



民航處 *Civil Aviation Department*

飛行標準及適航部

Flight Standards and Airworthiness Division

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INVESTIGATION OF CAL 642 ACCIDENT ON 22 AUGUST 1999

TEST REPORT ON CAPTAIN'S WIPER MOTOR & ELECTRICAL CIRCUIT COMPONENTS

Test Requirement:- Minutes of Accident Investigation Team Meeting dated 11 January 2000 Meeting Note item 6. a.

Location of Test:- Electrical Workshop 2110 at the HAECO Component Overhaul Facility at Tseung Kwan O (TKO)

Date of Test:- 17th February 2000

Test Witnesses:- C M Lee – Inspector of Accident, HKCAD
K W Lau – HAECO QA Head of Section, TKO

Items Tested:- Wiper Motor and Drive Assembly (Captains Position)
Vendor - Rosemount Aerospace Inc, USA
P/N 2313M-537
S/N 00097

15 AMP Main Power Supply Circuit Breaker (Captains wiper)
Vendor – Jackson Inc, USA
P/N 700-030-15, (700-066-15) (76374-9137)
S/N None visible

5 AMP Wiper Control Power Supply Circuit Breaker (Captains wiper)
Vendor – Jackson Inc, USE
P/N 8500-005-5 (76374-9151)
S/N None visible

Captain's Wiper Control Switch
Vendor – Cole, USA
P/N 200-3061
S/N None visible

1. Testing Method and Considerations

All components were checked for any obvious damage prior to testing, none was evident. All components had been removed from the subject aircraft by HAECO. The wiper motor had been removed intact, together with attachment hardware. However, the circuit breakers (CBs) and control switch had been removed by the release of the attachment feature and the cutting of the associated circuit wiring. Therefore, the testing which was possible was applied to each separate unit/item, and not the physical circuit installed upon the subject aircraft. Although HAECO was nominated and willing to accomplish the testing, they do not hold specific maintenance approval for the MD-11 Wiper Motor, which being classified as a rotatable component, would normally be tested and serviced in accordance with an approved Component Maintenance Manual (CMM). On the other hand, the CBs and Control Switch being of a consumable design, would not normally be the subject of overhaul and repair. Therefore, the scope of the testing was done on the basis that HAECO were not approved for these components, but possessed enough experience and knowledge to apply basic testing techniques. In addition to this, consideration must be given to the fact that unit specifications or CMM's were not to hand. On this basis, best practice was applied to the rudimentary scope of the testing that was possible. All test power was applied in accordance with MD-11 wiring diagrams, reference 30-43-01 supplied by China Airlines.

2 Unit Testing and Results

2.1 Wiper Motor Assembly

2.1.1 This unit was tested to establish the correct operation of the following features:

- i) Operation of the drive motor.
- ii) Operation of drive brake.
- iii) Functioning of parking switch circuit.

2.1.2 Witnessed operation of main drive motor:

- i) The unit ran smoothly without undue noise or vibration.
- ii) No load current draw at low speed was 5 amps.
- iii) No load current draw at high speed was 7.5 amps.
- iv) The output shaft to the wiper arm was witnessed to rotate back and forth in an arc of approximately 30 degrees.
- v) The unit brake released when power was applied, and had a circuit resistance of 60 ohms.
- vi) The wiper parking system interrupter switch was tested during motor operation and found to make and break as would be expected.

It was not possible to apply any representative working load to this unit while running due to the fact that no test bench is available at HAECO. Furthermore, the power and size of this unit is such that any additional testing could only be accomplished on a suitable test stand, or alternatively by the unit being temporarily installation upon another MD-11 aircraft. As no CMMs, or unit design specifications were available, we are unable to determine how this unit conforms to such data.

2.2 15 AMP Main Power Circuit Breaker

2.2.1 This unit was tested to establish the correct operation of the following features:

- i) Ability to sustain a continuously applied current of 15 amps without tripping.
- ii) Test the current overload protection of the unit.

2.2.2 Witnessed operation of the 15 amp CB:

- i) This unit was able to carry a load of 15 amps for over 2 minutes without tripping.
- ii) When tested in overload, a circuit trip occurred after 22 seconds with a load of 30 amps applied.

2.3 5 AMP Control System Power Circuit Breaker

2.3.1 This unit was tested to establish the correct operation of the following features:

- i) Ability to sustain a continuously applied current of 5 amps without tripping.
- ii) Test the current overload protection of the unit.

2.3.2 Witnessed operation of the 5 amp CB:

- i) This unit was able to carry a load of 5 amps for over 2 minutes without tripping.
- ii) When tested in overload, a circuit trip occurred after an average elapsed time of 6 to 8 seconds with a load of 10 amps applied.

2.4 Captains Wiper Control Switch

2.4.1 This unit was tested to establish the correct operation of the following features:

- i) The switch rotated to all three detented positions.
- ii) Basic circuit electrical resistance and continuity test across all six contact positions.
- iii) Basic electrical insulation/leakage test of all terminal to switch the body (aircraft electrical grounding plane).

2.4.2 Witnessed results of the above switch tests:

- i) The switch rotated with positive detents at three positions corresponding to OFF, LOW and HIGH.
- ii) The resistance check applied to all switch contact positions produced the following results:

Across the "A" Contacts

C-1 = 1.2 ohms, C-2 = 2.2 ohms and C-3 = 1.5 ohms

Across the "B" Contacts

C-1 = 2.2 ohms, C-2 = 2.8 ohms and C-3 = 1.6 ohms

- iii) The insulation tests applied to all of the "A" and "B" contacts to the unit body, resulted in an infinity ohmic resistance being achieved, indicating no circuit electrical breakdown.

3. Conclusion

In view of the limited amount of test and specification data to hand for these units, it is not possible to make comprehensive operation statements. However, from the witnessed rudimentary test results, and the condition of the subject components, there is nothing to suggest that they would not be able to operate and function, as designed.

This witness test report was raised and presented by;

C M Lee - Inspector of Accident

Signed:-



Dated:- 18 February 2000