

CONFIDENTIALAVRO AIRCRAFT LIMITED
INTER-DEPARTMENTAL MEMORANDUM

Ref: 3221/11/J
 Date: 1 September, 1958
 To: See Distribution
 From: E.F. Burnett - Weight Supervisor
 Subject: Arrow 2 A/C 25206 Weight and C.G. Summary Report: 7-0400-82 Issue 1

Attached is the initial copy of Weight & C.G. Summary Report: 7-0400-82 Issue 1 for A/C 25206 dated September 1st, 1958, for your retention.

In this summary Weight comparisons are made to 7-0400-34 Issue 23, the similar type summary for Mk 2 Prodn. Aircraft. Subsequent issues of this report, however, will be compared to the preceeding issue, in the usual manner.

The report will be revised on a monthly basis and is issued complete on the 1st of each month.

Classification cancelled / changed to: UNCLASSIFIED

By authority of: DRDA 7/DARFT 5-8/DAS Eng 6-4-5

Date: 5 Nov 1992

Signature: E. Aubrey

Unit / Rank / Appointment: DS/S 3, Secretary CRAD HQ DRP

E.F. Burnett *ppkey*
 E.F. Burnett

EFB/ag

cc: Messrs. J.C. Floyd F. Brame D. Inglis
 R.N. Lindley W. Czerwinski D. Moore
 R. Marshall J. Lucas R. Cairns
 C.V. Lindow S. Kwiatkowski D. Brownridge
 J.W. Ames A. Cornish
 B.C. Alford T. Roberts
 D. Wade C. Marshall
 D.N. Scard J. Zurakowski
 A.R. Buley A. Crust (6 copies for R.C.A.F.)



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

Aircraft: Arrow 2
A/C 25206
Date : 1 September, 1958

Report: 7-0400-82
Issue : 1

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I N D E X

Sheet

Content

1-1 to 1-3

Introductory notes and explanations of weight changes relative to Mk 2 prod A/C defined in Weight Report 7-0400-34 Issue 23.

2-1 to 2-2

Weight & C.G. Summary

3-1

Horizontal C.G. Plot showing basic fixed points on flight envelope for ballasted Aircraft. The possible variations of C.G. with fuel used have been omitted until such time as a fully approved fuel sequencing is established.

4-1 to 4-15

I.B.M. detail sheets of Weights and C.G.'s.

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Introduction & Weight Changes

The following is the initial issue of a Weight & C.G. Summary for the first Mk 2 Aircraft, serial No. 25206, with PSL3 Engines (preproduction versions), based on the latest information available.

All weight & C.G. changes for the subject aircraft are quoted herein, relative to 7-0400-34 Issue 23, which is the current similar type statement for a production version of the Mk 2 Aircraft.

In future issues of this report all weight & C.G. changes will be quoted relative to the **previous** issue, and the above paragraph applies **ONLY** to this issue of the Weight report.

Note:

1. This summary is for the Aircraft as at first flight. Future changes eg possible fitment of Weapons pack etc. will be dealt with as Flight Test Statements at the applicable time, if required.
2. To the extent of currently available information this statement could also be applicable to A/C 25208. Aircraft 25207, however, is entirely different and is the Orenda PSL3 Flight Test Vehicle. Weight & C.G. summaries will be issued for this Aircraft at a later date.

General:

- a) Orenda PSL3 Engines comprise the Power Plant. These will be an early preproduction version but a specific weight for them is not yet available. (Weight recorded is 4,800 lb each, Orenda's latest available weight for preproduction engines, excluding Nose Bullet, Input Frame and AVRO installed accessories).
- b) An Instrument package containing Flight Test Instrumentation is installed.

Only a preliminary estimate of the contents of the pack is yet available, however, the pack will be weighed separately prior to flight and ballasted if necessary, to compensate for equipment shortages.

A reasonably detailed estimate of other Flight Test Installations throughout the Aircraft has been made, these amount to 517lb.

- c) "Partial Astra" is fitted in this and some other early Mk 2 Aircraft. This comprises Navigational & Communication equipment only.

Minneapolis Honeywell MH64 Damping System is also installed.

- d) For early flights of A/C 25206 additional emergency fire extinguishing equipment will be installed.
- e) Where actual weights of Arrow 1 parts that apply to Arrow 2 Aircraft have been obtained, these weights have been recorded in the Arrow 2 records, Some weights of Arrow 2 parts have also been obtained.

On I.B.M. sheets in the report, immediately preceeding the item title will be found a number varying from 0 to 100. This is the percentage actual weight recorded in the relevant item.

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General: Cont'd

- e) To increase the long range capabilities of the Aircraft tailcone plugs have been introduced to restrict the exhaust area. Provision for carrying these plugs, which are jettisonable, will be made on all Mk 2 A/C. The plug may be installed for any mission, but would probably be jettisoned prior to combat. It is only recorded in this report for a ferrying mission.

1. Structure

a) Wings No Weight Change

b) Fin & Rudder

I.R. Seeker Head Mtg. Structure - deleted, no provisions for the IR system will be made on A/C 25206, 25207 or 25208 - 10.75

c) Fuselage Complete No weight change.

Total Structural Decrease - 10.75

2. Landing Gear

Main Landing Gear - for the initial Mk 2 Main Gear existing forgings are to be utilized and it is estimated by Dowty that there will be an increase of approx. 55 lb/leg over the wt. of the unmodified Mk 1 leg assy. This will NOT apply to the ultimate Mk 2 design, which it is hoped will be lighter than existing Mk 1 Main Gears + 110.00

Total Landing Gear Increase + 110.00

3. Power Plant & Services

Engine Instrumentation - this seems to be rather a nebulous item. A weight for the specific engines to be installed on A/C 25206 is not yet available. Orenda quote the weight of their pre-production series of PSl3 Engines at 4,800 lb each, this is recorded; but they also state that the early engines will have about 50 lb of instrumentation. Until more specific details can be obtained this allowance will be recorded. + 100.00

Power Plant Group Increase + 100.00

4. Flying Controls Group

No weight change.

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5. Equipment Group

Weight lb

Missile Pack & All services in pack - deleted, this is replaced by an Instrument Pack	-2,238.52
Instrument Pack Structure - new item	+ 692.00
Pack Instrumentation - initial Flight Test Dept estimate of full pack requirements	+1,726.00
Flight Test Installations - other installations throughout the A/C	+ 517.00
Radio & Radar Remov - full Astra I deleted	-2,110.48
Radio & Radar Fixed - full Astra I deleted	- 880.04
Radar Door Actuation - included with 'Astra Minus' system below	- 10.00
MH64 Damping System - cable allowance deleted, est. in full with Astra Minus system, see below	- 87.34
"Astra Minus" - Navigational & Communication equipment only	+ 689.00
Additional Fire Protection - this is an emergency system applicable to A/C 25206 only	+ 180.61
Air Conditioning System - there is no cooling ducting in the fin for the IR seeker head, since I.R system not applicable to this A/C	- 12.22
Cockpit Equipment - deleted, applicable to A/C 25209 & subsequent, map case, board etc	- 6.00

Total Equipment Group Decrease -1,539.99

6. Trapped Fuel No weight change.

7. Operational Load

Missiles - not applicable	-1,728.00
Missile Cocoons - not applicable	- 84.00

Total Operational Load Decrease -1,812.00

Summary

Weight Change - Aircraft Basic Weight

Structure	- 10.75
Landing Gear	+ 110.00
Power Plant	+ 100.00
Equipment	-1,539.99
	<u>-1,340.74</u>

Weight Change - Operational Load

Missiles	- 1,728.00
Cocoons	- 84.00
	<u>- 1,812.00</u>

Ballast + 1,476.00

Weight Change - Operational Weight Empty (A/C less Fuel)
BALLASTED Condition

Mk 2 Prodn. A/C
ref 7-0400-34 Issue 23

47,261.94

A/C 25206

45,585.20

-1,676.74 lb

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Weight & C.G. Summary

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Sheet : 2-1

Description	Wt. lb	H. Arm	V. Arm
Structure	19,201.34	566.51	137.23
Wings	10,041.11	642.92	142.18
Fin & Rudder	1,030.60	753.90	208.30
Fuselage Fwd Sta 255 ins	2,599.15	184.59	128.63
Sta 255 - 485 ins	1,714.59	375.78	129.90
Sta 485 - 591.65 ins	1,160.24	538.44	105.63
Sta 591.65 - 742.5 ins	1,576.20	659.72	110.71
Sta 742.5 ins aft	1,036.81	806.89	129.18
"Marry-Up"	42.64	466.91	109.85
Landing Gear - Retracted	2,791.98	491.52	135.28
Main Landing Gear	2,142.67	539.39	141.00
Main Gear Doors & Fairing	287.98	538.52	138.40
Nose Landing Gear	333.81	170.81	99.70
Nose Gear Door & Fairing	27.52	162.22	88.66
Power Plant & Services	11,546.72	671.99	121.41
Engines Bare PS13	9,600.00	689.94	121.25
Engine Accessories (Inlet frame etc)	303.04	607.92	119.29
Engine Instrumentation (Orenda supplied)	100.00	690.00	121.25
Engine Controls	32.32	319.90	117.49
Gear Box & Drives on Fuselage	293.93	602.27	102.24
Gear Box & Starter on Engine	305.20	614.82	105.66
Fire Extinguisher System (basic)	73.58	686.35	131.21
Engine Mountings	75.39	671.91	141.52
Fuel System	763.26	529.78	135.19
Flying Controls Group	1,932.26	651.64	138.17
Mechanical Flying Controls	958.44	677.70	147.63
Hydraulic Flying Controls	973.82	626.00	128.86
Equipment Fixed & Removable	7,570.74	398.56	114.51
Instruments	34.61	167.52	138.92
Probe	15.25	-23.71	108.00
Cockpit Pressure Sealing	5.00	186.00	130.00
Oxygen System	26.07	240.54	156.70
Ejector Seats	342.94	204.50	134.11
Air Conditioning System	864.09	341.68	135.33
Cockpit Insulation	14.31	187.48	132.00
Hydraulics Utilities System	631.57	503.07	118.31
Sequencing of Nose U/C Door	27.00	200.00	115.00
Mechanical Door Stops Main U/C Doors	3.02	516.00	120.00
Anti-skid control System	37.68	480.00	113.97
Drag chute	91.07	786.68	143.19
Electrical System	1,254.16	439.96	112.66
Low Pressure Pneumatics	50.08	394.63	126.02
Surface Finish	100.00	591.52	140.20
Intake De-icing Boots	88.00	195.82	118.00
Canopy Actuation	64.92	221.99	154.35
Cabin Consoles	17.28	174.66	124.33
MH64 Damping System	99.08	450.83	140.34
Partial Astra System	689.00	343.65	118.32
Instrument Pack Structure	692.00	384.86	93.56
Pack Instrumentation	1,726.00	393.40	95.00
Flight Test Installations	517.00	499.27	130.44
Additional Fire Protection (25206 only)	180.61	398.87	108.63

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Description	Wt. lb	H. Arm	V. Arm	%M.A.C.
Trapped Fuel	213.80	548.26	141.79	
Aircraft Basic Weight U/C Up	43,256.84	564.14	128.97	
U/C Down		566.58	124.94	
Useful Load (less usable fuel)	852.36	307.68	130.77	
Crew	390.00	194.00	136.50	
Engine Fire Extinguisher Fluid	25.00	730.00	129.00	
Oil	138.97	636.92	110.57	
Oxygen	13.39	259.68	159.91	
Water for Air Conditioning	285.00	267.91	131.56	
Ballast	1,476.00	100.00	114.00	
Operational Weight Empty U/C Up	45,585.20	544.32	128.52	29.92
U/C Down		546.64	124.70	30.56
Max. Internal Fuel (2491 gals at 7.8 lb/gal)	19,433.00	541.85	144.16	
Gross Weight (Max. Int. Fuel) U/C Up	65,018.20	543.58	133.19	29.72
U/C Down		545.20	130.51	30.16
Max External Fuel (500 gal at 7.8 lb/gal + drop tank)	4,242.36	520.32	60.79	
Tailcone Plugs	252.00	857.07	128.60	
Max. Gross Weight (Int + Ext fuel) U/C Up	69,512.56	543.30	128.75	29.64
U/C Down		544.82	126.24	30.06

- N.B. 1) Aircraft datum = 120 ins above an arbitrarily chosen ground line
- 2) Aircraft is ballasted such that the aft. C.G. ~~at~~ a typical flight envelope, excluding any effects of fuel sequencing (see note on sheet 3), does not exceed 31% M.A.C. Mk 2 A/C Radar Noses have provisions for 900 lb ballast, current theoretical requirements are 1,476 lb; however, this summary is only of a preliminary nature and this ballast figure is subject to change.

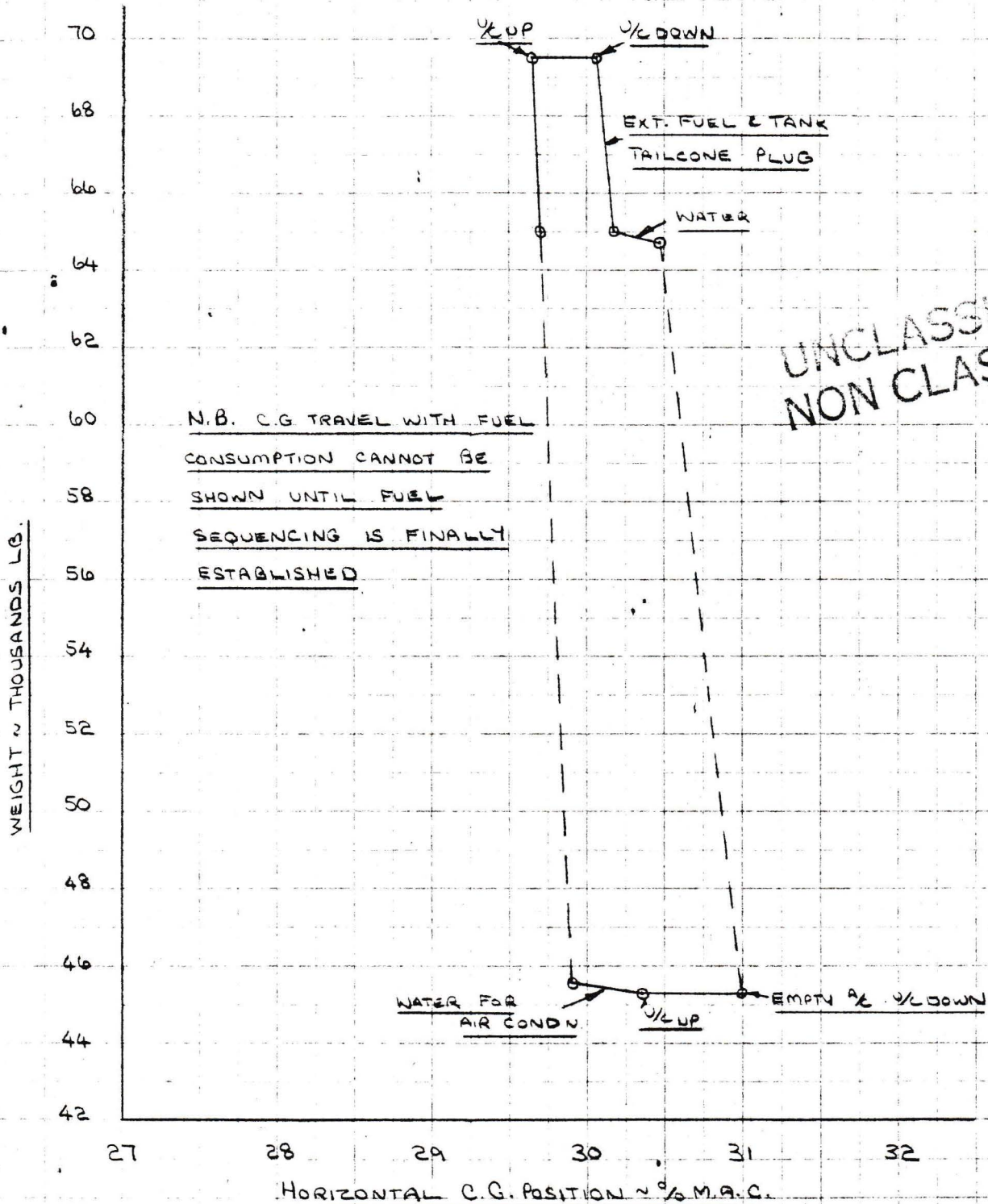
HORIZONTAL C.G. PLOT OF FIXED
POINTS ON ARROW 2 A/C 25206
FLIGHT ENVELOPE

DATE: Sept 1st 1958

SHEET: 3

BY: Kathleen Lyffur

A/C WITH 1476 LB BALLAST AT STA 100 INS



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