



Service Bulletin

TAT SB11-05, Revision None

Issued: 09/23/2011

Model SR22 w/ Turbonormalizer

Installed per STC SA10588SC

And SE10589SC

The Engineering Aspects of This Service Bulletin are FAA DER Approved.

COMPLIANCE

MANDATORY

BACKGROUND

A number of field reports, at least two incidents (on airport forced landings), and one (non-injury) accident have prompted this service bulletin. The field reports are supported by photographic and physical parts evidence, and by direct experience. Collectively, this data documents an unusually frequent occurrence of cracked ceramic insulators found in Champion RHB32S fine wire spark plugs installed in a variety of aircraft.

Champion RHB32S fine wire plugs were installed as original equipment in most, but not all, turbonormalized SR 22 aircraft (TN SR22). The same failure mode for the cracking of RHB32S fine wire spark plugs has also been observed in normally aspirated SR22 aircraft, a Columbia 400, a normally aspirated Bonanza, and a Cessna T310R.

Downloaded engine data from the two incident aircraft and from the non-injury accident aircraft is strongly consistent with pre-ignition events as the cause of the two incidents and the accident. In no case has the affected cylinder been operating at higher than normal cruise cylinder head temperatures (CHT) when the pre-ignition events began in the affected cylinder. The modest initial operating CHT precludes consideration of other abnormal combustion events, such as detonation. The only abnormal combustion events that fit the data are pre-ignition type combustion events.

Cracked and damaged ceramic insulators on spark plugs are known to be a common cause of pre-ignition type combustion events in aircraft piston engines. Pre-ignition combustion events are the most destructive combustion process known to affect piston engines. So far as is known, similar issues with RHB32E (massive style) are not occurring.

The initial production run of approximately the first 200 TN SR 22 aircraft delivered to customers during late 2006 and the first half of 2007 were equipped with RHB32E (massive style) spark plugs. Thereafter the next approximately 700 to 750 TN SR 22 aircraft were delivered with RHB32S fine wire spark plugs installed. A significant, but unknown, number of those aircraft have later had the RHB32S fine wire spark plugs removed and RHB32E massive style spark plugs installed as replacements.

Tornado Alley Turbo, Inc. (TAT) maintains close customer contacts through various means and through its routine product support activities. TAT has neither seen nor heard of any report of any cracked RHB32E massive spark plug in that group of aircraft equipped with RHB32E massive spark plugs. Since those aircraft are the oldest aircraft in the fleet of TN SR 22 aircraft, if there was an ongoing problem with ceramic cracking in those massive spark plugs in that fleet of aircraft, one would expect that problem to have manifested itself prior to the currently recognized spark plug ceramic cracking problem with RHB32S fine wire spark plugs.

Figure 1 is an example of two cracked fine wire RHB32S spark plugs from one engine.



Figure 1.



Figure 2. See associated engine monitor data in Figure 4, below.

Figure 2 (above) is an example of another cracked RHB32S fine wire plug and associated damage to the piston from pre-ignition. The pre-ignition on cylinder # 5 is clearly documented in the downloaded engine data. See Figure 4.



Figure 3.

Note, the cracks in this example are obvious. However, in some instances, cracks may only be visually detectable after the spark plugs are cleaned in accordance with normal shop practices.

A recent service event at TAT found one visually obvious cracked RHB32S plug and then three additional fine wire plugs revealed barely visible cracks after routine shop cleaning. That aircraft had 474.2 hours in service. Those four plugs were removed from a TN SR 22.

EFFECTIVITY

All Cirrus Design SR22 aircraft equipped with a Tornado Alley Turbo Inc. Turbonormalizing System installed per STC SA10588SC and SE10589SC. These instructions are effective on the date of issue.

APPROVAL

Engine Technologies, Inc., the Turbonormalizing System STC holder, has approved all technical data in this Service Bulletin that affect the type design.

PURPOSE

The purpose of this Service Bulletin is to instruct owners of Turbonormalized Cirrus Design SR22 airplanes to have all Champion RHB32S fine wire spark plugs replaced with alternative approved spark plugs which are described at the end of this service bulletin.

SAFETY CONCERN:

Tornado Alley Turbo, Inc. has directly observed and further received a number of well documented reports of cracked spark plug ceramic insulators on turbonormalized engines with Champion RHB32S fine wire spark plugs. These direct observations, two forced landing incidents, and one accident are consistent with reports of the same types of RHB32S spark plug failures involving other aircraft equipped with IO-550N, TSIO-550G, and TSIO-520-BB engines.

A cracked spark plug ceramic, in some cases, creates a hot spot on the spark plug that results in ignition of the fuel/air mixture early in the compression stroke and well in advance of the normal spark event. This pre-ignition at normal cruise to high power settings creates extremely high CHTs in a very short time, on the order of 30-60 seconds. See Figure 4 which details this event in connection with the damaged cylinder shown in Figure 2, above. This rapid (≈ 1.5 to 3.5 degrees F / second) increase in cylinder head temperatures, if not corrected immediately, may cause, and has caused destruction of piston rings and pistons. See Figure 2, above. This piston and ring damage will normally cause the crank case to become pressurized from the pumping action of the piston and oil can then be forced out of the crank case breather until the engine oil pressure drops to zero. This may lead to engine stoppage and a forced landing.

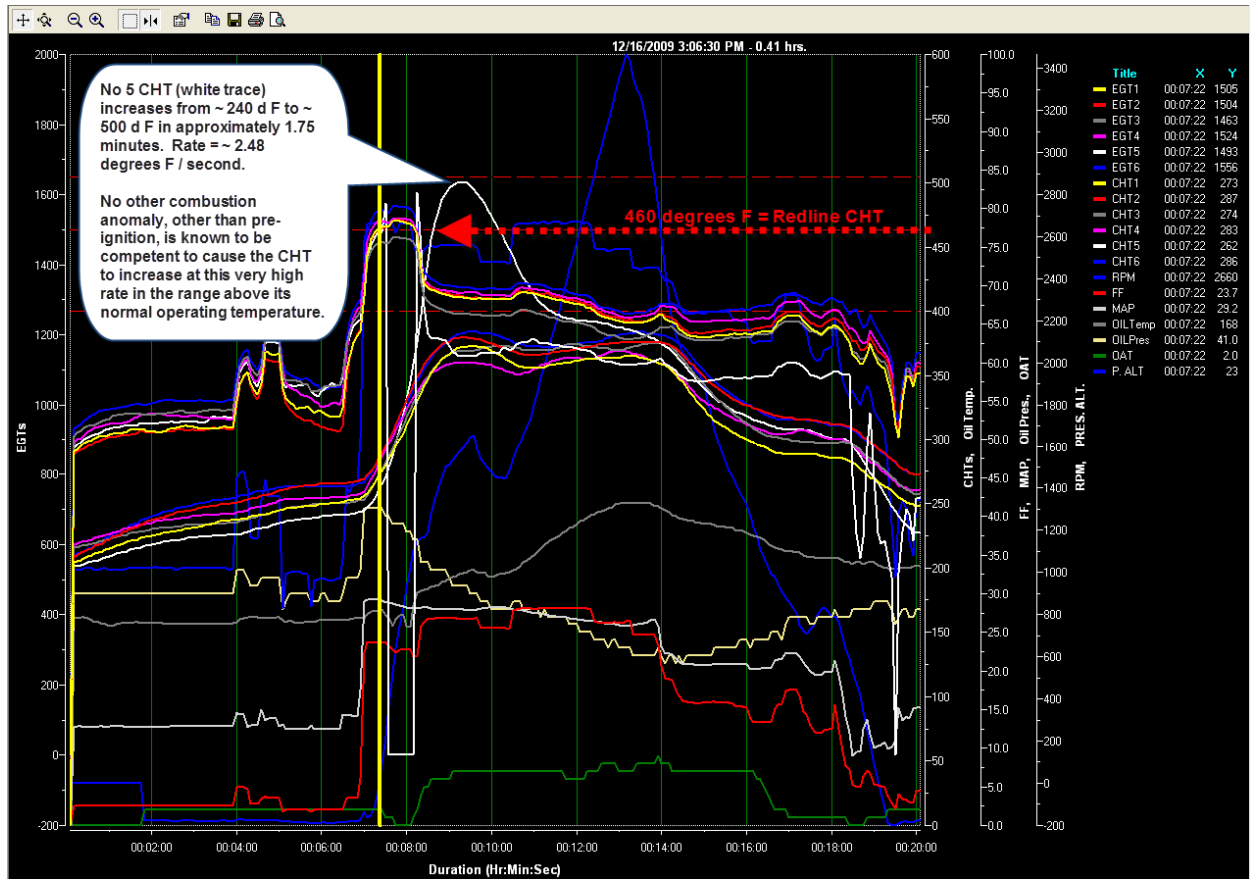


Figure 4.

CORRECTIVE PILOT ACTION: In the event a very rapid and unusual rise in any CHT is observed, the pilot should (altitude permitting) immediately reduce the power with the throttle to idle for 3 to 5 seconds and then advance the power with a full rich mixture to the minimum power level required to maintain flight. Thereafter, land at the first available opportunity and ground the aircraft until the cause is determined and corrected. Performing this corrective action before the CHT exceeds the normal engine redline CHT (460 degrees F) will likely, but not necessarily, prevent significant damage to the engine.

ACTIONS REQUIRED:

Pilots of aircraft covered by this mandatory service bulletin should be made aware of the issue and should be specifically provided and made aware of the Corrective Pilot Action described above, and the information in paragraph 3 of the Accomplishment Instructions, below.

Check engine logbooks within ten days of the date of this service bulletin. If logbooks indicate that Champion RHB29E or RHB32E spark plugs or other spark plug manufacturer equivalent spark plugs are installed, no further action is necessary under this Mandatory Service Bulletin, other than a log book entry showing compliance. If the engine logbooks do not clearly document the specific type of spark plugs in the engine, or if Champion RHB32S spark plugs are installed, perform the steps listed in the Accomplishment Instructions within 50 hours or at the next scheduled maintenance event, whichever comes first.

When spark plugs are to be replaced, replace them with one of the following spark plugs:

- Champion RHB29E (preferred)
- Champion RHB32E (acceptable if 29 heat range massive electrode plugs are not available)
- Autolite URHB32E (acceptable if 29 heat range massive electrode plugs are not available)
- Tempest URHB32E (acceptable if 29 heat range massive electrode plugs are not available)
- Any other spark plug listed in Tornado Alley Turbo, Inc. Service Instructions to be issued subsequent to this Service Bulletin

WARRANTY INFORMATION

Parts and labor are not covered under warranty.

MANPOWER REQUIREMENTS

For replacement of 12 spark plugs in one engine: One mechanic, 1 to 1½ hours.

WEIGHT AND BALANCE: Weight change: None.

ACCOMPLISHMENT INSTRUCTIONS

1. Prior to reaching 50 hours TIS from date of this service bulletin or at next scheduled maintenance event, whichever comes first, replace spark plugs with approved spark plugs from list above.
2. Maintain spark plugs in accordance with standard maintenance practices. Replace spark plugs as needed with approved spark plugs when necessary.
3. Pending the accomplishment of the removal and replacement of the RHB32S fine wire spark plugs as described in step 1, above, if, at any time, any unusual roughness or other abnormal engine operation is noted, then have the spark plugs removed and replaced with new spark plugs before further flight.
4. Make an appropriate log book entry, documenting that spark plugs are installed in the engine that conform to the requirements of this Mandatory Service Bulletin.

PARTS AVAILABILITY

Contact Tornado Alley Turbo Inc. for approved spark plugs.
Spark plugs may also be obtained from other aviation supply companies.