AVRO AIRCRAFT LIMITED

Inter-Departmental Memorandum

Ref 7766/16A/J
Date April 1, 1958
To S. E. Harper
From J. D. Hodge
Subject AIR CONDITIONING ENGINEERING TESTS

Herewith R.F.T. No. 5045 "Air Conditioning Engineering Tests" which lists the testing required to establish the operation of the Arrow 1 Air Conditioning System.

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AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5045

SHEET NO. 1 OF

DATE: April 1, 1958

AIRCRAFT and/or	ASSIGNMENT NO.	WORK ORDER NO.
25201 25202 25203	X73-384	

AIR CONDITIONING ENGINEERING TESTS

1. OBJECT

To prove the operation of the Arrow 1 Air Conditioning System.

2. INSTRUMENTATION

All instrumentation as called for in Report No. FAR/C105/1 Section 6 (Issue 8) is required for these tests. For convenience a copy of this section is included with this R.F.T.

3. PROCEDURE

3.1 It is required to have continuous recording of the following quantities at all times throughout flight.

3.1.1 Engine bleed static pressure (port engine)
3.1.2 Engine bleed temperature (port engine)
3.1.3 Turbine inlet total pressure
3.1.4 Turbine inlet temperature
3.1.5 Turbine outlet static pressure
3.1.6 Turbine outlet temperature
3.1.7 Turbine R.P.M.
3.1.8 Cabin inlet temperature
3.1.9 Cabin outlet temperature
3.1.10 Equipment inlet temperature

NOTE:- The measurement of these quantities will establish whether the air conditioning system is working efficiently or not. Should any problems arise it will be necessary to record all data as shown in the instrumentation list.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

AVRO AIRCRAFT LIMITED

MALTON, ONTARIO

REQUISITION FOR FLIGHT TEST

R.F.T. NO. 5045

SHEET NO. 2 OF 2

DATE: April 1, 1958

AIRCRAFT	ASSIGNMENT NO.	WORK ORDER NO.
25201 25202 and/or 25203	X73-384	

3.2 When proper operation of the system has been established recordings of all data are required for three flight cases, to check the theoretical calculations already made. These three cases are as follows:-

3.2.1 Subsonic cruise at 40,000' M= 0.92
3.2.2 Maximum speed at maximum altitude
3.2.3 Cruise at sea level M = 0.4

4. DATA REQUIRED

4.1 Recording of ten items as under Procedure section 3.1.

4.2 Recordings of all instrumentation for Procedure section 3.2.

R.F.T. PREPARED BY:	APPROVED BY:	AUTHORIZED BY:
A Anderson		
DATE FOR COMPLETION	PRIORITY	ESTIMATED COMPLETION DATE:

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AIR CONDITIONING SYSTEM

Items underlined are changed from Issue 7, Ref. 7028/02A/J, November 27, 1956.

1. LIST OF INSTRUMENTATION

Number indicates location in system, see sketch.

T - instrument to measure temperature.

P_s - instrument to measure static pressure.

P_t - instrument to measure total head pressure.

$\triangle P$ - $P_t - P_s$.

Location See Sketch	Instruments Required		Description
1	T	P_s	As close to Port engine bleed as possible.
2		P_s	Downstream from the reducing valve on Port engine line at such a distance that the valve does not affect the measurement.
3	T	P_s $\triangle P$	Mass flow for fuel pressurization system.
4	T	P_t	Turbine inlet conditions.
5	T	P_s (rake)	Turbine outlet conditions. The temperature probe should be located downstream from the turbine outlet at the junction point.
6	T	RPM	Fore and aft bearing temperatures and shaft R.P.M.
7A	T		Cabin inlet (at temperature sensor).
7B	T	P_s $\triangle P$	Mass flow from cabin. Measure temperature at sensor and pressure downstream from this.
8	T	P_s	Cabin conditions. Temperature to be measured at six points.
9	T	P_s or P_t (rake)	As close as possible to fan inlet. (Static or total may be measured)
10	T	P_s or P_t (rake)	As close as possible to fan outlet. (Static or total may be measured)
11	T		Ram air exit.
12	T		In equipment duct.

(Continued.....

2.1 Temperature

Instrument	Range (°F)	Accuracy (±°)	Accuracy (% of Range)	Recording Frequency
T1	+100 +1000	±10	1%	1/sec
T3	-20 +400	±5	1%	5/min
T4	-20 +250	±5	2%	5/min
T5	-30 +100	±4	2%	5/min
T6	0 +500	(to be built into turbine unit)		2/min
T7a&B	-20 +130	±5	3%	5/min
T8 (6 off)	0 +200	±2	1%	
T9	0 +500	±10	2%	5/min
T10	0 +600	±10	2%	5/min
T11	0 +500	±10	2%	5/min
T12	0 +140	±5	3%	5/min

2.2 Static Pressure

Instrument	Range (psia)	Accuracy (psi)	Accuracy (% of Range)	Recording Frequency
P_s1	0-360	±10	2%	1/sec
P_s2	0-100	±1	1%	1/sec
P_s3	0-100	±1	1%	5/min
P_s5 (rake)	0-20	±0.2	1%	5/min
P_s7	0-20	±0.2	1%	5/min
P_s8	0-20	±0.1	0.5%	1/sec
P_s9 (rake)	0-20	±0.2	1%	5/min *
P_s10(rake)	0-20	±0.2	1%	5/min *

* Note: Either static or total may be measured.

(Continued.....

2.3 Total Head Pressure

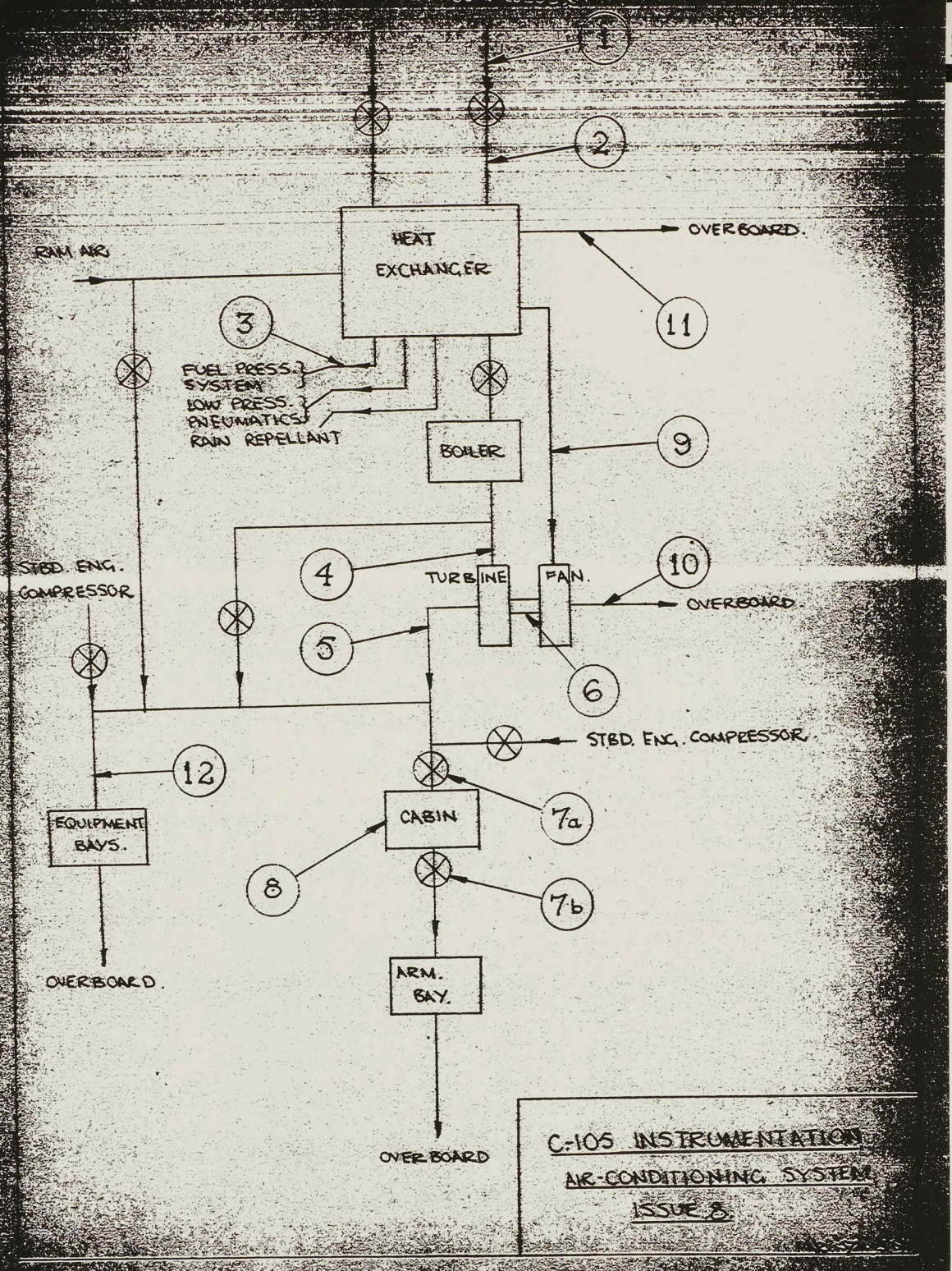
Measurement	Range	Accuracy (psi)	Accuracy (% of Range)	Recording Frequency
$\Delta P3$	0-5 psi	±0.25	5%	5/min
P_t4	0-100 psia	±1	1%	5/min
$\Delta P7$	0-1 psi	±0.05	5%	5/min
P_t9 rake	0-30 psia	±0.3	1%	5/min *
P_t10 rake	0-30 psia	±0.3	1%	5/min *

* See note Page 23.

2.4 Miscellaneous

In addition, it is required to measure turbine R.P.M., see location 6 in sketch. As in the case of bearing temperature, transducers will be built into the unit by AIResearch.

The sampling rate required for turbine R.P.M. is 5/sec.



C-105 INSTRUMENTATION
AIR-CONDITIONING SYSTEM
ISSUE 8.