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72-FAR-51

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A/C 25215 72/FAR/51

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INSTRUMENTATION FOR PERFORMANCE AND HANDLING EVALUATION - RCAF/AVRO

S/L Cooley

Nov. 1958

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AVRO AIRCRAFT

Inter-Departmental Memorandum

Ref 8188/02A/J
Date October 28, 1958
To Mr. S.E. Harper
From T. Roberts
Subject 72/FAR/51 - INSTRUMENTATION FOR PERFORMANCE AND HANDLING EVALUATION - RCAF/AVRO

Herewith a list of the measurements to be made for the RCAF/AVRO Performance and Handling evaluation of the Arrow 2 aircraft. This evaluation is tentatively scheduled to be carried out on aircraft 25215.

The list was drawn up after discussion between Flight Test Engineering, the Technical Dept. and the RCAF, and is based on a Memo by Mr. J. Lynch entitled Instrumentation for RCAF Phase 4 aircraft (Ref. 3881/02A/J)

T. Roberts
Technical Design Coordinator
Flight Test

Classification cancelled/changed to .....
by authority of ..... (date) .....
signature ..... Rank .....

K.D.J. Owen Sqn Ldr
C.E.P.E. Approval

Project Approval

DHM/bb

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CIRCULATION

Messrs J.Chamberlin
F.Brame
C.Lindow
F.Mitchell
A.Buley
T.Higgins
D.Scard
D.Woolley (6)
J.Lynch
J.Gale
J.Lucas
J.Hodge
J.Ames
W/C G.Waterman
W/C G.Waterman (2) AVRO T.S.D. RCAF for transmittal to S/L K. Owen, C.E.P.E. Detachment.

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MALTON – ONTARIO

TECHNICAL DEPARTMENT (Aircraft)

UNCLASSIFIED
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AIRCRAFT: 25215

REPORT NO: 72/FAR/51

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TITLE:

INSTRUMENTATION FOR PERFORMANCE AND HANDLING EVALUATION – R.C.A.F./AVRO

PREPARED BY D.H. Martin DATE Oct./58

RECOMMENDED FOR APPROVAL A. Roberts DATE Nov 11/58

APPROVED _____ DATE _____

APPROVED FOR RELEASE _____ DATE _____

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REPORT NO. 72/FAR/51

SHEET NO. i

AIRCRAFT:		PREPARED BY	DATE
		D.H. Martin	Oct.1958
		CHECKED BY	DATE

ARROW 2 PERFORMANCE AND HANDLING INSTRUMENTATION

This report is issued to cover the instrumentation requirements for the joint R.C.A.F. and AVRO Performance and Handling Evaluation of the Arrow 2 aircraft. A similar philosophy with regards to method of recording has been adopted for this testing as for Phase 2 (R.C.A.F. Performance Evaluation of the Arrow 1 aircraft). High accuracy is essential and instrumentation reliability important for the Performance parameters and so the large majority of the recording is to be by means of an auto-observer, with a few parameters on oscillograph for convenience. All parameters required for the Handling assessment are recorded by oscillograph

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REPORT NO. 72/FAR/51

SHEET NO. 1

AIRCRAFT:		PREPARED BY	DATE
		D.H. Martin	Oct.1958
		CHECKED BY	DATE

AUTO-OBSERVER

	ITEM	RANGE	ACCURACY
1.	Time	-	± .01 secs
2.	Frame counter and pilot coding	-	± .01 secs
3.	Altitude	0 to 80000 ft.	± 200 ft.
4.	Airspeed	50 to 800 kts.	± 2 kts.
5.	Ambient total temperature	218 to 450°K	± 1°K
6.	L.P. Compressor RPM (port & stbd)	0 to 110%	± ½%
7.	H.P. Compressor RPM (port & stbd)	0 to 110%	± ½%
8.	Fuel used - engine (port & stbd)	0 to 2000 gals	± 1%
9.	Fuel used - afterburner (port & stbd)	0 to 1500 gals	± 1%
10.	Fuel temperature - engine (port & stbd)	0 to 80°C	± 5°C
*11.	Engine intake static pressure (port & stbd)	0 to 25 psi	± 1%
*12.	Engine intake total pressure (port & stbd)	0 to 35 psi	± 1%
*13.	By-pass static pressure (port & stbd)	0 to 25 psi	± 1%
*14.	By-pass total pressure (port & stbd)	0 to 35 psi	± 1%
*15.	By-pass total temperature (port & stbd)	0 to 300°C	± 1%
*16.	Turbine discharge total pressure (port & stbd)	0 to 45 psi	± 1%
*17.	Turbine discharge total temperature (port & stbd)	0 to 650°C	± 1%
18.	Final nozzle area (port & stbd)	500 to 1200 in^2	± ½%
*19.	Jet pipe wall static pressure (port & stbd)	0 to 35 psi	± 1%
*20.	Ejector wall static pressure (port & stbd)	0 to 25 psi	± 1%

* See note over.

OSCILLOGRAPH

	ITEM	RANGE	ACCURACY
1.	Pitch angle	-60° to +60°	± 1%
2.	Pitch rate	-30° to +30°/sec	± ½%
3.	Roll angle	-85° to +85°	± 1%
4.	Roll rate	-300° to +300°/sec	± ½%
5.	Yaw rate	-30° to +30°/sec	± ½%
6.	Angle of attack	-10° to +20°	± 1%
7.	Angle of sideslip	-15° to +15°	± 1%
8.	Normal acceleration - full range	-3g to +10g	± 1%
9.	Normal acceleration - limited range	-2g to +4g	± 1%
10.	Lateral acceleration	-½g to +½g	± 1%
11.	Longitudinal acceleration	-1g to +1g	± ½%
12.	Elevator angle (port & stbd)	-30° to +20°	± 1%
13.	Aileron angle (port & stbd)	-19° to +19°	± 1%
14.	Rudder angle	-30° to +30°	± 1%
15.	Elevator stick position	0 to 11 ins	± 2%
16.	Aileron stick position	0 to 10 ins	± 2%
17.	Rudder pedal position	0 to 6.65 ins	± 2%
18.	Elevator stick force	-80 lb to +120 lb	± 1%
19.	Aileron stick force	-30 lb to +30 lb	± 1%
20.	Rudder pedal force	-250 lb to +250 lb	± 1%
21.	Airbrake angle (port & stbd)	0 to 60°	± 2%
22.	Cockpit temperature	0 to 70°C	± 2%
23.	Cockpit pressure	0 to 20 psi	± 2%

The following notes apply to the auto-observer instrumentation list. The numbers used below correspond to the item numbers.

11. 3 wall probes manifolded.

12. Provision should be provided for 3 rakes with separate instruments for each.

13. 14. 15 These are required for determination of by-pass air weight flow. The sensors should be placed as near as practicable to the plane of the final nozzle with afterburner lit. All parameters should be obtained by means of a rake or by multiple manifolded probes as in Phase 2.

16. 17. Orenda probes are to be used for these measurements.

19. 4 manifolded probes placed 1 pipe diameter upstream of the primary nozzle exit.

20. Flight Test Engineering has agreed to look into the feasibility of installing 4 manifolded probes at each of at least 6 planes. Failing this, 12 probes may be used, stationed in a helical fashion and probably manifolded in 3 groups of 4, as in Phase 2.

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REPORT NO. 73/TAR/51

SHEET NO. 4

AIRCRAFT:		PREPARED BY	DATE
		D.H. Martin	Oct. 1958
		CHECKED BY	DATE

MISCELLANEOUS NOTES

1. The R.C.A.F. wish to know C.G. position, and have indicated that it may be necessary to measure individual tank contents if the fuel sequencing is not reliable, such that the estimated C.G. vs. Aircraft Weight becomes meaningless.

2. For correlation of pilot reports during tests for buffet limits and handling in turbulent air, it would be of assistance to have a recording of normal acceleration at the pilot's position. This measurement has not been added to the present list but may be requested later.