



Memorandum For Record

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Eastern Region

Date: 8/24/2023
NTSB Accident Number: ERA23FA033

As part of the investigation of N8020R, which crashed during takeoff on October 21, 2022, near Keene, NH, Lycoming Engines, who was a Party to the NTSB Investigation was asked if they had a 200-Horsepower exemplar IO-360-A1B engine available to perform operational testing with and without fuel injector nozzle inserts or restrictors installed. The manufacturer did not have that make and model engine available, but they did have a 160-Horsepower IO-360-L2A engine at 2,400 rpm available, and agreed to perform the testing. That engine was equipped with the current 2-piece fuel injector nozzle, which was the same specified for the accident engine.

As part of the operational testing of the IO-360-L2A engine performed on May 5, 2023, a snapshot of the engine parameters consisting of cylinder head temperature (CHT), manifold pressure inches of Mercury (inHg), horsepower, and fuel flow were documented (Figure 1). During the baseline testing with all fuel injector nozzle inserts or restrictors installed the engine produced a baseline corrected power of about 163-Horsepower, but with one fuel injector nozzle insert or restrictor removed the engine produced about 128-Horsepower, or about 79% of the baseline value. With all fuel injector nozzle inserts or restrictors removed the engine produced about 152-Horsepower, or about 93% of the baseline value (Figure 2).

During operational testing of the engine without inserts or restrictors installed, fuel leakage at the nozzles (Figure 3) and onto the air induction tubes (Figure 4) occurred.

2400 RPM Mixture Sweep

2399 RPM
 Locked Throttle Mixture
 Distribution Sweep

Date: 05-May-2023
 Model: IO-360-L2A
 S/N: RL-27180-51E
 Run Numbers: 4-11

Fuel Grade: 100LL
 Altitude: Sea Level
 Average IAT: 59°F
 Average OGT: 186°F
 Spark Timing: 25° BTDC

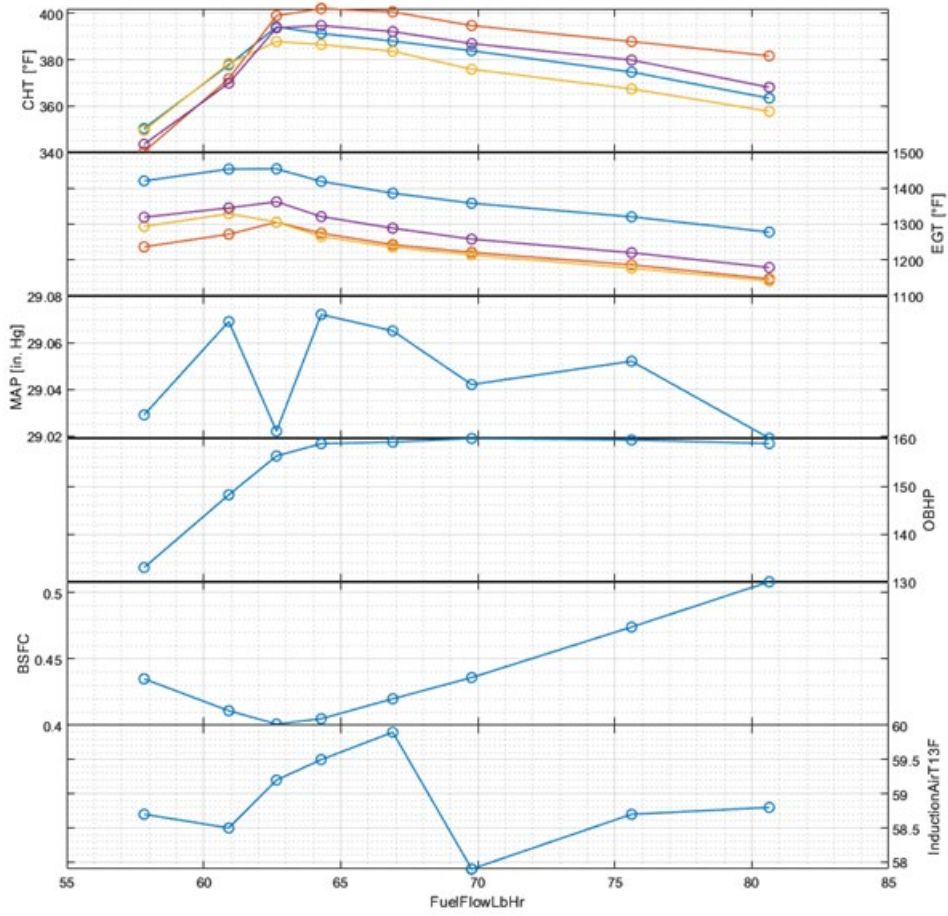


Figure 1: Digital Photograph From Lycoming. Engine Parameters During Baseline Testing with all Fuel Injector Nozzle Inserts Installed.

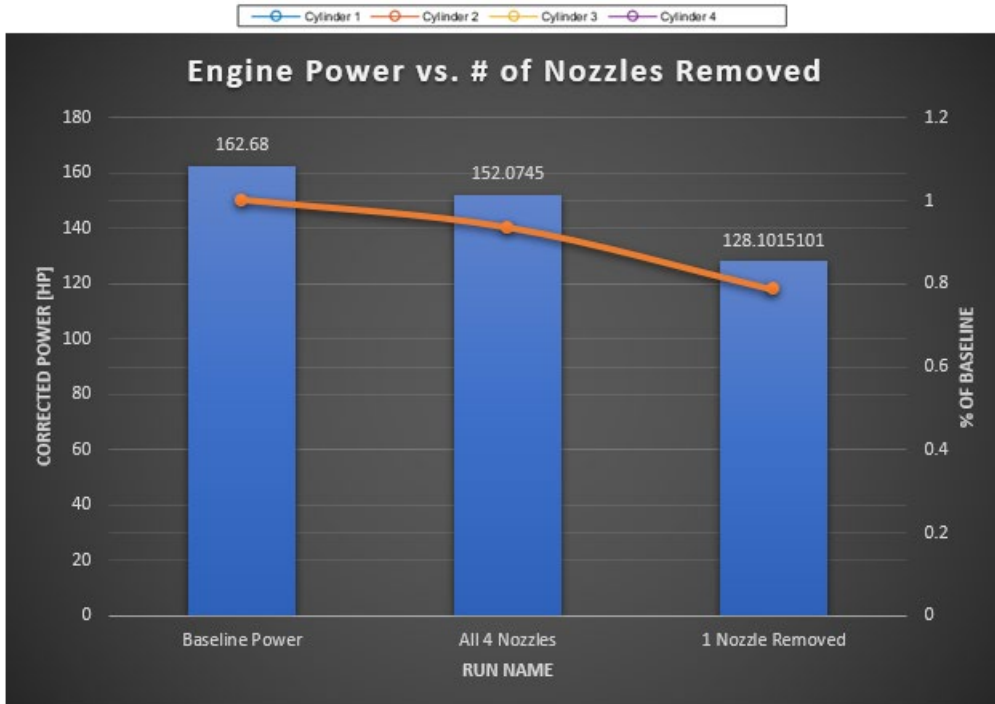


Figure 2: Digital Photograph From Lycoming. Left Column is Engine Power Baseline, Middle Column is Engine Power with All Fuel Injector Nozzle Inserts Removed and Right Column is Engine Power with only 1 Fuel Injector Nozzle Insert Removed.



Figure 3: Digital Photograph From Lycoming. View Showing Leakage From Fuel Injector Nozzle During Engine Operation Testing without an Insert or Restrictor Installed.

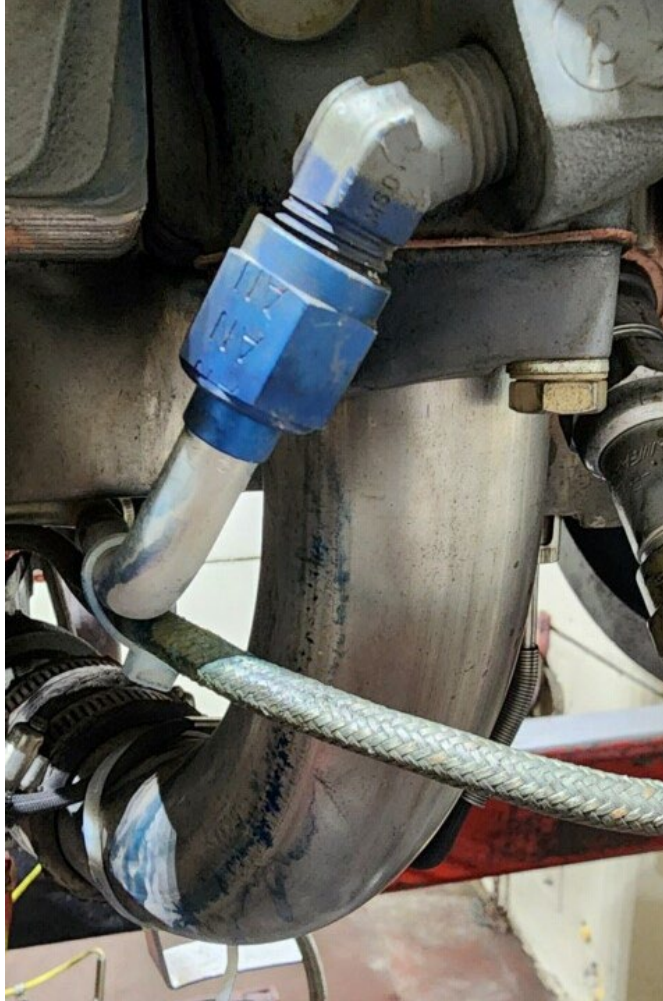


Figure 4: Digital Photograph From Lycoming. View Showing Leakage From Fuel Injector Nozzle onto No. 1 Cylinder Induction Pipe During Engine Operation Testing without an Insert or Restrictor Installed.