Australian Government
Civil Aviation Safety Authority

AIRWORTHINESS BULLETIN

Beech 200 and 300 Inverter Fire

AWB 24-009 **Issue** : 2
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1. Effectivity

Beech B200/300.

2. Purpose

To alert operators of Beech B200/300 aircraft of the potential for inverter wiring damage that may lead to a fire in the inboard wing.

3. Background

When a Beech B200 arrived at a maintenance facility at Archerfield Airport following a transit flight from Brisbane Airport, burning fuel was seen to be dripping from the port inboard wing. Subsequent investigation identified a fuel/electrical fire centred around the PC-17 inverter and associated wiring.

Figure 1 – Inverter location

The cavity (Figure 1) that the inverter is mounted in is a confined area between the main and aft spars, outboard of the port engine nacelle. Significant fire/heat damage occurred to critical aircraft structure requiring extensive repair. Detailed examination of the fire zone identified the most probable seat of the fire as being the rear panel of the inverter cavity, on which the main DC contactor and earth stud were mounted (Figure 2). This area showed extensive fire damage and, of particular interest, was electric arc damage (circled) behind the DC input wire. Figure 3 shows the damage to the DC input wire adjacent to the site of the arc damage which has evidence of the melting of the copper wire consistent with the length of the arc damaged area.

Figure 2 – Arc / fire damage to aircraft structure

Figure 3 – Heat damage to DC input wire

Figure 4 shows the main fuel line flexible coupler directly below this arc damaged area. There is evidence of fire damage to the top of the coupler.

Figure 4 – Fuel line flexible coupler

Figure 5 – Wire routing for starboard inverter.

As a comparison, Figure 5 shows that the starboard inverter input line which is routed differently having some evidence of chafing on the structure from an earth wire

4. Analysis

Whilst the initial source of the fuel could not be determined, the prolonged ground operations reported by the pilot would have raised the temperature in the cavity vaporising any fuel present and increasing the risk of fire.

There is strong evidence that the arcing of the inverter DC input cable did not draw sufficient current to cause the 50 amp fusible link to fail. This is possible if the contact between the power wire and metal structure is intermittent and the aluminium structure vaporised due to arcing. Either the electrical arc or the molten metal generated would be hot enough to ignite either fuel or fuel vapour in the cavity.

Examination of the inverter itself suggested that it was still functioning during this incident and only failed once the main DC contactor was damaged by the fire resulting in the removal of the DC power source from the device.

5. Conclusion

The most obvious contributing factor to this incident appears to be the arcing from the DC input wire. This was probably caused by the wire chafing against the aircraft structure over an extended period of time. Further evidence has been found confirming that chafing had occurred in other locations.

This incident is an example of the concerns relating to ageing wiring/insulation in aircraft. As the aircraft age the effects of wire chafing becomes more pronounced. The damage, unless identified and the cause remedied, will increase over time until a failure occurs. In this case the aircraft appeared to be well maintained with the records being good quality and documenting the numerous upgrades, refurbishments and maintenance activities that had occurred.

6. Recommendations

B200/300 operators should inspect the aircraft wiring and installation, particularly those associated with the inverters to identify any chafing. If evidence of chafing is found, consideration should be given to raising a modification to introduce wiring standoffs, re-routing or renewal of the wiring to eliminate the potentially unsafe conditions that allow chafing to occur.

The inspection should include ensuring that additional wiring has been routed and configured in accordance with the manufacturer's maintenance data. Additional wiring and/or modifications should be checked to verify that routing and configuration complies with the applicable approved maintenance data and installed in accordance with current practices. An important point to note is that an electrical load analysis is required to verify that there are no negative effects of additional electrical loads when upgrades, refurbishment and modifications have been carried out to electrical systems.

7. Reporting

CASA requests that any evidence of chafing/arcing on inverter wiring looms be reported via the SDR system.

8. Enquiries

Enquiries with regard to the content of this Airworthiness Bulletin should be made via the direct link e-mail address:

AirworthinessBulletin@casa.gov.au

or in writing, to:

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