



# OAS TECHNICAL BULLETIN

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## Subject: Top Cub Cold Weather Operations

### Background:

- During November 2013, Cub Crafters CC-18 (Top Cubs) operated by DOI were taken out of service due to instances of the engine not accelerating properly (stumbling) during throttle advancement from idle to mid-range power settings during colder winter-time temperatures of 30° F and below. The major concern was that this stumbling might be problematic during take-off and go-around situations.
- OAS subsequently notified CubCrafters, which agreed to conduct winter weather testing and evaluation by the manufacturer to determine the probable causes of this problem and develop technical solutions to minimize reoccurrences.

### Findings:

- Ground and flight testing determined that there is a correlation between the OAT and fuel/air mixture produced by the type of carburetor installed. In low altitude, cold weather operations, it may be difficult for the carburetor to achieve the proper stoichiometric ratio of fuel to air. For operations during colder temperatures, the Marvel-Schebler Model 4164 carburetor appears to perform better than the OEM-supplied AVStar 5193 carburetor by providing a slightly richer mixture at idle and in the transition to normal operating rpm.
- Further testing also determined that stumbling was most prevalent when low outside air temperatures prevented the engine from reaching/maintaining normal engine operating oil temperature of 100-245°F at idle/near idle rpm. In response, CubCrafters has developed and flight tested a winterization kit which restricts the flow of ambient air over the engine and oil cooler. CubCrafters has recommended installation of the kit for flights in which ambient temperatures fall below 32°F. The kit will have to be removed for operation above 40°F at sea level to avoid excessively high cylinder head temperatures during high power settings.
- CubCrafters is in the process of obtaining FAA approval for this kit, which they believe will ensure operation at normal operating temperature down to at least -20°F. Further testing will determine if operations can be safely conducted at even lower ambient temperatures.

**Conclusions:** While each bureau is free to adopt specific temperature conditions, measured at the point of departure, for resuming Top Cub flight operations, based on the above findings and the Top Cub's demonstrated history of performing well in above freezing conditions, the general consensus is that until such time as the winterization kits can be approved and distributed, the risk of future stumbling can be minimized by operating within the guidance of the CC-18-180 Pilot's Operating Handbook and FAA Approved Airplane Flight Manual (POH/AFM) with emphasis on the following:

- Ensure the engine is adequately warmed up prior to take-off. Pre-heat the engine or overnight the aircraft in a heated hangar, if possible. If the engine cannot be warmed up sufficiently to perform a smooth acceleration from idle to full power during the engine run-up, abort the mission and wait for warmer weather!
- Use carburetor heat during other phases of flight IAW the POH/AFM. Pilots are encouraged to use carb heat during descent for approach and landing, until landing is assured. Consider adding full throttle and ensure carb heat control is moved to cold position during go-arounds. Avoid long descents with low power settings which cool the engine. Apply carb heat while still at high RPM before engine temperatures cool.
- Observe oil pressure limits of 60-95 psi
- Install the Marvel Schebler, Model 4164 carburetors on all Alaska-based Top Cubs as soon as practical.
- Once the CubCrafters winterization kits are available and installed, closely monitor cylinder head temperatures while operating in the in the 32° to 40° F temperature window to avoid exceeding POH limits.

  
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