



Service Bulletin

TAT SB11-07, Revision None

Issued: 10/12/2011

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

AIRCRAFT AFFECTED:

Cessna Aircraft Company Model 177RG with turbnormalizer system installed per STC's SA4081NM and SE4082NM

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.

Downloaded engine data from the two incident aircraft and from the non-injury accident aircraft is strongly consistent with preignition 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 preignition 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 preignition type combustion events.

Cracked and damaged ceramic insulators on spark plugs are known to be a common cause of preignition type combustion events in aircraft piston engines. Preignition combustion events are the most destructive combustion process known to affect piston engines.

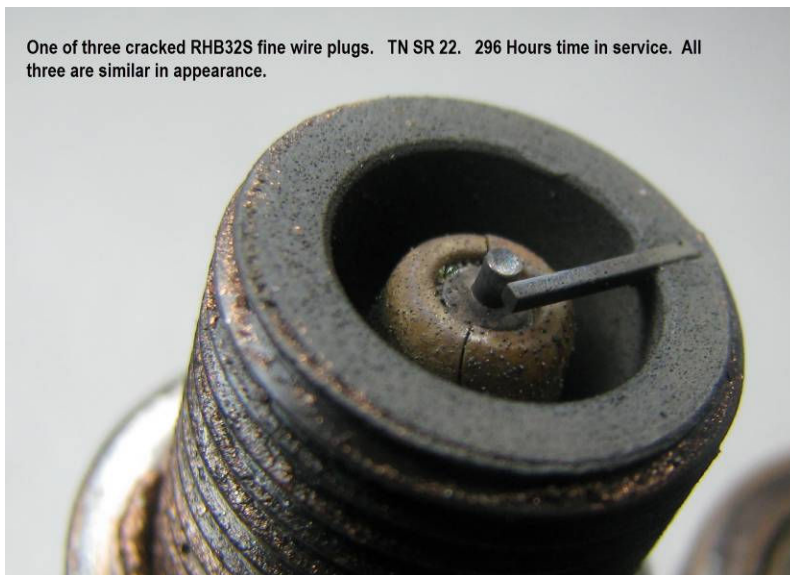


Figure 1. An example of two cracked fine wire RHB32S spark plugs from one engine.



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 preignition. The preignition on cylinder # 5 is clearly documented in the downloaded engine data. See Figure 4.



One of three cracked RHB32S fine wire plugs. TN SR 22. 296 Hours time in service. All three are similar in appearance.

Figure 3.

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 TATI 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 SR22.

So far as is known, similar issues with RHB32E (massive style) spark plugs are not occurring.

EFFECTIVITY

Cessna Aircraft Company Model 177RG with turbnormalizer system installed per STC's SA4081NM and SE4082NM. This service bulletin only applies to turbnormalized Cessna 177RG aircraft with Lycoming IO-360-A1B6 or -A1B6D engines that have Champion RHB36S or RHB32S spark plugs installed. The RHB36S and RHB32S spark plugs are long reach plugs with 3/4-20 wire ends. Not all IO-360-A series engines use the long reach plugs. See Lycoming Service Instruction No. 1042Z or later revision for methods of determining spark plug reach.

These instructions are effective on the date of issue.

APPROVAL

General Aviation Modifications, Inc., the Turbonormalizing System STC holder for STC's SA4081NM, and SE4082NM 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 turbnormalized aircraft modified in accordance with STC's SA4081NM and SE4082NM to have all Champion RHB36S and RHB32S fine wire spark plugs replaced with alternative approved spark plugs which are described later in 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 turbnormalized 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 a variety of different engines, including TCM IO-550-N, IO-550-BB, TSIO-550-C, TSIO-520-UB, IO-470-N, IO-520, and TSIO-520-BB.

In the aggregate, TATI is aware of at least 29 individual aircraft that have been found with one or more cracked fine wire spark plugs, during the last two years. In addition, a review of the FAA SDR data base reveals a pattern of cracked fine wire RHB32S spark plugs going back to approximately 1996. Recently, in one instance, a TSIO-550-C engine is reported by the mechanic who has serviced the engine to have averaged approximately one (1)

cracked RHB32S fine wire spark plug every 89 hours, on average, for a total of 11 failed fine wire spark plugs during the first 982 hours of service.

The FAA advises pilots as follows:

“Preignition . . . [is] often created by . . . a cracked spark plug insulator, or other damage in the cylinder that causes a part to heat sufficiently to ignite the fuel/air charge.”
Pilot’s Handbook of Aeronautical Knowledge, Chapter 6.

A cracked spark plug ceramic, in some cases, results in a loose piece of the ceramic that remains in or is lodged in the spark plug cavity. Because it cannot “heat sink” in the intended normal manner, the small ceramic piece will then increase in temperature and eventually will glow hot enough to ignite the fuel air charge early in the compression stroke, well in advance of the normal spark event. This preignition 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 as shown in 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.

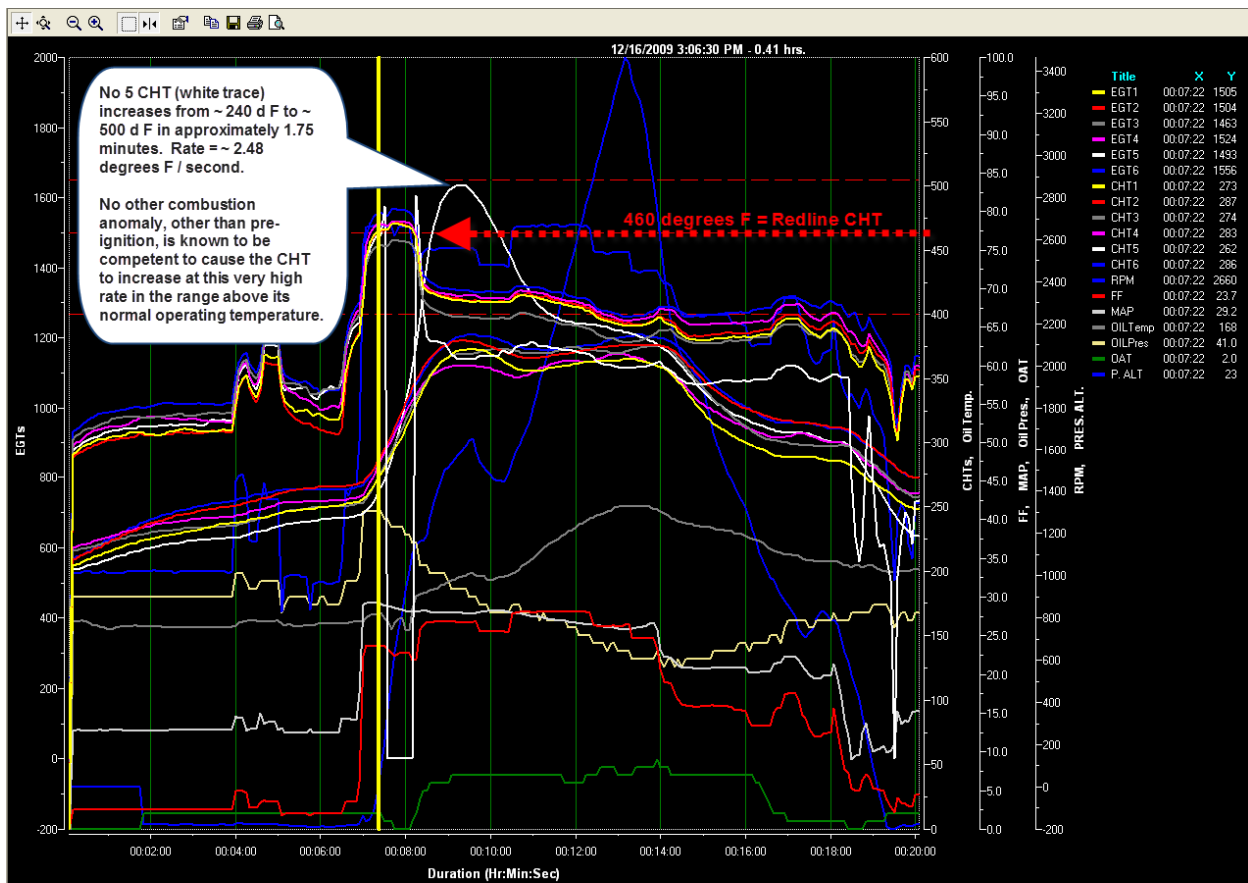


Figure 4.

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 (500 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 RHB36S or 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 8 spark plugs in one engine: One mechanic, ¾ to 1 hour.

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. Inspect, recondition, regap, and test spark plugs on intervals recommended by engine manufacturer in accordance with spark plug manufacturer's service manual (for example: Champion document AV6-R). Experience with each particular engine may suggest modified inspection, reconditioning, and regapping intervals. Replace spark plugs with approved spark plugs when necessary. Checking spark plug gaps and deposits at appropriate regular intervals is crucial to preventing engine misfires.
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. At the same time, check remainder of ignition system for other potential causes of engine roughness.
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.