Turbine Engine Troubleshooting

Juan Nunez

[Institutional Affiliation(s)]

Author Note

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An electrical ignition system is employed by most aircraft engines to generate a spark that initiates the combustion process in the turbine engine. An engine failing to start even after being rotated by the starter, and indicating a light-off, implies that there is a specific problem in the ignition system. In this case, a logical approach to troubleshooting can allow the malfunctioning or defective system to be singled out after a series of steps and instrument readings.

The ignition system must first undergo a routine inspection. The ignition lead terminals should be inspected to see if they are free of carbon tracking, arcing or cracks, and the wire insulation should be flexible with no signs of arcing. Any high-voltage arching, shorts, or loose connections should be inspected for component mountings (Flight Mechanic, 2017). It is necessary to ensure that the ignition system is discharged before this component inspection is carried out. It is better to power down the ignition system for at least 3 minutes before initiating the inspection as some exciters use capacitors that can still dissipate residual energy..

If the aircraft engine fails to start, then after determining that the condition is not occurring due to a fuel-related or airframe electrical fault, the defective component of the ignition system has to be isolated. Before using a tester, an audible check can be performed to determine if sparks are being delivered to the engine. Although, this check would not provide a concrete diagnosis of the components’ condition, it can serve as a basic check for establishing the likelihood of an ignition systems’ fault. As the starter tries to rotate the engine, the inspector can listen for a snapping noise to check the igniter. The snapping sound indicates a fully operational plug which is audible from the exhaust duct. If a malfunction is suspected, the igniter can be removed and the start cycle activated to determine if it is creating sparks (Flight Mechanic, 2017). Moreover, because there are two plugs fired by the exciters simultaneously, it is possible that one plug may be non-operational while the other produces the snapping sound.

If the igniter plugs are not firing, then the next step is to verify whether the exciter is receiving input power by using a digital multimeter. The normal input voltage, connector polarity, and ampere requirements are displayed on the exciter’s data plates to be verified. If turning the ignition system on leads to a trip in the circuit breaker, then it indicates that there is a short-circuit in the exciter and it may be drawing excessive current. It may also occur if the wiring harness of the airframe has shorted (Sparks & Mottier, 1999). A portable ignition system tester can be further used to isolate any other malfunctioning component. The tester contains two remote sensors that perform a functional check of the output provided by the exciter, in terms of its stored energy and spark rate. Both values indicate a more accurate picture of the exciter’s condition, and can be tested either at the lead output or at the exciter’s junction. If the functional tests of the lead and the exciter indicates that they are operational, then the igniter has to be replaced. The portable tester works by energizing the ignition system and entering the part number into its system. The output values for the stored energy and spark rate are given in terms of high, low, or pass on the tester. A pass indicates that the lead and exciter are not the cause of the start-up fail, while a low or high indicates requires that the test be repeated by connecting the tester’s sensor directly to the exciter’s output. The results will then determine whether the lead is to be replaced or the exciter itself (Eischen, 2005). As a precaution, the test equipment must only be handled by an experienced and knowledgeable inspector and necessary precautions to avoid electrical shock from residual discharge should be taken.

# References

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