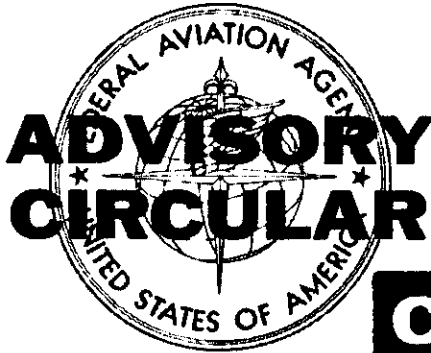


Federal Aviation Agency



AC NO: AC 90-13 CH 1

AIR TRAFFIC CONTROL
AND
GENERAL OPERATIONS

EFFECTIVE :

12/23/65

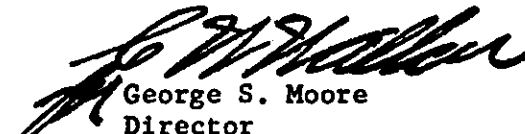
CHANGE

SUBJECT : TURBOJET TRAINING PROGRAM - GENERAL AVIATION CHANGE

1. PURPOSE. This advisory circular change transmits a page change to Attachment 1 of AC 90-13 to provide suggested minimum hours of pilot training for general aviation turbojet aircraft certificated subsequent to the issuance of AC 90-13.

PAGE CONTROL CHART

| Remove Page | Dated | Insert Page | Dated |
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| Attachment 1, Page 1 | 4/22/64 | Attachment 1, Page 1 | 12/23/65 |



George S. Moore
Director
Flight Standards Service

Federal Aviation Agency

ADVISORY CIRCULAR

AC NO: AC 90-13

AIR TRAFFIC CONTROL
AND
GENERAL OPERATIONS

EFFECTIVE : 4/22/64

SUBJECT : TURBOJET TRAINING PROGRAM - GENERAL AVIATION

1. PURPOSE. This circular recommends areas of coverage for initial and recurrent training of general aviation pilots in turbojet aircraft. It further outlines procedures for the executive operator to follow if he desires to designate a company check pilot and obtain Federal Aviation Agency authorization for this check pilot to conduct six-month pilot proficiency checks.
2. GENERAL.
 - a. The introduction and forecast rapid growth of turbojet aircraft in the general aviation fleet has resulted in the need for guidelines relative to initial and recurrent pilot training in these aircraft. In the past, initial training has been conducted for the most part by the aircraft manufacturer at the time the customer took delivery of the aircraft. In the future, we anticipate that both initial and recurrent training will be given by the manufacturer, professional training organizations, sales organizations, and executive operators. We believe this Advisory Circular will assist these organizations in establishing turbojet training programs which include the necessary areas of coverage.
 - b. Although recurrent training and proficiency flight checks are presently not required by regulation, the complexity of modern turbojet aircraft, together with the complex traffic system in which they are operated, makes such highly desirable. This training becomes particularly important to many pilots since it usually provides their only opportunity to practice emergency procedures. Lack of familiarity with emergency procedures cannot be tolerated if safe operation of modern complex aircraft is to be accomplished.
 - c. There is no intent to imply here that the minimum number of hours suggested for training (Attachment 1, page 1) is adequate for all pilots. We believe the time recommended is the minimum needed to present adequate coverage of the necessary areas of operation.

4/22/64

3. GROUND SCHOOL SUBJECTS FOR INITIAL AND RECURRENT TRAINING PROGRAMS.

- a. The following outline is primarily a checklist which may be used by training organizations in establishing training programs for initial and recurrent training on turbojet aircraft. All subject areas and specific items are not necessarily applicable to the recommended training for each particular aircraft and no attempt is made to specify or relate subject matters to a particular aircraft. Inspectors qualified in the aircraft are available for counsel on problems in the establishing and conduct of a particular training program.
- b. The suggested items for coverage have been compiled from several sources of expert knowledge and experience in the turbojet training field, including the training programs of several air carriers who have experienced considerable success in their training endeavors.

(1) Civil Air Regulations and Civil Aeronautics Manuals Relative to Each Part, Where Applicable.

- (a) CAR/CAM 4b, Airplane airworthiness. (Items pertaining to performance)
- (b) Special Regulations SR-422 - Turbine powered transport category airplanes of SR-422 current design. (Items pertaining to performance)
- (c) Federal Aviation Regulations Parts 91 and 61.

(2) Navigation.

- (a) High altitude charts
- (b) En route requirements and procedures
- (c) Terminal area requirements and procedures

(3) Meteorology.

- (a) Principles of pressure pattern flying
- (b) Wind systems - including jet stream
- (c) Clear air turbulence, thunderstorms, tornadoes, and hurricanes
- (d) High altitude weather, cloud formations, instrument errors
- (e) Interpretation of weather, prognostic charts

(4) Airway Traffic Control.

- (a) Jet flight planning
- (b) High altitude flight control

- (c) Transponder usage
- (d) Types of approaches and holding procedures

(5) Emergencies.

- (a) Aircraft evacuation
- (b) Firefighting
- (c) Smoke evacuation
- (d) Fuel dumping
- (e) Hydraulic failure
- (f) Gear extension and retraction failure
- (g) Intentional gear collapse
- (h) Utilization of emergency exits
- (i) Decompression
- (j) Emergency descents

(6) Operations.

- (a) Aircraft manuals and charts
- (b) Weight and balance
- (c) Jet flight planning
- (d) Ground handling
- (e) Cruise control - maximum range climb procedure
- (f) Ferry flights
- (g) High altitude physiology
- (h) Turbulence penetration
 - 1 Maneuvering margins associated with areas of turbulence at high altitude
 - 2 Flight through turbulence
 - 3 Importance of maintaining continuous yaw damper operation in turbulence
 - 4 Proper operation of airborne weather radar and its limitations at high altitudes

(7) Equipment.

- (a) General description
- (b) Performance and limitations
- (c) Powerplants
- (d) Systems
 - 1 Fuel
 - 2 Oil
 - 3 Hydraulic
 - 4 Pneumatic
 - 5 Water injection
 - 6 Heating
 - 7 Cooling
 - 8 Pressurization
 - 9 Autopilot
 - 10 Radio and radar

- 11 Electrical
- 12 Vacuum
- 13 Ignition
- 14 Oxygen
- 15 Induction
- 16 Ice elimination
- 17 Instruments
- 18 Control system
- (e) Oxygen equipment
- (f) Emergency equipment
- (g) Emergency systems and procedures

(8) Desirable Familiarization Assignments.

- (a) Air route traffic control center - emphasis on high altitude traffic control, and jet penetration procedures
- (b) Airport traffic control tower

4. FLIGHT TRAINING MANEUVERS FOR INITIAL, TRANSITION, AND RECURRENT TRAINING.

- a. The maneuvers listed in this Advisory Circular will, if properly presented and mastered, prepare the pilot for the required type rating or the recommended proficiency check.
- b. All maneuvers are not pertinent to all aircraft. Only those applicable need be included in the specific curriculum.
- c. A safe operational altitude should be established for each maneuver.
- d. The use of a checklist is recommended.
- e. The asterisks indicate those maneuvers for which an instrument hood should be utilized after VFR proficiency has been attained.
- f. The curriculum should include at least the following:
 - (1) Briefing session
 - (2) Preflight inspection of the aircraft
 - (3) Engine starting
 - (4) Taxiing
 - (5) Takeoffs
 - (a) Normal
 - (b) Crosswind
 - (c) Night
 - (d) Aborted
 - (e) Simulated engine failure
 - 1 Takeoffs with the authorized maximum takeoff weight (or simulation thereof) with simulated failure of the critical engine; such failure to occur as closely as practical to

the critical engine failure speed V_1 and climbout as closely as possible to takeoff safety speed V_2

- (f) *Takeoffs with hood used after becoming airborne but prior to reaching 100 feet altitude
- (g) Noise abatement procedures

(6) *Climb and climbing turns.

- (7) *Maneuvers - Minimum Speed. Minimum airspeed for maneuvering should be a precomputed airspeed ten knots above prestall or buffet speed, or stick shaker speed as related to aircraft gross weight configuration and with the flaps in takeoff, approach, and landing position in straight and level flight and in turns.

g. *Approach to Stalls. Approaches to stalls should be conducted from straight flight and turns with reduced power. Approaches to stalls should be accomplished with gear and flaps in en route, takeoff, approach, and landing configuration. Prior to executing this maneuver the stall speed, buffet speed, or stick shaker speed should be determined as related to aircraft gross weight, configuration, and altitude. This maneuver is an approach to a stall. It is not recommended that the aircraft be allowed to stall, shake, or slow down below the initial buffet or stick shaker speed any more than is necessary for recognition of stall warning.

h. *Rapid Descent and Pullup. A minimum descent of 2,000 feet is recommended to provide time for stabilization of airspeed and rate of descent.

i. Engine-Out Procedures and Familiarization.

- (1) *Turbojet engine shutdown
- (2) *Turbojet engine air-starts
- (3) In two-engine aircraft, simulate engine failure during:
 - (a) Takeoff
 - (b) Climb
 - (c) Cruise
 - (d) Approach
 - (e) Go-around
 - (f) Landing
- (4) In four-engine aircraft, simulate failure of two engines with gear and flaps in:
 - (a) En route climb configuration
 - (b) Approach configuration
 - (c) Landing configuration
- (5) The following maneuvers and procedures should be conducted:
 - (a) At the authorized maximum takeoff weight, (or simulation thereof) takeoff with simulated failure of the critical engine; such failure to take place as closely as possible

to the critical engine failure speed V_1 and climbout as closely as practical to takeoff safety speed V_2 ,

- (b) At the authorized maximum landing weight, (or simulation thereof) flight in four-engine airplanes with the most critical combination of two engines inoperative, or operating at idle thrust, and
 - (c) At the authorized maximum landing weight, (or simulation thereof) simulated pullout from the landing and approach configuration accomplished at a safe altitude with the critical engine inoperative, or operating at idle thrust.
- j. Roll Rates. Spoilers extended or retracted.
 - k. Dutch Roll. A maximum bank angle of 10 degrees, either side of level flight, is recommended when setting up the motion. Bank angle greater than 15 degrees, either side of level flight, is not recommended and should be avoided.
 - l. Spoilers - Speed Brake. Proficiency in all appropriate uses of spoilers and speed brakes.
 - m. *Stabilizer Trim.
 - (1) Procedures to be used for runaway stabilizer
 - (2) Procedures to be used for jammed stabilizer
 - (3) Procedures to be used for landing and "go-around" with horizontal stabilizer out of trim
 - n. Tuck and Mach Warning.
 - (1) Overspeed warning system
 - (2) Mach airspeed indicator
 - (3) Mach trim compensator - speed limitations if inoperative
 - (4) Any other method used to warn the pilot of approach to the Mach limit or tuck speed
 - (5) Knowledge of the characteristic of the particular airplane as it enters Mach, tuck, or pitch-up
 - o. *Recovery from Unusual Attitudes. The aircraft should be placed in attitudes unusual to normal flight and the recovery made to straight and level flight. Such attitudes may be one of the various combinations of noseup, nosedown, power-on, power-off, and 45° bank right or left. Particular care should be taken to preclude allowing the airplane to exceed any placarded speed, designed load, or any other limitations in the flight manual.

- p. *Emergency Descent. Maneuver should be terminated as soon as practical after satisfactory configuration and preselected airspeed have been established.
- q. *Traffic Control Procedures.
 - (1) Area departure
 - (2) Holding procedures, high and low altitudes
 - (3) Proper use of radio
 - (4) Airport traffic patterns
- r. *Instrument Approach, Missed Approach, and Orientation Procedures for ILS, VOR, ADF, LFR, GCA, PAR, ASR.
 - (1) Instruction and practice in the conduct of instrument approaches using all of the above facilities to the lowest landing minimum for which pilot and equipment are eligible.
 - (2) Use of autopilot, approach coupler, flight director, or integrated flight instrument systems.
- s. Landings.
 - (1) Normal
 - (2) Night
 - (3) Crosswind
 - (4) Zero flap
 - (5) Maneuvering to landing with simulated failure of:
 - (a) One engine on two-engine aircraft
 - (b) Two engines, same side on four-engine aircraft
 - (c) Any combination of two engines on three-engine aircraft
 - (6) Maneuvering to a landing under circling landing minimum conditions
 - (7) Aborted approaches - go-arounds
 - (8) Noise abatement procedures for landing
 - (9) Jammed stabilizer
- t. Systems Use.
 - (1) Anti-icing
 - (2) Deicing
 - (3) Pressurization and air conditioning
 - (4) Fuel
 - (5) Cockpit and aircraft lighting
 - (6) Navigational and communication
 - (7) Flight instrumentation
 - (8) Hydraulic
 - (9) Electrical
 - (10) Control

- (11) Ignition
- (12) Oxygen
- (13) Pneumatic

u. Inflight Emergency Procedures.

- (1) Powerplant fire
- (2) Heater and cargo compartment - fire detector and fire-smoke removal
- (3) Powerplant failure
- (4) Cabin fire-smoke removal
- (5) Flight instrument power failure
- (6) Electrical fires and failures
- (7) Pneumatic failure
- (8) Hydraulic system failures
- (9) Boost off flight procedures
- (10) Emergency decompression
- (11) Fuel dumping

v. Ground Emergencies.

- (1) Emergency evacuation
- (2) Brake fire
- (3) Use of emergency brake
- (4) Engine and fuselage fires
- (5) Battery overheat

5. DESIGNATION OF COMPANY CHECK PILOT.

- a. Executive aircraft operators are encouraged to establish a program for recurrent flight training and proficiency checking of their pilots. Some of the executive operators may desire to contract with professional training organizations or the manufacturer for such training; others may wish to establish their own training programs. In the event the company desires to establish such a program, they are encouraged to select a pilot in their organization to act as a company check pilot. If the selected pilot meets the requirements described in this Advisory Circular, he may be designated by the Federal Aviation Agency to conduct proficiency flight checks. An inspector will counsel the selected check pilots on methods and procedures used in conducting such checks as well as the standards expected of the pilot being checked. The inspector will then conduct the proficiency check of the selected pilot and observe one or more flight checks given by him. When satisfied with the check pilot's performance, the inspector will advise the company in writing that the check pilot is considered competent and is authorized to conduct proficiency checks. The company check pilot must demonstrate his proficiency to an FAA inspector each six-month period in order to retain this authorization.

- b. Several companies utilizing like aircraft may desire to establish a cooperative training program and select a member pilot as a check pilot. The inspector should follow the same procedure as outlined in paragraph 5.a. above to assist in this program.
- c. The following minimum experience qualifications should be met by a company check pilot before FAA authorization is granted to conduct proficiency flight checks:
 - (1) ATR certificate and type rating in the aircraft utilized
 - (2) 100 hours pilot-in-command in the type of aircraft in which he will conduct proficiency checks

6. HOW TO GET THIS PUBLICATION.

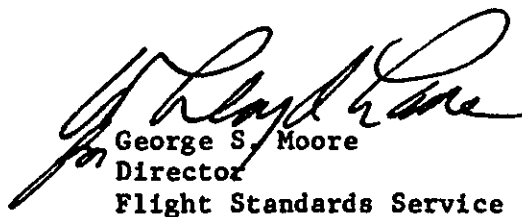
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Turbojet Training Program - General Aviation
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George S. Moore
Director
Flight Standards Service

ATTACHMENT 1
SUGGESTED MINIMUM HOURS OF TRAINING

AC 90-13 CH 1
12/23/65

INITIAL

RECURRENT TRAINING
(or six-month check)

Operational
Ground School
in
Conjunction
with Flight

Systems Ground
School

Flight

Ground School

Flight

PC

2C

PC

2C

PC

2C

PC

2C

LOCKHEED
(JetStar

80

80

34

20

10

16

16

1/As necessary to satisfactorily pass six month proficiency check.

SABRELINER

56

56

30

20

10

16

16

* JET COMMANDER

56

56

20

20

10

16

16

LEAR JET

40

40

30

20

10

16

16

FAN JET
FALCON

56

56

30

20

10

16

16

DH-125

56

56

30

20

10

16

16

1/ Applies to all aircraft.

Attachment 1
Page 1

ATTACHMENT 2. CONSOLIDATED LIST OF PILOT FLIGHT CHECK MANEUVERS

| | Airline Transport | Type Rating | Proficiency Check | Company Check Pilot |
|---|----------------------|----------------|----------------------|------------------------|
| 1. Equipment Examination (oral) | x | x | x | x |
| 2. Preflight Check | x | x | x | x |
| 3. Taxiing - Sailing or Docking | x | x | x | x |
| 4. Runup | x | x | x | x |
| 5. Takeoffs | x | x | x | x |
| *6. Climbs and Climbing Turns | x | x | x | x |
| *7. Maneuvering at Slow Speed | x | x | | x |
| *8. Approaches to Stalls | x | x | | x |
| 9. Stalls | x | x | | x |
| 10. Airport Traffic Pattern | x | x | x | x |
| 11. Landing Technique | x | x | x | x |
| 12. Crosswind Takeoff and Landings | x | x | x | x |
| 13. Traffic Control Procedures | x | x | x | x |
| *14. Steep Turns | x | x | | x |
| *15. Timed Turns | x | x | x | x |
| *16. Recovery from Unusual Attitudes | x | | | x |
| *17. Use of Radio Equipment | x | x | x | x |
| *18. Orientation | x | x | x | x |
| *19. Beam Bracketing | x | x | | x |
| 20. Cone (Station) Identification | x | x | | |
| *21. Instrument Approach Procedure | x | x | x | x |
| 22. Missed Approach Procedures | x | x | x | x |
| *23. Use of Directional Radio | x | x | x | x |
| 24. Rapid Descent and Pullup | x | x | x | x |
| 25. Engine(s)-Out Procedures | x | x | x | x |
| *26. Maneuvering with Engine(s) Out | x | x | x | x |
| 27. Maneuvering for Landing at Weather Minimums | x | x | x | x |
| 28. Takeoff and Landings with Engine(s) Failure | x | x | x | x |
| 29. Emergencies | x | x | x | x |
| 30. Smoothness and Coordination | x | x | x | x |
| *31. Judgment | x | x | x | x |
| | | | | |

*Must be performed under the hood.

This computer has been recently developed by the Federal Aviation Administration to replace the Koch Chart. Two versions are available. One is for fixed-pitch propeller aircraft, and the other is for variable pitch propellers. It is for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The price is 50¢. When ordering, specify either fixed pitch or variable pitch.

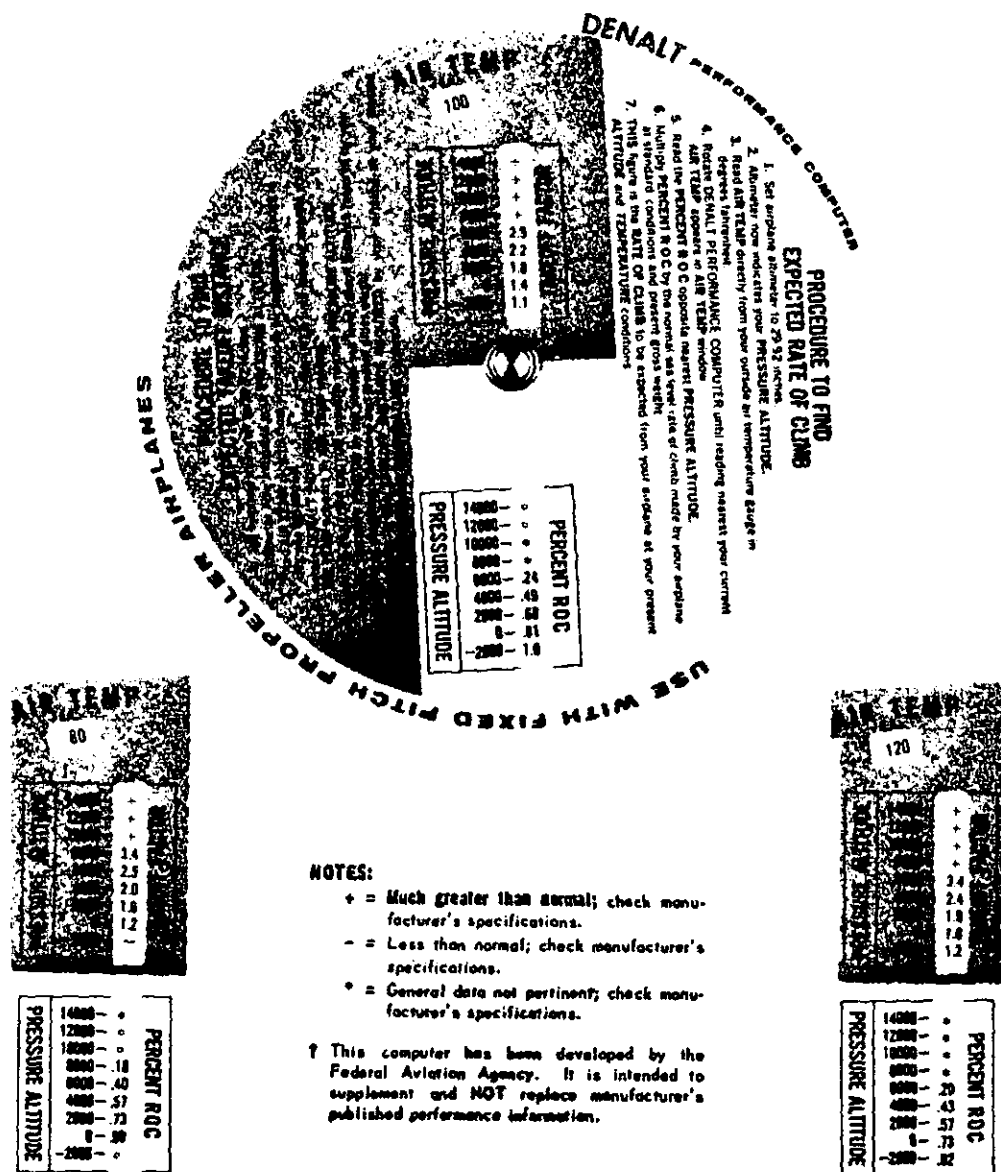


FIGURE 3. DENALT PERFORMANCE COMPUTER