

Rocky Mountain Region

Turbocharged Single Engine Cessna Aircraft

Standard Operating Procedure

01-Feb-2010

For all CAP Pilots in Rocky Mountain Region requesting privileges to act as PIC in CAP Turbocharged Cessna aircraft (TCA) must receive ground and flight training and an endorsement by a CAP TCA IP/CP assigned to RMR or any Wing in RMR as required in the current RMR Supplement 60-1.

Objective:

Standardize the operating procedures for turbocharged aircraft and train the CAP pilots to operate TCA in RMR with knowledge, correct procedures, and proficiency. This is not a check ride, but a training guide on how to operate TCA to our standards in RMR/Wings. The Wing DOV's from COWG, UTWG, and RMR have developed this TCA SOP.

Requirement:

- Pilot has to meet the requirements to start flight training in RMR, see RMR/ 60-1 Supplement.
- Pilots with no prior TCA experience will be required as a minimum to receive ground and flight instruction in RMR TCA to include 5 hours flight training time and receive an endorsement from the CAP TCA IP/CP that the pilot can operate TCA to the RMR SOP standards.
- Pilots with previous TCA experience will be required as a minimum to receive ground and flight instruction in RMR TCA to include 2 hours flight training time and receive an endorsement from the CAP TCA IP/CP that the pilot can operate TCA to the RMR SOP standards.

Academic Outline:

Pilot will demonstrate oral and written knowledge: (Included but not limited to)

- Schematic design and description of turbocharger systems
- Engine monitoring systems (EGT), fuel flow systems
- Waste gate system
- Manifold pressure variation with engine RPM, Altitude, Airspeed, Mixture
- Failure of Turbocharger in flight

- TCA pilot operating handbook for model aircraft
- Momentary overshoot of manifold pressure
- Altitude operation
- Emergency procedures
- Mixture/Power management for all flight configurations
Engine start, Taxi, Run up, Takeoff, Climb out, Cruise, Descent, Approach, Landing, Balked landing, Taxi, and Engine cool down

Operation of Turbocharged Airplanes

1. Power Management TCA

NOTE: Make all power changes slowly and smoothly. Do not make large power changes-plan to keep power settings in the green or normal operating area, except for takeoff and landing.

- Takeoff:** Takeoff using full, red-line power. Older T182s, the turbocharger waste gate is manual and is mechanically linked directly to the throttle; therefore, throttle control is needed to keep engine power from exceeding red-line. On the newer C182T Nav III the waste gate is automatically adjusted, so the pilot only needs to refer to the manifold pressure during takeoff to confirm it does not exceed red-line. *Caution!* On older T182 you can over boost the MP, smoothly set initial power to 28-29" MP and lock throttle, turbo will spool up to approximately 31" at that time.
- Climb out:** Once established in enroute climb, power should be adjusted as recommended in the POH. For the older T182, engine power must be increased occasionally during climb to maintain a constant power setting because of its manual waste gate. Normally 25"MP and 2400 RPM for cruise climb 90-100 KIAS.
- Cruise, Descent, and Landing:** In accordance with the POH, recommend for cruise power setting 65% power or 23" MP / 2300 RPM for maximum engine life and fuel efficiency. For T182, engine power must be reduced occasionally during descent to maintain a constant power setting because of its manual waste gate. Keep engine in the green operating area on the MP during cruise descents or at least until the CH temperate drops after a minute or two to prevent shocking cooling of the cylinder heads. Recommend to use 20" mp in cruise descents.
- Balked Landings:** Maximum power should be used in go-arounds unless less power is needed. For the T182, using full throttle, combined with pushing in the carburetor heat, can cause an over-boost condition: thus, any throttle increase above 25" must be performed slowly and carefully. Recommend to push in carburetor heat prior to applying full power. If you notice that you have a high power setting over 23" and the carburetor heat still on, reduce power to 20" and then put heat to cold position to keep from over boosting MP.

- e. **Engine Cool Down:** Turbo cool-down is normally not an issue in an airplane. The engine is operating at low power settings throughout the final approach, landing, taxi and shutdown. This provides adequate time for the turbo temperature to stabilize. If the pilot believes that the turbo has not had an adequate time to cool down, the engine should be run at 800-1000 RPMs for two minutes prior to engine shutdown. Taxi time is included in this cool down time.
2. **Mixture Control in TCA – Operation on the lean side of peak is not allowed.**
- a. **Engine start and Taxi:** Engine start is by the POH. After startup, the mixture should be leaned to a maximum RPM setting @ 1200 RPM.
 - b. **Run up:** Prior to run up, the mixture may need to be slightly enriched to allow the engine to run at 1700-1800 RPM.
 - c. **Take off:** Just prior to take off, the mixture shall be set to full rich (T182) or 24 gal/hr (T182T).
 - d. **Climb out:** The mixture should be adjusted in accordance with the POH. If engine power is < 75%, the mixture should be adjusted to 150-200 rich of peak EGT to keep cylinder head temperature below 400, use richer mixture setting and additional climb out airspeed to keep CHT from exceeding this temperature.
 - e. **Cruise:** During engine power settings between 65% and 75%, the mixture should be set to 100 rich of peak. Below an engine power setting of 65%, such as during searches, the power can be adjusted to 50 rich of peak. Monitor cylinder head to keep cylinder head temperature below 400, use a combination of cowl flaps and richer mixture setting to keep CHT from exceeding this temperature. Recommend to run engine @ 65% or less for maximum engine life and fuel efficiency. 23"/2300 RPM.
 - f. **Descent:** Enrichen the mixture, as necessary, to keep the engine running smoothly, normally you will not have to enrichen mixture for descents.
 - g. **Approach and Landing:** The mixture control should be set to the same approximate location as used during climb out: i.e., to provide 150 rich of peak at 25". This setting will keep the engine running at idle power, and also at maximum power if a go-around is necessary.
 - h. **Balked Landing:** Immediately after selecting go-around power with the throttle (above 25"), the mixture should be set to full rich. On the T182T, the mixture can be set to 24 gal/hr once the climb out is established. NOTE: Push in carburetor heat as you advance power or reduce power to 20" and then push in carburetor heat to prevent over boosting MP.
 - i. **Taxi after landing:** Lean for taxi is recommended as stated earlier.

Training by IP or CP

NOTE: This training syllabus and a required endorsement that the CAP pilot can operate TCA to the RMR standards. This can be entered on an abbreviated form 5 under Other endorsements. A complete form 5 is not required but could be completed depending on the training and evaluations situation. Upload the form 5 into Ops Quals for documentation of training and endorsement.

- The training will include but is not limited to:
 - All Operations as outlined in the SOP:

Engine Start, Taxing, Takeoff, Climb-out, Cruise, Descent, Approach and Landing, Go-Around, After landing taxi.

- Flight Maneuvers as outlined on the FORM 5 for training in all flight operations:

Take off & Climbs, Touch & Go, Stall Patterns, Slow flight, Go-around, Emergency procedures for all flight operations, Descents from Altitude, Approaches & Landings.

- An endorsement is required from the CAP TCA IP/CP that the CAP pilot can operate the TCA to the SOP standards for TCA in RMR.