AirShares Elite Turbo Engine FAQs

Introduction

The Tornado Alley turbo-normalizing system installed on the Cirrus SR22's TCM IO-550 engine not only significantly increases both climb and cruise performance, but also expands the operating envelope of this versatile aircraft to allow flight at higher altitudes, up to 25,000 feet.

While the basic in-flight management of the turbo engine is simple, relative to its normally aspirated cousin, there are a few questions that come up regularly, so AirShares Elite West account manager, Justin Beitler, and I decided to put together this "frequently asked questions" document to address these.

Resources

There are a number of on-line resources available for the Cirrus pilot to research turbo systems and piston engine management. Here are a few; click on titles to link:

- ☐ Cirrus Design SR22 Turbo Features
- ☐ AirShares Elite Safety Pages
- ☐ Tornado Alley web site
- ☐ John Deakin's series of piston engine management articles
- ☐ Cirrus Owners and Pilots Association (COPA)
- ☐ General Aviation Modifications, Inc. (GAMI)
- ☐ Advanced Pilot Seminars

Disclaimer

This document is intended for use as a training supplement to the Cirrus SR22 G3 Turbo transition training and recurrent training curricula. It is not intended to supersede the procedures outlined in the FAA approved aircraft flight manual (AFM). In the event of a conflict, the AFM shall take precedence.

Frequently Asked Questions

1. What's the difference between turbo normalizing and turbo charging and which one am I flying?

These two terms are erroneously used interchangeably and even some of the Cirrus training material is mislabeled, so it's easy to be confused. A *turbocharged* engine has manifold pressure boosted above ambient sea level pressure, increasing the amount of power the engine is capable of producing. A *turbonormalized* engine automatically compensates for the loss of ambient sea level pressure as the aircraft's altitude increases. This allows the engine to maintain sea level rated horsepower up to very high altitudes. It does not increase the amount of horsepower the engine is capable of producing. The Cirrus SR22 Turbo is equipped with a turbo normalizer.

2. What kind of fuel do I use and should I assume the FBO is aware of this?

The turbonormalized IO-550 installed in your Cirrus SR22 runs on 100LL AvGas and should not be fueled with anything else. Do NOT assume that the FBO knows enough not to attempt fueling your airplane with Jet-A. We recommend supervising any refueling operation at an unfamiliar FBO whenever possible. There was a fatal accident in Brazil in early 2008 that was a direct result of misfueling a turbo G3 with Jet-A.

3. Can you recommend a hot start procedure that works?

Yes. Prepare for starting by turning on the boost pump (LOW) with power lever and mixture full forward. Immediately clear the area and engage the starter. Reduce the throttle after the engine starts. If the engine doesn't fire, the engine may be flooded; simply pull the mixture lever back and keep cranking with the boost pump on. Remember to keep cranking intervals limited to 20 seconds with 20 seconds of cool-down time in between.

4. Should I lean the mixture for a high density altitude takeoff?

No. Because this aircraft has a turbonormalizing system that maintains near sea level manifold pressure for all takeoffs, the mixture should normally be full rich for takeoff, even at high elevation airports. Leaning for takeoff and during maximum performance climb may cause excessive cylinder head temperatures. For maximum power operations (Power Lever full forward - 2700 RPM, 29.6 in. Hg manifold pressure) fuel flow should be 35 to 36 GPH. On hot days, takeoff performance will be improved slightly with the fuel flow at 34 GPH until clear of obstructions, then the fuel flow should be returned to the 35 to 36 GPH range.

5. Should I lean the mixture during climb?

It depends. We recommend leaving the mixture full rich for the climb to mid-level altitudes (<18,000 feet) typically flown by our pilots. This reduces workload, as

cylinder head temperatures (CHTs) do not need to be so closely monitored. For fuel economy on a longer trip or climb to higher altitudes, then leaning per POH instructions is recommended, being careful to maintain CHTs below 380°F. See table below for a comparison of full power vs. lean of peak (LOP) operation in the climb to various altitudes.

Full Power Climb vs. Lean of Peak Climbs

The following is a comparison between a lean of peak climb and full power climb from sea level

Cruise Altitude (MSL)	Fuel Savings LOP (Gallons)	Range Increase LOP (NM)
2,000	.5	5
4,000	.9	9
6,000	1.4	14
8,000	1.9	20
10,000	2.5	26
12,000	3.1	33
14,000	3.7	41
16,000	4.4	49
18,000	5.1	58
20,000	5.1	58
22,000	5.0	59
24,000	5.0	60
25,000	4.9	60

6. The POH says the maximum certificated altitude is 25,000 feet MSL. Can the aircraft fly higher than that?

Legally, no. Climbing above 25,000 feet MSL would be exceeding the limitations specified in the POH. However, this is not the "critical altitude" of this aircraft. The critical altitude is that height above sea level where the waste gate is fully closed and above which the turbo normalizing system can no longer compensate for the decrease in atmospheric pressure. To date, this altitude has not been published for the Cirrus SR22 Turbo.

7. The engine is running hot in the climb. Why is that and what can I do about it?

CHT cooling is a function of airflow over the engine and fuel flow to the cylinders. This is usually only a problem with LOP (<18 GPH) climb operations to 18,000 feet, above which a full mixture climb is required. If CHTs reach 380°F, then increase airspeed and *decrease* fuel flow 0.5 gph at a time. If CHTs can not be maintained below 380°, then switch to a full mixture climb and plan accordingly. Use of the HIGH boost pump setting is recommended above 18,000 feet.

8. I've set my fuel flow to 17.5 GPH during cruise, but the CHTs are exceeding 380°. What am I supposed to do?

Lean the mixture an additional 0.3 GPH at a time until all CHTs fall below 380° after a few minutes. After setting the power lever to 2500 RPM, the fuel flow range for normal cruise operations specified in the POH is 16.0 – 17.6 GPH. For economy

cruise, reduce the power lever to 24" – 26" manifold pressure, which should result in a fuel flow of 13 – 14.5 GPH. We recommend setting 16.5 – 17.0 GPH in cruise.

9. How lean is too lean?

When the engine quits! Seriously, the cruise power fuel flows specified under the normal operations section of the POH range from a MAXIMUM of 18.0 GPH to an economy cruise power setting of 13 – 14.5 GPH. There is no minimum specified because the engine simply runs cooler the leaner the mixture until there is simply not enough fuel to maintain combustion.

10. The MFD manifold pressure gauge is indicating in the yellow on takeoff. Is that OK?

Yes. The Avidyne MFD parameters were originally set up for the normally aspirated SR22. Operation in the yellow arc, 29.6" – 32" manifold pressure, is normal with full power. If the manifold pressure exceeds 32", reduce the power lever to maintain an indication at or below 32".

11. On takeoff, the engine appears to be over-boosting and sending the manifold pressure readings into the red arc. Why is that and what can I do about it?

Manifold pressure may momentarily increase to 32" or beyond on first flight of the day due to cooler oil temperatures and associated higher oil pressures. This is acceptable under these conditions, but normal full throttle should be 29.6". The fuel flow will also increase in proportion to the increase in manifold pressure. If manifold pressure exceeds 32" on takeoff or during full power climbs, reduce power to maintain no more than 32". A thorough warm up prior to departure will also help with this, allowing oil temperature to reach at least 150°.

Note*: If the engine indicates above 31" for more than two (2) minutes after takeoff, then the system needs to be readjusted. If the manifold pressure consistently exceeds 29.6", during full power climbs or high power cruise with the oil temperature above 190° F, then the system should be adjusted to reduce manifold pressure under these conditions.*

12. Should I fly the turbo airplane faster on final?

No. There is no procedural change for traffic pattern airspeeds with the turbo or G3 SR22 from the G2, normally aspirated model. The normal (and emergency) full flap approach speed on final should be between 80 and 85 knots indicated at or near maximum gross weight of 3400 lbs. Short field approach speed, and an effective target speed for light payloads, remains 77 knots indicated. Loss of control accidents on landing are usually caused by excessive airspeed on final.