



MEMORANDUM OF RECORD

Exhaust CO Exposure Research

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Submitted by: Jonathan Heggie, Sol Aerial Surveys pilot

NTSB Accident Number: ERA22FA114

Narrative:

The following is a summary of research conducted by Sol Aerial Surveys at my request. The goal of the research was to use the accident make/model airplane and simulate the wind direction and speed from the day of the accident so that, the wind velocity was directly aligned with engine exhaust to cockpit vector, as seen in Figure 1.

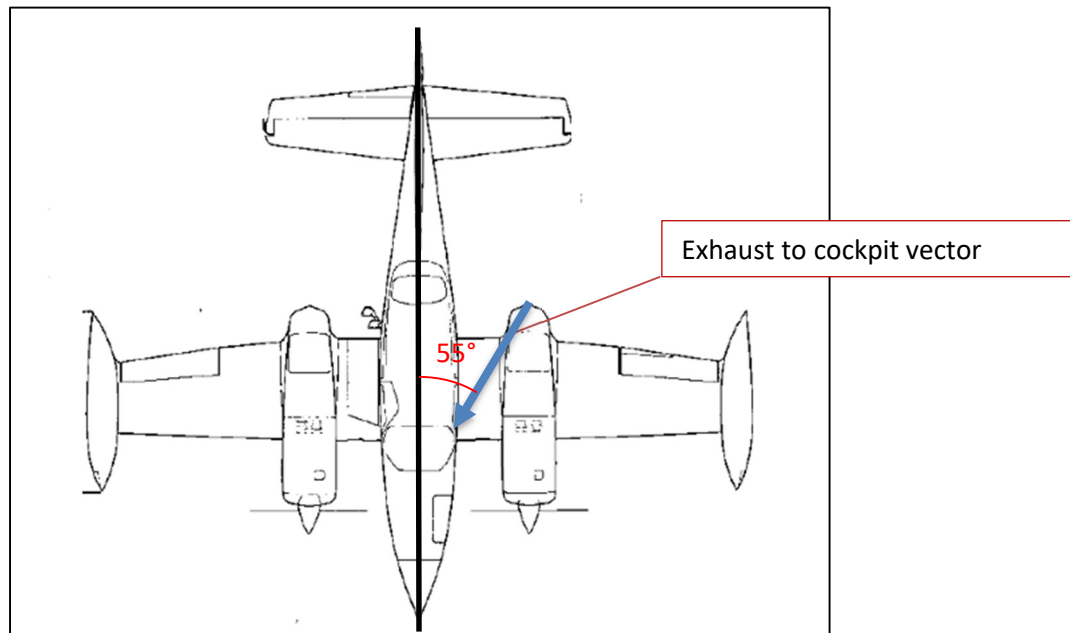


Figure 1 - View of airplane with exhaust to cockpit vector

On the day of the of the accident, winds were from 060° true at 7 kts, and the airplane's engines were started on the ramp, where the airplane then taxied to the run-up area of runway 2 for run-up and surveying computer start-

up. During this taxi and subsequent run-up, the accident airplane was heading 196° true (205° magnetic), with the relative wind to the airplane being a 44° left quartering tailwind, which would have blown the exhaust from the left engine toward the cockpit and heater air intake at the nose of the airplane. The airplane was on this heading for about 8-10 minutes per the statement of another company pilot who taxied out in front of the accident airplane and conducted the run-up at the approach end of runway 2 while turned into the wind.



Figure 2 - Danville Regional Airport with wind velocity

The following was the report of the testing performed to determine the ability of the carbon monoxide to enter the cockpit from the engine exhaust during taxi in similar wind conditions and relative wind.

Date: October 1, 2022

Airport: F70 (French Valley California)

Runway: 18

Wind Condition: Variable out of the south

Temperature: Warm day

Power settings: Engines idle/taxi RPM range.

CO Detector: Electronic/Audible

My startup and taxi time was "average". I taxied to runway 18 with the door cracked open and window open due to the heat that day. The heater was left off, including the fan. Neither were turned on. During the taxi, the electronic CO detector read "0" PPM the whole time. As I approached the run up area, I closed the door and window. Once I got to the run up area I angled, the airplane close to an East- NorthEast orientation to put the breeze off my right quartering tail based on the grass and other indicators. Almost immediately, I noticed the audible alarm on the CO detector going off. I looked over and could see the number on the CO detector rising

through the 50-60PPM range. I immediately grabbed my phone to take a video. As you'll see in the video, it quickly rose above 100 PPM within the 17 second video. At the time, I was unsure what level would be harmful to myself. For that reason, I shut the video off so I could focus on clearing the cabin air. The number eventually climbed up to around 150-160 before finally coming back down. There were very minor exhaust odors present during the high readings.

NOTE: If the heater had been turned on the day of the accident, when outside temperatures were 33° F, the heater would have drawn in air at the ventilation inlet on the front of the nose (fan driven to draw in air). With the heater running and exhaust passing over the inlet, the exhaust would have been drawn into the cabin for 8-10 minutes.

