



RECORD OF EXAMINATION

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NTSB Accident Number: CEN21LA261

Narrative:

Examination/test run were under the supervision of the Federal Aviation Administration with Enstrom and Lycoming, who were parties to the investigation. The helicopter was examined in Des Moines, Iowa on July 15, 2020, by the FAA and Enstrom. The engine was test run on November 9, 2020, at Lycoming Engines in Williamsport, Pennsylvania, under the supervision of the FAA.

Post-accident examination of the flight controls and drive train to the main rotor blades and tail rotor blades confirmed continuity of both systems.

The turbocharger installation was under supplemental type certificate (STC) SE484GL for the installation of Rajay Model 325E10-2, P/N RJO332, or Model 3BT5EE10J2, P/N 103574-00 turbocharger. The STC was issued to Enstrom Helicopter Corporation. Enstrom purchased HIO-360-F1AD engines with turbochargers installed by Lycoming, who helped develop the STC. Because the helicopter type design required the installation of the turbocharged engine, there are no STC installation instructions.

According to the Enstrom 280FX Operator's Manual, the engine idle rpm with clutch disengaged was: minimum – 1,450 rpm and 1,500 rpm. According to the Enstrom Helicopter representative, the pilot said that the engine ran rough at idle but smoothed out about 1,100 rpm. The representative stated that magneto to engine timing would most likely have been set to 21° - 22° before top center (BTC) for better performance when it was installed at the Enstrom Service Center that installed the engine onto the accident helicopter. The engine, with turbocharger installed, had a normal rated power of 225 hp at 3,050 rpm. The rated power of the engine without a turbocharger was 190 hp at 3,050 rpm. Engine specifications for a turbocharger equipped engine such as power versus engine speed, fuel pump pressure output, or engine timing were not

provide to the National Transportation Safety Board Investigator-in-Charge (NTSB IIC) and are unknown.

The engine was a Lycoming factory rebuild from January of 2020 with approximately 23 hours since its factory rebuild. The engine was removed from the airframe and shipped to Lycoming Engines, Williamsport, Pennsylvania for an engine run. The engine was run without the turbocharger system because it was removed by Lycoming for the engine run without the knowledge of the NTSB IIC. The Lycoming representative stated that they do not test HIO-360-F1AD engines at the factory with the turbo system because Enstrom installs it under an STC.

The engine run consisted of four engine start attempts. During the first start attempt, the engine did not start. The magneto grounding socket, which was a pressed fitting into the magneto housing, was also found to be missing. The ground wire was wedged into grounding socket for the second start attempt. The factory seal on the magneto retaining nuts was not present. A check of magneto to engine timing revealed that it had an advance of about 5° BTC and once the timing was adjusted to the engine data plate specifications, the engine started during a second start attempt, and there were no further magneto issues that precluded normal operation. After the second start attempt of the engine, the engine idle speed was 1,250 rpm and was then adjusted to 1,150 rpm for subsequent test runs. After the third start attempt, the engine idled at the 1,150 rpm. The fuel pressure from the fuel pump was 30.1 psi (Lycoming test specifications indicated that the fuel pressure setting from the fuel pump should be 18-28 psi). The fuel pressure was adjusted to 22 psi with the engine operating. The engine attained rated power but not engine speed as specified in the test's specification of 3,050 rpm. The engine met test specifications at engine speeds: 1,500 rpm, 1,800 rpm, 2,200 rpm. It was noted that the injector had a rich mixture, and the injector idle/mixture lever stop was not in place on the injector. The lever stop was found on the test cell floor. When injector was replaced with a slave injector and a propeller speed adjustment made, the engine produced rated power at 3,050 rpm.

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