



Turbo Genius

Two industry leaders – Cirrus and Tornado Alley – have teamed up to bring you a smarter turbo. You get the speed you need ... plus the performance, efficiency, high-altitude flying, and ease of operation you desire.



WHY YOU SHOULD OWN THE TN SR22 . . .

. . . WITH THE TAT TURBO

Faster

Cooler

Burns less fuel



In 2006, Cirrus and Tornado Alley introduced the TN SR 22 with the TAT Turbonormalizing System.

- Cirrus branded it the “Smart Turbo” from the two “industry leaders”.
- Over 900 happy Cirrus pilots are flying the proven, fast, efficient, cool running TN SR22.
- Without question, this is the most successful turbo aircraft ever introduced to general aviation.
- The TN SR 22 is still the Smart Turbo.

Regardless, Cirrus has decided to introduce an additional, alternative, turbo Cirrus, powered by a legacy technology TCM turbocharged engine, virtually identical to the Columbia 400 / Cessna Corvallis.

You now have a choice. Below are ten good reasons that demonstrate why the TAT TN SR22 remains the smart choice for you. Be “Smart” - - Get the Smart Turbo!



The TAT TN SR22 "Smart-Turbo™"

1. Cooler

It does run cooler.

The TAT TN SR 22 "Smart" Turbo uses modern high compression ratio (8.5:1) pistons which are, inherently more thermodynamically efficient than the lower compression pistons used in the Corvallis/Columbia 400, and now, the SR 22T.

The 8.5:1 compression ratio engine, when coupled with modern computer optimized intercoolers, creates a very cool running and fuel efficient engine.

How much cooler?

On Avidyne equipped aircraft, the TAT TN SR 22 cylinder head temperatures normally run about 40 to 50 degrees cooler when compared to the "new" TCM SR 22T.

On current production "Perspective" aircraft, the TAT TN SR22 aircraft typically run at least 20-30 degrees cooler than the TCM SR 22T.

Engineering data reveals that Aluminum rapidly loses its strength with increasing cylinder head temperatures above approximately 380° F.

TAT has never met a disinterested and knowledgeable engineer that would agree that "hotter is better" with respect to cylinder head temperatures.

Notwithstanding, TCM may try to convince new owners that "hotter is better." If they do, ask:

- How hot is too hot?
- Explain why cooler is not better?



The TCM Legacy Technology SR22T

Hotter

The TCM SR22T runs hotter for a number of reasons, including the use of low compression ratio (7.5:1) pistons that were first adopted by TCM back in 1964, for the very first TCM TSIO engines - - none of which had intercoolers.

Although TCM started including intercoolers on certain of their TSIO series engines in 1984, to this day, those intercooler installations are still not optimized for the aircraft engine environment.

Consider this: If faced with near monopoly market power in the aircraft piston engine market, companies like Cirrus could easily be forced to "accept" legacy technology engine configurations. Has this happened to Cirrus?

How much hotter?

TCM and Cirrus have revised the POH to advise that 400+ degree routine cruise cylinder head temperatures on the SR22T are acceptable and the owners should not worry about that.

How can TCM, rationally, recommend 380° F as a maximum operating cylinder head temperature in some of their engine manuals, yet decide that 400+ is acceptable for the Cirrus TCM SR 22T installation ?

There is a lot of "real world" experience from the late 1980s and the 1990s with TCM turbocharged engines that routinely operated in the 390 to 400+ degree cylinder head temperature range. That time frame disclosed a lot of TCM engines that underwent premature top overhauls.

Many of those top overhauls frequently happened in the next 200 to 400 hours after the engine went out of warranty.



The TAT TN SR22 "Smart-Turbo™"

2. And it is not just cylinder head temperatures. TITs are cooler, too!

The Turbine Inlet Temperature of the TN SR22 typically operates between 1580 and about 1630°F.

Even then, Tornado Alley Turbo went to great lengths to provide strategically located heat shields to protect the engine from the infra-red heat given off by every exhaust and turbo system.

This is another reason the Tornado Alley Turbo system runs cooler.



The TCM Legacy Technology SR22T

The TCM SR22T legacy technology engine with the low compression pistons inherently runs at much hotter TIT levels. Data shows they will often run as much as 1680°F in cruise.

The amount of infra red heat energy flooding the engine compartment increases as the fourth power with the temperature of the exhaust gasses, so even modest increases in the exhaust and turbine inlet temperatures result in a much hotter engine compartment in every way.

Either because they didn't understand the importance of the heat issue, or because they were determined to reduce manufacturing costs on the SR22T system, there are no heat shields in many critical areas of the SR22T engine compartment.

3. The entire engine compartment of your TAT TN SR22 is superbly engineered.

TAT only uses state of the art "lifetime" fire proof silicon fuel and oil lines in the engine compartment.

Your mechanic will love you for having them, because they are much easier to work with during engine maintenance.

They cost more initially - - but they last much longer and save money over the "ownership" life of the engine and airframe.

TCM still uses legacy technology "rubber" engine compartment fuel and oil hoses.

In order for those hoses to pass certification requirements, the FAA requires them to be covered with legacy technology "fire sleeves". Fire sleeves are bulky and hard to work with in the engine compartment. They also tend to absorb oil and become dirty and, yes, just plain "ugly" over time.

And then you have to pay money to replace them at routine intervals, because they are not "lifetime" hoses.

In the past, Cirrus would never have accepted this kind of *retro-grade* technology on their aircraft.



The TAT TN SR22 "Smart-Turbo™"



Clean. Simple. High attention to detail.



Note the blue silicon high temperature "lifetime" oil lines and the stainless steel heat shield around the hot section of the turbo charger.



The TCM Legacy Technology SR22T



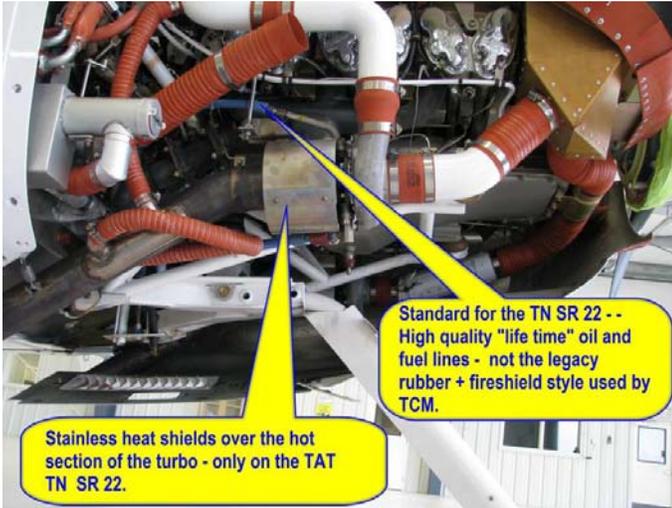
Cluttered. Legacy technology intercoolers.
No detailing evident.



There is no effort to install heat shields around the turbo section, even though it often operates near 1700 degrees F on the TCM system installed in the SR22T.



The TAT TN SR22 "Smart-Turbo™"



Stainless heat shields over the hot section of the turbo - only on the TAT TN SR 22.

Standard for the TN SR 22 -- High quality "life time" oil and fuel lines - not the legacy rubber + fireshield style used by TCM.

The TAT TN SR22 engine installation reveals a high level of concern for the important details that allow a high powered turbo charged engine to operate with cool cylinder head and induction air temperatures.

By using dual wastegates, the TAT TN SR22 avoids the use of a high temperature exhaust cross-over tube which heats up the back of the engine and the fuel pump causing vapor lock problems.

4. Less Fuel (more efficient)

Fuel flow:

Full power (full rich) in the climb: **35 gph**
 Full throttle (Lean of Peak) in the climb: **17.5 gph**

High Speed Cruise: **17.6 gph**

High Power / High Speed Cruise
 (with CHTs under 380° F)



The TCM Legacy Technology SR22T



Legacy high pressure / high temperature exhaust heat exchanger (used on the Columbia/Corvallis) . Sits next to the firewall and under the fuel pump.

Legacy style rubber oil line with bulky fire sleeve.

Example of legacy style rubber oil line with bulky fire sleeve.

Also shown here is the legacy TCM "wrap around" cross over exhaust tube that sits immediately under the fuel pump and next to the fire wall. This is a typical TCM design configuration that has always been subject to criticism. TAT eliminated this problem with its innovative fully dual and independent exhaust system arrangement.

More Fuel (less efficient)

Fuel flow:

Full power (full rich) in the climb: **38 gph**
 ? (*Lean of Peak climbs in the SR22T do not appear to be workable on a routine basis.*)

High Speed Cruise (same airspeed): **18.1-18.4 gph**

High Power / High Speed Cruise
 (with CHTs under 380° F) -- **Not possible.**



The TAT TN SR22 "Smart-Turbo™"

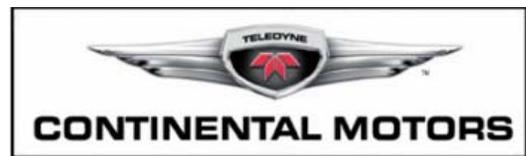
5. Operating Costs – FUEL :

In LOP cruise, at the same True Air Speed, the Tornado Alley Turbo TN SR22 "Smart-Turbo™" is more efficient. From the early numbers we have seen reported, the TN SR22 burns about 0.6 to 0.8 gph less fuel per hour at the same true airspeed.

Depending on the price of 100LL, over a 2000 hour TBO engine run, that amounts to about **\$7,600** in fuel cost savings.

But that's not all.

The TN SR22 will do "real world" Lean of Peak Climbs rather gracefully. Those add up at the rate of about \$20 per flight in fuel savings, or about **\$14,000.00** over a TBO interval.



The TCM Legacy Technology SR22T

The TCM SR22T will cost **~\$7,600** more in cruise fuel costs over the TBO of the engine.

The TCM SR22T will cost **~\$14,000** more in fuel costs due to its inability to reliably operate Lean of Peak in the climb, and its higher cruise fuel flows.

6. Operating Costs – Engine Overhauls:

But there are more cost savings with the Smart-Turbo™ than just fuel savings.

At TBO, you can get a Factory Remanufactured normally aspirated IO-550N for **\$33,000**.

TAT will overhaul all of the turbo components for **\$14,000**.

Total cost to the owner is about \$47,000.

The "Smart-Turbo™" will save the owner at least \$12,000 at overhaul time!

At TBO, you can buy a Factory Remanufactured TSIO-550 engine to replace the TSIO-550 in your Cirrus from TCM for **\$59,200** (Air Power Quoted Prices, May, 2010).

Total cost to the owner is about \$59,200.



The TAT TN SR22 "Smart-Turbo™"

To summarize:

Fuel savings \$21,600
Overhaul savings 12,000+

Total ownership savings. . . **\$33,600**

At each TBO engine run!

(PS. You can buy a nice avionics upgrade at TBO with the \$33,600 fuel savings from flying a TAT TN SR22.)

(PPS. \$33,600 over an 2000 TBO is nearly \$17/hour in reduced operating costs.)



The TCM Legacy Technology SR22T

PS: If you think about it for a few minutes, you will know why TCM really wants Tornado Alley Turbo "off" the Cirrus aircraft!

7. Propeller Integration – Ease of Use

The original integrated propeller & throttle linkage in the Cirrus SR22 - - was and remains an elegant idea that combines exceptional functionality and simple ease of operation.

As best that TAT can determine, Cirrus eliminated this wonderful feature in the TCM SR22T in a misguided attempt to save a couple of pounds.

One of the worst aspects of this approach is that, during descents from the flight levels, with the propeller fixed at 2500 RPM, the prop will be driving the engine.

Experienced pilots and mechanics have known and taught and been taught that letting the propeller drive the engine for long periods during the descent and approach is just a bad idea.

That practice is hard on the engine. For those reasons, the TAT TN SR22 will keep the variable RPM control. Period.

Fixed speed propeller at 2500 RPM?

You have to be kidding? Right?

There is a reason why airplanes have variable pitch propellers with in-flight adjustable RPM prop governors:

They perform better.

Every airplane incorporates a lot of compromises. But this new idea from TCM and Cirrus is really just a "bad idea" that somehow "escaped" inside Cirrus.

Consider this; will the neighbors under the traffic pattern at your local airport really enjoy hearing your FIXED RPM (2500) scream over their heads while you fly downwind, base leg, and final approach?

Not friendly to our neighbors on the ground!

Get ready for some noise complaints!



The TAT TN SR22 "Smart-Turbo™"

8. 100LL and G100UL Avgas:

GAMI's G100UL fuel is flying around – today – in a TN SR22 Cirrus.

And it is doing that with the Manifold Pressure set up to produce more than 110% of the rated 310 BHP. On hot days . . . in the summer time.

It is real. You can come to GAMI's state of the art engine test stand and observe its operation on the TN Cirrus engine -- for yourself!

G100UL is a complete drop in replacement for 100LL.

It can be mixed in the tank of the aircraft in any proportions with existing 100LL.

It is much more likely that a fuel like the G100UL, or someone else's equivalent 100 Motor Octane Number fuel will be the replacement fuel for 100LL, than a fuel like 94UL which will cripple the general aviation fleet.



The TCM Legacy Technology SR22T

94 UL?

For commercial reasons of its own, TCM is "pushing" 94UL as a replacement fuel.

Lycoming is totally opposed to this concept.

It is highly unlikely it will ever be "the" fuel that replaces 100LL.

None of the high performance type specific owner groups (ABS, COPA, MMOPA) are likely to accept TCM's self-interested push for a 94UL fuel that would cripple the performance of most of the aircraft flown by their members.

While it may be technically possible to operate the TSIO-550-K engine in the SR22T with this 94UL fuel, based on data we have seen, and tests we have run on similar fuel, owners would find the performance and operating limitations required by that fuel to be absolutely unacceptable.

Lycoming has this right!

9. New technology:

The TN SR22 "Smart" turbo from Tornado Alley Turbo can be upgraded to operate with an **electronic density controller** and an **electronic mixture controller**, as well as additional enhancements that TAT is not yet ready to disclose.



Stagnant Product Line:

When is the last time anybody can remember - - - that TCM brought an enhanced engine upgrade product to the existing customer in the field?

In the interest of full disclosure, the FADEC ignition system has been on the market for 5 years and is in the hands of 1 Cirrus customer.

Based on history, the TCM legacy technology SR22T is a dead end with respect to further enhancements and developments.



The TAT TN SR22 "Smart-Turbo™"

10. FASTER

Did we mention still more speed?

The TN SR22 with GAMI's new electronic air density wastegate controller has been flown by a number of Cirrus owners during market research demonstration flights.

They know that the upcoming TDN SR22 it is at least 8 knots faster than the current TN SR22.

The current TN SR22 is, already at least 2 to 4 knots faster than the SR22T with the legacy TCM engine.

The electronic density waste gate controller is already in FAA certification flight test and the TAT TN SR22 with that new controller is easily **10 knots faster** than the TCM SR22T.



The TCM Legacy technology SR22T

SLOWER

The TCM SR22T is already limited by excessively high CHTs with no margin for any enhancement that might bring more speed to that engine and aircraft





You have a choice. Wouldn't you rather own and fly this proven, elegant, state-of-the-art, efficient, and cost effective aircraft?



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