Civil Aeronautics Manual 34

# Flight Navigator Certificates

February 1955

U. S. DEPARTMENT OF COMMERCE

Sinclair Weeks, Secretary

CIVIL AERONAUTICS ADMINISTRATION

F. B. Lee, Administrator

# Flight Navigator Certificates

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Civil Aeronautics Manual 34

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# Introductory Note

Civil Aeronautics Manual 34 contains the rules, policies and interpretations issued by the Administrator of Civil Aeronautics in application to the various sections of Civil Air Regulations Part 34, Flight Navigator Certificates.

CAA *rules* are supplementary regulations issued pursuant to authority expressly conferred on the Administrator in the Civil Air Regulations. Such rules are mandatory and must be complied with.

CAA *policies* provide detailed technical information on recommended methods of complying with the Civil Air Regulations. Such policies are for the guidance of the public and are not mandatory in nature.

CAA *interpretations* define or explain words and phrases of the Civil Air Regulations. Such interpretations are for the guidance of the public and will be followed by the Administrator in determining compliance with the regulations.

The table of contents is arranged to show the title and number of each section of the regulations. Any rules, policies or interpretations follow the pertinent section of the regulations and are identified by consecutive dash numbers appended to the regulation section number. The text contains only the rules, policies and interpretations which have been issued.

This manual supersedes Supplements No. 2 and 3 to Civil Aeronautics Manual 34 dated June 8, 1951. Moreover, the contents of this manual supersede any contradictory material which may be found in any Aviation Safety Release or like publication outstanding on the issuance date of this manual.

# Flight Navigator Certificates

## Reguirements for Certificate

34.5–1 *Color deficiency limitation (CAA policies which apply to sec. 34.5).* When an applicant holds a medical certificate bearing the notation "DEFECTIVE COLOR VISION," the flight navigator certificate will bear the limitation "NOT VALID FOR USE OF AERONAUTICAL CHARTS OR NAVIGATION EQUIPMENT WHICH REQUIRES ABILITY TO DISTINGUISH AVIATION SIGNAL RED, AVIATION SIGNAL GREEN, OR WHITE."

34.6–1 *Satisfactory flight navigation experience (CAA policies which apply to sec. 34.6 (a) (1)).* Flight time applied exclusively to the practice of long-range navigation methods, with emphasis being placed on celestial navigation and dead reckoning, will be considered satisfactory flight navigation experience. This flight time should be substantiated by a logbook, by records of the armed services or certificated air carriers, or by a letter signed by a certificated flight navigator. Any statement or letter substantiating experience should be attached to the application form. If a logbook is used to substantiate flight experience, the notation "logbook checked" with the initials of the Aviation Safety agent or flight navigator examiner should be made on the application form.

34.6–2 *Credit for pilot experience (CAA interpretations which apply to sec. 34.6 (a) (1)).* Pilots must have logged at least 500 hours of cross-country flight, of which at least 100 hours must have been at night, before any credit for this time can be given toward the flight navigation experience requirements. Pilots who meet the specified cross-country flight time conditions will be given credit for 100 hours of satisfactory flight navigation experience.

34.6–3 *Determination of position in flight by celestial observations (CAA policies which apply to sec. 34.6 (a) (2)).* On the application form the applicant will certify that he has determined his position in flight not less than 25 times by night by celestial observations and not less than 25 times by day by celestial observations in conjunction with other aids.

34.6–4 *Statement of graduation from approved flight navigator course (CAA policies which apply to sec. 34.6(b)).* An applicant who applies as a graduate of a flight navigator course approved by the Administrator must present a statement of graduation, signed by an official of the approved school, which should be attached to the application form and made a part of the airman's record.

34.6–5 *Requirements for approved flight navigator courses (CAA rules which apply to sec. 34.6(b)).*

(a) General. A graduate of an approved flight navigator course is deemed to have met the minimum experience requirements for the flight navigator certificate. For this reason, it is essential that an approved course of training for flight navigators include sufficient coverage of the subject to insure the required minimum proficiency of applicants who apply for certification as graduates of an approved course.

(b) *Application for approval.* An agency or applicant desiring approval of a flight navigator course must submit to the local Aviation Safety district office three copies of the course outline, a description of the facilities and equipment to be used, and a list of instructors with their qualifications, together with a letter to the Administrator requesting approval.

(c) *Training course outline.*

(1) *Format.* The ground course outline and the flight course outline shall be combined in one looseleaf binder and shall include a table of contents divided into two parts—ground course and flight course. Each part of the

table of contents must contain a list of the major subjects, together with hours allotted to each subject and the total classroom and flight hours.

(2) *Ground course outline.* It is not mandatory that a course outline have the subject headings arranged exactly as listed in this subparagraph. Any arrangement of general headings and subheadings will be satisfactory provided all the subject material listed here is included and the acceptable minimum number of hours is assigned to each subject. Each general subject shall be broken down into detail showing items to be covered.

If any agency desires to include additional subjects in the ground training curriculum, such as international law, flight hygiene, or others which are not required, the hours allotted these additional subjects may not be included in the minimum classroom hours.

The following subjects with classroom hours are considered the minimum coverage for a ground training course for flight navigators:

| *Subject* | *Classroom hours* |
|---|---|
| Civil Air Regulations | 5 |
| To include: | |
| Part 34. | |
| Part 40. | |
| Part 41. | |
| Part 42. | |
| Part 43. | |
| Part 60. | |
| Meteorology | 40 |
| To include: | |
| Basic weather principles. | |
| Temperature. | |
| Pressure. | |
| Winds. | |
| Moisture in the atmosphere. | |
| Stability. | |
| Clouds. | |
| Hazards. | |
| Air masses. | |
| Front weather. | |
| Fog. | |
| Thunderstorms. | |
| Icing. | |
| World weather and climate. | |
| Weather maps and weather reports. | |
| Forecasting. | |
| International Morse code: | |
| Ability to receive code groups of letters and numerals at a speed of eight words per minute. | |
| Navigation Instruments (exclusive of radio and radar) | 20 |
| To include: | |
| Compasses. | |
| Pressure altimeters. | |
| Airspeed indicators. | |
| Driftmeters. | |
| Bearing indicators. | |
| Aircraft octants. | |
| Instrument calibration and alignment. | |
| Charts and Pilotage | 15 |
| To include: | |
| Chart projections. | |
| Chart symbols. | |
| Principles of pilotage. | |
| Dead Reckoning | 30 |
| To include: | |
| Air plot. | |
| Ground plot. | |
| Calculation of ETA. | |
| Vector analysis. | |
| Use of computer. | |
| Search. | |
| Absolute Altimeter With Applications | 15 |
| To include: | |
| Principles of construction. | |
| Operating instructions. | |
| Use of Bellamy's formula. | |
| Flight planning with single drift correction. | |
| Radio and Long-Range Navigational Aids | 35 |
| To include: | |
| Principles of radio transmission and reception. | |
| Radio aids to navigation. | |
| Government publications. | |
| Airborne D/F equipment. | |
| Errors of radio bearings. | |
| Quadrantal correction. | |
| Plotting radio bearings. | |
| ICAO Q code for direction finding. | |
| Loran. | |
| Consol. | |

| *Subject* | *Classroom hours* |
|---|---|
| Celestial Navigation | 150 |
| To include: | |
| The solar system. | |
| The celestial sphere. | |
| The astronomical triangle. | |
| Theory of lines of position. | |
| Use of the Air Almanac. | |
| Time and its applications. | |
| Navigation tables. | |
| Precomputation. | |
| Celestial line of position approach. | |
| Star identification. | |
| Corrections to celestial observations. | |
| Flight Planning and Cruise Control | 25 |
| To include: | |
| The flight plan. | |
| Fuel consumption charts. | |
| Methods of cruise control. | |
| Flight progress chart. | |
| Point-of-no-return. | |
| Equitime point. | |
| Long-Range Flight Problems | 15 |
| Total (exclusive of final examinations) | 350 |

(3) *Flight course outline.*

(i) A minimum of 150 hours of supervised flight training shall be given, of which at least 50 hours of flight training must be given at night, and celestial navigation must be used during flights which total at least 125 hours.

(ii) A maximum of 50 hours of the required flight training may be obtained in acceptable types of synthetic flight navigator training devices.

(iii) Training must be given in dead reckoning, pilotage, radio navigation, celestial navigation, and use of the absolute altimeter.

(iv) Flights should be at least four hours in length and should be conducted off civil airways. Some training on long-range flights is desirable, but is not required. There is no limit to the number of students that may be trained on one flight, but at least one astrodome or one periscopic sextant mounting must be provided for each group of four students.

(d) *Equipment.*

(1) Classroom equipment shall include one table at least 24″ x 32″ in dimensions for each student.

(2) Aircraft suitable for the flight training must be available to the approved course operator to insure that the flight training may be completed without undue delay. The approved course operator may contract or obtain written agreements with aircraft operators for the use of suitable aircraft. A copy of the contract or written agreement with an aircraft operator shall be attached to each of the three copies of the course outline submitted for approval. In all cases, the approved course operator is responsible for the nature and quality of instruction given during flight.

(e) *Instructors.*

(1) Sufficient classroom instructors must be available to prevent an excessive ratio of students to instructors. Any ratio in excess of 20 to 1 will be considered unsatisfactory.

(2) At least one ground instructor must hold a valid flight navigator certificate, and be utilized to coordinate instruction of ground school subjects.

(3) Each instructor who conducts flight training must hold a valid flight navigator certificate.

(f) *Revision of training course.*

(1) Requests for revisions to course outlines, facilities, and equipment shall follow procedures for original approval of the course. Revisions should be submitted in such form that an entire page or pages of the approved outline can be removed and replaced by the revisions.

(2) The list of instructors may be revised at any time without request for approval, provided the minimum requirement of paragraph (e) of this section is maintained.

(g) *Credit for previous training and experience.*

(1) Credit may be granted by an operator to students for previous training and experience which is provable and comparable to portions of the approved curriculum. When granting such credit, the approved course operator should be fully cognizant of the fact that he is responsible for the proficiency of his graduates in accordance with subdivision (i) of subparagraph (3) of this section.

(2) Where advanced credit is allowed, the operator shall evaluate the student's previous training and experience in accordance

with the normal practices of accredited technical schools. Before credit is given for any ground school subject or portion thereof, the student must pass an appropriate examination given by the operator. The results of the examination, the basis for credit allowance, and the hours credited shall be incorporated as a part of the student's records.

(3) Credit up to a maximum of 50 hours toward the flight training requirement may be given to pilots who have logged at least 500 hours while a member of a flight crew which required a certificated flight navigator or the Armed Forces equivalent. A similar credit may also be given to a licensed deck officer of the Maritime Service who has served as such for at least one year on ocean-going vessels. One-half of the flight time credited under the terms of this paragraph may be applied toward the 50 hours of flight training required at night.

(h) *Students records and reports.* Approval of a course shall not be continued in effect unless the course operator keeps an accurate record of each student, including a chronological log of all instruction, subjects covered and course examinations and grades, and unless he prepares and transmits to the local Aviation Safety district office not later than January 31 of each year, a report containing the following information for the previous calendar year:

(1) The names of all students graduated, together with their school grades for ground and flight subjects.

(2) The names of all students failed or dropped, together with their school grades and reasons for dropping.

(A sample form is illustrated in figure 1 for guidance.)

(i) *Quality of instruction.* Approval of a course shall not be continued in effect unless at least 80 percent of the students who apply within 90 days after graduation are able to qualify on the first attempt for certification as flight navigators.

(j) *Statement of graduation.* Each student who successfully completes an approved flight navigator course shall be given a statement of

BLANK NAVIGATION SCHOOL

ANNUAL REPORT
APPROVED FLIGHT NAVIGATOR COURSE

Date_____

| Name of student | Date enrolled | Date graduated or failed | Final grade | | Date and reasons for dropping student |
|---|---|---|---|---|---|
| | | | Ground | Flight | |
| | | | | | |

*Figure 1. Sample form of annual report of approved flight navigator course.*

graduation. An acceptable statement of graduation is as follows:

CIVIL AERONAUTICS ADMINISTRATION,
*Washington 25, D. C.*

GENTLEMEN: This is to certify that ---------- on
(Name of graduate)
---------- successfully completed a
(Date of graduation)
course of training for flight navigators which is approved by the Administrator of Civil Aeronautics.

Signed ----------
Title ----------
School ----------

(k) *Inspections.* Approved course operations will be inspected by authorized representatives of the Administrator as often as deemed necessary to insure that instruction is maintained at the required standards, but the period between inspections shall not exceed 12 months.

(l) *Change of ownership, name, or location.*

(i) *Change of ownership.* Approval of a flight navigator course shall not be continued in effect after the course has changed ownership. The new owner must obtain a new approval by following the procedure prescribed for original approval.

(ii) *Change in name.* An approved course changed in name but not changed in ownership shall remain valid if the change is reported by the approved course operator to the local Aviation Safety district office. A letter of approval under the new name will be issued by the regional office.

(iii) *Change in location.* An approved course shall remain in effect even though the approved course operator changes location if the change is reported without delay by the operator to the local Aviation Safety district office, which will inspect the facilities to be used in the new location. If they are found to be adequate, a letter of approval showing the new location will be issued by the regional office.

(m) *Cancellation of approval.*

(1) Failure to meet or maintain any of the requirements set forth in this section for the approval or operation of an approved flight navigator course shall be considered sufficient reason for cancellation of the approval.

(2) If an operator should desire voluntary cancellation of his approved course, he should submit the effective letter of approval and a written request for cancellation to the Administrator of Civil Aeronautics through the local Aviation Safety district office.

(n) *Duration.* The authority to operate an approved flight navigator course shall expire 24 months after the last day of the month of issuance.

(o) *Renewal.* Application for renewal of authority to operate an approved flight navigator course may be made by letter to the local Aviation Safety district office at any time within 60 days prior to the expiration date. Renewal of approval will depend upon the course operator meeting the current conditions for approval and having a satisfactory record as an operator.

34.7–1 *Written examination (CAA policies which apply to sec. 34.7).*

(a) *Eligibility to take written examination.* The flight navigator written examination will be given to any person who meets the eligibility requirements of section 34.2 through section 34.6.

(b) *The examination.* The examination is of the multiple choice type and consists of four sections (Civil Air Regulations, Fundamentals of Air Navigation, Meteorology, and Plotting and Computing), each of which is graded separately. A minimum grade of 70 percent is required to pass each section. An applicant will not be required to complete section 3, Meteorology, of the examination if he holds a valid airline transport pilot certificate or an instrument rating, or a Form ACA–578A issued within the past 24 months showing successful completion of this subject for the airline transport pilot certificate or the instrument rating.

(c) *Examination procedure.* The examination is divided into Parts I, II, and III, each of which must be completed at one session. Part I covers the sections on Civil Air Regulations, Fundamentals of Air Navigation, and Meteorology. The time limit is three hours. Parts II and III cover the section on Plotting and Computing. The time limit is four hours for Part II and six hours for Part III. No applicant will be permitted to start any part of the examination unless the remaining hours that the office will be open exceed the time limit of the part.

## 18. FLIGHT NAVIGATOR PRACTICAL EXAMINATION CHECK SHEET

*(To be completed by CAA Representative)*

| PLACE OF EXAMINATION | DATE OF EXAMINATION |
|---|---|
| | |

| TYPE AND REG. NO. OF AIRCRAFT USED | NAME OF AIR CARRIER OR AIRCRAFT OWNER |
|---|---|
| | |

GRADING LEGEND S—SATISFACTORY (70-100) U—UNSATISFACTORY (0-69)

| ITEM NO. | ITEM | GRADE | |
|---|---|---|---|
| | | EXAMINER | AGENT |
| | GROUND TEST | | |
| 1. | STAR IDENTIFICATION (*Pointer system*) | | |
| 2. | USE OF STAR FINDER | | |
| 3. | SHOTS AGAINST PRECOMPUTED CURVE | | |
| 4. | 3-STAR FIX OR LOP OF SUN | | |
| 5. | COMPENSATION AND SWINGING OF COMPASS | | |
| 6. | ALIGNMENT OF DRIFT METER | | |
| 7. | ALIGNMENT OF ASTRO-COMPASS OR PER. SEXTANT | | |
| | FLIGHT TEST | | |
| 8. | INTERPRETATION OF WEATHER DATA | | |
| 9. | PREPARATION OF FLIGHT PLAN | | |
| 10. | COMPUTATION OF FUEL LOAD | | |
| 11. | DETERMINATION OF PNR AND EQUITIME POINT | | |
| 12. | PREPARATION OF CRUISE CONTROL CHART | | |
| 13. | USE AND INTERPRETATION OF CRUISE CONTROL CHART | | |
| 14. | EQUIPMENT CHECK | | |
| 15. | LOCATION OF EMERGENCY EQUIPMENT | | |
| 16. | KNOWLEDGE OF EMERGENCY EQUIPMENT | | |
| 17. | USE OF FLUX-GATE AND GYROSYN COMPASSES | | |
| 18. | SETTING AND ALTERING COURSES | | |
| 19. | CHART KNOWLEDGE | | |
| 20. | PILOTAGE | | |
| 21. | COMPUTER ABILITY | | |
| 22. | DETERMIN. OF TRACK, G. S. AND WIND BY DOUBLE DRIFT | | |
| 23. | DETERMIN. OF G. S. AND WIND BY DRIFT METER TIMING | | |
| 24. | AIR PLOTS | | |
| 25. | ETA'S | | |
| 26. | KNOWLEDGE AND USE OF RADIO FACILITIES | | |
| 27. | CARE IN TUNING | | |
| 28. | STATION IDENTIFICATION | | |
| 29. | USE OF MANUAL LOOP | | |
| 30. | EVALUATION OF RADIO BEARINGS | | |
| 31. | CORRECTION AND PLOTTING OF RADIO BEARINGS | | |
| 32. | DIVERSION TO ALTERNATE — C. H., ETA, FUEL REM. | | |
| 33. | BASIC ADJUSTMENTS OF LORAN RECEIVER | | |
| 34. | KNOWLEDGE AND USE OF LORAN | | |
| 35. | KNOWLEDGE AND USE OF CONSOL METHOD | | |
| 36. | USE OF ABSOLUTE ALTIMETER | | |
| 37. | DETERMINATION OF "D" FACTORS | | |
| 38. | DETERMINATION OF DRIFT BY ALTIMETRY | | |
| 39. | INTERPRETATION AND APPLICATION OF ALTIMETER DATA | | |
| 40. | SINGLE LOP INTERPRETATION (*Radio, press, celes.*) | | |
| 41. | SINGLE LOP APPROACH | | |
| 42. | USE OF ASTRO-COMPASS | | |
| 43. | DETERMINATION OF COMPASS DEVIATION | | |
| 44. | ACCURACY OF CELESTIAL FIXES | | |
| 45. | SELECTION OF BODIES FOR OBSERVATION | | |
| 46. | HANDLING OF ROUTINE REPORTS | | |
| 47. | LOG ENTRIES | | |
| 48. | WEATHER OBSERVATION AND INTERPRETATION IN FLIGHT | | |
| 49. | DETERMINATION OF WIND FROM FIXES | | |
| 50. | ESTIMATES FOR LETDOWN | | |
| 51. | OVER-ALL SPEED | | |
| 52. | OVER-ALL ACCURACY | | |
| 53. | ALERTNESS | | |
| 54. | CO-ORDINATION OF NAVIGATION METHODS | | |
| 55. | CO-ORDINATION OF DUTIES WITH TIME | | |

REMARKS:

| FROM | TO | HOURS | |
|---|---|---|---|
| | | DAY | NIGHT |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

*Figure 2. Flight navigator practical examination check sheet.*

Each applicant must provide his own plotter, divider, and computer for the examination. Work paper, plotting sheets, the Air Almanac, H. O. No. 9, Part II, and the proper volumes of H. O. No. 218 will be provided by the examining agent. If an applicant wishes to use blank forms and other navigation or logarithmic tables, he may do so, provided that such forms and tables are submitted to the examining agent for scrutiny prior to the beginning of the examination. No other material may be brought to the examination room. Papers used for computation during the examination must be surrendered to the examining agent before the applicant leaves the examination room.

Examination answer sheets are graded in the Washington, D. C., office and a report of grades is mailed directly to the applicant. This report will be accepted within a period of 24 months as evidence of having met the knowledge requirements for the certificate.

34.8-1 *Practical examination (CAA policies which apply to sec. 34.8).*

(a) *Eligibility to take practical examination.* The applicant must satisfactorily complete the written examination prior to taking the practical examination. Where delay would cause inconvenience to an applicant or an air carrier, the practical examination may be given prior to the applicant receiving his "Report of Written Examination," or when the applicant has failed any section of the written examination except section 4, Plotting and Computing. A designated flight navigator examiner is not authorized to give the practical examination under these circumstances, unless he receives prior approval from the supervising CAA agent.

(b) *Demonstration of skill.* An applicant will be required to pass practical tests on the prescribed subjects. These tests may be given by Aviation Safety personnel and designated flight navigator examiners.

(c) *The examination.* The practical examination consists of a ground test and a flight test as itemized on the examination check sheet shown in figure 1. Each item must be completed satisfactorily in order for the applicant to obtain a passing grade. Items 5, 6, 7 of the ground test may be completed orally, and items 17, 22, 23, 33, 34, 35, 36, 37, 38, and 39 of the flight test may be completed by an oral examination when a lack of ground facilities or navigation equipment makes such procedure necessary. In these cases a notation to that effect shall be made in the "Remarks" space on the check sheet.

(d) *Examination procedure.* An applicant will provide an aircraft in which celestial observations can be taken in all directions. Minimum equipment shall include a table for plotting, a drift meter or absolute altimeter, an instrument for taking visual bearings, and a radio direction finder.

More than one flight may be used to complete the flight test and any type of flight pattern may be used. The test will be conducted chiefly over water whenever practicable, and without regard to radio range legs or radials. If the test is conducted chiefly over land, a chart should be used which shows very little or no topographical and aeronautical data. The total flight time will cover a period of at least four hours. Only one applicant may be examined at one time, and no applicant may perform other than navigator duties during the examination.

When the test is conducted with an aircraft belonging to an air carrier, the navigation procedures should conform with those set forth in the carrier's operations manual. Items of the flight test which are not performed during the routine navigation of the flight will be completed by oral examination after the flight or at times during flight which the applicant indicates may be used for tests on those items. Since in-flight weather conditions, the reliability of the weather forecast, and the stability of the aircraft will have considerable effect on an applicant's performance, good judgment must be used by the agent or examiner in evaluating the tests.

GROUND TEST. For the ground test, in the order of the numbered items on the examination check sheet, an applicant will be required to:

(1) Identify, without a star identifier, at least six navigational stars and all planets available for navigation at the time of the examination and explain the method of identification.

(2) Identify two additional stars with a star identifier or sky diagrams and explain identification procedure.

(3) Precompute a time-altitude curve for a period of about 20 minutes and take 10 single observations of a celestial body which is rising or setting rapidly. The intervals between observations should be at least one minute. Mark each observation on the graph to show accuray. All observations, after corrections, shall plot within 8 minutes of arc from the time-altitude curve, and the average error shall not exceed 5 minutes of arc.

(4) Take and plot one 3-star fix and 3 LOP's of the sun. Plotted fix or an average of LOP's must fall within 5 miles of the actual position of the observer.

(5) Demonstrate or explain the compensation and swinging of a liquid-type magnetic compass.

(6) Demonstrate or explain a method of of aligning one type of drift meter.

(7) Demonstrate or explain a method of aligning an astro-compass or periscopic sextant.

FLIGHT TEST. For the flight test, in the order of the numbered items on the examination check sheet, an applicant will be required to:

(8) Demonstrate his ability to read weather symbols and interpret synoptic surface and upper air weather maps with particular emphasis being placed on winds.

(9) Prepare a flight plan by zones from the forecast winds or pressure data of an upper air chart and the operator's data.

(10) Compute from the operator's data the predicted fuel consumption for each zone of the flight, including the alternate.

(11) Determine the point-of-no-return for the flight with all engines running and the equitime point with one engine inoperative. Graphical methods which are part of the company's operations manual may be used for these computations.

(12) Prepare a cruise control (howgozit) chart from the operator's data.

(13) Enter actual fuel consumed on the cruise control chart and interpret the variations of the actual curve from the predicted curve.

(14) Check the presence on board and operating condition of all navigation equipment. Normally a check list will be used. This check will include a time tick or chronometer comparison. Any lack of thoroughness during this check will justify this item being graded unsatisfactory.

(15) Locate emergency equipment, such as, the nearest fire extinguisher, life preserver, life rafts, exits, axe, first aid kits, etc.

(16) Recite the navigator's duties and stations during emergencies for the type of aircraft used for the test.

(17) Demonstrate the proper use of a flux gate compass or gyrosyn compass (when available), with special emphasis on the caging methods and the location of switches, circuit breakers, and fuses. If these compasses are not part of the aircraft's equipment, an oral examination will be given.

(18) Be accurate and use good judgment when setting and altering headings. Erroneous application of variation, deviation, or drift correction, or incorrect measurement of course on the chart will be graded as unsatisfactory.

(19) Demonstrate or explain the use of characteristics of various chart projections used in long-range air navigation, including the plotting of courses and bearings, and the measuring of distances.

(20) Demonstrate ability to identify designated landmarks by the use of a sectional or WAC chart.

(21) Use a computer with facility and accuracy for the computation of winds, drift correction and drift angles, ground speeds, ETA's, fuel loads, etc.

(22) Determine track, ground speed, and wind by the double drift method. When a drift meter is not part of the aircraft's equipment, an oral examination on the use of the drift meter and a double drift problem shall be completed.

(23) Determine ground speed and wind by the timing method with a drift meter. When a drift meter is not part of the aircraft's equipment, an oral examination on the procedure and a problem shall be completed.

(24) Demonstrate the use of an air plot for determining wind between fixes and for plotting pressure lines of position when using pressure and absolute altimeter comparisons.

(25) Give ETA's to well defined check points at least once each hour after the second hour of flight. The average error shall not be

more than 5 percent of the intervening time intervals, and the maximum error of any one ETA shall not be more than 10 percent.

(26) Demonstrate knowledge and use of D/F equipment and radio facility information. Grading on this item will be based largely on the applicant's selection of those radio aids which will be of most value to his navigation, the manner with which he uses equipment, including filter box controls, and the precision with which he reads bearings. The aircraft's compass heading and all compass corrections must be considered for each bearing.

(27) Use care in tuning to radio stations to insure maximum reception of signal and check for interference signals. Receiver will be checked to ascertain that antenna and BFO (Voice–CW) switches are in correct positions.

(28) Identify at least three radio stations using international Morse code only for identification. The agent or examiner will tune in these stations so that the applicant will have no knowledge of the direction, distance, or frequency of the stations.

(29) Take at least one radio bearing by manual use of the loop. The agent or examiner will check the applicant's bearing by taking a manual bearing on the same station immediately after the applicant.

(30) Show the use of good judgment in evaluating radio bearings, and explain why certain bearings may be of doubtful value.

(31) Determine and apply correctly the correction required to be made to radio bearings before plotting them on a Mercator chart, and demonstrate the ability to plot bearings accurately on charts of the Mercator and Lambert conformal projections.

(32) Compute the compass heading, ETA, and fuel remaining if it is assumed that the flight would be diverted to an alternate airport at a time specified by the agent or examiner.

(33) Check the counter scales of a Loran receiver for accuracy, and explain the basic (face) adjustments which affect tuning and counter alignment. A guide sheet may be used for this test.

(34) Demonstrate a knowledge of the basic principle of Loran and the ability to tune a Loran receiver, to match signals, to read time differences, to plot Loran LOP's, and identify and use sky waves.

(35) Take and plot bearings from a consol station and explain the precautions which must be taken when tuning a radio receiver for consol signals. Also, discuss those conditions which affect the reliability of consol bearings.

(36) Demonstrate the ability to properly operate and read an absolute altimeter.

(37) Determine the "D" factors for a series of compared readings of an absolute altimeter and a pressure altimeter.

(38) Determine drift angle or lateral displacement from the true heading line by application of Bellamy's formula or a variation thereof.

(39) Interpret the altimeter comparison data with respect to the pressure system found at flight level. From this data evaluate the accuracy of the prognostic weather map used for flight planning and apply this analysis to the navigation of the flight.

(40) Interpret single LOP's for most probable position, and show how a series of single LOP's of the same body may be used to indicate the probable track and ground speed. Also, show how a series of single LOP's (celestial or radio) from the same celestial body or radio station may be used to determine position when the change of azimuth or bearing is 30° or more between observations.

(41) Select one of the celestial LOP's used during the flight and explain how to make a single line of position approach to a point selected by the agent or examiner, giving headings, times, and ETA's.

(42) Demonstrate the proper use of an astro-compass or periscopic sextant for taking bearings.

(43) Determine compass deviation as soon as possible after reaching cruising altitude and whenever there is a change of compass heading of 15° or more.

(44) Take celestial fixes at hourly intervals when conditions permit. The accuracy of these fixes shall be checked by means of a Loran, radio, or visual fix whenever practicable. After allowing for the probable error of a Loran, radio, or visual fix, a celestial fix under favorable conditions should plot within 10 miles of the actual position.

(45) Select celestial bodies for observation,

when possible, whose azimuths will differ by approximately 120° for a 3-body fix and will differ by approximately 90° for a 2-body fix. The altitudes of the selected bodies should be between 25° and 75° whenever practicable.

(46) Have POMAR and any other required reports ready for transmission at time of schedule, and be able to inform the pilot in command promptly with regard to the aircraft's position and progress in comparison with the flight plan.

(47) Keep a log with sufficient legible entries to provide a record from which the flight could be retraced.

(48) Note significant weather changes which might influence the drift or ground speed of the aircraft, such as, temperature, "D" factors, frontal conditions, turbulence, etc.

(49) Determine the wind between fixes as a regular practice.

(50) Estimate the time required and average ground speed during a letdown, under conditions specified by the pilot in command.

(51) Work with sufficient speed to determine the aircraft's position hourly by celestial means and also make all other observations and records pertinent to the navigation. The applicant should be able to take the observation, compute, and plot a celestial LOP within a time limit of 8 minutes; take and plot a Loran LOP within a time limit of 3 minutes for ground waves and 4 minutes for sky waves; observe the absolute and pressure altimeters and compute the drift or lateral displacement within a time limit of 3 minutes.

(52) Be accurate in reading instruments and making computations. Errors which are made and corrected without affecting the navigation will be disregarded unless they cause considerable loss of time.

An uncorrected error in computation (including reading instruments and books) which will affect the reported position more than 25 miles, the heading more than 3°, or any ETA more than 15 minutes will cause this item to be graded unsatisfactory.

(53) Be alert to changing weather or other conditions during flight which might affect the navigation. An applicant should not fail to take celestial observations just prior to encountering a broken or overcast sky condition; and he should not fail to take a bearing on a radio station, which operates at scheduled intervals and which would be a valuable aid to the navigation.

(54) Show a logical choice and sequence in using the various navigation methods according to time and accuracy, and check the positions determined by one method against positions determined by other methods.

(55) Use a logical sequence in performing the various duties of a navigator and plan work according to a schedule. The more important duties should not be neglected for others of less importance.

## Certification Rules

34.10-1 *Where to obtain application forms (CAA policies which apply to sec. 34.10).* Application forms can be obtained from Aviation Safety district offices, Aviation Safety agents, and designated flight navigator examiners. Application for the written examination may be made at any Aviation Safety air carrier or international district office. Application for the practical examination and the certificate may be made to any Aviation Safety agent or a designated flight navigator examiner.

34.12-1 *Issuance of temporary certificates (CAA policies which apply to sec. 34.12).* Temporary flight navigator certificates are issued to qualified applicants by Aviation Safety agents pending the examination of the applicant's record and the issuance of a certificate of greater duration by the Washington office.

34.13-1 *Reexamination of practical test (CAA policies which apply to sec. 34.13).* When the flight test portion of the practical examination has been failed, the 5 hours of additional instruction must be given in flight.

34.13-2 *Statements of instruction (CAA policies which apply to sec. 34.13).* Statements of instruction will be accepted only from the following individuals under the conditions shown below:

(a) *Certificated Flight Navigator.* All sections of the written examination, the ground test, and the flight test.

(b) *Certificated Ground Instructor.* Section 1 of the written examination if rated on Civil

Air Regulations, and section 3 of the written examination if rated on Meteorology.

(c) *Supervising or Check Navigator with the Armed Forces.* Sections 2, 3, and 4 of the written examination, the ground test, and the flight test.

(d) *Operations Official for an Approved Flight Navigator Course.* All sections of the written examination, the ground test, and the flight test.

34.20-1 *Airman Identification Card (CAA rules which apply to sec. 34.20).* An airman Identification Card, Form ACA-2135, is issued by the Administrator to meet the requirements of section 34.20.

34.20-2 *Other identification cards acceptable to the Administrator (CAA rules which apply to sec. 34.20).* Identification cards which are acceptable in lieu of Form ACA-2135 to meet the requirements of section 34.20 are as follows:

(a) Aircrewman Identification Card, Form ACA-2116.1, issued by CAA.

(b) Crew Member Certificate, Form ACA-2116.1, issued by CAA. This certificate is a current revision of the Aircrewman Identification Card.

(c) Current identification cards issued to members on active duty or on reserve status by:

(1) U. S. Army.
(2) U. S. Navy.
(3) U. S. Air Force.
(4) U. S. Marine Corps.
(5) U. S. Coast Guard.
(6) U. S. Merchant Marine.
(7) National Guard.
(8) Civil Air Patrol.

34.20-3 *Application (CAA rules which apply to sec. 34.20).* An applicant for an airman identification card shall comply with the following procedure:

(a) *Application.* The applicant shall apply in person to an Aviation Safety agent, or an Aviation Safety district office.

(b) *Form.* Application for Airman Identification Card, Form ACA-2134, shall be completed in single copy, typed or printed in ink, and contain precise information on each item.

(c) *Proof of identity.* The applicant shall furnish proof of his identity. The agent may exercise his discretion in the method by which he identifies the applicant. Identification of the applicant may be established by one or more of the following means:

(1) Airman Identification Card, Form ACA-935, issued by the CAA to the applicant during World War II.

(2) The agent's knowledge of the applicant's identity.

(3) The applicant's identification by a person known to the agent.

(4) Combinations of identification cards and licenses held by the applicant.

(5) Comparison of the applicant's signature with that on other cards and licenses held by him.

(d) *Proof of place and date of birth.* The following documentary evidence is satisfactory evidence of place and date of birth:

(1) Airman Identification Card, Form ACA-935, issued by CAA during World War II. (If he held this card and lost it, he may write to CAA, Airman Records Branch, Washington 25, D. C., and obtain confirmation that it was issued to him and the information it contained.)

(2) Birth Certificate. (When the applicant's birth certificate does not contain the exact name now used by him, he shall explain the difference on the application form.)

(3) Baptismal record, if it contains the full name and place and date of birth.

(4) Naturalization papers, if place and date of birth are shown.

(5) Passport, expired or current.

(6) Aircrewman Identification Card, or Crew Member Certificate, Form ACA-2116.1.

(7) Statement from any state or Federal Government agency which has the applicant's birth certification on file.

(8) Statement from any military, state, municipal, local, or Federal Government agency which has established, by investigation or otherwise, the applicant's place and date of birth.

Applicants who cannot furnish the documents listed in (1) through (8) may present affidavits from attending physician, either parent, brother, sister, relative, or acquaintances who have personal knowledge of the applicant's place and date of birth.

Military identification cards, service records, discharge papers, drivers' licenses, and the like are not acceptable documentary evidence of place and date of birth.

(e) *Evidence of citizenship.* The following documentary evidence is satisfactory evidence of citizenship:

(1) Any document listed in paragraph (d) of this section if citizenship is claimed in the country of birth.

(2) Naturalization papers.

(3) Currently valid passport.

(4) Statement from an appropriate official of a foreign government that the applicant is a citizen of that country.

(5) Civil Aeronautics Board waiver of citizenship requirements for the issuance of an airman certificate to stateless or other persons.

(6) Certified statements from persons, courts, or agencies in authority on cases of derivative citizenship, uncompleted naturalization, or other complex citizenship status. Such statements must contain information on the current status of the applicant's citizenship.

(f) *Photographs.* The applicant shall furnish two photographs which are:

(1) Taken from the same negative.

(2) One inch square, full face, head only.

(3) Taken within the past twelve months, and

(4) Readily recognizable as photographs of applicant.

(g) *Fingerprints.* The applicant shall be fingerprinted only by an Aviation Safety agent or other CAA employee authorized by the agent.

(h) *Reissuance of lost card.* An applicant who has lost his Airman Identification Card, Form ACA–2135, may obtain another by making application exactly as required for his original card, or by:

(1) Writing to the CAA Airman Records Branch, W–253, Washington 25, D. C., and explaining the circumstances of the loss, and requesting a letter verifying that such card had been issued, and

(2) Presenting the letter and two photographs, as required for original issuance, to an Aviation Safety agent, who will issue a duplicate card.

34.20–4 *Scheduled air carrier airmen (CAA interpretations which apply to sec. 34.20).* An airman certificated under Part 34 is not required to hold an identification card when he is exercising the privileges of his certificate in operations conducted by a scheduled air carrier. This includes any operation in which the airman is carrying out his duties as an employee of a scheduled air carrier.

34.20–5 *Other airman certificate (CAA interpretations which apply to sec. 34.20).* An identification card which meets the requirements of section 34.20 for navigators will also meet the identification card requirements for any other airman certificate which he may hold.



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