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Civil Aeronautics Manual 22

Lighter-Than-Air Pilot Certificates

November 15, 1955

U. S. DEPARTMENT OF COMMERCE

Sinclair Weeks, Secretary

CIVIL AERONAUTICS ADMINISTRATION

F. B. Lee, Administrator

Lighter-Than-Air Pilot Certificates

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Civil Aeronautics Manual 22

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Introductory Note

Civil Aeronautics Manual 22 contains the rules, policies, and interpretations issued by the Administrator of Civil Aeronautics in application to the various sections of *Civil Air Regulations* Part 22, *Lighter-Than-Air Pilot* 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 Administration 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 shall become effective November 15, 1955, unless otherwise indicated and will be revised from time to time in accordance with the changes in the Civil Air Regulations Part 22, or as the need for additional explanations are brought to the attention of the Administrator.

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Lighter-Than-Air Pilot Certificates

Student Lighter-Than-Air Pilot Certificates

22.10–1 *Where to obtain student lighter-than-air pilot certificates (CAA policies which apply to sec. 22.10).* Student lighter-than-air pilot certificates may be obtained by qualified applicants from Aviation Safety Agents in Aviation Safety District Offices.

22.10–2 *Minor applicants (CAA interpretations which apply to sec. 22.10* (a)). Unmarried applicants under 21 years of age must furnish the written consent of either parent, or legal or natural guardian, in the space provided on the application, or on a separate sheet. No consent is required for married male applicants under 21, but a married female applicant under 21 years of age must furnish the consent of her husband, who may be under 21.

22.10–3 *Evidence of meeting physical standards (CAA policies which apply to sec. 22.10 (e)).* The Administrator, or his representative (Aviation Safety Agent or lighter-than-air pilot examiner) will accept a first-, second-, or third-class medical certificate issued within 24 months preceding the date of application as evidence of the applicant's meeting the physical standards.

22.10–4 *Color deficiency limitation (CAA policies which apply to sec. 22.10 (e)).* When an applicant holds a medical certificate bearing the notation DEFECTIVE COLOR VISION, the student pilot certificate will bear the limitation NOT VALID FOR NIGHT FLIGHT OR BY COLOR SIGNAL CONTROL. This limitation may be removed by the successful completion of a special medical test authorized by the CAA Medical Division, W–265, Washington 25, D. C.

Private Lighter-Than-Air Pilot Certificates

22.11–1 *Evidence of meeting physical standards (CAA policies which apply to sec. 22.11 (e)).* The Administrator, or his representative (Aviation Safety Agent or lighter-than-air pilot examiner) will accept a first-, second-, or third-class medical certificate issued within 24 months preceding the date of application as evidence of the applicant's meeting the physical standards.

22.11–2 *Color deficiency limitation (CAA policies which apply to sec. 22.11 (e)).* When an applicant holds a medical certificate bearing the notation DEFECTIVE COLOR VISION, the private pilot certificate will bear the limitation NOT VALID FOR NIGHT FLIGHT OR BY COLOR SIGNAL CONTROL. This limitation may be removed by the successful completion of a special medical test authorized by the CAA Medical Division, W–265, Washington 25, D. C.

22.11–3 *Demonstration of aeronautical knowledge (CAA policies which apply to sec. 22.11 (f)).* Applicants for a private lighter-than-air pilot certificate will be required to pass the appropriate written examination furnished by the Administrator within 24 months prior to the date of issuance of the certificate. To pass the examination the applicant is required to answer correctly, within one hour, 45 of the 50 questions on the examination.[1] The applicant will be required to pass the written examination before the practical examination can be taken.

22.11–4 *Prerequisite for taking written examination (CAA policies which apply to sec. 22.11 (f)).* Applicant will be required to hold a valid student lighter-than-air pilot certificate.

22.11–5 *Evidence of flight experience (CAA policies which apply to sec. 22.11 (g)).* Flight experience required by section 22.11 (g) of this part should be substantiated by a logbook maintained in accordance with the requirements of section 22.32 (f) of this part.

[1] Complete information on the coverage of the private pilot written examination is found in the CAA booklet, *Questions and Answers for Private Pilots*, for sale at most airports, and at the U. S. Government Printing Office, Washington, D. C. (25 cents)

22.11-6 *Flight test (CAA policies which apply to sec. 22.11 (h)).*

(a) Applicant will be required to successfully accomplish the following maneuvers:[2]

(1) Ground handling and mooring.
(2) Preflight checks.
(3) Runups.
(4) Takeoffs.
(5) Ascents.
(6) Turns (right and left) and figure 8's.
(7) Straight and level flight.
(8) Descents.
(9) Landings (positive static balance).
(10) Landings (negative static balance).

22.11-7 *Quality of performance (CAA policies which apply to sec. 22.11 (h)).* The applicant will be required to demonstrate his ability to exercise reasonable judgment and smoothness in all required flight maneuvers. Exercise of reasonable judgment will be demonstrated when the conduct of the flight maneuver results in compliance with part 60 of this subchapter, avoidance of critical situations which require corrective action by the agent or examiner to maintain continued safe operation, and the observance of accepted good operating practices for flight conditions encountered.

22.11-8 *Conduct of flight test (CAA policies which apply to sec. 22.11 (h)).* The flight test will be conducted by an Aviation Safety Agent or a private or commercial lighter-than-air pilot examiner. The flight test, including all maneuvers, will be discussed thoroughly with the applicant so as to insure complete understanding of what is expected.

22.11-9 *Military competence requirements—written examination—private lighter-than-air pilot (CAA policies which apply to sec. 22.11 (i)).* An applicant for a private lighter-than-air pilot certificate based on military competence will be required to accomplish satisfactorily within one hour an examination on Parts 43 and 60 of the Civil Air Regulations with a passing grade of not less than 70 percent.

22.11-10 *Documentary evidence acceptable for issuance of certificate based on military competence (CAA policies which apply to sec. 22.11 (i)).*

(a) An official identification card indicating that the applicant is a member of the armed forces of the United States or a civilian employee of the ferry or transport services thereof is acceptable documentary evidence. Documentary evidence of flight status will consist of (1) official orders to solo flight status, or (2) a copy of USAF Form 5 or a copy of a USN flight log properly endorsed to show solo flight status, or (3) official orders showing graduation from and rating as a lighter-than-air pilot by a military flying school, or (4) a copy of orders showing duty involving flying as a rated lighter-than-air pilot, or (5) a properly executed Certificate of Pilot Status, Form ACA-356, signed by the appropriate commanding officer.

22.11-11 *Evidence of military discharge or release—private lighter-than-air pilot (CAA policies which apply to sec. 22.11 (i)).* Documentary evidence of honorable discharge or release from the armed forces should consist of an original or photostatic copy of such discharge or release. Persons discharged from the service or removed from flight status for reasons of flight deficiency, for the good of the service, or as a result of disciplinary action will not be issued a lighter-than-air pilot certificate on the basis of military competency.

22.12-1 *Evidence of meeting physical standards (CAA policies which apply to sec. 22.12 (e)).* The Administrator, or his representative, will accept a first- or second-class medical certificate issued within 12 months preceding the date of the application as evidence of the applicant's meeting the physical standards.

22.12-2 *Color deficiency limitation (CAA policies which apply to sec. 22.12 (e)).* When the applicant holds a medical certificate bearing the notation DEFECTIVE COLOR VISION, the commercial pilot certificate will bear the limitation NOT VALID FOR NIGHT FLIGHT OR BY COLOR SIGNAL CONTROL. This limitation may be removed by the successful completion of a special medical test authorized by the CAA Medical Division, W-265, Washington 25, D. C.

[2] See app. A for Guide to Satisfactory Performance of Required Maneuvers.

Commercial Lighter-Than-Air Pilot Certificates

22.12–3 *Demonstration of aeronautical knowledge—commercial lighter-than-air pilot (CAA policies which apply to sec. 22.12 (f)).* The applicant for a commercial lighter-than-air pilot certificate will be required to pass a written examination provided by the Administrator. A passing grade of at least 70 percent is required. Applicants who pass the written examination will be given a report of grade achieved. This report, and reports previously issued, will be accepted within a maximum period of 24 months from date of issuance as evidence of having met this certificate requirement.

22.12–4 *Written examination (CAA policies which apply to sec 22.12 (f)).*

(a) The written examination for commercial lighter-than-air applicants will consist of the commercial pilot and instrument rating examinations. Subjects covered are as follows:

(1) Civil Air Regulations, including both visual and instrument flight rules.
(2) Navigation by dead reckoning, pilotage, and by radio.
(3) Meteorology.
(4) General servicing and operation of airships.

(b) The applicant will be required to pass the written examination before the practical examination can be taken. Written examinations will be valid for the issuance of a commercial lighter-than-air certificate for a period of 24 months.

(c) An applicant who holds a valid heavier-than-air commercial pilot certificate will be required to pass only the general servicing and operation of airship and the instrument examination.

(d) An applicant who holds a valid heavier-than-air commercial pilot certificate with an instrument rating will be required to pass only the general servicing and operation of airships.

22.12–5 *Prerequisite for taking written examination (CAA policies which apply to sec. 22.12 (f)).* To be eligible to take the commercial lighter-than-air written examination, an applicant will be required to hold either a private lighter-than-air pilot certificate or a valid student lighter-than-air certificate which has been endorsed for solo and cross country.

22.12–6 *Evidence of flight experience (CAA policies which apply to sec. 22.12 (g)).* Flight experience required by section 22.12 (g) of this part should be substantiated by a logbook maintained in accordance with section 22.32 (f) of this part.

22.12–7 *Flight test (CAA policies which apply to sec. 22.12 (h)).*

(a) Applicant will be required to successfully accomplish the following maneuvers:[3]

(1) Ground handling and mooring.
(2) Preflight check.
(3) Runups.
(4) Takeoffs.
(5) Ascents.
(6) Turns (right and left) and figure 8's.
(7) Straight and level flight.
(8) Precision turns (180° and 360°).
(9) Climbing turns.
(10) Diving turns.
(11) Descents.
(12) In flight ETA computations.
(13) Radio operation and tuning.
(14) Radio orientation.
(15) Beam bracketing and tracking.
(16) Locating cone of silence.
(17) Traffic control and approach procedure.
(18) Landings (positive static balance).
(19) Landings (negative static balance).

22.12–8 *Quality of performance (CAA policies which apply to sec. 22.12 (h)).* The applicant will be required to demonstrate his ability to exercise reasonable judgment and smoothness in all required flight maneuvers. Exercise of reasonable judgment will be demonstrated when the conduct of the flight maneuver results in compliance with part 60 of this subchapter, avoidance of critical situations which require corrective action by the agent or examiner to maintain continued safe operation, and the observance of accepted good operating practices for flight conditions encountered.

[3] See app. A for Guide to Satisfactory Performance of Required Maneuvers.

22.12-9 *Conduct of flight test (CAA policies which apply to sec. 22.12 (h)).* The flight test will be conducted by an Aviation Safety Agent or a commercial lighter-than-air pilot examiner. The test, including all maneuvers, will be discussed thoroughly with the applicant so as to insure complete understanding of what is expected.[4]

22.12-10 *Radio skill (CAA policies which apply to sec. 22.12 (i)).* Final approach procedures for airplanes need not necessarily be followed by lighter-than-air applicants. An applicant may elect to consider his initial approach as a final approach and go direct to the airport, if such procedure does not require more than 90° of turn over the station. Orientation and approach procedures will be discussed prior to the flight test. Orientation and approach may be made utilizing either LF or VHF range facilities.

22.12-11 *Military competence requirement—written examination—commercial lighter-than-air pilot (CAA policies which apply to sec. 22.12 (j)).* An applicant for a commercial lighter-than-air pilot certificate based on military competence will be required to accomplish satisfactorily within one hour an examination on Parts 43 and 60 of the Civil Air Regulations, with a passing grade of not less than 70 percent.

22.12-12 *Documentary evidence acceptable for issuance of certificate based on military competence (CAA policies which apply to sec. 22.12 (j)).*

(a) An official identification card indicating that the applicant is a member of the armed forces of the United States or a civilian employee of the ferry or transport services thereof is acceptable documentary evidence. Documentary evidence of flight status will consist of (1) official orders to solo flight status, or (2) a copy of USAF Form 5 or a copy of a USN flight log properly endorsed to show solo flight status, or (3) official orders showing graduation from and rating as a lighter-than-air pilot by a military flying school, or (4) a copy of orders showing duty involving flying as a rated lighter-than-air pilot, or (5) a properly executed Certificate of Pilot Status, Form ACA-356, signed by the appropriate commanding officer.

22.12-13 *Evidence of military discharge or release—commercial lighter-than-air pilot (CAA policies which apply to sec. 22.12 (j)).* Documentary evidence of honorable discharge or release from the armed forces should consist of an original or photostatic copy of such discharge or release. Persons discharged from the service or removed from flight status for reasons of flight deficiency, for the good of the service, or as a result of disciplinary action will not be issued a lighter-than-air pilot certificate on the basis of military competency.

Free Balloon Pilot Certificates

22.13-1 *Written examination (CAA policies which apply to sec. 22.13 (f)).* Applicants for a free balloon pilot certificate will be required to pass the appropriate written examination furnished by the Administrator within 24 months prior to the date of issuance of the certificate. To pass the examination the applicant is required to answer correctly, within one hour, 45 of the 50 questions on the examination which covers Civil Air Regulations, meteorology, navigation, and general operation of free balloons.[5] The applicant will be required to pass the written examination before the practical examination can be taken.

22.13-2 *Prerequisite for taking written examination (CAA policies which apply to sec. 22.13 (f)).* Applicant will be required to hold a valid student lighter-than-air pilot certificate.

22.13-3 *Evidence of flight experience (CAA policies which apply to sec. 22.13 (g)).* Flight experience required by section 22.13 (g) of this part must be substantiated by a logbook maintained in accordance with section 22.32 (f) of this part.

22.13-4 *Flight test (CAA policies which apply to sec. 22.13 (h)).*

[4] See app. A for Guide to Satisfactory Performance of Required Maneuvers.

[5] Complete information on the coverage of the free balloon pilot written examination is found in the CAA booklet, *Questions and Answers for Private Pilots,* for sale at most airports, and at the U. S. Government Printing Office, Washington, D. C. (25 cents)

(a) Applicant will be required to successfully accomplish the following maneuvers:[6]

(1) Ground handling and mooring.
(2) Preflight checks.
(3) Takeoffs.
(4) Ascents.
(5) Descents.
(6) Landings (positive static balance).

22.13–5 *Quality of performance (CAA policies which apply to sec. 22.13 (h)).* The applicant will be required to demonstrate his ability to exercise reasonable judgment in all required flight maneuvers. Exercise of reasonable judgment will be demonstrated when the conduct of the flight maneuver results in compliance with part 60 of this subchapter, avoidance of critical situations, and the observance of accepted good operating practices for the flight conditions encountered.

22.13–6 *Conduct of flight tests (CAA policies which apply to sec. 22.13 (h)).* Following successful completion of the written examination, the flight test will be conducted by an Aviation Safety Agent. The test, including all maneuvers, will be discussed thoroughly with the applicant so as to insure complete understanding of what is expected.

Lighter-Than-Air Pilot Certificates

22.20–1 *Where to obtain forms and make application (CAA policies which apply to sec. 22.20).*

(a) Application forms are obtainable from a representative of the Administration or one of its regional, district, or field offices.

(b) An application for a lighter-than-air pilot certificate is to be presented in person to an Aviation Safety Agent or to a designated lighter-than-air pilot examiner.

(c) An applicant qualifying on the basis of military competency (see section 22.11 (i) and section 22.12 (j) of this part) is to present his application to an Aviation Safety Agent.

22.21–1 *Reissuance of certificates held by aliens (CAA policies which apply to sec. 22.21 (c)).* Lighter-than-air pilot certificates or free balloon pilot certificates held by individuals other than United States citizens, which are about to expire or have expired, will be reissued by Aviation Safety Agents upon receipt of application for renewal.

22.21–2 *Issuance of temporary lighter-than-air pilot certificates (CAA policies which apply to sec. 22.21 (d)).* Temporary lighter-than-air pilot certificates are issued to qualified applicants by Aviation Safety Agents and designated lighter-than-air pilot examiners pending the examination of the applicants' records and the issuance of certificates of greater duration by the Administrator.

22.24–1 *Examinations and tests (CAA policies which apply to sec. 22.24).* Written examinations will be given only by Aviation Safety Agents. Flight tests may be conducted by Aviation Safety Agents or designated private or commercial lighter-than-air pilot examiners.

Pilot Regulations

22.32–1 *Airman identification card (CAA rules which apply to sec. 22.32 (g)).* An Airman Identification Card, Form ACA–2135, is issued by the Administrator and may be used to meet the requirements of section 22.32 (g) of this part.

22.32–2 *Other identification cards acceptable to the Administrator (CAA rules which apply to sec. 22.32 (g)).*

(a) Identification cards which are acceptable in lieu of Form ACA–2135 to meet the requirements of section 22.32 (g) of this part are as follows:

(1) Aircrewman Identification Card, Form ACT–2116.1, issued by CAA.

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

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

(i) U. S. Army.
(ii) U. S. Navy.
(iii) U. S. Air Force.

[6] See app. A for Guide to Satisfactory Performance of Required Maneuvers.

(iv) U. S. Marine Corps.
(v) U. S. Coast Guard.
(vi) U. S. Merchant Marine.
(vii) National Guard.
(viii) Civil Air Patrol.

22.32-3 *Application (CAA rules which apply to sec. 22.32 (g)).* An applicant for an airman identification card shall comply with the following procedures:

(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 identify.* 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.

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.

(i) Applicants who cannot furnish any of the documents listed in (1) through (8) of this paragraph 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.

(ii) 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 (c) 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) 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 photgraphs which are:

(1) Taken from the same negative;

(2) One-inch square, full face, head only;

(3) Taken within the past 12 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.

22.32-4 *Other airman certificates (CAA policies which apply to sec. 22.32 (g)).* An identification card which meets the requirements of this part for pilots will also meet the identification card requirements for any other airman certificates which he may hold.

APPENDIX A

Guide to Satisfactory Performance of Required Maneuvers

The flight test items are explained below, with a guide as to required performance and important factors which apply to each.

Private and/or Commercial Lighter-Than-Air Pilot-Certificate

1. *Ground handling and mooring.*

(a) *Performance.*

(1) Demonstration of ability to "fly" the airship on the ground.

(2) Adequate knowledge of ballasting, trimming procedure, and pressure control.

(3) Correct use of controls and engines.

(b) *Important factors.*

(1) Smoothness and proper use of controls to minimize yawing and pitching.

(2) Smooth use of throttles to prevent ship from drifting astern or ahead.

(3) Careful attention to ballasting to insure that ship does not become too heavy or too light for the existing condition of field and weather.

(4) Trimming technique to insure maximum controllability while in the hands of ground crew and particularly prior to unmasting to insure that ship is not excessively bow heavy after unmasting. (Applies when this maneuver is executed incident to the test, otherwise applicant will be examined orally on this phase; i. e., unmasting.)

(5) Maintenance of adequate gas pressure in order that full control travel may be realized and bow mooring assembly (envelope) stresses minimized.

2. *Preflight checks.*

(a) *Ship hangared or moored to mast.*

(1) *Performance.*

(i) Inspection of:

(*a*) Exterior and interior of ship, including review of daily weightoff.

(*b*) Amount of fuel, oil, and ballast aboard, including standard ship equipment (loose gear).

(ii) Check of—

(*a*) Control tension and operation.

(*b*) Superheat.

(*c*) Radio.

(iii) Preparation for and actual starting and warming engines.

(iv) Adjustment and check of instruments.

(v) Check of ship's trim.

(vi) ICS or oral check to insure all stations manned, doors closed, sand ballast properly stowed and manned.

(2) *Important factors.*

(i) Thoroughness of all checks.

(ii) Use of checkoff list.

(b) *Ship in hands of ground crew.*

(1) *Performance.* A visual check of fuel and oil aboard, if ground handling conditions permit; otherwise, information furnished by the pilot being relieved will suffice, including his oral report of discrepancies, static condition, and trim of ship. (Desired information can be furnished by radio prior to the initial landing.)

(2) *Important factors.*

(i) Expeditious changing of crews, if ground handling of ship is difficult.

(ii) Presence of applicant on the field prior to the landing to observe landing conditions, if applicable.

3. *Runups.*

(a) *Performance.*

(*i*) Runup of engines to recommended power settings to scavenge the cylinders of accumulated exhaust gases and oil, for checking accessories, performance, and power output of engines.

(ii) On ships equipped with a flight engineer's station, all operations, with the exception of the first one, normally will be performed by the flight engineer. When ship is in the hands of the ground crew, runup time for each engine shall be held to a minimum to facilitate ground handling. Normally, initial runup will be performed at the mast or in a hangar by a certificated mechanic and final runup by the pilot is for scavenging purposes and a final check of instruments, magnetos, and general performance. There may be occasions when ground handling conditions will be such that scavenging of cylinders will be the only operation practicable.

(b) *Important factors.*

(i) Smoothness of throttle use and absence of "torching."

(ii) Instruments and accessories check.

(iii) Testing controls for freedom and full travel.

(iv) Check of traffic on the ground and in the air.

(v) Control-tower check for takeoff clearance, if required.

4. *Takeoffs.*

(a) *Performance.*

(i) Selection of suitable takeoff site.

(ii) Smooth safe takeoff.

(b) *Important factors.*

(i) Traffic check.

(ii) Selection of takeoff site and heading.

(iii) Precise application of power during "up-ship" takeoff.

(iv) Smooth application of power as rapidly as conditions will permit during a "heavy" takeoff.

(v) Maintenance of a positive angle of inclination consistent with the dictates of existing conditions (normally, 50 percent of the maximum angle permissible) in order that the ship may not become airborne with marginal controllability and adequate elevator control may be insured in the event of loss of power or sudden reduction in wind velocity.

(vi) Use of dampers and blower as necessary in order to maintain adequate pressure, particularly if a gas pressure drop results from loss of superheat or other reasons.

(vii) Direction of rudder pilot as necessary, should ship be equipped with two-pilot controls. (In such cases, one set of controls shall be manned by a certificated lighter-than-air pilot. Applicant's takeoff proficiency with rudder controls (K-type or equivalent) need not be demonstrated unless he shows lack of general proficiency, particularly with regard to laxity in directing the rudder pilot.)

(viii) Smooth reduction in power as soon as well airborne and as soon as conditions permit.

(ix) Coordination of controls.

(*a*) Light tail-wheel contact during takeoff is not considered disqualifying, particularly when the airship is "heavy," the takeoff area small, and the wind light. However, a negative angle of inclination during takeoff after controllability (adequate elevator response) is a disqualifying and hazardous maneuver in most instances.

5. *Ascents.*

(a) *Performance.*

(i) Ascents at rates up to 600 feet per minute (private), 1,200 feet per minute (commercial), maintaining gas pressure between 1 inch and 1¾ inches of water.

(ii) Ship in prescribed trim (within reasonable limits) when ascent terminates at designated altitude.

(b) *Important factors.*

(i) Knowledge of the air system and its limitations.

(ii) Trimming procedure.

(iii) Coordination.

(iv) Smooth change in ship's attitude.

(v) Ability to control rate of ascent within reasonable limits, particularly while flying in turbulent air.

(vi) Full awareness of the necessity for adequate pressure control and the effect static trim has on controllability.

(*a*) The airship should be in static equilibrim or nearly so, when practicable. The precision with which the maneuvers can be executed will depend largely upon the turbulence of the air at the time of execution. Accord-

ingly, no set formula can be prescribed for evaluation of results; experience is the best guide. Ascents should terminate well below pressure height in the interest of safety and in order to insure normal operation of the air system.

6. *Turns (right and left) and figure 8's.*

(a) *Performance.*

(i) Turns (right and left) at cruising speed, at approximately minimum turning radius.

(ii) Maintaining constant altitude (plus or minus 100 feet) provided turbulence is not excessive.

(b) *Important factors.*

(i) Coordination.

(ii) Alertness (looking before turning left, and asking copilot to look before turning right).

(iii) Rudder technique in controlling constantly changing drift angle.

(iv) Ability to anticipate the need for elevator control to counteract the elevator effect produced by the rudder while turning.

(*a*) The method of determining the accuracy of turns is optional. Satisfactory results may be obtained by use of road intersections, turning within well-spaced section lines (using the four sides of the area for reference), using a prominent tree or structure as a pylon, etc. It is expected that right-hand turns made from the elevatorman position (K–type) will be executed with less precision than those executed from the rudderman position (K–type), and vice versa.

7. *Straight and level flight.*

(a) *Performance.*

(i) Flight at constant altitude (plus or minus 100 feet, provided turbulence is not excessive) at cruising speed, maintaining cruising gas pressure.

(ii) Straight flight with reference to highways and section lines or a specified compass heading.

(b) *Important factors.*

(i) Coordination of controls.

(ii) Maintenance of heading and altitude with a minimum of yawing and pitching.

(iii) Smooth use of controls.

(iv) Adjustment and maintenance of the trim of the ship for maximum controllability.

(v) Maintenance of gas pressure within cruising limits.

(*a*) The maneuver is for the purpose of checking the appplicant's ability to control the ship in a smooth, well-coordinated manner, permitting changes in altitude, direction, and attitude consistent with the turbulence of the air encountered. The use of brute force, involving large angles of control movements which place undue stress on the ship, is to be avoided.

8. *Precision turns (180° and 360°).*

(a) *Performance.*

(i) Turns at constant altitude through 180° and 360° during actual or simulated instrument conditions with a degree of accuracy consistent with air conditions encountered.

(ii) Maintenance of gas pressure of not less than 1 inch and not more than 1¾ inches of water.

(b) *Important factors.*

(i) Altitude.

(ii) Pressure.

(iii) Coordination.

(iv) Accuracy of heading.

9. *Climbing turns.*

(a) *Performance.*

(i) Turns while climbing at 400 to 600 feet per minute, maintaining gas pressure specified in *Ascents.*

(ii) Starting and terminating the maneuver with the ship in approximately neutral dynamic trim.

(b) *Important factors.*

(i) Coordination.

(ii) Alertness.

(iii) Pressure control and trim.

(*a*) Reasonable deviation from prescribed rate of ascent is permitted, particularly if the air is turbulent.

10. *Diving turns.*

(a) *Performance.*

(i) Turns while descending at 400 to 600 feet per minute, maintaining gas pressure specified in *Ascents.*

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(ii) Starting and terminating the maneuver with the ship in approximately neutral dynamic trim.

(b) *Important factors.*

(i) Coordination.

(ii) Alertness.

(iii) Pressure control and trim.

(*a*) Reasonable variation in the rate of descent is permitted, particularly if the air is turbulent.

11. *Descents.*

(a) *Performance.* Descents at rates up to 600 feet per minute (private) and 1,200 feet per minute (commercial) maintaining gas pressure between 1 inch and 1¾ inches of water, terminating the maneuver with ship in approximately neutral dynamic trim.

(b) *Important factors.*

(i) Coordination.

(ii) Pressure and trim.

(*a*) Reasonable variation in the rate of descent is permitted.

12. *Estimated time of arrival (ETA) in-flight computation.*

(a) *Performance.*

(i) ETA in-flight computation of an actual or theoretical flight of not less than 100 miles at cruising speed along an established airway at an altitude of not more than 2,000 and not less than 1,000 feet.

(ii) Consideration of weather and conditions anticipated.

(iii) Estimation of fuel requirement for the flight.

(b) *Important factors.*

(i) Applicant's knowledge of performance characteristics of the ship being flown.

(ii) Interpretation of weather reports and ability to estimate weather trends likely to occur during the period of the flight.

(iii) Judgment.

13. *Radio operation and tuning.*

(a) *Performance.*

(i) Knowledge of how to tune to a prescribed frequency (station) and peak the signal, to differentiate voice from course signals when tuned to a range station, to recognize an improperly tuned signal, and to recognize distortion due to improper use of volume control.

(ii) Correct use of the radio on builds and fades by proper use of volume control, if used in radio range navigation.

(iii) Recognition of the effect of excessive volume in analyzing signals in the bisignal or twilight zone.

(b) *Important factors.*

(i) Correct tuning.

(ii) Use of volume control.

14. *Radio orientation.*

(a) *Performance.* Orientation by any recognized method which is practicable under all conditions on the particular range being used and which will accomplish orientation in the least possible time.

(b) *Important factors.*

(i) Identification of range an on-course signals.

(ii) Recognition of fades, builds, and bisignals.

(iii) Selection of best orientation method.

(iv) Precise execution of orientation.

(v) Technique in bracketing range legs.

(vi) Control of signal volume.

(vii) Proper maneuvering of airship throughout as to altitude, heading, trim, and pressure.

(viii) Cone identification.

(ix) Coordination.

(x) Judgment.

15. *Beam or radial bracketing and tracking.*

(a) *Performance.*

(i) Flight along a given range leg with a minimum variation of heading in order to maintain position relative to the range leg.

(ii) Estimation of drift and average heading.

(b) *Important factors.*

(i) Position.

(ii) Heading.

(iii) Constant altitude.

(iv) Trim.

(v) Pressure.

(vi) Estimation of drift and average heading.

(vii) Radio operation (use of manual volume control).

16. *Locating cone of silence or station.*

(a) *Performance.* Recognition of the cone of silence or station by an accepted method.

(b) *Important factors.*

(i) Elimination of false cones.

(ii) Accuracy of cone.

(iii) Recognition of build and fade.

(iv) Correct heading after leaving cone.

17. *Traffic control and approach procedure.*

(a) *Performance.*

(i) Standard airship instrument approach (letdown) procedure for airport being used.

(ii) ADF approach (optional).

(*a*) Applicant will be required to use only such radio equipment as has been allotted to him. Radio failures and other unusual conditions may be included at any time during the approach.

(b) *Important factors.*

(i) Obtaining clearance.

(ii) Following such clearance explicitly.

(iii) Timing (allowance being made for existing wind conditions).

(iv) Adherence to approved or agreed upon minimums for approach and pull-up.

(v) Proper maneuvering of ship throughout as to attitude, altitude, trim, pressure, and headings.

(vi) Judgment used in any given unusual conditions.

(vii) Reaction and ability to make quick, accurate corrections.

(viii) Timing and smoothness of control.

(*a*) There may be occasions when deviation from the standard approach procedure will be required or desirable because of existing conditions, such as making a descent with precise rate control and zero ground speed, maintaining position over a range, until contact is established.

18. *Landings (positive static balance).*

(a) *Performance.*

(i) Normal landing with the ship 200 pounds statically heavy, placing the ship in the hands of the ground crew with minimum forward speed.

(ii) Termination of landing (ground speed zero) with ship in positive or neutral trim.

(iii) Weighoff and trim check prior to the final approach, using a checkoff list (if required for the type).

(b) *Important factors.*

(i) Weighoff and trim technique.

(ii) Smooth, coordinated use of controls.

(iii) Tower clearance (if required).

(iv) Precise use of throttles.

(v) Touching down or placing ship in the hands of the crew with minimum forward speed, pressure normal, and control adequate.

(vi) Static trim upon completion of landing.

(vii) Judgment, particularly with regard to the applicant's decision to land on the wheel or to the crew as a result of landing conditions.

19. *Landings (negative static balance).*

(a) *Performance.*

(i) Normal landing with ship 200 pounds statically light placing the ship in the hands of the ground crew with minimum forward speed consistent with existing wind conditions.

(ii) Weighoff and trim check prior to the final approach, using a checkoff list (if required for the type).

(b) *Important factors.*

(i) Weighoff and trim technique.

(ii) Smooth, coordinated use of controls.

(iii) Tower clearance (if required).

(iv) Precise use of throttles.

(v) Placing ship in the hands of the crew with minimum forward speed, with pressure normal, and with adequate control.

(*a*) Negative, nose heavy, trim should be only sufficient to permit landing with maximum controllability, trimmed as near neutral as conditions permit.

Free Baloon Pilot Certificate [1]

1. *Ground handling and mooring.*

(a) *Performance.* Demonstration not required; oral examination acceptable.

(i) Knowledge of wind effect on balloon during ground handling.

(ii) Weighoff.

(iii) False weighoff.

(iv) Ripcord use.

(b) *Important factors.*

(i) Precise weighoff procedure.

(ii) Ability to recognize a false weighoff, or make sufficient weighoffs to insure that a true one is obtained.

(iii) Use of ripcord to minimize damage to balloon and injury to personnel.

2. *Preflight checks.*

(a) *Performance.*

(i) Visual inspection of accessible portions of the balloon and rigging.

(ii) Distribution of ballast.

(iii) Check of equipment and instruments.

(iv) Location of ripcord with relation to valve cord in order that there be no question concerning the identity of each.

(v) Check of gas valve to insure no sticking in open or partially open position and removal of appendix tieoff.

(b) *Important factors.*

(i) Thoroughness of all checks.

4. *Takeoffs.*

(a) *Performance.*

(i) Selection of suitable takeoff site.

(ii) Well-controlled, safe takeoff.

(b) *Important factors.*

(i) Adjustment of balloon's static condition to suit existing condition of wind, terrain, and proximity of obstructions.

(ii) Timing of pilot's release order, particularly if balloon envelope is oscillating.

(iii) Use of drag rope, when expedient.

5. *Ascents.*

(a) *Performance.*

(i) Ascents at rates consistent with the quantity of ballast available.

(b) *Important factors.*

(i) Ability to ascend so as to maintain a safe altitude with the least expenditure of ballast (as is necessary with an airship in the event of engine failure or the making of repairs in flight).

(ii) Ability to maintain constant altitude or slow rate of ascent when feasible.

11. *Descents.*

(a) *Performance.* Descents with a minimum expenditure of gas and ballast, using the drag rope when practicable.

(b) *Important factors.*

(i) Knowledge of the effect of superheat.

(ii) Timed operation of gas valve.

(iii) Judicious use of ballast.

18. *Landings (positive static balance).*

(a) *Performance.* Normal landing in a smooth, well-controlled manner, either by valving gas or valving gas and operating the rip panel ("ripping").

(b) *Important factors.*

(i) Use of drag rope, when practicable.

(ii) Timing.

(iii) Valve and ballast technique.

(iv) Judgment.

[1] Maneuvers are numbered in accordance with the outline established for Private and for Commercial Lighter-Than-Air Pilot Certificate Flight Test. (See page 9.)

AVIATION INFORMATION

U. S. GOVERNMENT PRINTING OFFICE: 1955

CAM 22 does not include a study guide — does have an explanation of flight test items (in Appendix A).

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