



## **Introduction**

This Special Airworthiness Information Bulletin (SAIB) alerts you, owners, operators, pilots, mechanics, and certificated repair facilities of the **potential for propeller failures on piston engine aircraft due to prolonged operation in a restricted RPM (revolutions per minute) range as a result of inaccurate tachometers, missing or improper tachometer markings, or missing or improper instrument panel placards.**

Piston engine aircraft typically have a maximum propeller RPM indicated on the tachometer. Many aircraft models also have a range of restricted propeller RPMs. As an example, an aircraft may require a placard that states to, "Avoid continuous operation between 2,000 and 2,250 RPM". Such limitations typically result from certification testing when increased propeller stresses are observed during certain operating conditions. Prolonged violation of such restrictions could result in structural damage to a propeller leading to propeller failure.

Today, many general aviation aircraft are over 30 years old. Replacement or modification of the tachometer, propeller, engine, and/ or instrument panels might have occurred over the years. Also during this time, periodic tachometer calibration may also have been neglected.

The FAA is concerned that many tachometers and restriction placards in older aircraft are no longer correct, thereby increasing the risk of exposing the propeller to damaging vibratory stresses. The concerns are that:

- If a tachometer was replaced or modified, the tachometer might not have the proper markings (redlines, yellow arcs, red arcs, green arcs, or other noted limitations).
- Tachometers might be out of calibration resulting in propellers being operated in a restricted RPM operating range or causing propellers to exceed their maximum propeller RPM.
- Instrument panel placards for RPM restrictions might be incorrect or missing.
- If a propeller and/ or engine was replaced or modified, the propeller RPM restrictions or placards might not be correctly updated.
- Non-compliance with Airworthiness Directives that require changes to RPM restrictions are not reported.

## **Background**

Propeller manufacturers determine a propeller's operating vibratory stresses during certification. RPM zones of localized high vibratory stress are a relatively common finding during testing. If a zone of localized high vibratory stress occurs within the propeller operating range, then the propeller may be approved with the addition of an operating restriction, placard, or life limit.

Operating restrictions for the propeller may be found in the Aircraft Maintenance Manual, Pilots Operating Handbook or Approved Flight Manual, Type Certificate Data Sheet (TCDS), or Supplemental Type Certificate (STC) documentation. The documentation may mandate the installation of a red or yellow arc on the aircraft tachometer and/ or an instrument panel placard. A life limit, where applicable, is included in the Airworthiness Limitations Section of the Aircraft or Propeller Instructions for Continued Airworthiness. An operating restriction or life limit may also be mandated by an Airworthiness Directive.

Failure to comply with tachometer markings and instrument panel placards could result in prolonged operation within a restricted RPM range and increase the potential for a propeller failure.

Mechanical tachometers do not necessarily retain their accuracy for the life of the aircraft. Reports of tachometer errors of 50 RPM are common. Errors of 150 to 250 RPM have been reported. Using an inaccurate tachometer could result in a restricted RPM range or maximum RPM red line being unknowingly violated by the pilot, which could result in repetitive or prolonged exposure to damaging propeller stresses.

The most common failure associated with this condition is a blade tip separation that results from a fatigue crack, but failure of the propeller hub and/ or blade retention feature can also occur. Prolonged operation within a restricted RPM range, or above the maximum RPM, will be further aggravated by the presence of surface conditions such as nicks or corrosion pits.

## **Recommendations**

- Check the aircraft records for replacement or modification of the tachometer, and changes to the propeller model, engine model, or installation changes.
- Verify that the proper RPM restrictions are accurately marked on the tachometer and instrument panel placard.
- Check the accuracy of the tachometer to ensure that the readings are accurate.
- Check the accuracy of mechanical tachometers at intervals not to exceed 60 months.
- Contact the propeller manufacturer for corrective action if the propeller was operated in a restricted range.

## **For Further Information Contact**

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