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UNITED STATES DEPARTMENT OF THE INTERIOR AVIATION MANAGEMENT

AVIATION ACCIDENT PREVENTION BULLETIN

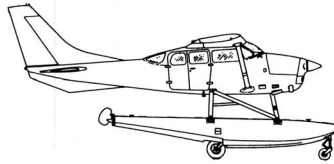
No. 05-01

January 26, 2005

Subject: Step Turns and Fuel Management

Area of Concern: Fixed Wing Operations

Distribution: Aviation Operations



Discussion: During a training mission on August 10, 2004 two highly experienced DOI pilots flying an amphibian Cessna 206 narrowly avoided a serious accident when they experienced an engine failure shortly after takeoff.

The crew stated that they had performed a prolonged step turn to the left with the right fuel tank selected immediately prior to taking off. The fuel level in the right fuel tank was relatively low, with just a little more than a quarter of the tank remaining. Due to high centrifugal loads that are inherent in step turns the fuel was forced towards the outside of the turn, and in this case away from the fuel tank's supply line.

NOTE: This aircraft had been modified with internal range extension fuel tanks, which may have aggravated the situation, by allowing fuel to flow even farther outboard and away from fuel supply lines.

Numerous books on seaplane/floatplane flying document that step turns are inherently uncoordinated and can lead to the airplane tipping to the outside of the turn. However, these references and the Cessna 206 Information Manual fail to discuss the potential for pilot-induced fuel starvation when performing a prolonged step turn.

The Cessna Pilot Safety and Warning Supplement booklet warns that fuel flow to the engine may be interrupted due to uncoordinated flight. However, it also fails to mention that step turns, which are inherently uncoordinated, can also lead to fuel flow interruption and possible engine failure:

Flight Coordination vs. Fuel Flow. The shape of most airplane wing fuel tanks is such that, in certain flight maneuvers, the fuel may move away from the fuel tank supply outlet. If the outlet is uncovered, fuel flow to the engine may be interrupted and a temporary loss of power might result. Pilots can prevent inadvertent uncovering of the tank outlet by having adequate fuel in the tank selected and avoiding maneuvers such as prolonged uncoordinated flight or sideslips which move fuel away from the feed lines.

The DOI-AM investigation has ruled out a purely mechanical cause for the engine failure and believes that the engine failure was caused by fuel starvation, which resulted from a prolonged "step turn" that the crew performed immediately before takeoff.

In an effort to prevent similar events in the future, pilots performing uncoordinated (out of trim) maneuvers such as step turns must understand the potential adverse effects that these maneuvers can have on fuel flow and fuel management in airplanes.

/s/ Robert Galloway
Aviation Safety Manager