UNITED STATES OF AMERICA

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C.

ISSUED: July 12, 1973

Adopted by the NATIONAL TRANSPORTATION SAFETY BOARD
at its office in Washington, D. C.
on the 20th day of June 1973

FORWARDED TO:

Honorable Alexander P. Butterfield
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATIONS A-73-47 & 48

As a result of the National Transportation Safety Board's investigation of an incident involving Cessna aircraft, Model 421, N421MC, which was en route from Salt Lake City, Utah, to Los Angeles, California, on February 19, 1973, the Safety Board is submitting recommendations for your consideration.

Aircraft N421MC, owned by Magana & Cathcart, Attorneys, Los Angeles, California, was at 22,000 feet m.s.l., when the pilot noted both oil pressure gauges fluctuating and going to zero. The pilot landed the aircraft at McCarran Field, Las Vegas, Nevada, without further difficulties. When checked, the left engine had two quarts of oil and the right engine had three quarts of oil. Normal capacity is 13 quarts of oil per engine. The Board believes that a double engine failure was imminent and that only the pilot's close monitoring of the oil gauges averted complete failure.

Both engines and their oil systems were inspected and were refilled to the maximum of 13 quarts per engine.

The aircraft was then flown, at lower than normal altitudes, from McCarran Field to Santa Monica, California. The engines were reinspected immediately upon arrival at Santa Monica. The left engine oil supply was down four quarts and the right engine was down one quart. The owners grounded the aircraft as defective.

Both engine turbochargers on N421MC were replaced with modified units. The modified turbochargers were supplied by Cessna Aircraft, and each new unit incorporated a check valve in the turbocharger oil return line between the air-oil separator and the oil scavenge pump.

The above-cited incident is not an isolated occurrence. There were seven other instances reported to Cessna in the past 2 years involving oil quantity loss in Model 421 aircraft. In each of these cases, the immediate fix was to replace the turbochargers with modified units. The incorporation of a check valve in the oil return line is a temporary fix recommended by Cessna to alleviate the condition of oil loss until a permanent fix can be engineered.

Cessna Aircraft Engineering theorizes that the oil loss was caused by air leakage past the turbocharger compressor shaft oil control rings, which allowed the oil cavity and the oil return system of the turbocharger to become pressurized. In addition to the pressurization of the return system, the oil became aerated, which foamed the oil, and thus decreased the efficiency of the oil scavenge pump. The air-oil separator, located downstream of the scavenge pump, allowed a portion of this emulsion to be pumped overboard through the air-oil separator vent when back pressure occurred in the return line.

The question of scavenge pump efficiency, when oil foaming is present, is being pursued by Continental Motors, the engine manufacturer. Continental Motors has tested 25 engines with turbochargers installed to evaluate the scavenge pump operation. To date, these ground tests have been negative in that nothing definitive could be determined from the tests to indicate any change in the normal operational function of the pump.

It is our understanding that the Federal Aviation Administration is processing an Airworthiness Directive to install a check valve in the air-oil separator return line as a temporary fix to the oil loss problem. Notwithstanding, the Board believes that the danger of engine failure from oil depletion and lack of lubrication due to the aforementioned conditions will persist. Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

1. Restrict the maximum flight altitude of the Cessna 421 until a permanent fix that will eliminate the oil quantity loss problem can be determined and installed.

2. Reevaluate the engine turbocharger system on the Cessna 421 aircraft regarding its suitability for high-altitude operations.

Reed, Chairman, McAdams, Thayer, Burgess, and Haley, Members, concurred in the above recommendations.

By: John H. Reed
Chairman