



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

ENGINE EXAM / RUN (Rev A)

WPR19FA167

Activity Dates: February 19-20, 2020

This document contains 7 embedded images

A. EXAMINATION PARTICIPANTS:

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B. ACTIVITY SUMMARY

On February 19, 2020, the activity previously begun with the IIC (Andrew Swick) at the CAT facility in Mobile AL was continued and completed. The previous activity resulted in a mostly successful run program, except at idle. This current activity was intended to address/correct the idle problem. The exam/repair/replacement activity focused on the throttle metering assembly ('metering plug'), and followed by a successful engine run in an engine test cell. The following are the highlights of that activity:

- The metering assembly (MA) is normally affixed to the throttle body (Fig 1)
- The internal spring and its associated Teflon washer in the metering plug (Fig 2) were replaced
- The external MA housing was replaced due to the potential of it being distorted by the post accident fire
- The throttle body (with MA) was flow-tested on a test bench
 - The test bench used an unspecified liquid as a fuel substitute (for safety). This will be referred to as 'fuel' in this description
 - The test used a fixed input fuel pressure and measured fuel output pressure through a series of 7 throttle plate angles (2°, 9°, 18°, 30°, 47°, 55°, 74°)
 - The output pressures were converted to flow rates (as lbs/hr or pph) and compared to the target ranges as the pass/fail criteria
- The first check at the idle (2°) setting showed an excessively high flow
 - Actual ~37 pph vs target range of 12.9 – 13.5 pph
- The test series was discontinued, and the MA was disassembled
- The following components were changed out for new: (Fig 3)
 - Idle mixture adjust screw (dirty/contaminated washer & shaft)
 - MA Housing O-ring (brown, ~1.25" ID)
 - Throttle body O-ring (black, ~1.25" ID)
- The MA was reassembled, reinstalled on the throttle body and re-tested
- The second check at the idle (2°) setting still showed an excessively high, but improved, flow

- This occurred even though the idle mixture screw was turned in until it bottomed (Leanest setting)
 - Actual ~16 pph vs target range of 12.9 – 13.5 pph
- The full test series was completed anyway (Fig 4), but in a discontinuous fashion, when the idle mix screw was re-adjusted when at the 47° setting
 - All test points failed (high flow)
- The idle mix screw was adjusted when at the 74° setting to reduce the flow to within the target value range (Actual of 219.82 vs target of 210.0 220.5)
- A second flow test series, the first in this configuration, was run (Fig 5)
 - The 2° and 9 settings failed (high flow)
 - The other 5 settings passed
- The MA was removed and disassembled
 - The mating surfaces of the metering plug and metering cam were lapped to polish their interface
 - Hard deposits of what appeared to be melted plastic that re-solidified on the throttle body bore walls in the vicinity of where the throttle plate sealed against the bore wall were removed by scraping and polishing (Fig 6)
 - The plastic was presumed to be a result of the post accident fire
- The throttle body with the MA was re-assembled and retested
- This third full test series was successful for all 7 throttle plate angles (Fig 7)
- The throttle body was installed on the accident engine, and the engine was successfully run in the test cell
 - These results will be provided under separate cover by CAT

C. PHOTOGRAPHS

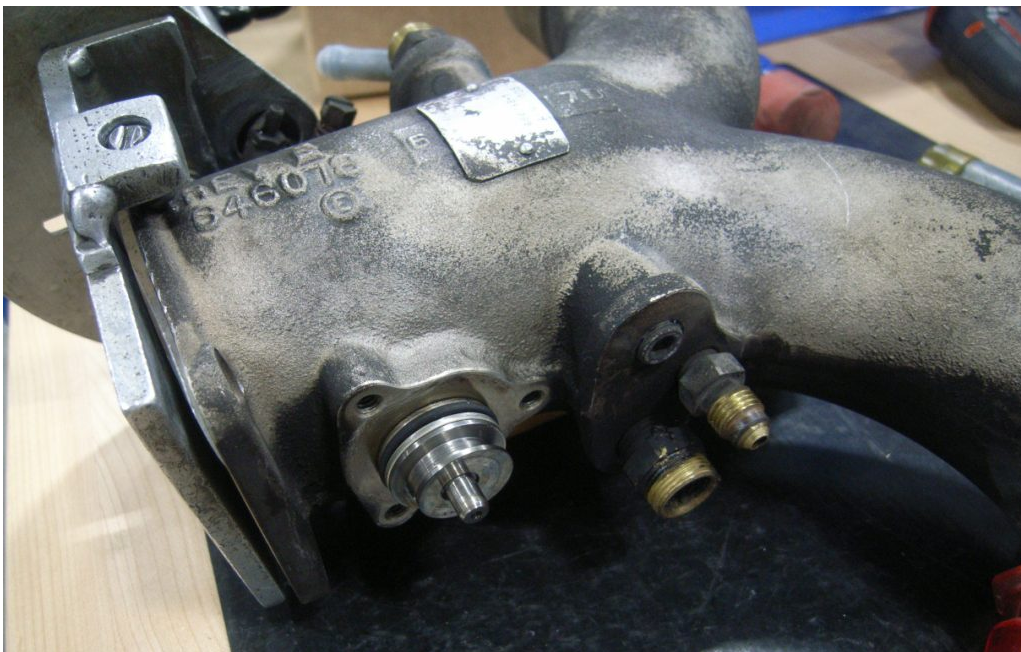


Figure 1 - Metering Assembly on Throttle Body



Figure 2 - Metering Plug (mating surface, prior to lapping)



Figure 3 – Removed Idle Mixture Screw (cleaned) and MA O-Rings



Figure 2 - Test Results (First full run)

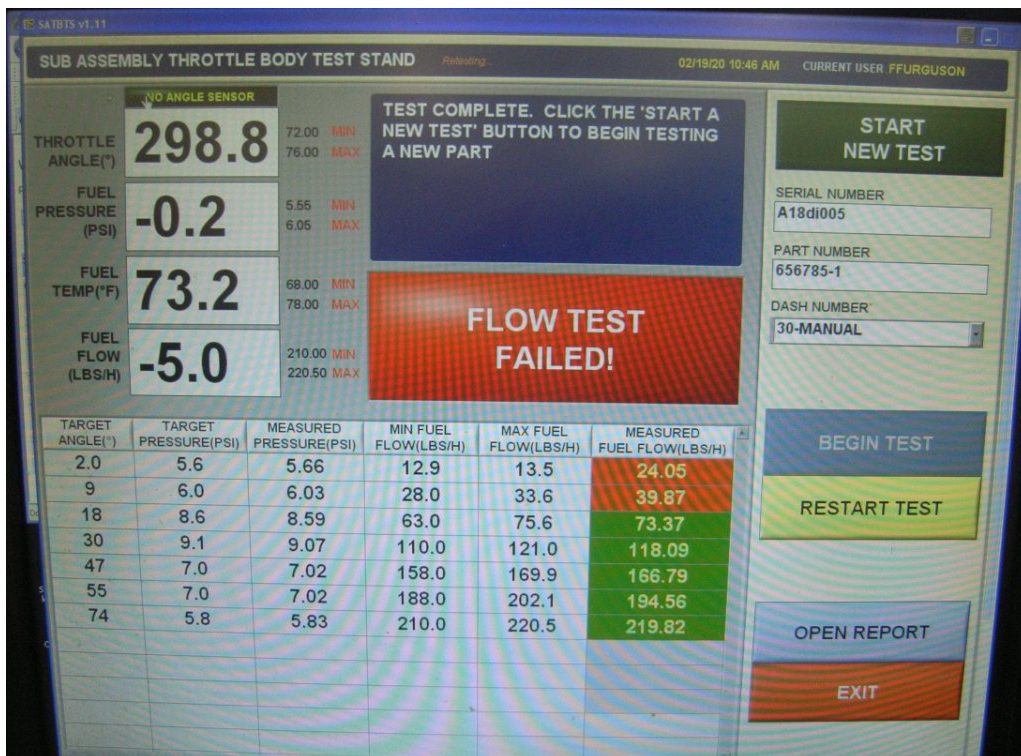


Figure 3 - Test Results (Second full run)



Figure 4 - Throttle Bore Deposits (Downstream of cleaned area)

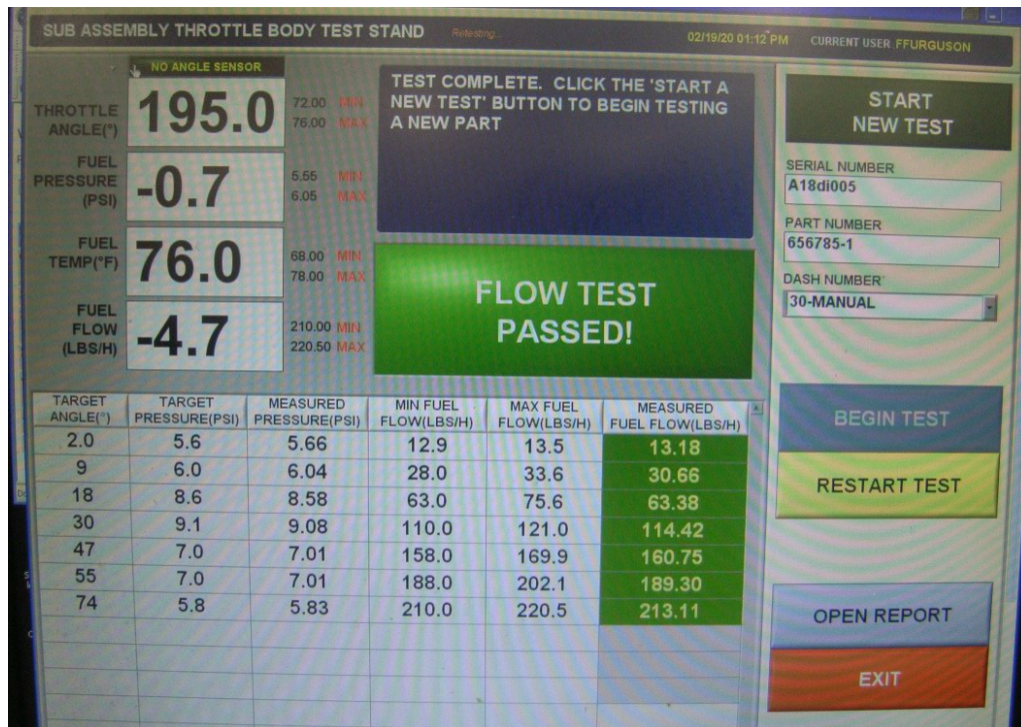


Figure 5 - Test Results (third/final full run)