

QC
Avro
C-105
7-0400-63

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CF105
R-7-0400-63
Iss-2

Classification cancelled / changed to Unclass
Arrow 1 Report: 7-0400-63
By Ch 25025 & 25025 Issue : 2
Date 27 Sept 58
Signature WRIGHT & COMPANY
SECRET
Unit / Rank / Appointment NRSS 1 July/58

~~SECRET~~

AVRO AIRCRAFT LIMITED
INTER-DEPARTMENTAL MEMORANDUM

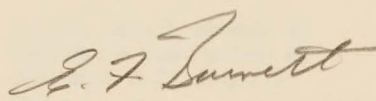
Ref: 1645/11/J
Date: 1 July, 1958
To: See Distribution
From: E.F. Burnett - Weight Supervisor
Subject: Arrow 1 A/Cs 25204 & 25205 Weight and C.G. Summary Report 7-0400-63
Issue 2

Classification cancelled / Changed to UNCLASS
By authority of AVES
Date 27 Sept 56
Signature PPSully
Unit / Rank / Appointment AVR35

Attached is a copy of Weight and C.G. Summary Report 7-0400-63
Issue 2 dated July 1, 1958.

The report defines the aircraft to the completed configuration
including the fitment of full Astra. An appendix is attached
which indicates the Weight & Balance for Phase I Flight Testing
prior to fitment of full Astra.

The report will be issued monthly until the actual weight of the
Aircraft has been obtained.


E.F. Burnett

EFB/ag

cc: Messrs. J.C. Floyd J.P. Booth A.J. Crust
R.N. Lindley F. Brame (6 copies for
C.V. Lindow W. Czerwinski R.C.A.F.)
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15-855/93

55863

S E C R E T

Aircraft: Arrow 1
A/C 25204 & 25205
Date: 1 July, 1958

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I N D E X

<u>Sheet</u>	<u>Content</u>
1-1 to 1-5	Introductory notes and explanations of Weight changes.
2-1 to 2-2	Weight and C.G. Summary
3-1 to 3-4	Appendix I - 4th and 5th Aircraft prior to installation of Full Astra I trials.
4-1	Horizontal C.G. Envelope for A/C with full Astra I.
4-2	Horizontal C.G. Envelope for ballasted Aircraft.
5-1 to 5-15	I.B.M. detail sheets of Weights & C.G.s for an A/C with full Astra I T.I.

S E C R E T

Aircraft: Arrow 1
A/C 25204 & 25205
Date: 1 July, 1958

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Sheet : 1-1

Introduction and Weight Changes

The following is a weight & C.G. summary for the fourth and fifth Arrow I aircraft Nos. 25204 & 25205, with J75P5 engines, based on the latest information available.

All weight and C.G. changes are quoted relative to Issue 1 of June 1st, 1958.

Note:-

This summary is for the Aircraft in the completed stage with full Astra I trial installations and a completed Instrument Package.
For a preliminary estimate of the condition of the Aircraft at first flights see Appendix I.

General:

- a) Pratt & Whitney J75 P5 Engines comprise the Power Plant for A/C 25204 and 25205 (5,850 lb each, Pratt and Whitney's latest brochure weight with their installation kit, confirmed by P. & W actual weight recorded in Engine Inspection records).
- b) The Instrument Package containing Flight Instrumentation is installed. This pack is entirely different from those for A/Cs 25201 to 25203.

Initial proposals have been received from RCA as to their instrumentation requirements in the pack - these, together with Flight Test requirements total 1,157 lb unit weights. It is felt that the current estimate of 2,000 lb of equipment in the pack will adequately cover further allowances for cabling and additional Air Conditioning equipment, detailed estimates of which are not yet available. Additional water required for Air Conditioning is considered separately as an item of Operational Load.

A reasonably detailed estimate of other proposed Flight Test Installations throughout the Aircraft has been made. These installations amount to 887 lb.

- c) There are no emergency fire protection nor emergency landing lowering installed.
- d) A Missile seeker is installed, mounted beneath the Aircraft, between A/C Stas. 485 and 538.7 ins, from the dive brake jack beams. Canadair has supplied information to the effect that missile seeker shall weigh 124.4 lb.

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Aircraft: Arrow 1
A/C 25204 & 25205
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- e) There is to be a trial installation in these A/C of the full R.C.A. Astra I system, but with the following amendments:-

- 1) A complete J4 Compass system is added
- 2) The missile auxiliaries normally housed within, or in close proximity to, the missile pack will not be necessary, however, one each of the Range Slaving units, angle slaving units and Optical Mode units will be installed in the Instrument Pack.
- 3) The miniature stable platform, amplifier assy and platform repeater will not be required.

N.B.

When Astra I is first installed the I.R. Tracker system and ARD501 Homer system may not be available.

- f) The Mk 1A Tailcones and Stinger are fitted.

- g) Due to material substitutions and concessions introduced by Planning and Production Departments, there is a structural weight penalty of 72lb approx. This is all recorded in the structural weight breakdown. No account has been taken of variations on machinings nor of minor shop repair schemes, since it is impossible to assess these, except where actual weights have been obtained. Major repair schemes e.g. cracked outer skin on Air Intakes have been assessed and recorded.

- h) A dry weighing has now been obtained of A/C 25201. Based on the good agreement shown between estimated and actual weights of A/C 25201 it is felt that this summary is entirely representative of the subject aircraft in the complete form, within + 0.30%. (This figure is as good as can be expected from the accuracy of the electronic weighing cells currently used).

Preceding the report titles on the I.B.M. Tabulation sheets, will be found a number varying from 0 to 100, this is the percentage of actual weight recorded within the report.

- j) No further work is being proceeded with in the fuel management system for Arrow 1 Aircraft. The fuel proportioners are functioning satisfactorily and it is not considered necessary to fit the fuel sequencing system.
- k) The Aircraft as recorded with full Astra I trial installation (ref note e) is not ballasted. However, in Appendix I will be found an estimate of A/C 25204 and 25205 for early Flight testing, these Aircraft are ballasted such that the C.G. on a flight envelope (using fuel proportioners) does not travel aft of 31% M.A.C.

SECRET

Aircraft: Arrow 1
A/C 25204 & 25205
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<u>1. Structure</u>	<u>Weight lb</u>
a) <u>Wings</u>	
I/W Struct. F/S to M/Spar - addition of stiffening elements in the U/C Bay	+ 4.75
<u>Total Wing Increase</u>	+ 4.75
b) <u>Fin & Rudder</u>	
No weight change	
c) <u>Fuselage Fwd Sta. 255 ins</u>	
Formers F.F. - miscellaneous brackets added	+ 0.44
Crew's Bulkheads - sequencing valve and Astra ground test mtg. added	+ 1.65
redesign O ₂ pressure control mounting	+ 0.15
equipment bracketry added	+ 0.46
Miscellaneous Items FF - equip. bracketry added	+ 1.71
<u>Front Fuselage Increase</u>	+ 4.41
d) <u>Centre Fuselage Sta 255 - 485 ins</u>	
Electronics Bay - fully est. to prod. drgs. - previously some scheme ests were used	= 0.09
<u>Centre Fuselage Decrease</u>	= 0.09
e) <u>Duct Bay Sta 485 - 591.65 ins</u>	
No weight change	
f) <u>Engine Bay Sta 591.65 - 725.5 ins</u>	
No weight change.	
g) <u>Rear Fuselage Sta 742.5 ins aft</u>	
No weight change	
h) <u>Fuselage Joints</u>	
No weight change.	
<u>Total Structural Increase</u>	+ 9.07

S E C R E T

Aircraft: Arrow 1
A/C 25204 & 25205
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2.	<u>Landing Gear</u>	<u>Weight lb</u>
	No weight changes	
3.	<u>Power Plant & Services</u>	
	No weight changes	
4.	<u>Flying Controls Group</u>	
	Mechanical Flying Controls - redesign of elevator quadrant with one bob weight	- 2.89
	Misc. changes throughout system	+ 3.71
	Hyd. F/Controls - fuselage - further details of prod. drgs. and equipment weights	- 1.43
	<u>Flying Controls Decrease</u>	<u>- 0.61</u>
5.	<u>Equipment Group</u>	
	Air Conditioning - addition of shuttle valves and temperature sensor, alterations to other valves etc, manifolds under floor steel were aluminum	+ 13.64
	Landing Gear Doors - sequencing - an electrical system is already allowed for, for Nose U/C; a mechanically operated system is now being introduced for the Main U/C Doors.	+ 33.30
	Radio & Radar Fixed - addition of gyro mounting box in Duct Bay area 4th and 5th A/C only	+ 12.11
	Radio & Radar Remov - Full Astra I installed as for a production Mk 2A/C, but with a complete J4 Compass system added and the miniature stable platform amp assy and platform repeater not needed. Wts. to R.C.A. latest statement. The missile auxiliaries are not installed except for 1 each range slaving unit, angle slaving unit and optical mode unit, in the Instrument pack for the missile seeker	- 83.20
	Missile Seeker - An allowance of 120 lb was previously made for the seeker and installation. Canadair now state the seeker will weigh 124.4 lb - the installation is estimated at 42.6 lb. Hence	+ 47.00
	<u>Total Equipment Increase</u>	<u>+ 22.85</u>

S E C R E T

Aircraft: Arrow 1
A/C 25204 & 25205
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6. Trapped Fuel

Weight lb

Trapped Fuel - Aircraft 25201 was weighed dry and then drained thus, establishing a weight of fuel trapped within the system

+ 372.00

Trapped Fuel * + 372.00

7. Operational Load

Residual Fuel - this is the fuel that is drainable but unusable, the figure has also been established experimentally. Previously this report contained both trapped and residual fuel, which were theoretically underestimated

+ 66.60

Total Operational Load Increase * + 66.60

N.B.

- * This has not influenced the Gross weight of the Aircraft, see also note following Wt. & C.G. summaries Sht. 2-2.

Summary

Weight Change - Aircraft Basic Weight

Structure	+	9.07
Flying Controls	..	0.61
Equipment	+	22.85
Trapped Fuel	+	<u>372.00</u>
	+	<u>403.31</u>

Weight Change - Operational Load

Residual Fuel + 66.60

Weight Change - Operational Weight Empty (A/C less usable fuel)

Issue 1
48,811.17

Issue 2
49,281.08

+ 469.91 lb

S E C R E T

Aircraft: Arrow 1
A/C 25204 & 25205
Date: 1 July, 1958

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Sheet : 2-1

Wt. & C.G. Summary
Full Astra
Installed

Description	Weight lb	H. Arm ins	V. Arm ins
Structure	18,786.74	564.44	137.52
Wings	10,008.91	643.08	142.24
Fin & Rudder	1,045.38	754.89	209.88
Fuselage Fwd. Sta 255 ins	2,624.73	184.17	128.30
Sta. 255 - 485 ins	1,684.85	379.34	130.45
Sta 485 - 591.65 ins	1,018.71	533.73	104.38
Sta 591.65 - 742.5 ins	1,437.47	660.98	107.30
Sta 742.5 ins aft	912.38	807.53	128.96
"Marry-Up"	54.31	462.81	104.25
Landing Gear - Retracted	2,662.42	488.76	135.00
Main Landing Gear	2,018.57	538.99	141.00
Main Gear Doors & Fairings	282.34	537.60	138.37
Nose Landing Gear	333.81	170.81	99.70
Nose Gear Door & Fairing	27.70	162.60	88.70
Power Plant & Services	13,770.66	652.46	120.35
Engines & Accessories J75 P5	11,913.81	665.32	119.78
Gear Box & Drives on Fuselage	276.70	603.71	103.24
Gear Box & Starter on Engine	286.80	589.18	105.54
Engine Controls	33.35	375.79	118.49
Engine Nose Bullets	75.61	562.69	115.11
Fire Extinguishing System	65.53	700.45	134.21
Engine Mountings	206.21	635.04	127.71
Fuel System	912.65	537.27	135.48
Flying Controls Group	2,153.25	624.75	134.90
Mechanical Flying Controls	953.45	675.98	147.72
Hydraulic Flying Controls	1,199.80	584.03	124.71
Equipment Fixed & Removable	10,408.39	349.48	110.90
Instruments	46.07	163.69	138.70
Probe	15.25	-23.71	108.00
Cockpit Pressure Sealing	5.00	186.00	130.00
Ejector Seats	342.94	204.50	134.11
Oxygen System	22.40	252.82	156.03
Air Conditioning System	853.20	338.84	130.01
Surface Finish	100.00	591.52	140.20
Cockpit Insulation	14.31	187.48	132.00
Drag Chute	90.99	786.18	143.17
Low Pressure Pneumatics	1,131.18	414.71	112.90
Intake Deicing Boots	88.00	195.82	118.00
Canopy Actuation	65.86	222.01	154.36
Cabin Consoles	23.62	180.23	125.05
Hydraulics Utilities System	654.93	503.19	117.65
Sequencing of U/C Doors	66.89	345.66	116.36
Instrument Pack Structure	686.80	385.81	94.68
Pack Instrumentation	2,000.00	394.00	95.00
Flight Test Installation	886.78	486.12	118.21
MH64 Damping System	184.72	464.22	135.05
Radio & Radar Fixed	853.64	216.95	115.30
Radio & Radar Removable	2,052.10	206.42	107.84
Missile Seeker	167.00	519.29	50.64

S E C R E T

Aircraft: Arrow 1
A/C 25204 & 25205
Date: 1 July, 1958

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Description	Weight lb	H. Arm ins	V. Arm ins	% M.A.C.
Trapped Fuel	372.00	560.00	136.00	
U/C Up		541.63	126.59	
Aircraft Basic Weight	48,153.46			
U/C Down		543.73	123.11	
Useful Load (Less Fuel)	1,127.62	378.06	128.44	
Crew	390.00	194.00	136.50	
Engine Fire Extinguisher Fluid	25.00	730.00	129.00	
Residual Fuel	285.00	557.84	136.07	
Oxygen Charge	13.39	259.69	159.91	
Water for Air Conditioning	280.00	315.00	114.00	
Oil	134.23	608.92	115.68	
U/C Up		537.89	126.63	28.14
Operational Wt. Empty	49,281.08			
U/C Down		539.95	123.23	28.72
Max. Internal Fuel (2452 gals at 7.8 lb/gal)	19,123.00	540.80	114.09	
*				
U/C Up		538.70	131.51	28.37
Gross Weight (Max. Int. Fuel)	68,404.08			
U/C Down		540.18	129.06	28.78

N.B.

- 1) Aircraft Datum - 120 ins above an arbitrarily chosen ground line
- 2) * The trapped and residual fuel within the aircraft were determined experimentally be actual weighings in the dry and drained conditions etc. for A/C 25201. The figures obtained were considerably in excess of those originally calculated.

Experimentally determined figure = 657 lb
Calculated figure = 218 lb

Increase in trapped + residual fuel = +439 lb

Now actual weighings of A/C 25201 in a fully fuelled condition have indicated that it would not be desirable to alter the total estimated fuel within the Aircraft at this time. Hence since the unusable fuel has been increased by 439 lb., the usable fuel has been decreased by a similar amount.

It is hoped that in the near future an experimental determination of the volume of fuel contained in individual tanks will be possible, since currently only calculated figures are available.

S E C R E T

Aircraft: Arrow 1
 A/C 25204 & 25205
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Appendix I

Introduction:-

This appendix is to cover the condition of A/C 25204 and 25205 prior to the installation of full Astra I.

All weight changes will be quoted relative to the completed aircraft as defined in the main text of this report.

Changes applicable to early stages of A/C 25204 & 25205 Weight lb

1. Structure

Fin Structure for 1 R tracker - not installed initially	- 10.75
Radome - longer radome fitted as A/C 25201, full electrical properties unnecessary	+ 21.42
<u>Total Structural Increase</u>	<u>+ 10.67</u>

2. Landing Gear

No weight change

3. Power Plant

No weight change

4. Flying Controls

No weight change

5. Equipment Group

Interim Radio & Radar - this will be installed initially until Astra I units become available	+ 648.68
Radio & Radar Remov - Full Astra I units will not be installed	-2052.10
Radio & Radar Fixed - the wiring and racks etc for complete Astra I will not be installed	- 853.64
Missile Seeker - this will not be installed	- 167.00
Probe - Mk. 2 probe replaced by Mk 1, since Mk 1 radome is fitted	- 0.25
MH 64 Damping - delete cable allowance now in Interim Radio & Radar weight	- 85.64
Instrumentation in Pack - full instrumentation will not be available initially, but it is assumed that the pack will be ballasted to simulate the completed condition, the weight of the pack - with water for Air Conditioning will be maintained by ballast	+ 140.00

<u>Total Equipment Decrease</u>	<u>-2369.95</u>
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S E C R E T

Aircraft: Arrow 1
A/C 25204 & 25205
Date: 1 July, 1958

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Wt. & C.G. Summary
A/C Prior to Astra I Inst.

Description	Weight lb	H. Arm ins	V. Arm ins
Structure	18,797.41	563.71	137.41
Wings	10,008.91	643.08	142.24
Fin & Rudder	1,034.63	754.84	209.36
Fuselage Fwd Sta 255 ins	2,646.15	182.87	128.13
Sta 255 - 485 ins	1,684.85	379.34	130.45
Sta 485 - 591.65 ins	1,018.71	533.73	104.38
Sta 591.65 - 742.5 ins	1,437.47	660.98	107.30
Sta 742.5 ins aft	912.38	807.53	128.96
"Marry-Up"	54.31	462.81	104.25
Landing Gear - Retracted	2,662.42	488.76	135.00
Main Landing Gear	2,018.57	538.99	141.00
Main Gear Doors & Fairings	282.34	537.60	138.37
Nose Landing Gear	333.81	170.81	99.70
Nose Gear Door & Fairing	27.70	162.60	88.70
Power Plant & Services	13,770.66	652.46	120.35
Engines & Accessories J75P5	11,913.81	665.32	119.78
Gear Box & Drives on Fuselage	276.70	603.71	103.24
Gear Box & Starter on Engine	286.80	589.18	105.54
Engine Controls	33.35	375.79	118.49
Engine Nose Bullets	75.61	562.69	115.11
Fire Extinguishing System	65.53	700.45	134.21
Engine Mountings	206.21	635.04	127.71
Fuel System	912.65	537.27	135.48
Flying Controls Group	2,153.25	624.75	134.90
Mechanical Flying Controls	953.45	675.98	147.72
Hydraulic Flying Controls	1,199.80	584.03	124.71
Equipment Fixed and Removable	8,038.44	394.67	113.06
Instruments	46.07	163.69	138.70
Probe	15.00	-38.14	108.00
Cockpit Pressure Sealing	5.00	186.00	130.00
Ejector Seats	342.94	204.50	134.11
Oxygen System	22.40	252.82	156.03
Air Conditioning System	853.20	338.84	130.01
Surface Finish	100.00	591.52	140.20
Cockpit Insulation	14.31	187.48	132.00
Drag Chute	90.99	786.18	143.17
Low Pressure Pneumatics	56.71	421.32	127.66
Electrical System	1,131.18	414.71	112.90
Intake Deicing Boots	88.00	195.82	118.00
Canopy Actuation	65.86	222.01	154.36
Cabin Consoles	23.62	180.23	125.05
Hydraulics Utilities System	654.93	503.19	117.65
Sequencing of U/C Doors	66.89	345.66	116.36
Instrument Pack Structure	686.80	385.81	94.68
Pack Instrumentation (Probably ballasted)	2,140.00	391.50	95.00
Flight Test Installations	886.78	468.12	118.21
MH64 Damping System	99.08	450.83	140.34
Interim Radio & Radar	648.68	342.30	124.04

S E C R E T

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A/C 25204 & 25205
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Description	Weight lb	H. Arm ins	V. Arm ins	% M.A.C.
Trapped Fuel	372.00	560.00	136.00	
U/C Up		559.21	127.74	
Aircraft Basic Weight	45,794.18			
U/C Down		561.42	124.09	
Useful Load	987.62	380.34	133.04	
Crew	390.00	194.00	136.50	
Engine Fire Extinguisher Fluid	25.00	730.00	129.00	
Residual Fuel	285.00	557.84	136.07	
Oxygen Charge	13.39	259.69	159.91	
Water for Air Conditioning	140.00	268.00	132.00	
Oil	134.23	608.92	115.68	
Ballast	1,057.00	100.29	113.65	
U/C Up		545.38	127.53	30.21
Operational Weight Empty	47,838.80			
U/C Down		547.50	124.03	30.80
Max. Internal Fuel (2432 gals at 7.8 lb/gal) *	19,123.00	540.80	144.09	
U/C Up		544.07	132.26	29.85
Gross Weight (Max Int Fuel)	66,961.80			
U/C Down		545.58	129.76	30.27

N.B.

- 1) Aircraft datum - 120 ins above an arbitrarily chosen ground line
- 2) * See note on Sheet 2-3
- 3) The above figures are for the aircraft in the BALLASTED condition such that the aft C.G. on the horizontal C.G. Envelope, using fuel proportioners does not exceed 31% M.A.C. i.e. 1057 lb distributed on the Shear Panel and the slide rail mounting brackets between Sta 67.5 and 96.25 ins.

These figures are theoretical. Currently provision is only made for approx. 900 lb of ballast at these locations, however, further details and calculations on A/C 25204 and 25205 may reveal that 900 lb is adequate, since this summary is of a preliminary nature only.

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DATE: JUL 1st 1958

SHEET: 4-1

BY: Kathleen Lyffue

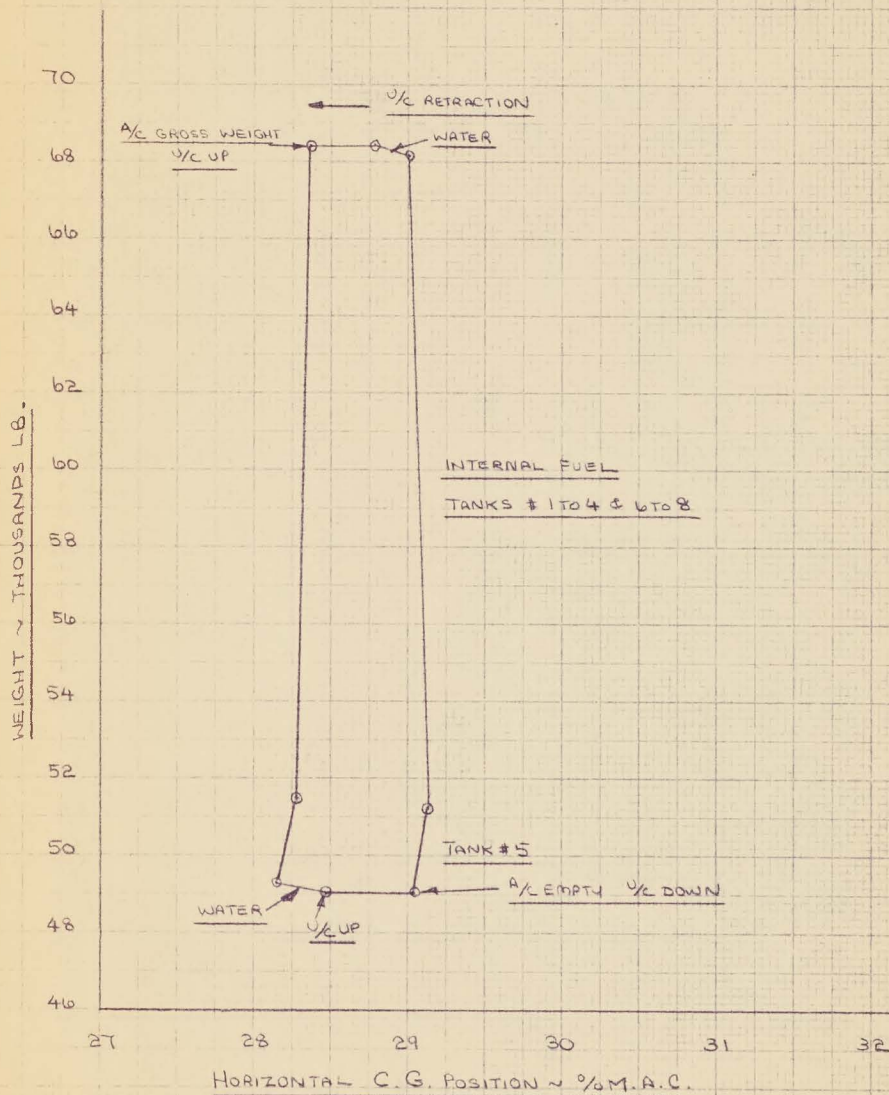
HORIZONTAL C.G. ENVELOPE

ARROW I ~ 1/2 25204 & 25205

NORMAL FLIGHT CONDITIONS

FUEL PROPORTIONERS USED

A/C WITH FULL ASTRA I TRIAL INSTALLATIONS



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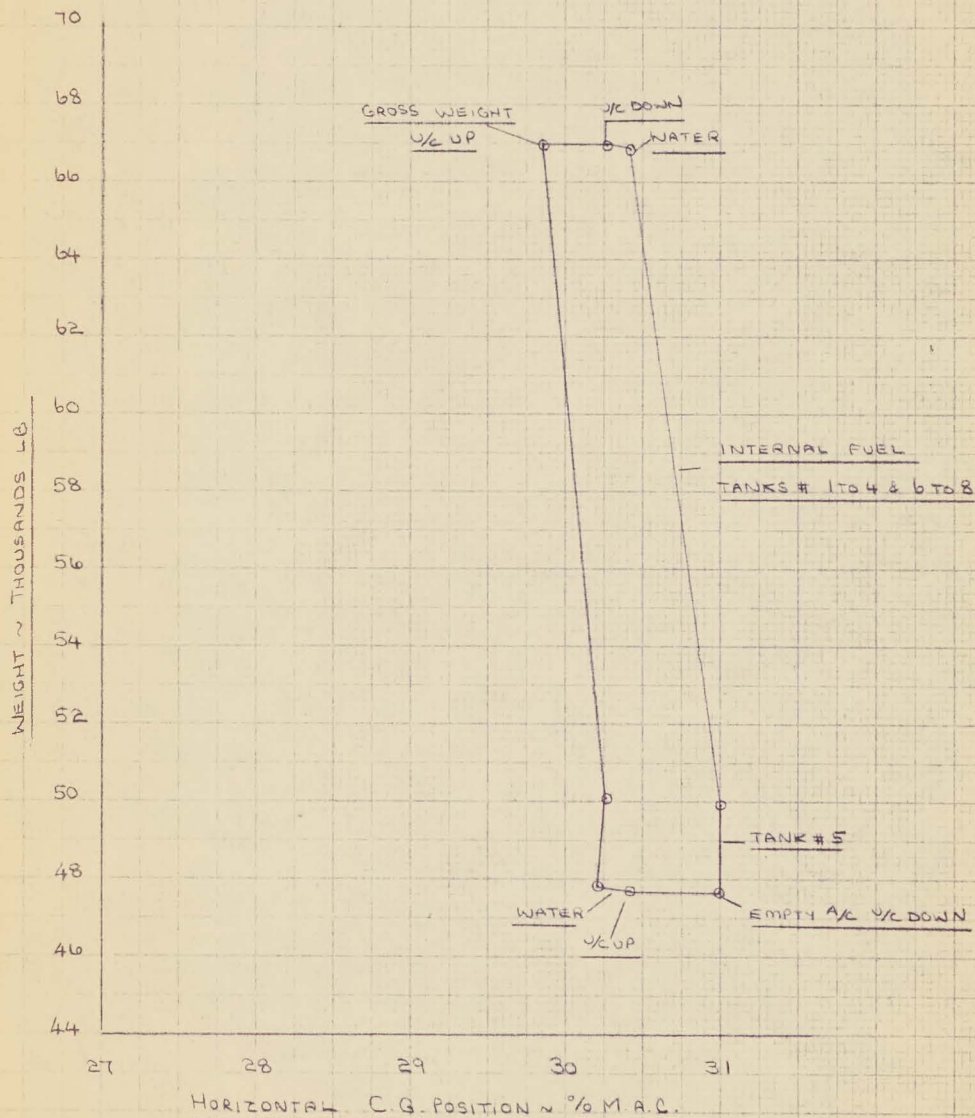
SHEET: 4-2

BY: Kathleen Lyffine

HORIZONTAL C.G. ENVELOPE
ARROW I ~ 1/2 25204 & 25205
NORMAL FLIGHT CONDITIONS
FUEL PROPORTIONERS USED

1/2 PRIOR TO INSTALLATION OF ASTRA I

12. EARLY FLIGHTS WITH BALLAST IN RADAR NOSE



WEIGHT AND C. OF G BY FUNCTIONAL GROUP COMPONENT

PROJECT_____

[illegible]

WEIGHT AND C. OF G BY

FUNCTIONAL GROUP COMPONENT

REPORT NO.

SHEET

[illegible]

WEIGHT AND C. OF G BY FUNCTIONAL GROUP COMPONENT

PROJECT_____

DESCRIPTION		REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM
FIN AND RUDDER GROUP		2000000			
100	FIN	2010000083		851707495	
	BUZZ DAMP STRUC PROV FIN	2010000183		1858030	
12	FIN TO WING MARRY UP	20100002		48306853	
	FIN POD FOR I R TRACKER	2010000383		10757600	
				91260	
93	RUDDER	2020000084		132788132	
				13278	

WEIGHT AND C. OF G BY FUNCTIONAL GROUP COMPONENT

REPORT NO. _____

SHEET _____

[illegible]

WEIGHT AND C. OF G BY FUNCTIONAL GROUP COMPONENT

REPORT NO. _____

SHEET _____

	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM	V. ARM	H. MOMENT	V. MOMENT
	301005652		6160	17636	11561	1086378	712158
717 3	301005958		5577	1367	11524	397514	64189
CK	301006154		5007	41403	14202	2073048	711094
ECTOR	301006254		1981	33428	16400	662209	324884
V ARC	301006352		2115	25699	15352	543534	324695
URE	301006454		2119	29285	10309	620549	218448
	301006559		8457	77280	9910	6535570	838089
	301006659		10403	77168	13059	8027787	1358528
R F	301006759		5143	77149	13796	3967773	709528
R R F	301006859		2616	78134	15379	2043985	402315
	301006959		9001	77929	13652	7014389	1228817
ED R	301007059		2799	77170	12570	2159988	351834
	301007159		4398	483168	12877	36580613	5663820
M R F	301007259		8835	83155	13729	7346744	1212957
E B	301007358		9196	6400	10284	610216	94510
D B	301007556		2435	2514	13145	127609	31942
D B	301007656		7640	54472	9006	4161661	688058
	301007756		5348	55246	8800	2954556	470624
	3010078		8552	25500	12000	218025	102600
F F	3010079		1092	22000	12000	240240	131040
	3010080		5204	8500	9800	252200	50960
	3010081		2521	58475	9150	1474155	230672
50	3010082		4437	74250	11500	328928	50945
F F	301008652		1021	19050	12150	194501	124052
			644272			307506494	77323048
	302000072		11790	50884	9049	5999224	1066877
	3020001		4064	8794	9374	198104	38058
			12196			6197328	1104935
	3030000						
	303010055		772482	1079	11868	16283106	9167793
			77248			16283106	9167793
COPIES	3040000						
	304010053		24208	17686	15915	4281427	3852703
			24208			4281427	3852703
	304020053		15321	23277	16223	3566269	2485526
			15321			3566269	2485526

AVRO AIRCRAFT LTD.
MALTON, ONT.

**WEIGHT AND C. OF G BY FUNCTIONAL GROUP
COMPONENT**

PROJECT _____

DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. AF
ENGINE GROUP	5000000			
ENGINE J 75	5010000		1187578665	
			1187578	
J 75 ENGINE SERV ACCESS	5010100		3803629	
			3803	
ACC GEAR BOXES ON FUS D B	502000156		4445578	
ACC GEAR BOXES ON FUS E B	502000258		23225608	
			27670	
ENGINE CONTROLS	5030000			
35 ENGINE CONTROLS F F	503000152		1558166	
35 ENGINE CONTROLS G F	503000254		117268	
35 ENGINE CONTROLS E R	503000458		946637	
35 ENGINE CONTROLS I W	503000562		689497	
35 ENGINE CONTROLS ENG	5030006		2564	
			3335	
B3 GEARBOX AND STARTER ON EN	5040000		28680589	
			28680	
91 ENGINE ANTI ICING	5050000		7561562	
			7561	
FIRE EXT SYSTEM	5060000			
FIRE EXTING SYSTEM D B	506000256		146553	
FIRE EXTING SYSTEM E B	506000358		6407703	
			6553	
ENGINE MTGS AND BRACKETS	5070000			
64 ENG MOUNTING AND BRKTS	5070001		14653625	
ENGINE MTGS ACCESSORIES	5070002		5202662	
ENGINE MTGS ACCESSORIES C	5070003		766642	
			20621	

WEIGHT AND C. OF G BY FUNCTIONAL GROUP COMPONENT

REPORT NO. _____

SHEET _____

	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM	V. ARM	H. MOMENT	V. MOMENT
	5000000						
	5010000		1187578	66543	11983	790250029	142307472
			1187578			790250029	142307472
ESS	5010100		3803	62941	10354	2393646	393763
			3803			2393646	393763
S D B	5020001	56	4445	57866	9765	2572144	434054
S E B	5020002	58	23225	60850	10431	14132413	2422600
			27670			16704557	2856654
	5030000						
	5030001	52	1558	16668	12431	259687	193675
	5030002	54	1172	6800	11800	31356	13806
	5030004	58	9466	3787	10081	603425	95366
	5030005	62	6894	9745	13137	342743	90514
	5030006		2564	137	10000	16034	2500
			3335			1253245	395861
ON EN	5040000		28680	58918	10554	16897682	3026887
			28680			16897682	3026887
	5050000		7561	56269	11511	4254499	870347
			7561			4254499	870347
B	5060000						
B	5060002	56	1465	5318	13749	80764	20074
	5060003	58	6407	70381	13414	4509311	859435
			6553			4590075	879509
KETS	5070000						
TS	5070001		14653	62504	12935	9158711	1895366
IES	5070002		5202	66213	12248	3444400	637141
IES C	5070003		7666	4236	13192	492048	101051
			20621			13095159	2633558

WEIGHT AND C. OF G BY FUNCTIONAL GROUP COMPONENT

PROJECT _____

DESCRIPTION		REFERENCE NO.	COMP. NO.	WEIGHT	H. AREA
FLYING CONTROLS GROUP		6000000			
MECHANICAL CONTROLS		6010000			
59	MECHANICAL CONTROLS F F	6010001	52	10992	1620
	MECHANICAL CONTROLS C F	6010002	54	1213	4000
70	MECHANICAL CONTROLS FIN	6010005	83	12528	787
74	MECHANICAL CONTROLS I W	6010006	62	39689	718
85	MECHANICAL CONTROLS O W	6010007	64	30260	770
	MECHANICAL CONTROLS C A	6010008		663	709
				95345	
FLYING CONTROLS HYDRAULIC		6020000			
	FLYING CONT HYDRAULICS D	6020001	56	3618	563
	FLYING CONT HYDRAULICS E	6020002	58	45384	651
	FLYING CONT HYDRAULICS R	6020003	59	48	758
77	FLYING CONT HYDRAULICS I	6020004	62	27475	703
66	FLYING CONT HYDRAULICS O	6020005	64	13086	740
63	FLYING CONT HYDRAULICS FI	6020006	83	5564	760
	FLYING CONT HYDRAULICS R	6020008	51	3500	1130
	FLYING CONT HYDRAULICS F	6020009	52	18423	203
	FLYING CONT HYDRAULICS C	6020010	54	2882	356
				119980	

WEIGHT AND C. OF G BY FUNCTIONAL GROUP COMPONENT

REPORT NO. _____

SHEET _____

	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM	V. ARM	H. MOMENT	V. MOMENT
P	60000000						
	60100000						
F F	6010000152		10992	16269	11434	1788288	1256825
C F	6010000254		12134	0097	11790	486377	143013
FIN	6010000583		12528	78782	22159	9869809	2776080
I W	6010000662		39689	71859	14385	28520119	5709263
O W	6010000764		30260	77061	13563	23318659	4104164
C A	60100008		6637	0984	14338	470624	95061
			95345			64453876	14084406
AULIC	60200000						
CS D	6020000156		3618	56342	10468	2038454	378732
CS E	6020000258		45384	65157	11020	29570853	5001317
CS R	6020000359		4875	875	10824	36420	5196
CS I	6020000462		27475	70357	14721	19330586	4044595
CS O	6020000564		13086	74031	13587	9687697	1777995
CS FI	6020000683		5564	76036	20808	4230643	1157757
CS R	6020000851		3500	11309	10513	395815	367955
CS F	6020000952		18423	20376	10200	3753870	1879146
CS C	6020001054		2882	35670	11132	1028009	320824
			119980			70072347	14933517

AVRO AIRCRAFT LTD.
MALTON, ONT.

WEIGHT AND C. OF G BY FUNCTIONAL COMPONENT

PROJECT _____

DESCRIPTION		REFERENCE NO.	COMP. NO.	WEIGHT	H. A.
FIXED EQUIPMENT GROUP		7000000			
INSTRUMENTS		7010000			
INSTRUMENTS F F		7010001	52	4407	161
NAVIG TABLE AND STOWAGE		7010004	52	200	220
				4607	
COCKPIT PRESSURE SEALING		7020000	52	500	186
				500	
OXYGEN SYSTEM		7030000			
58	OXYGEN SYSTEM	7030001	52	2240	252
				2240	
AIR CONDITIONING SYSTEM		7040000			
AIR CONDITIONING F F		7040001	52	4558	182
AIR CONDITIONING C F		7040002	54	4759	294
AIR CONDITIONING D B		7040003	56	2159	516
AIR CONDITIONING C A		7040005		2806	394
AIR CONDITIONING ENG		7040006		2855	640
AIR CONDITIONING I W		7040007	62	805	15
				85320	
HYDRAULICS MAIN SYSTEM		7050000			
32	UTILITY HYDRAULICS F F	7050001	52	8981	1200
29	UTILITY HYDRAULICS C F	7050002	54	4578	440
20	UTILITY HYDRAULICS D B	7050003	56	2733	556
74	UTILITY HYDRAULICS E B	7050004	58	7892	605
24	UTILITY HYDRAULICS I W	7050005	62	1351	155
32	UTILITY HYDR NOSE U C	7050006	91	213	188
24	UTILITY HYDR MAIN U C	7050007	92	2980	541
NUC AND MUC DOOR SEQ MECH		7050010		6689	345
				72182	
CABIN INSULATION		7070000	52	1431	187
				1431	
BRAKE PARACHUTE		7080000			
BRAKE PARACHUTE F F		7080001	52	462	168

WEIGHT AND C. OF G BY FUNCTIONAL GROUP COMPONENT

REPORT NO. _____

SHEET _____

	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM	V. ARM	H. MOMENT	V. MOMENT
UP	7000000						
	7010000						
	70100001	52	4407	16112	13909	710056	612970
WAGE	70100004	52	200	22000	13000	44000	26000
			4607			754056	638970
ALING	7020000	52	500	18600	13000	93000	65000
			500			93000	65000
	7030000						
	70300001	52	2240	25282	15603	566317	349507
			2240			566317	349507
STEM	7040000						
	70400001	52	4558	18260	10634	832291	484698
	70400002	54	47599	29442	13499	14014098	6425389
	70400003	56	2159	51690	12474	1115987	269314
	70400005		28069	39471	13687	11079115	3841804
	70400006		2855	64017	13900	1827685	396845
	70400007	62	8051	1500	15950	41200	12760
			85320			28910376	11430810
EM	7050000						
F	70500001	52	8981	12007	110926	1802577	981264
F	70500002	54	4578	44016	10399	2015052	476066
B	70500003	56	27338	55692	11077	15225079	3028230
B	70500004	58	7892	60587	10861	4781526	857150
W	70500005	62	13511	55304	14234	7472123	1923156
C	70500006	91	213	18863	9318	40178	19847
C	70500007	92	2980	54325	14100	1618885	420180
MECH	7050010		6689	34566	11636	2312120	778332
			72182			35267540	8484225
	7070000	52	1431	18748	13200	268284	188892
			1431			268284	188892
	7080000						
	70800001	52	462	16895	12875	78055	59483

WEIGHT AND C. OF G BY FUNCTIONAL GROUP COMPONENT

[illegible]

WEIGHT AND C. OF G BY FUNCTIONAL GROUP COMPONENT

REPORT NO. _____

SHEET _____

	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM	V. ARM	H. MOMENT	V. MOMENT
ED C F	714000354		14155	27602	9900	3907063	1401345
ED D B	714000456		1381	51886	13472	716546	186048
ED F IN	714000583		3200	76180	24600	2437760	787200
ED C A	7140006		19540	22161	12000	4330259	2344800
ED I W	714000762		2228	54570	16000	1215820	356480
			85364			18520203	9840909
	716000052		6586	22201	15436	1462158	1016615
			6586			1462158	1016615
	717000052		2362	18023	12505	425703	295368
			2362			425703	295368
	719000152		363	18744	12200	68041	44286
Y	719000253		642	20218	15900	12940	10176
	719000354		1400	37197	12455	520758	174370
ES	719000455		408	22798	12020	93016	49042
	719000556		377	53828	11200	202932	42224
	719000658		443	66701	11200	295485	49616
	719000759		648	80362	13175	520746	85374
	719000862		315	160144	14400	1895137	453744
	719000964		106	770650	13590	753836	145005
EDGE	719001065		319	63948	13526	203994	43148
RON	719001174		353	79190	13556	279541	47853
ATOR	719001282		566	75523	14260	427460	80712
	719001383		639	74663	20837	477097	133148
ER	719001484		202	81279	21431	164184	43291
			10000			5915167	1401989
ATIONS	7200000		88678	46812	11821	41511945	10482626
			88678			41511945	10482626

WEIGHT AND C. OF G BY FUNCTIONAL GROUP COMPONENT

REPORT NO. _____

SHEET _____

	REFERENCE NO.				COMP. NO.	WEIGHT	H. ARM	V. ARM	H. MOMENT	V. MOMENT
GROUP	8	0	0	0	0					
	8	0	1	0	1	52	34294	20450	13411	7013123
							34294			7013123
	8	0	2	0	0	0				
OV R N	8	0	2	0	1	0	1	0	1	51
OV F F	8	0	2	0	1	0	2	5	2	52
OV C F	8	0	2	0	1	0	3	5	4	54
OV D B	8	0	2	0	1	0	4	5	6	56
OV F I N	8	0	2	0	1	0	5	8	3	58
OV C A	8	0	2	0	1	0	6			
OV F B	8	0	2	0	1	0	7	5	8	58
OV I W	8	0	2	0	1	0	8	6	2	62
						205210			42359453	21564459
	8	0	3	0	0	0				
	8	0	3	0	1	0	1	5	2	52
	8	0	3	0	1	0	2	5	4	54
	8	0	3	0	1	0	3	5	8	58
	8	0	3	0	1	0	4	6	2	62
	8	0	3	0	1	0	5	6	4	64
	8	0	3	0	1	0	6	5	1	65
	8	0	3	0	1	0	7			
						18472			8575120	2494634
	8	0	5	0	8	0	0	9	4	
						68680	38581	9468	26497431	6502622
						68680			26497431	6502622
	8	0	5	0	9	0	0	9	4	
						200000	39400	9500	78800000	19000000
						200000			78800000	19000000
INST	8	0	6	0	0	0				
						16700	51929	5064	8672143	845688
						16700			8672143	845688

WEIGHT AND C. OF G BY FUNCTIONAL GROUP COMPONENT

PROJECT _____

DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. AR
OPERATIONAL LOAD	9000000			
CREW MEMBERS	9010000	52	39000	194
			39000	
ENGINE OIL	9020000			
ENGINE OIL USABLE	9020001		8816	612
ENGINE OIL TRAPPED ENG	9020002		1773	626
ENGINE OIL TRAPPED D B	9020003	56	1925	580
ENGINE OIL TRAPPED E B	9020004	58	909	599
			13423	
OXYGEN CHARGE	9040000			
OXYGEN CHARGE F F	9040001	52	722	04
OXYGEN CHARGE C F	9040002	54	1267	262
			1339	
100 ENGINE FIRE EXT FLUID	9060000		2500	730
			2500	
100 RESIDUAL FUEL	9070000		28500	557
			28500	
100 TRAPPED FUEL	9080000		37200	560
			37200	
WATER FOR AIRCONDITIONING	9100000			
WATER FOR AIRCOND C F	9100001	54	12500	268
WATER FOR AIRCOND APF	9100002	94	12500	362
UNUSABLE WATER AIRCOND C	9100003	54	1500	268
UNUSABLE WATER AIRCOND AP	9100004	94	1500	362
			28000	

