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Avro
CF105
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By authority of CF-105 AVRS
27 Sept 66
DRB
COCKPIT PRESSURIZATION TEST
Signature AVRS
LOG/105/39 AVRS June 1956
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J. H. PARKIN
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ANNEXE
J. H. PARKIN
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Date 27 Sept 96

Signature P. Bell

Unit / Rank / Appointment NRS S

CF-105

COCKPIT PRESSURIZATION TESTS

LOG/105/39

June 1956

Compiled J.D. Higgs WO2

Checked G.P. Emmerson

Approved J.P. Booth

ENGINEERING DIVISION

AVRO AIRCRAFT LIMITED, MALTON, ONTARIO

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1. INTRODUCTION

This report deals with the method of carrying out a cockpit pressurization test on the CF-105 by ground service personnel during second line maintenance, and the ground test equipment required.

The method of checking the cockpit pressurization depends to a great extent on the advisability of having a man in the cockpit while the cockpit pressure is being raised and lowered.

At the 18th meeting of the Maintenance Sub-committee, June 19th, the question of personnel safety was raised. The R.C.A.F. expressed the opinion that it would probably be necessary to have a man in the cockpit to seal leaks, but psychological problems would be experienced in selecting personnel to carry out this job due to the hazard involved.

A letter from the Institute of Aviation Medicine verified that some hazard existed, and that there would have to be some medical selection of the personnel taking part in the tests. A copy of this letter is enclosed.

With these facts in mind, a procedure for checking cockpit pressurization was originated that eliminated the requirement for having a man in the cockpit.

2. GROUND TEST EQUIPMENT

(a) Cabin Leakage Tester Portable - Sprague Model S-414

This item of equipment is available at AVRO, and is used on the CF-100.

Alternatives

4G/1529 Pressure Tester Aircraft Cabin ID/CAN
or

4G/1815 Pressure Tester Aircraft Cabin IE/CAN

Manufactured by Godfrey Engineering Co. Ltd.

Available in the R.C.A.F. Ref. EO.65D-10AB-2 and
EO.65D-10AA-2.

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LOG/105/39

2. GROUND TEST EQUIPMENT (continued)

- (b) Jumper Wire (AN16 Wire)
- (c) Ground Power and Air Conditioning truck.
- (d) Canopy Locking Mechanism.

This will consist of a solenoid that will be attached to the pilot's canopy locking slide to provide a means of locking the canopy from outside. A force of approximately 50 lbs., is required.

(e) Test Panel:

This test panel will house 2 switches, and circuit breakers that will control the operation of the cockpit dump valve and the canopy locking device.

3. SYSTEM DESCRIPTION

For complete details, refer to Air Conditioning Brochure P/EQUIP/62/1.

During flight, air is supplied to the cockpit from the expansion turbine of the air conditioning system. The cockpit discharge air is ducted through a Pressure Control Valve to the Armament Bay.

Requirements call for the cockpit to be unpressurized under 10,000 feet, and for the cockpit altitude to increase linearly above this altitude such that cockpit altitude is 25,000 ft., at an aircraft altitude of 60,000 ft.

A permissible cockpit leak rate has been provisionally set at 42.5 c.f.m.

The canopy seals are charged with air delivered from the water evaporator through a 3-way canopy seal valve.

2 CONFIDENTIAL



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LOG/105/39

4. PREPARATION FOR TEST

- 4.1 Lock Navigator Canopy by reaching through the "Access Panel Navigators Latch", located on the pilots bulkhead.
- 4.2 Attach Canopy Locking Device to pilots canopy locking slide, and make electrical connection to terminal strip E32, R.H. side pilot's cockpit.
- 4.3 Place Pilot's canopy locking handle in forward locked position,.
- 4.4 Place jumper wire between terminals 1 and 3 of terminal strip E32, thus over-riding the canopy actuation switch.
- 4.5 Attach air line from Cabin Leakage Tester to the Inlet fitting on cockpit floor in nose wheel well (7-2252-314), and attach the Static Line from the Cabin Leakage Tester to the outlet Fitting on the cockpit floor.

Attach the canopy seal air supply line to the 'T' fitting provided Aft of the navigators bulkhead through the Access Panel Sta. 215.

- 4.6 Make electrical connections from test panel to terminal strip E2, R.H. side nosewheel well and the cockpit Pressure Dump Solenoid on the aft face of Navigators bulkhead.
- 4.7 Connect Ground Electrical Power supply to Aircraft.

5. TEST PROCEDURES

5.1 Cockpit Pressure Test

- (a) Select "All Off" on the Cockpit Pressure Regulator Controller and the Cockpit Safety Valve Controller.
- (b) Select the canopy switch on the test panel to "Canopy Open" position.
- (c) Close the Pilot's canopy by operating the external canopy actuation switch.

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5.1 Cockpit Pressure Test (continued)

- (d) Select the canopy switch on the test panel to "Canopy Lock" position.
- (e) Inflate the canopy seals. Regulate the air supply to 20 p.s.i.g.

NOTE: Canopy seals may only be pressurized to 20 p.s.i.g. when canopy is closed.

- (f) Build up and regulate the cockpit pressure to 4.75 p.s.i.g.
- (g) Read the leak rate from the test rig's flow meter.
- (h) Acceptable leak rate - 42.5 c.f.m.

5.2 Cockpit Pressure Regulator Test

- (a) Select "Differential On" on the Cockpit Pressure Regulator Controller.
- (b) Build up the cockpit pressure until the regulator operates. This should occur between 4.5 and 5.0 p.s.i.g.

5.3 Cockpit Pressure Dump Test

- (a) Build up the cockpit pressure to 4.5 p.s.i.g.
- (b) Select dump switch on test panel to "Dump", this will open the Dump Valve allowing air to escape.
- (c) Time allowed for the pressure to drop to ambient pressure is 7.0 seconds.
- (d) Select dump switch on test panel to "Off" position.

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LOG/105/39

5.4 Cockpit Safety Valve Test

- (a) Select "All Off" on the Cockpit Pressure Regulator Controller.
- (b) Select "Differential On" on the Cockpit Safety Valve Controller.
- (c) Raise cockpit pressure until the Safety Valve operates. This should occur between 5.25 and 5.75 p.s.i.g.

6. At completion of tests, operate switch on test panel to unlock canopy.

Open canopy by operating the canopy actuation switch.

Disconnect and remove Canopy Locking Device.

Disconnect and remove air pressure lines, Static lines, and canopy seal lines, from the aircraft.

Disconnect and remove electrical leaks from ground test panel to terminal strip E2 and Cockpit Pressure Dump Solenoid.

Remove jumper wire between pins 1 and 3 on terminal strip E32.

Disconnect Electrical Ground Power Supply.

Select "Flight" on the Cockpit Pressure Regulator Controller and the Cockpit Safety Valve Controller and wire lock.

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APPENDIX 'A'

C O N F I D E N T I A L

IAM S-11 (FPME)

Toronto, Ont., 11 June, 1956.

A.V. Roe (Canada) Limited,
Malton, Ontario.

CF-105 - Test of
Canopy Patency

1 Reference is made to conversation with Mr. W. Farrance of your company regarding cabin pressurization tests on the CF-105.

2 Apparently there has been some question as to the advisability of having a man inside the cockpit during these tests. There is no doubt that there would be some slight hazard involved, but this is thought to be minimal if the test is properly carried out and there is some medical selection of the personnel taking part in the tests.

3 Hazards to which the man would be exposed would be; the risk of otitic barotrauma during a rapid increase in pressure; the possibility of disruption of the canopy with the resulting rapid increase in volume of body gases and the possibility of the introduction of toxic substances in the pressurizing gas. It is suggested that the following precautions should be observed:

- (a) The rate of increase of cabin pressure should either be under the control of the man in the cockpit, or failing this, he must be able to signal to the operator to either release the pressure, or to slow the rate of increase. It is suggested that the rate of increase to 4 p.s.i. should not be faster than 4 minutes and may require even a greater length of time, to prevent otitic barotrauma. It must be appreciated that this is comparable to a descent to ground level from 8,500 ft., and therefore, that people with upper respiratory tract infections should probably not be detailed for this duty.

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- 2 -

- (b) The risk in terms of pathological damage due to an explosive decompression is thought to be minimal, although of course if the man was in the act of swallowing, or had just completed a full inspiratory effort, there would be some risk. It is suggested that the personnel involved should be screened to ensure that they have no history of respiratory disease such as tuberculosis, spontaneous pneumo-thorax, or other possible pathological states.
- (c) The rate of decrease of pressurization should be reasonably slow, and it is suggested that the time involved to attain ambient pressure should be of the order of at least five seconds.
- (d) Gases used to pressurize the cockpit should be free from toxic substances such as carbon monoxide, etc.

4 The greater danger would appear to be one of explosive decompression, and in terms of this risk, I feel that most personnel would prefer to be inside the cockpit rather than outside, as the risk of a rapid expansion of body gases is probably less than the risk of flying pieces of glass from the disrupted canopy.

(D.G.M. Nelson), G/C.,
C.O. IAM.

C.C. AFHQ
" " O.C. TSD, Malton.

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