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Interagency Aviation Accident Prevention Bulletin

Subject: Aircraft Engine Carburetor Heat Rigging

Area of Concern: Preflight Inspection/Flight Safety

Distribution: All Aviation Operations

Discussion: This Accident Prevention Bulletin highlights a recurring hazard involving improperly rigged or partially functional carburetor heat systems identified during interagency operations and supported by general aviation accident data. Reduced carburetor heat effectiveness can result in undetected carburetor icing, partial power loss, or complete engine failure.

In carbureted piston engine airplanes, air passing through the carburetor can cool rapidly and form ice which will restrict air and fuel flow reducing engine power even in mild temperatures. Carburetor heat is a control in many piston aircraft that directs warm air into the carburetor to prevent or remove carburetor ice. Pilots typically use it during low power settings (like descent) or anytime carb ice is suspected.

During a recent post-maintenance preflight inspection following engine removal/replacement and an annual inspection, a DOI pilot identified an improperly rigged carburetor heat system on a CC18-180 Top Cub. The carburetor heat control exhibited abnormal stiffness and lacked the expected positive detents (“clicks”) at the limits of travel. During engine run-up, the RPM drop observed during carburetor heat application ranged from only 25–150 RPM, compared to the DOI fleet expectation of at least 100 RPM and 175 for Top Cubs. Although the Top Cub combined Aircraft Flight Manual/Pilot Operating Handbook (AFM/POH) specified only a minimum 75 RPM drop, further inspection revealed the carburetor heat door was not fully opening or closing due to improper rigging. Had the pilot relied solely on the checklist procedures contained in the AFM/POH, the deficiency may not have been detected.

A previous DOI fleet mission experienced an in-flight engine failure resulting in a forced landing due to inadequate carburetor heat rigging. Additional events have involved kinked, binding, or broken carburetor heat cables that degraded system performance.

The National Transportation Safety Board (NTSB) has investigated multiple accidents involving ineffective or improperly functioning carburetor heat systems, including a recent accident in Alaska, ANC25LA025 - Investigation.

Recommended Preflight and Operational Best Practices

Pilots should follow AFM/POH procedures for verifying carburetor heat operation before flight; however, additional functional checks may be necessary to ensure proper system performance.

- During cockpit preflight inspection, ensure the carburetor heat control moves smoothly throughout its full range of travel, rather than verifying only the "OFF/COLD" position.
- Verify positive detents ("clicks") at both ends of travel, indicating fully open and closed positions. Conduct a visual inspection if necessary.
- During engine run-up, confirm the RPM drop is appropriate for the aircraft and engine installation. While the AFM/POH provides minimum acceptable values, operational experience with specific aircraft may provide additional insight into normal system performance.
- When system functionality is in question, consult qualified maintenance personnel before flight.

Carburetor Heat Use

Carburetor icing can occur at temperatures as high as 90°F and relative humidity levels as low as 35 percent. Pilots should reference the FAA's Special Airworthiness Information Bulletin, SAIB-CE-09-35 for safety guidance and the Carburetor Icing Probability Chart to evaluate potential icing conditions.

Best Practices for Carburetor Heat Use:

- Use carburetor heat proactively to prevent ice formation, particularly prior to descents and during low-power operations.
- Apply carburetor heat *before* approach and descent whenever operating at low power settings or when atmospheric conditions are conducive to carburetor icing.
- Always apply full carburetor heat. Partial application may increase the likelihood of icing.
- If RPM or manifold pressure drops unexpectedly, or if engine roughness develops, immediately apply full carburetor heat.

Key Takeaway

Carburetor icing can gradually rob an engine of power, often with little warning. A moving carburetor heat control doesn't guarantee the system is working properly. Thorough functional checks—especially after maintenance—are essential to confirm proper operation and prevent avoidable power loss or engine failure.

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