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By authority of CF-105 AVRS
Date AIR CONDITIONING SYSTEM 10/16/56
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CF-105

AIR CONDITIONING SYSTEM GROUND TESTS

LOG/105/40

July 1956

Compiled by: G.P. Emerson

Approved by: J.P. Booth

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ENGINEERING DIVISION

AVRO AIRCRAFT LIMITED, MALTON, ONTARIO



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1. INTRODUCTION

During the R.C.A.F. Mock-up Evaluation of the Avro CF-105, in February 1956, several change requests were raised concerning the method of ground checking the CF-105 Air Conditioning System.

This report describes the proposed method and the equipment required for checking out the Air Conditioning System on the ground. On prototype aircraft, the air conditioning system will probably be checked before each flight. In service, it is anticipated that the check will be carried out on 25 hour inspections.

2. R.C.A.F. CHANGE REQUESTS

The Change Requests concerned with this report are listed for reference.

E1, E3, E4, E5, E6, E9, E15

3. TEST REQUIREMENTS

- 3.1 Check the Bleed Air Pressure downstream of the Pressure Reducing and Non Return Valve in the engine bleed line.
- 3.2 Check the temperature of the delivery air downstream of the Cockpit Temperature Control Valve.
- 3.3 Check the temperature of the delivery air downstream of the Radar Temperature Control Valve.
- 3.4 Check the temperature of the delivery air from the Expansion Turbine.
- 3.5 Check the flow rate of the delivery air to the Radar Nose. This serves as a flow check on the whole delivery system and assures that the Flow Augmentor is functioning properly.

The above checks will be carried out with engines running at an R.P.M. varying from Idle to Maximum without afterburner. The exact R.P.M. setting will be laid down at a later date.

These checks will provide the necessary data to the ground crew, to ensure the satisfactory operation of the complete air conditioning system.

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4. EQUIPMENT REQUIRED

4.1 Permanently Installed in the Aircraft

- (a) A pressure line will run from the top of the Heat Exchanger to a quick disconnect panel conveniently located in the wheel well.
- (b) A Thermocouple will be mounted in the air duct on the downstream side of the Cockpit Temperature Control Valve. The necessary electrical wires will run to the quick disconnect panel in the wheel well.
- (c) A Thermocouple will be mounted in the air duct on the downstream side of the Radar Temperature Control Valve. The necessary electrical wires will run to the quick disconnect panel in the wheel well.
- (d) A Thermocouple will be mounted in the air duct at the outlet of the Expansion Turbine. The necessary wires will run to the quick disconnect panel in the wheel well.
- (e) A pitot head will be mounted in the delivery air duct to the Radar Nose to measure air flow.
- (f) A pitot and static line will run from the pitot head in the delivery air duct in the Radar Nose to the quick disconnect panel in the wheel well.
- (g) A panel will be located in the wheel well to house quick electrical and pressure disconnect fittings.

4.2 Ground Test Equipment

Air Conditioning Test Unit - This unit will house 1 pressure gauge, 3 temperature gauges and one air speed indicator.

The test unit will be equipped with a pressure hose, an electrical cable and a pitot and static hose, each approximately 50 feet in length. The hoses and cables will be fitted with quick disconnect couplings to mate with corresponding couplings on the disconnect panel in the wheel well.

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5. METHOD OF TEST

The Test Unit will be equipped with long cables and hoses in order to allow the ground personnel to stand well clear of the aircraft with the engines running. This is intended to alleviate, as much as possible, the danger of injury due to the high engine noise level.

- 5.1 Connect the Test Unit to the aircraft by attaching the hoses and cables to the disconnect panel.
- 5.2 Start the L.H. engine and run at R.P.M. Check the performance of the L.H. Pressure Reducing and Non Return Valve by reading the pressure on the pressure gauge mounted on the Test Unit.
- 5.3 Start R.H. engine and run both engines at R.P.M., and check temperature readings on the temperature gauges and the air flow readings on the A.S.I. on the test panel.

It must be noted that the above data depends upon ambient temperature. The Test Unit will contain simple charts showing required temperature and pressure data versus ambient temperature. These charts will be mounted inside the lid of the Test Unit. The data for these charts will be determined from the performance of the air conditioning system on the rig test.

- 5.4 Shut down the L.H. engine and check the performance of the R.H. Pressure Reducing and Non Return Valve by reading the pressure on the pressure gauge in the Test Unit.

6. CHECK WATER LEVEL IN BOILER

At every turn-around, on both prototype and service aircraft, it will be necessary to check the water level in the boiler. A Filler Gate Valve is positioned in the filler pipe for the boiler. The Valve is controlled by a level switch in the boiler. During filling, when the level of the distilled water rises to a predetermined level, the level switch causes the Filler Gate Valve to close. When the valve closes, the water will back up in the filler pipe indicating to the operator that the tank is full. The water that has backed up in the filler pipe will drain back to tank through a 1/4 dia. hole in the Gate Valve.

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7. ANNUNCIATOR BOX CHECK

- 7.1 After completion of a flight or an engine run, a visual check of the Annunciator Box is to be carried out.
- 7.2 The Annunciator Box is part of a system consisting of the Annunciator Box, six Temperature Sensing Units and, two Pressure Sensing Units. Three Temperature Sensing Units and one Pressure Sensing Unit are located in each engine bleed line.
- 7.3 Should a Temperature Sensing Unit sense a leak in the engine bleed line or the Pressure Sensing Unit sense an over-pressure condition downstream of the Pressure Reducing Valve, a signal will be transmitted to the Annunciator Box causing the indicator flag for that line to become visible. At the same time, a signal will be transmitted to close the appropriate Engine Air Conditioning Shut-off Valve in the engine bleed line.
- 7.4 The indicator flag in the Annunciator Box will stay visible even when the electrical power has been cut off. A reset button is provided on the Annunciator Box to electrically reset the indicator flag.

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