiency. A copy of the manual may be found as Exhibit 2 in the back cover pocket of this report.

The preparation of the revised flight-check and the manual constitute the last steps in the series of projects concerned with the development of a new procedure for certifying pilots for the Airline Transport Rating. The flight-check is now believed to be ready for official use by the Civil Aeronautics Administration in certifying transport pilots in large multi-engine equipment. In an earlier report, Gordon[10] set certain standards for the new flight-check.

(1) That it be more reliable than current methods of evaluating flying proficiency. What was wanted was a method which when used by different check pilots would decrease the amount of disagreement shown by check pilots evaluating the same pilots.

(2) That it measure the skills which are most relevant to success or failure of the airline pilot on the job. What was wanted was an evaluation procedure that would measure the skills which had been found to make the difference between safe and efficient flying and flying which is not.

(3) That it be practical. Because of the difficult conditions under which pilots must be evaluated in the air, it was intended that efforts would be made to construct the new evaluation procedure to fit these conditions.

(4) That the new procedure would be acceptable to those whose job it would be to use it.

It appears that these standards have been met. The flight-check is important in the accurate evaluation of the high-level skills essential in transport flying and the use of this new flight-check should contribute to attaining one of the major objectives of the Civil Aeronautics Administration -- safe flight.

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[10]Gordon, Thomas. op. cit., p. xv

IV. SUGGESTIONS FOR A TRAINING COURSE IN FLIGHT-CHECKING PROCEDURES.

The effective use of the objective Standard Flight Check requires that inspectors and CAA agents be thoroughly trained in its application. It has been suggested that such training can be incorporated with the program of instruction administered through the CAA Standardization Center located at Oklahoma City.

In Appendix D is presented an outline for use in providing such training for inspectors and CAA agents. The outline includes a review of the manual and provides opportunities (a) for the demonstration of the manner in which the points raised in the manual apply to the administration of the flight check, and (2) for answering questions which may be raised by trainees concerning both the manual and the objective Standard Flight Check.

The training outline is tentative in character, and merely illustrates how the manual and certain other supplementary materials can be used to advantage in training inspectors and CAA agents. The situation at the Standardization Center or in the field may make it necessary to alter the details of the tentative outline.

APPENDIX A

THE AIRLINE TRYOUT OF A REVISION OF THE CAA FLIGHT TEST REPORT

AMERICAN INSTITUTE for RESEARCH
413 Morewood Avenue
Pittsburgh 13, Pennsylvania

10 January 1950

THE AIRLINE TRYOUT OF A REVISION OF THE CAA FLIGHT TEST REPORT

This is a brief explanatory note to describe the airline tryout of a revision of the CAA Flight Test Report.* This revision was developed as a possible substitute for the present CAA Form ACA-342A. It should be emphasized that the revision was not designed as a substitute for the six-months checks now used by the airline companies. However, the problems of flight-checking on the six-months checks are very similar and many of the methods and some of the maneuvers should be equally applicable. The problem of this latter check has been recommended as the subject for a subsequent study.

More than two years ago, the American Institute for Research, a non-profit research organization with experience in studies of aircrew problems, was assigned the task of applying new procedures to the problems of flight-checking. This work was carried out under the auspices of the National Research Council's Committee on Aviation Psychology with funds from the Civil Aeronautics Administration. The fundamental purpose of the research was to develop an objective flight-check for use in the original certification of airline captains; one based on recorded observations of pilots' performance on a standard set of maneuvers of critical importance. In devising the new check, the attempt was made to overcome a number of difficulties involved in flight-checking.

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* For detailed accounts of the development and tryout of the Objective Flight-Check, see:

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.: Civil Aeronautics Administration Division of Research, Report No. 85, April 1949.

Nagay, John A. The Airline Tryout of the Standard Flight-Check for the Airline Transport Rating. Washington, D.C.: Civil Aeronautics Administration Division of Research, Report No. 88, November 1949.

WHAT ARE THE PROBLEMS IN FLIGHT-CHECKING?

(1) The problem of what aspects of the pilot's job to measure

A flight-check that covered all possible aspects of the airline pilot's complex job would be entirely too long for practical use. It is necessary, therefore, to select only parts of the job for checking. But check pilots differ in their opinions of what maneuvers should be included; what one check pilot may consider to be important, another may feel is not essential.

In the construction of the Objective Flight-Check, this problem was met by basing the new check on those aspects of the pilot's job which were shown by research to be critical. Studies of accident reports and analyses of interviews with several hundred airline pilots and CAA agents produced a list of the critical requirements of airline pilots - those things which pilots do which make the difference between flying that is safe and that which is hazardous. There are a number of things that pilots do, such as takeoffs, turns, approaches, and landings. In each of these maneuvers some parts are critical and some are unimportant. The present check emphasizes those elements of the job which have been demonstrated to be critical.

(2) The problem of remembering and reporting

Flight-check forms in current use are generally filled in on the ground; therefore the accuracy of the check pilot's judgment depends to a large extent on how well he remembers what occurred during the flight. Many studies on the reports of eye-witnesses have made it common knowledge that memories of specific events tend to be blurred and distorted.

The check pilot using the Objective Flight-Check need not rely on memory because all recording is done in the air immediately after observations are made. Furthermore, he may devote his entire attention to observing and recording since it is planned that he conduct the check from the jump seat and that a safety pilot be provided to watch for other traffic from the right-hand seat.

(3) The problem of objectivity in observing and describing pilot performance

Even though observations are made and recorded immediately, the reports do not always convey the same impression to others. Many currently-used flight-checks consist of a list of maneuver titles with spaces following each for recording whether the pilot's performance was "Good," "Fair," or "Poor." Such reports can mean quite different things to different people.

Pilots who are checked with the Objective Flight-Check are assured that the judgment of their performance will be based on objective detailed records of what occurred during the check flight. Objectivity is attained by means of the following three techniques:

(a) The use of pictorial diagrammatic aids which portray various courses and attitudes of the plane for easy reference and comparison by check pilots.

(b) The use of quantitative data such as those which can be read accurately from flight instruments.

(c) The use of precise descriptions - not "how well" a pilot accomplished the ILS Approach as a whole, for example, but specifics such as that after the procedure turn he overshot or undershot the localizer or that he did not use the check list.

(4) The problem of uniformity in standards of performance

Check pilots differ in the standards which they expect pilots to meet. In addition to the fact that most flight-checks do not specify the standards in operational terms, their differences are probably due to variations in check pilot proficiency, training, and attitudes.

Standards on the Objective Flight-Check are the same for everyone; the items specify the standards which are to be met. Expert check pilot judgment is, however, indispensable, and is utilized in evaluating pilot performance on the new check. The basis of any flight-check must be the trained judgment of the check pilot as observer and reporter. The Objective Flight-Check helps him in his task by focussing his observations on the points of importance, and by providing a convenient record of his observations. The new check sets standards of performance which are uniform for all examiners, and it serves as a continuing reminder of the need for these consistent standards.

(5) The problem of defining the task for the pilot

Many flight-checks do not spell out the task for the pilot - he is uncertain as to precisely what is expected of him. For example, some people consider it most important not to lose any airspeed, while others emphasize the maintenance of a constant altitude. However, the examinee is frequently not informed of these individual standards.

The Objective Flight-Check stipulates that the check pilot and examinee discuss the flight on the ground so that the examinee knows in advance the limits he is expected to maintain.

Another factor that contributes to misunderstanding of the task is the lack of clear and uniform instructions.

The Objective Flight-Check outlines each point to be covered in such a way that the possibility of misunderstanding on the part of the pilot is minimized.

(6) The problem of acceptability of flight-checking procedures to pilots

An analysis of comments collected regarding the usual flight-checking procedures indicates that pilots frequently do not agree with the judgment of check pilots concerning their flying proficiency. Research has also shown that check pilots flying on the same flight often disagree in their ratings of the pilot's skill.

High agreement between check pilots is obtained on the Objective Flight-Check. For a pilot to know whether or not he has done a good job, he has simply to refer to the record.

(7) The problem of consistency of measurement

It is a common belief of check pilots that flying proficiency varies greatly from flight to flight. This belief is natural in view of the fact that flight-checks in general use result in inconsistent scores on successive flights. All the factors listed above contribute to this "unreliability" of flight-checks.

However, if basic skills are measured by the flight-check (and are measured objectively) the check should measure consistently. The Objective Flight-Check has shown higher agreement between scores on successive rides by the same pilot than any other on which data are available.

HOW SUCCESSFULLY HAVE THESE PROBLEMS BEEN MET?

If the new flight-check helps check pilots to agree in their evaluations of pilot proficiency - if it is a reliable flight-check - then it has met these problems successfully. The results of tryouts in which its reliability was tested are shown below. Note that these were not tests of the specific features. (Research is now under way to determine the individual contribution of features such as pictorial items, recording in the air, standard instructions, etc., to flight-checking procedures.) The tryouts reported here indicate that the over-all effect of this revision has been to produce a much more reliable flight-check.

Air Force and CAA Tryouts

The first tryout of the Objective Flight-Check was conducted at Barksdale Field with the cooperation of Air Force pilots. Twenty-seven pilots flew the check-flight twice. They were observed on the first flight by two check pilots and by two different check pilots on the second. Good check pilot agreement on the same and on different flights was demonstrated.

The check was revised on the basis of the findings of the first tryout and repeated with the same design on twenty-six CAA examiners and instructors at Oklahoma City. Here the results were even better and higher reliabilities were obtained than any reported in previous studies of earlier types of flight-checks.

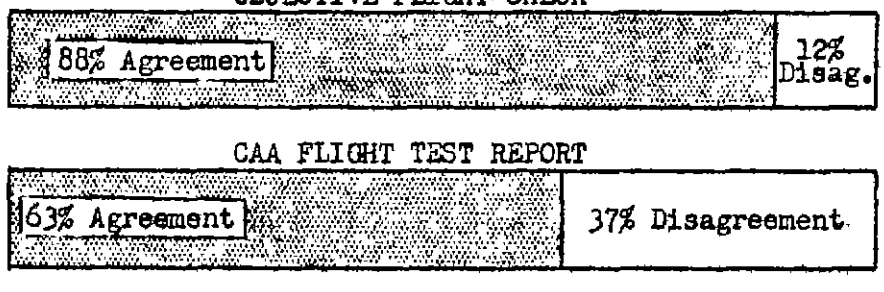
The Airline Tryout

The airline tryout compared the revised procedure with the one in current use: the CAA Flight Test Report Form ACA-342A. Airline personnel and CAA agents participated in an extensive tryout in which both flight-checks were used. A total of sixty-three experimental flights were flown by the following airlines:

Eastern Air Lines
American Airlines
Transcontinental and Western Air
Chicago and Southern Air Lines
Mid-Continent Airlines
Northeast Airlines
Northwest Airlines
Delta Air Lines
Colonial Airlines

Each pilot "applicant" flew two check rides, on different days. On each ride, CAA agents and airline observers rated his performance in the new flight-check booklet and on the CAA ATR Flight Test Report. There were different observers on the first and second rides. The diagram below shows how well the final Qualified-Not Qualified ratings agreed from one flight to the other.

AGREEMENT OF FLIGHT-CHECK RESULTS FOR SUCCESSIVE DAYS



Here is clear evidence that check pilots using the new flight-check are able to agree in their ratings of pilot performance and that the new flight-check measures consistently. With increased familiarity and training, this flight-check should give even better results. A final revision will be made on the basis of the comments and suggestions of pilots and check pilots who have used it.

WHAT BENEFITS CAN BE EXPECTED FROM THE ADOPTION OF THIS REVISED FLIGHT-CHECK?

(1) The adoption of this revised flight-check as the flight-check for the Airline Transport Rating will provide a more uniform standard of proficiency. Everyone will have to meet the same requirements. The provision of a record of just what the plane and pilot did will make the decision regarding certification more a function of the pilot's performance on the flight-check and less dependent on the biases of the particular check pilot to whom he happens to be assigned.

(2) With the adoption of this check, the pilot will be examined on the critical aspects of his job. The maneuvers included in this check are restricted to 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.

(3) The objective flight-check will help in the development of the pilot. The precise record of actual flight performance will point out the specific areas in which additional practice and training are needed to insure a high degree of proficiency. These records will show just why pilots have failed to qualify, and can serve as an index of the effectiveness of training procedures. An applicant who has failed will know exactly what he needs to practice; he can concentrate on these areas of weakness and not waste time on skills that he has thoroughly mastered. Even the applicant who has qualified should benefit, since the flight-check booklet will remind him of his minor lapses and show him which maneuvers he should emphasize in future practice to maintain and improve his proficiency.

(4) Finally, the resulting increase in the accuracy of the certification examination will contribute to the maintenance and improvement of high standards of pilot proficiency and safety in scheduled operations.

APPENDIX B

SUGGESTED FLIGHT-CHECK REVISIONS: AIRLINE TRYOUT PARTICIPANTS

SUGGESTED FLIGHT-CHECK REVISIONS: AIRLINE TRYOUT PARTICIPANTS

3. COCKPIT FAMILIARIZATION CHECK (p.5)

Suggested revisions:

1. In Item 2, it has been suggested that an allowance of three items incorrectly identified is too great for satisfactory performance. Would it be better to limit satisfactory performance to 24 or 25 items correctly identified. Ability to quickly identify and locate controls, valves, switches, and instruments is especially important for safe operation.

5. TAXIING (p.7)

Recommended revisions:

1. In Item 1, change "Obtained clearance to taxi" to "Made certain clearance to taxi obtained." Change "Failed to obtain clearance to taxi" to "Failed to make certain clearance to taxi obtained".

2. In Item 2, change "Slow" to "Too Slow". Add dotted lined box "Safe Speed" following "Too Slow" box.

3. In Item 7, change "other airplanes" to "collision objects".

6. BEFORE TAKEOFF PROCEDURES (p.8)

Suggested revisions:

1. In Item 2, should we include instructions for the pilot to point out the instruments as he checks them?
   Should we revise the instructions as follows:
   Instruct him to:
   1. Go through the run-up and pre-takeoff check when ready.
   2. Point to the engine and flight instruments as they are checked.

   Wouldn't this aid the check pilot to know which instruments were checked? Or should the pilot call out the instruments as he checks them?

Recommended revisions:

1. In Item 2, add a fourth condition to be kept in mind while positioning the plane for run-up: "Condition of area beneath propellors".

7. INSTRUMENT TAKE-OFF (p.9)

Suggested revisions:

1. Is there any real need for making this maneuver an optional one?

2. Is Item 3 clearly stated? Is it easily understood here that this item covers the short period during the takeoff just after the airplane becomes airborne and before the climb is established?

Recommended revisions:

1. The footnote for Item 3, should be changed to "Airspeed as prescribed in the approved airplane flight manual".

8. INTERCEPTING A PREDETERMINED TRACK AND TRACKING AWAY FROM STATION IN CLIMB (p.10)

Suggested revisions:

1. In Item 1, should failure to set gyro and/or azimuth with magnetic compass be disqualifying? Research data indicate that this error is a critical and frequently occurring error.

2. In Item 2, what is the best way to word this item? Would "Turned so as to intercept track with fewest degrees of turn" be more clear than "Turned right direction to intercept track quickest"?

9. MINIMUM SPEED MANEUVERING AND APPROACH TO STALL (p.11)

Suggested revisions:

1. Since some pilots feel that a stall in turn is too dangerous to be performed in a DC-3, should this item be omitted, or should it be included because it is critical?

   Should a stall with gear and flaps down be included?

2. Referring to Item 7, one group of pilots consider "the use of ailerons important in recovering from a stall; however, not as important as correct use of rudder in recovery". Research data indicate that improper use of aileron is the critical behavior. Should an additional item "Use of Rudder in Recovery" be included?

9. MINIMUM SPEED MANEUVERING AND APPROACH TO STALL (p.11) (con't)

Recommended revisions:

The instructions for this maneuver have been revised as follows to eliminate vagueness and ambiguity:

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

Instruct him to:

(1) Slow the plane down, etc.
(2) Make two shallow 180° turns one to the right and one to the left. Then, make two more shallow 180° turns, one to the right, and one to the left.

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

(1)

(2)

Next, instruct him to:

(1) Pull the plane up slowly when the signal is given until it approaches a stall. Do two stalls, one with wings level and one in turn.
(2) Recover as soon as buffeting is noticeable.

(3)

(4)

(5)

(6)

(7)

Qualified
Not Qualified

Comments:

10. STEEP TURNS (p.12)

Suggested revisions for discussion with CAA and ALPA representatives

1. It was felt that rather than specifying "steep turns (45° bank)", we should specify "steep turns (maximum bank as recommended by the manufacturer)" in the instructions.
Should we make such a change?

(2) Should turns through 360° rather than 180° be required?

11. RAPID DESCENT AND PULL-UP (p.13)

Suggested revisions:

1. What is the optimal speed for this maneuver? One airline reports making rapid descents at holding or cruising airspeeds. The Pilot Examiner's Handbook, Spetember, 1949, gives these instructions, #18. Exceeding Normal Limits: "Execute at normal approach speed: rapid descent of at least 1,000 feet, followed by level flight of one minute and a climbing 180° turn at maximum rate of climb. This will simulate letting down to a field surrounded by obstructions, followed by an emergency pull-up. Full panel will be used".

   Is the "normal approach speed" referred to in the above quotation normal insturment approach speed or normal contact approach speed? Is "Recommended Instrument Approach Speed" (Item 1) correct or should some other airspeed be used?

2. Should this maneuver be conducted with gear and flaps down? Is this more realistic?

   Might we also consider a possible reduction in flap setting prior to establishing minimum level flight?

3. Should a turn of at least 180° be made during the pull-up?

4. In Item 3, should the altitude limits be changed to 50 or 100 feet above and 0 feet below rather than 50 feet above and 50 feet below.

Recommended revisions:

1. In Item 5, change "Prescribed power settings are: " to "Prescribed METO power settings are: " .

2. The instructions should be clarified to read as follows:

   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

11. RAPID DESCENT AND PULL-UP (p.12) (con't)

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. Begin the descent as soon as the second hand on the clock is at the 60 second mark. Descend at the recommended instrument approach speed which is (_____).
(3) Stop the descent at 300 feet above field elevation.
(4) Begin a missed approach procedure two minutes after passing station.
(5) Climb away at the recommended climb speed, which is (_____).

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) Heading should be held constant during the descent.
(3) A leeway of ± 15 seconds is allowed on the time for application of power for the pull-up.
(4) Altitude at minimum altitude must be held to within ± 50 feet.

12. MANUAL LOOP AND TRACKING (p.13)

Suggested revisions:

1. In Item 1, should there also be a check on volume control, or does volume determine the "good null width".

13. APPROVED APPROACH PROCEDURE (p.15)

Suggested revisions:

1. Should the use of radio procedure, "in range", and/or "before landing" check lists be included?

2. Should voice procedure and ability to follow ATC directions be included?

3. Should bracketing the leg and following correct track be included?

4. In Item 3, should the altitude limits be changed to 50 or 100 feet above and 0 feet below?

14. APPROACH UNDER SIMULATED 400 AND 1 CONDITIONS (CONTACT) (p.16)

Suggested revisions:

1. In Item 3, should the below limits minimum be 350 feet until a straight-in landing can be made?

2. In Item 5, should the prescribed airspeed refer to maneuvering final approach, or over-the-fence airspeed?

Recommended revisions:

1. In Item 6, the second box ("Touched down beyond first third") should be disqualifying (heavy-lined) and the third box ("Made go-around because of overshooting") should be lightlined.

15. ILS APPROACH (p.17)

Suggested revisions:

1. In Item 1, should the second box ("Missed one or more items on written checklist") be disqualifying also?

2. In Item 3, is the airspeed initial, final, or letdown airspeed?

16. CROSS-WIND LANDING (p.18)

Recommended revisions:

1. Item 4 is out of sequence, and should follow Item 6 as follows:

Item 3 - airborne, flareout
Item 5 - airborne, attitude at touchdown
Item 6 - airborne, alignment above runway
Item 4 - touchdown
Item 7 - landing roll

17. CROSS-WIND TAKEOFF AND ENGINE FAILURE AFTER TAKEOFF (p.19)

Suggested revisions:

1. In Item 2, should the third box ("Held plane on ground too long") be disqualifying (heavy lined) or at least lightlined?

2. Should we consider checking altitude control? We might add an item as follows:

---

(6)

	Held altitude	Continued climb	Lost excessive altitude
ALTITUDE CONTROL	☐	☐	☐

18. ENGINE-OUT LANDING (p.20)

Suggested revisions:

1. It has been noted that on four engine equipment, two engines should be cut on this maneuver. Should we bring this to the check-pilot's attention? We might do it this way:

18. ENGINE-OUT LANDING
(Engine(s) throttled to 15" MP)

In four-engine aircraft it will be necessary to throttle two engines rather than just one engine.

In your directions etc.

Recommended revisions:

1. In Item 6, the third box ("Touched down beyond first third") should be disqualifying (heavy lined), and the fourth box ("Made go-around because of overshooting").

19. EMERGENCY PROCEDURES (p.21)

Suggested revisions:

1. It was suggested that this maneuver be used several times with a different emergency each time; i.e., carburetor, wing, windshield icing etc. Is this suggestion feasible, or would it make the check too long?

Recommended revisions:

1. There was some misunderstanding about when this maneuver should be performed. In order to make clear the idea that this maneuver can be done at any time during the flight-check, not necessarily at the end, we recommend these directions:

> "Cut an engine or engines sometime during a turn. This maneuver can be performed at your discretion any time during the check when a turn is required".

To place further emphasis on this point, it might be desirable to add suggestion (8) under How You Can Use This Form (p.2) as follows:

(8) Notice that Maneuver No. 19, Emergency Procedures on page 21 may be flown at any time.

APPENDIX C

LETTER FROM THE AIR LINE PILOTS ASSICIATION CONCERNING THE PROPOSED REVISIONS IN THE FLIGHT-CHECK, FEB. 21, 1950

(COPY)

AIR LINE PILOTS ASSOCIATION
International
3145 West Sixty-Third Street
Chicago 29

February 21, 1950

Mr. John A. Nagay, Project Director
American Institute for Research
Pittsburgh 13, Pennsylvania

Dear Mr. Nagay:

We regret not having forwarded to you sooner our comments on the latest revision of the Objective Flight Check Form which Dr. Flanagan left with us some time ago. We have studied this latest revision carefully and wish to comment herein on the Check Form on all of the maneuvers and instructions presently contained therein.

HOW YOU CAN USE THIS FORM

Respecting the instructions on page 2, we feel that item (8) relating to power settings is somewhat confusing. Does this mean that the pilot should use power settings that he would normally use if the airplane were loaded to its maximum certificated gross weight for the phase of the flight concerned?

1. PREPARATION FOR FLIGHT
This appears to be in order

2. EQUIPMENT FAMILIARIZATION CHECK
Respecting this particular maneuver, we still feel that the instructions should definitely stipulate that a written check list should be supplied the applicant and such check list used in evaluating his knowledge of the airplane.
It is noted that our previous recommendations on this matter have not been made in this final revision. Respecting the evaluation boxes, if a written check list is used, the two solid lined washout boxes seem perfectly in order. If no check list is used, the test in question becomes so subjective that we feel that failure on the check is too serious an evaluation.

3. COCKPIT FAMILIARIZATION CHECK
It is apparent that our recommendations from the beginning respecting the de-emphasis of speed in a check of this nature is not concurred with by other groups. It is the air line pilots' viewpoint that this emphasis of speed in flight training creates a definite hazard. It is far more important that the applicants demonstrate a knowledge of the correct positions and operation of the various controls and instruments in the cockpit rather than demonstrate the speed with which he is able to identify them. It is far more important that the applicant exercise good judgment in the preparation of the

aircraft for flight which is the prime objective of the cockpit check rather than mechanically rush through, racing against a stop watch and indicating only that he knows where each instrument or control is located. In practical operation, the cockpit check is a vital function in determining whether the controls and instruments are properly positioned and whether all components of the radio receivers and transmitters are operating satisfactorily. No mention of radio equipment is made in the latest revision of the Cockpit Familiarization Check although it logically does belong here. It is too late to check the radios after the engines are started and the aircraft is ready to taxi to the takeoff point. We sincerely believe that all timing references should be eliminated from this particular test. The applicant should be able to identify every item on the cockpit check list, check its operation and position it properly for flight. This should be done in a careful positive manner with little, if any, emphasis on speed. This entire check should be a challenge and response procedure in which the check pilot reads off the check list and the applicant checks the operation of and positions each instrument or control. Referring now to the latest revision of the Flight Check Form, we note that a number of changes have been red pencilled in respecting the instructions. We feel this should be taken one step further. Instruction (1), we feel, should read, "Demonstrate familiarity with the cockpit of the airplane by identifying, without indecision or faltering, all items which will be read off the cockpit checklist." Instruction (2), in our estimation, should be deleted from the instructions. The sentence beginning, "A good showing..." we feel, should also be deleted and the paragraph beginning with the words, "Begin timing as you call..." should be deleted in its entirety. Respecting the items in this particular test, our recommendations remain unchanged. Item (1) could be "Completeness of Cockpit Check" with two alternative evaluation boxes; "Checked all items on checklist"; "Missed one or more items", similar to that used in the "Starting Procedure" maneuver. Item (2) could stand as is and we feel that it would be entirely proper for an item (3) to be added respecting tuning and checking radios. This latter item could be lifted from the "Starting Procedure" maneuver.

4. STARTING PROCEDURE

It is noted that the items making up this test have been re-arranged so that "Tuning and Checking Radio" is listed as item (1). If it is necessitated that this particular item be included in the "Starting Procedure" maneuver, we do concur that it should be the first item in such maneuver, taking place prior to the starting of engines. Respecting the new item (3) on "Completeness of Pre-starting Check", we feel that the heavy lined box should be a light lined box. Since a written checklist is used, it is not likely that any items will be missed and if an item is missed, the most serious thing that could occur is that the engines will not start.

5. TAXIING
This maneuver as revised appears now to be satisfactory.

6. BEFORE TAKEOFF PROCEDURES
This maneuver as revised appears now to be satisfactory.

7. INSTRUMENT TAKEOFF
It is noted that this particular maneuver remains in the flight check as a mandatory maneuver. We still strongly feel that it should be optional. No applicant for an ATR will have had any opportunity to practice instrument takeoffs. It is our recommendation that if the maneuver is conducted as an instrument takeoff that no washout penalties should be assessed against the applicant. If the maneuver is conducted as a normal takeoff, the heavy lined washout boxes seem to be in order with the exception of the heavy lined box in item (6), "Check-Pilot Assistance". We feel that the need or lack of need for such assistance is so subjective and varies so greatly with the check pilot involved that this extreme penalty is not entirely in order. Respecting item (4), "Airspeed in Climb", it is our feeling that this should be set forth in a manner similar to that used in item (5) on the following maneuver, "Intercepting a Predetermined Track and Tracking away from Station in Climb". The appropriate instruction heading the maneuver should be changed accordingly as it was done in maneuver 8. It should be borne in mind concerning this instrument takeoff maneuver that if it was designed to approximate as closely as possible actual conditions, the takeoff would be made visually with an applicant going on instruments at approximately 200 feet and continuing his climb out.

8. INTERCEPTING A PREDETERMINED TRACK AND TRACKING AWAY FROM STATION IN CLIMB
This maneuver as revised appears now to be satisfactory.

9. MINIMUM SPEED MANEUVERING AND APPROACH TO STALL
This appears now to be in more precise order than formerly. However, we feel some confusion as to clarity still exists respecting item (5), "Recovery".

10. STEEP TURNS
Since this particular maneuver is not condoned in air transport flying and since the opportunity to practice steep turns rarely occurs, we feel that it is an extreme penalty to deny an applicant an ATR for failing this maneuver especially in view of the fact that the number of items in this maneuver has been doubled over and above its original content. Washout on this maneuver was not originally contemplated and we trust this viewpoint still exists despite the fact that it is now twice as easy to fail an applicant on the maneuver.

11. RAPID DESCENT AND PULL-UP
It is noted that the instructions have been clarified respecting this maneuver. The air line pilots still feel, however, that the

washout penalties in item (1), "Airspeed in Descent" are too severe. We have continually recommended that these two boxes be light lined penalty boxes, in view of the fact that it is commonly accepted as good technique to allow the airspeed to vary over a wider range thus being able to devote more attention to other problems arising during the instrument approach and obviate the problems that could arise by constantly jockeying the throttles in an effort to maintain constant airspeed. It is our further recommendation respecting item (6), "Airspeed in Climb" be worded similar to item (5), in the maneuver No. 8, "Intercepting a Predetermined Track and Tracking away from Station in Climb". Relating to item (7), "Heading after Turn", we feel this needs further clarification. Is it necessary that the reference "180°" be included? It seems to confuse the problem. It is our understanding that the check pilot will fill in the two blanks provided in the item and that the applicant must stay within ± 5° of the direction indicated in the parenthesis to the right.

12. ORIENTATION AND TRACKING
Relative to the instructions heading this maneuver, it is our opinion that the newly drafted sentence, "Use the omnireceiver, ADF, or manual loop...", should properly follow instruction (2) rather than as it now appears following instruction (1). We believe this revision will clarify the instructions considerably.

13. You state on your insert page that a choice may be made by the applicant as to whether he desires to fly the low frequency range or an ILS approach. We strongly recommend that no such choice be permitted. We feel that the examinee should make both the radio range approach and an ILS approach since in actual operation he very often will combine the two or will be required to make one or both of such approaches, depending upon the facilities available at the different airports. Both maneuvers should be mandatory.

13A. LOW FREQUENCY RANGE PROCEDURE
Respecting item (1), we assume that the evaluation box to the right is a light lined box and not a washout box. This is in accord with our feelings on this particular item. Relative to item (3), "Airspeed on Initial Letdown", we wish to state again that we feel the arbitrary establishment of a 10 mph maximum and minimum airspeed over and above that recommended with a subsequent washout if the applicant drops more than 10 mph in airspeed is far too severe. We feel this "slow" box should be a light lined penalty box only. The same thought pertains to item (7), "Airspeed on Letdown from Station". Maintenance of constant airspeed, we feel, is not as crucial as the washout box indicates. We have set forth our reasons in a number of places in this letter and we specifically refer you to our comments at the conclusion of this report, respecting arbitrary standards on airspeed.

13B. ILS APPROACH
Respecting Item (1), the air line pilots feel that the center category, "Missed One or More Items on Written Checklist" should be deleted from the item, since, if a checklist is used and a challenge and response check is made, it is difficult to understand how the applicant could have "Missed One or More Items on Written Checklist". On item (3) we feel that the washout box for dropping 10 mph below the recommended approach speed is far too severe. This should be a light lined penalty box. Our reasons for this recommendation have been clearly set forth previously in this letter respecting the inadvisability of constantly making changes in power settings in an attempt to maintain a constant airspeed. These reasons are equally valid here. We note that a number of revisions in wording have been made in items (4) and (5) in an attempt to clarify such wording. We believe that this did improve these items but we still strongly recommend that the washout boxes in items (4) and (5) be changed to light lined boxes and that a new item be added to this maneuver as previously recommended, setting up two alternatives as follows: "Would have been able to land" (dotted box); and "Would not have been able to land without excessive maneuvering" (heavy lined box).

14. APPROACH UNDER SIMULATED 400 AND 1 CONDITIONS (CONTACT)
This maneuver as revised appears now to be satisfactory.

15. CROSS-WIND LANDING
It is noted that in item (2) a washout provision is made for dropping 10 mph under the recommended "over the fence" speed. We would like to reiterate our previous recommendations that speed at the flare-out point be utilized rather than "over the fence" airspeed, since there are so many differing opinions as to where the "fence" is. Also we feel that the slow speed washout penalty is far too severe and that it should be a light lined box.

16. CROSS-WIND TAKEOFF AND ENGINE FAILURE AFTER TAKEOFF
This maneuver as revised appears now to be satisfactory.

17. ENGINE-OUT LANDING
It is noted that specific provisions are stated for the check pilot to throttle back two of the four engines when the test is performed in a four-engine aircraft. We strongly recommend against any such practice since the excessive cooling of the throttled-back engines may result in a great hazard should it be necessary to call upon those two engines for power and emergency pull-up during the maneuver. Respecting item (4) on "Airspeed Control", we again recommend that a light lined penalty box supplant the heavy washout box presently incorporated in this item for the reason that with the wide range of speed which may be safely utilized on present day aircraft, it is proper technique to permit the airspeed to vary within such safe wide limits rather than keep the power settings constant in an effort to keep the speed constant.

18. EMERGENCY PROCEDURES
Relative to item (4), "Airspeed During Engine-Out Procedure" we wish to set forth again our recommendations as stipulated respecting airspeed in maneuver 17 and that a light lined penalty box supplant the washout box in this item.

In summary, we feel that too much emphasis has been placed on the speed of the applicant's reactions rather than to his judgment, technique and calculated control of the aircraft at all times. It is the viewpoint of the air line pilots that hasty action in the cockpit has been responsible for more mistakes than thoughtful calculated action. Therefore, neither in training nor in the administering of an ATR flight check should the applicant be given the impression that he is being rushed or harried. Too many people have the concept that as soon as a pilot receives a stimulus that something is not exactly right, he should immediately be galvanized into activity and begin cutting switches, pulling levers, etc. Experience has demonstrated that the correct remedial action in an emergency, even if slightly delayed, is superior to hasty snap judgments.

It is our opinion also that too much emphasis has been placed on arbitrary standards, particularly as they relate to time and speed control. In regard to speed control, if the applicant is warned that the prime item on which he will be evaluated is the maintenance of his airspeed within narrow limits - not necessarily the safe limits for the aircraft - he is quite likely to devote too much of his attention to this item and be diverted from all the other matters which should be receiving his consideration. Consequently, he may achieve passing performance on the control of his airspeed but his achievement level on all the other items under consideration may deteriorate. Modern aircraft have a wide range of safe speeds and therefore, during most maneuvers, the maintenance of an arbitrary standard is no more than a diverting influence. For example, during an ILS approach on a heavy four-engine aircraft where there is considerable lag between the application of power and the response of the aircraft, many pilots prefer to vary the airspeed over a wider range in order to maintain the glide path rather than constantly increasing and decreasing the power settings. To constantly increase and decrease the power settings may result in a more erratic glide path configuration than would result from allowing the airspeed to fluctuate over a wider range until the aircraft is in close proximity to the airport whereupon the speed then becomes more critical. The technique will vary from pilot to pilot and from aircraft to aircraft and therefore the imposition of an arbitrary speed range is somewhat impractical.

The air line pilots feel that an ATR test flight should approximate as closely as possible the procedures that will be encountered by the applicants in actual transport flying. Therefore, the checking and inspection of the aircraft prior to and during flight should be accomplished in accordance with the approved procedure presently in use. For example, the checklists employed should be the actual checklists provided for the aircraft in which the test will be taken. The applicants should then demonstrate a

knowledge of each item on the checklist - not merely an ability to identify a percentage of the items on that checklist. If all the items on the checklist are not pertinent to the operation of the aircraft, they should not be included in the checklist. In addition, the sequence of checking the airplane for flight should be the one used in actual operation. For example, the radios should be checked at the time the cockpit checklist is being completed. In this manner, if anything is found to be inoperative in the cockpit, the aircraft may be refused for the flight.

The air line pilots appreciate the opportunity that has been extended them to take a constructive part in the preparation of the proposed ATR flight check form. We realize that it would not be possible for the National Research Council to adopt all of our recommendations. We feel, however, that we are able to draw upon a wider range of experience in transport flying than any other single group in the nation. The object of this flight check is to select candidates who have the necessary qualifications as air transport pilots. We necessarily feel that these qualifications must remain high. It is however, at the same time, our opinion that the qualifications should be practical and similar to those encountered in actual transport flying. Naturally subjectivity cannot be removed from any evaluation test which relies so greatly upon judgment - judgment on the part of the applicant and judgment on the part of the check pilot. However, if this flight check form serves to effect even a small percentage of increased agreement as to the applicant's qualifications, it will have accomplished its goal.

It is our understanding that this flight check form will now undergo a period of service testing. We will greatly appreciate receiving accounts from time to time as to the results which are obtained. It is further realized that certain modifications may have to be made from time to time after this period of service testing is under way. The air line pilots would appreciate an opportunity to participate further.

Sincerely yours,

AIR LINE PILOTS ASSOCIATION

/s/ Clarence N. Sayen

Clarence N. Sayen
Executive Vice President

cc: Dr. Flanagan

CNS/ek

APPENDIX D

SUGGESTIONS FOR A TRAINING COURSE IN FLIGHT-CHECKING PROCEDURES

SUGGESTIONS FOR A TRAINING COURSE IN FLIGHT-CHECKING PROCEDURES

Review of Present Procedures

CAA aviation safety agents are indoctrinated in CAA procedures at the Aeronautical Center at Oklahoma City. Two types of trainees are handled: those who are newly inducted into the CAA are given their initial training and agents who are already established are brought in at irregular intervals for refresher and standardization courses.

Two of the Center's courses apply directly to flight-checking and a 5-hour course in flight test standardization is included in each:

a. A 2-weeks refresher course

b. A 4-weeks course during which the trainee himself qualifies for the Airline Transport Rating

The refresher course involves 26 hours in the air of which 13 are first pilot time. Trainees go through the present ATR test; spend an entire week on VHF equipment (ILS, GCA, and VOR); and make two cross-country flights during which nothing but VHF facilities are used. Ground school consists of 5 hours in the Link, 5 hours study of equipment of the transport category, and 5 hours on the giving of , eligibility for, etc., the flight-check.

The course that qualifies trainees for the ATR consists of 56 hours of flying, 28 of which are first pilot time. This involves considerable cross-country work and all of the required maneuvers are covered. In addition, there are 18 hours of Link, 10 hours review of the ATR written test, 4 hours of discussion of low frequency equipment and procedures, and 5 hours on the giving of and standardizing procedures for the flight-check. The materials used in instructing agents in flight-checking procedures are the Manual of Operations and the Civil Air Regulations. Each maneuver is discussed in ground school sessions and the agent observes his instructor's testing techniques when he takes his own ATR test.

Suggested Curriculum Revisions Following the Adoption of the New Flight-Check

With the adoption of the new PILOT FLIGHT TEST REPORT FOR THE AIRLINE TRANSPORT RATING FLIGHT EXAMINATION, two general changes in the curriculum appear to be necessary. Both ground school and in-flight training would be affected. In the air, trainees should be given an

opportunity to fly the maneuvers specified in the flight-check and to give an ATR check to another trainee under the supervision of an instructor. The present ground school curriculum should be supplemented by the study of the FLIGHT-CHECK MANUAL and the new flight-check form.

The logical place to add the study of the manual to the curriculum appears to be in the present flight test standardization course since both new and established agents are exposed to it. The new check contains several features which are considerably different from flight-checking procedures in current use and will be equally new to recent and established agents alike.

A consideration of the materials in the manual can probably be accomplished in about 3 additional hours of ground school assuming that the trainees have already read and become familiar with the manual and flight-check before attending the classes. Two units of study are suggested:

UNIT I ORIENTATION

(Suggested time allotment: 1 hour)

The purpose of this unit is to acquaint trainees with some of the problems involved in the evaluation of flying proficiency and how they were met in the construction of the new procedure and to make them aware of the part played by pilots in the development of the form.

MATERIALS

(1) Pilot Flight Test Report for the Airline Transport Rating Flight Examination (the flight-check booklet)

(2) Flight-Check Manual, pp. 1-8

(3) CAA Division of Research Report No. , Revisions of the Standard Flight-Check for the Airline Transport Rating Based on the Airline Tryout. Appendix A, pp. 6-12

(4) CAA Division of Research Report No. 85, The Development of a Standard Flight-Check for the Airline Transport Rating Based on the Critical Requirements of the Airline Pilot's Job. pp. 10-16

CONTENT

Introduction: A new procedure for the in-flight section of the ATR examination has been adopted; this session is for the purpose of considering something about how it was developed. (2) pp.1,2

Problems of Flight-Checking and How Met: (3)pp.6-12, (2)pp.3-8, (4)pp.10-16

Stress that the critical aspects of the pilot's job are covered in the check; recording done in the air; use of pictures, quantative data; specific descriptions, (Illustrate in flight-check, Maneuver 15, pp.19, "CROSS-WIND LANDING", for example); uniform standards; specific standard instructions to the applicant; check pilot agreement.

Reliability: (2)pp.6-7, (4)pp.10-12

A test is reliable if you make nearly the same score no matter who scores it or if your score doesn't vary too greatly from one testing to the next. Check pilots can agree in their evaluations of an examinee's flying skill using the new procedure. Illustrate unreliability with story about two check pilots who were examining a candidate for a rating, and, after the flight, one check pilot praised the candidate for his exceptionally fine performance; the other failed him.

UNIT II USING THE NEW CHECK

(Suggested time allotment: 2 hours)

The purpose of this unit is to familiarize trainees with the use and scoring of the procedure.

MATERIALS

(1) and (2) from Unit I
(3) Blackboard and chalk
(4) Model of a multi-engined aircraft
(5) Instrument panel mock-up with movable dials

General Instructions: (1), (2)pp.7-13

Stress filling in the blanks before the flight; familiarizing the applicant with what is expected of him; giving standard instructions (advisability of reading same); recording immediately after observing; putting applicant at ease; impartiality in checking; following the prescribed sequence of maneuvers; checking from the jump seat.

Specific Instructions and Scoring: (1), (2)pp.13-24

At this point each maneuver in the flight-check should be discussed in detail by the class, with both the specific instructions for administering the maneuvers and scoring them being taken into consideration. When discussing scoring, emphasize that check pilot judgment is not

eliminated by the use of objective techniques and insure that the trainees understand the "waiver" clause and that reasons for issuing waivers must be justified in the "Comments" section of the check. The discussion should be supplemented by simulating maneuvers for the class to score. Three or four maneuvers should be illustrated in detail. The performance of an applicant can be demonstrated by drawings on the blackboard, by illustrating attitudes of the aircraft by means of a model, by indicating instrument readings on mock-up dials, and by telling the class about special weather conditions or aspects of the applicant's behavior which are difficult to demonstrate. In addition, problems should be brought up as each maneuver is discussed. Specimen graded maneuvers could be prepared and the class required to assign the final "Qualified" or "Not Qualified" score and explain. In the discussion of the specific instructions for the maneuvers, check back to the job components (2)pp.7-8, which are being measured by each and make certain that the trainees understand what the task is in each maneuver.

IN-FLIGHT USE OF THE CHECK

(Suggested time allotment: 5 hours for each group of 2 trainees)

It is suggested, as mentioned before, that each trainee be given an opportunity to both give and take an ATR test under the supervision of an instructor. When giving the test to another trainee, the "examiner" should sit in the jump seat with the instructor in the right-hand seat. When taking the test, he sits, of course, in the left-hand seat. It should be pointed out that this suggested giving and taking of the test is not intended to replace any of the practice of maneuvers already scheduled in the Center's flight curriculum but is recommended as additional flight training.