QC
Avro
CF105
R-7-0400-63
Iss-1

Arrow 1
A/C 25204 & 25205

Report: 7-0400-63
Issue : 1

WEIGHT & C.G. SUMMARY

SECRET

1 June/58

SECRET

AVRO AIRCRAFT LIMITED
INTER-DEPARTMENTAL MEMORANDUM

Ref: 9616/11/J
Date: 1 June, 1958
To: See Distribution
From: E.F. Burnett - Weight Supervisor
Subject: ARROW 1 A/Cs 25204 and 25205 WEIGHT & C.G. SUMMARY REPORT 7-0400-63 Issue 1

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

This is the first issue of this report on Weight & Balance for A/C 25204 and 25205 specificly.

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.

This report will be issued monthly until the actual weight of the aircraft has been obtained.

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S E C R E T

Aircraft: ARROW 1
A/C 25204 & 25205
Date: 1 June, 1958

Report: 7-0400-63
Issue : 1

I N D E X

Sheet	Content
1-1 to 1-6	Introductary notes and explanations of Weight changes.
2-1 to 2-2	Weight & 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.

Aircraft: ARROW 1
A/C 25204 & 25205
Date: 1 June, 1958

Report: 7-0400-63
Issue : 1
Sheet : 1-1

INTRODUCTION & WEIGHT CHANGES

The following is a weight and C.G. summary for the fourth and fifth Arrow I Aircraft, Nos. 25204 & 25205, with J75 P5 Engines, based on the latest information available. All weight and C.G. changes are quoted relative to 7-0400-64 Issue 2 of June 1st, 1958, which is the current similar statement issued for A/C 25202 and 25203.

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 seperately as an item of Operational Load.

A resonably 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 & 538.7 ins, from the dive brake jack beams. Information is still awaited from Canadair regarding the weight & C.G. of this unit; until this is forthcoming an allowance of 120 lb is made for the seeker and its installation.

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 ammendments:

Aircraft: ARROW 1
A/C 25204 & 25205
Date: 1 June, 1958

Report: 7-0400-63
Issue : 1
Sheet : 1-2

GENERAL:-

e) Cont'd)

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.

N.B. When Astra I is first installed in the I.R. Tracker System and ARD 501 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 72 lb 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) Several weighings of A/C 25201 have been made and the results obtained show good agreement with the estimated weights for that Aircraft. However, at no time has it yet been possible to obtain a dry or a drained weight of the complete aircraft.

A considerable number of parts and components have been weighed. Structural weights have checked within 0.5% of estimated weights. Equipment (most units covered by Avro Specifications have now been weighed) has shown a consistant increase averaging about 11% over manufacturer's quotations or initial specification weights (excluding Engines & Gear Boxes). Preceeding 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.

A summary of actual weights obtained so far, is as follows:-

Structure	70.04	%
Landing Gear	98.99	%
Power Plant	5.06	%
Flying Controls	50.19	%
Equipment	22.62	%

i.e. % of the Basic Weight of A/C Nos. 25204 and 25205.

Aircraft: ARROW 1
A/Cs 25204 & 25205
Date: 1 June, 1958

Report: 7-0400-63
Issue : 1
Sheet : 1-3

GENERAL:-

j) No further work is being proceeded with on 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 trail 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.

1. STRUCTURE	WEIGHT lb
a) Wings	
I/W skins - alterations to some bracketry.	+ 1.15
Weight Increase Wings	+ 1.15
b) Fin & Rudder	
I.R. Tracker Seeker Mtg. - addition of pod to Fin leading edge to mount 1 R seeker head	+ 10.75
Fin & Rudder Increase	+ 10.75
c) Fuselage Fwd Sta 255 ins	
Radome - shorter radome as for Mk. 2 with full electrical properties (for early flights the radome as on A/C 25201 will be fitted see Appendix I)	- 21.42
Radar Nose Structure - Mk 2 design replaces Mk 1 fwd Sta 120 ins	- 29.13
Bulkhead Sta 120 ins - misc changes, bracketry etc	+ 0.20
Bulkhead Sta 255 ins - misc bracketry changes etc	+ 0.75
Fwd Fuselage Decrease	- 49.60
d) Centre Fuselage Sta 255 - 458 ins	
Radar Access Door Lower - redesigned for 4th and 5th A/C	+ 3.19
Equipment Bay Structure - modification to Air Conditioning and addition of Air data computor mounting	+ 3.39

Aircraft: ARROW 1,
A/C 25204 & 25205
Date: 1 June, 1958

Report: 7-0400-63
Issue : 1
Sheet : 1-4

1. STRUCTURE Cond'd — WEIGHT lb

d) Centre Fuselage Sta 255 - 425 ins (Cond'd)

Electronic Bay Structure - addition of mounting structure to accomodate Astra I units + 8.00

Centre Fuselage Increase + 14.58

e) Duct Bay Sta 485 - 591.65 ins

Longitudinal Beams - addition of seeker mounting brackets to I/B Dive Brake Jack Beams + 8.08

Duct Bay Increase + 8.08

f) Engine Bay Sta 591.65 - 742.5 ins

No weight change.

g) Rear Fuselage Sta 742.5 ins

No weight change, since the 2nd & 3rd Aircraft, to which the 4th and 5th A/C are being compared, already have the Mk 1A Tailcones and Stinger fitted.

h) Fuselage Joints

No weight change

TOTAL STRUCTURAL DECREASE - 15.04

2. LANDING GEAR

Nose U/C Door and Fairing - partial redesign of door and fairing + 1.03

TOTAL LANDING GEAR INCREASE + 1.03

3. POWER PLANT & SERVICES

No weight change

4. FLYING CONTROLS GROUP — WEIGHT lb

F/C Hydraulics Fuselage	- The system has been extensively revised in design to include the hydraulic requirements for the Astra I system (Antenna drive etc).	+ 146.69
	TOTAL FLYING CONTROLS INCREASE	+ 146.69

5. EQUIPMENT GROUP

Air Conditioning	- general alterations to ducting and some valves, an additional water boiler turbines etc. have been added in the instrument pack, to cater to the cooling requirements etc. of Astra I (see also Inst. Pack below)	+ 17.49
Cabin Consoles	- added structure for mounting of signal data convertor etc	+ 6.17
L.P. Pneumatics	- design changes, added air line for waveguide pressurisation and line to pressurise oil resevoir in Air Conditioning bay etc.	+ 2.06
Missile Seeker & Installation	- to be suspended beneath the A/C between Stas. 485 & 538.7 ins - allowance only - weight data awaited from Canadair	+ 120.00
Flight Test Instrumentation	- this has been re-valuated for these A/C, less items are monitored	- 569.95
Instrumentation in Pack	- this contains mainly R.C.A. equipment with some Flight Test units and additional Air Conditioning units. Exact details are somewhat vague (see also General note (b)) but 2,000 lb appears to be an adequate allowance. (Water for Air conditioning see Op. Load)	-1048.00
Interim Radio & Radar	- This has been deleted and replaced by a full Astra I system (see below)	- 648.68
Radio and Radar Removable	- Full Astra I System installed, however, plus J4 Compass System The missile auxiliaries are not installed except for 1 each range slaving unit, angle slaving unit & optical mode unit in the Instrument Pack for the missile seeker	+2135.30

Aircraft: ARROW 1
A/C 25204 & 25205
Date: 1 June, 1958

Report: 7-0400-63
Issue : 1
Sheet : 1-6

EQUIPMENT GROUP (Cont'd)	WEIGHT lb
Radio & Radar Fixed - this will be assumed to be similar to that in Mk. 2 production Aircraft, until such time as a detailed est. of A/C 25204 & 25205 installations can be made	+ 841.53
Electrics F.F. - allowance made to cover changes to panels E1 and E3	+ 5.00
Probe - Mk 2 probe fitted associated with Mk. 2 radome	+ 0.25
MH 64 Damping System - cables for this system were incl in Interim R.&R for A/Cs 25201-3 Since Interim R&R is deleted - an allowance must be made based on A/C 25201-3 for cable assys with the MH 64 units	+ 85.64
TOTAL EQUIPMENT INCREASE	+ 946.81

OPERATIONAL LOAD	
Water for Air conditioning - an additional boiler is installed in the Pack, exactly the same as that in the Air Conditioning Bay. This necessitates 125 lb usable water & 15 lb trapped water being added	+ 140.00
TOTAL OPERATIONAL LOAD INCREASE	+ 140.00

SUMMARY *

Weight Change - Basic Weight

Structure	- 15.04
Landing Gear	+ 1.03
Flying Controls	+ 146.69
Equipment	+ 946.81
	+1079.49

Weight Change - Operational Load

+ 140.00

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

7-0400-64-2	7-0400-63-1	
47,591.68	48,811.17	+ 1,219.49

* This summary quotes preliminary figures for the completed 4th and 5th A/C. In the early stages full Astra I will not be fitted etc. see Appendix I.

Aircraft: ARROW 1
A/C 25204 & 25205
Date: 1 June, 1958

Report: 7-0400-63
Issue : 1
Sheet : 2-1

WT. & C.G. SUMMARY A/C WITH COMPLETE
ASTRA I TRIAL INSTALLATION

DESCRIPTION	WEIGHT lb	H. ARM ins	V. ARM ins
STRUCTURE	18,777.67	564.53	137.53
Wings	10,004.16	643.13	142.25
Fin & Rudder	1,045.38	754.89	209.88
Fuselage - Fwd Sta 255 ins	2,620.32	184.14	128.32
Sta 255 - 485 ins	1,684.94	379.33	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	2,153.86	624.52	134.80
Mechanical Flying Controls	952.63	675.92	147.59
Hydraulic Flying Controls	1,201.23	583.76	124.65
EQUIPMENT FIXED & REMOVABLE	10,385.54	348.30	111.49
Instruments	46.07	163.68	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	839.56	339.61	133.87
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
Nose U/C Door Actuation (Wheel extended)	33.59	202.56	97.89
Instrument Pack Structure	686.80	385.81	94.68
Pack Instrumentation	2,000.00	394.00	95.00
Flight Test Installations	886.78	468.12	118.21

Aircraft: ARROW 1
A/C 25204 & 25205
Date: 1 June, 1958

Report: 7-0400-63
Issue : 1
Sheet : 2-2

DESCRIPTION	WEIGHT lb	H. ARM ins	V. ARM ins	% M.A.C.
MH64 Damping System	184.72	464.22	135.05	
Radio & Radar Fixed	841.53	212.59	114.94	
Radio & Radar Removable	2,135.30	212.80	108.97	
Missile Seeker	120.00	519.00	44.50	
U/C Up		541.34	126.65	
Aircraft Basic Weight	47,750.15			
U/C Down		543.46	130.16	
USEFUL LOAD (less Fuel)	1,061.02	365.98	127.54	
Crew	390.00	194.00	136.50	
Engine Fire Extinguisher Fluid	25.00	730.00	129.00	
Residual Fuel	218.40	553.98	134.04	
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		537.53	126.67	28.05
Operational Wt Empty	48,811.17			
U/C Down		539.60	123.24	28.62
Max. Internal Fuel (2508 gals at 7.8 lb/gal)	19,562.00	540.99	144.09	
U/C Up		538.52	131.65	28.32
Gross Weight (Max Int. Fuel)	68,373.17			
U/C Down		540.00	129.29	28.73

N.B. 1) Aircraft Datum = 120 ins above an arbitrarily chosen ground line.

Aircraft: ARROW 1
A/Cs 25204 & 25205
Date: 1 June, 1958

Report: 7-0400-63
Issue : 1
Sheet : 3-1

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 24204 & 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
TOTAL STRUCTURAL INCREASE	+ 10.67
2. LANDING GEAR	
No weight change.	
3. POWER PLANT	
No weight change.	
4. FLYING CONTROLS	
No weight change.	
5. EQUIPMENT	
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	-2135.30
Radio & Radar Fixed - the wiring for complete Astra I trials will not be installed	- 841.53
Missile Seeker - this will not be installed	- 120.00
Probe - Mk. 2 probe replaced by Mk. 1 since Mk. 1 radome is fitted	- 0.25

5. EQUIPMENT (Cont'd)

	WEIGHT lb
MH 64 Damping - delete cable allowance, now in Interim R & R	- 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
TOTAL EQUIPMENT DECREASE	-2394.04

6. OPERATIONAL LOAD

Water for Air Conditioning - since an incomplete pack will probably be fitted initially the Air Conditioning equipment may not be installed. Thus the weight of water in the second boiler will be simulated by ballast (see Equip. Group)	- 140.00
OPERATIONAL LOAD	- 140.00

SUMMARY

Weight Change - Aircraft Basic Weight

Structure	+ 10.67
Equipment	-2394.04
	-2383.37
Ballast	+1057.00

Op. Load - Water - 140.00

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

BALLAST CONDITION

Completed A/C	Early A/C	
48,811.17	47,344.80	- 1,466.37 lb

Aircraft: ARROW 1
A/C 25204 & 25205
Date: 1 June, 1957

Report: 7-0400-63
Issue : 1
Sheet : 3-3

WT. & C.G. SUMMARY
A/C PRIOR TO ASTRA I INST.

DESCRITION	WEIGHT lb	H. ARM ins	V. ARM ins
STRUCTURE	18,788.34	563.80	137.42
Wings	10,004.16	643.13	142.25
Fin & Rudder	1,034.63	754.84	209.36
Fuselage - Fwd Sta 255 ins	2,641.74	182.84	128.15
Sta 255 - 485 ins	1,684.94	379.33	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
Engine & Accessories J74 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	2,153.86	624.52	134.80
Mechanical Flying Controls	952.63	675.92	147.59
Hydraulic Flying Controls	1,201.23	583.76	124.65
EQUIPMENT FIXED & REMOVABLE	7,991.50	394.45	113.34
Instruments	46.07	163.68	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	839.56	339.61	133.87
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
Nose U/C Door Actuation (Wheel extended)	33.59	202.56	97.89
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

Aircraft: ARROW 1
A/C 25204 & 25205
Date: 1 June, 1958

Report: 7-0400-63
Issue : 1
Sheet : 3-4

DESCRITION	WEIGHT lb	H. ARM ins	V. ARM ins	L. ARM
MH64 Damping System	99.08	450.83	140.34	
Interim Radio & Radar	648.68	342.30	124.04	
U/C Up		559.36	127.73	
Aircraft Basic Weight	45,366.78			
U/C Down		561.59	124.04	
USEFUL LOAD (less Fuel)	921.02	366.58	132.34	
Crew	390.00	194.00	136.50	
Engine Fire Extinguisher Fluid	25.00	730.00	129.00	
Residual Fuel	218.40	553.98	134.04	
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		545.36	127.51	30.21
Operational Wt. Empty	47,344.80			
U/C Down		547.50	123.97	30.80
Max. Internal Fuel (2508 gals at 7.8 lb/gal)	19,562.00	540.99	147.09	
U/C Up		544.08	132.36	29.86
Gross Weight (Max. int. Fuel)	66,906.80			
U/C Down		545.60	129.85	30.27

N.B.

1) Aircraft datum = 120 ins above an arbitrarily chosen ground line.

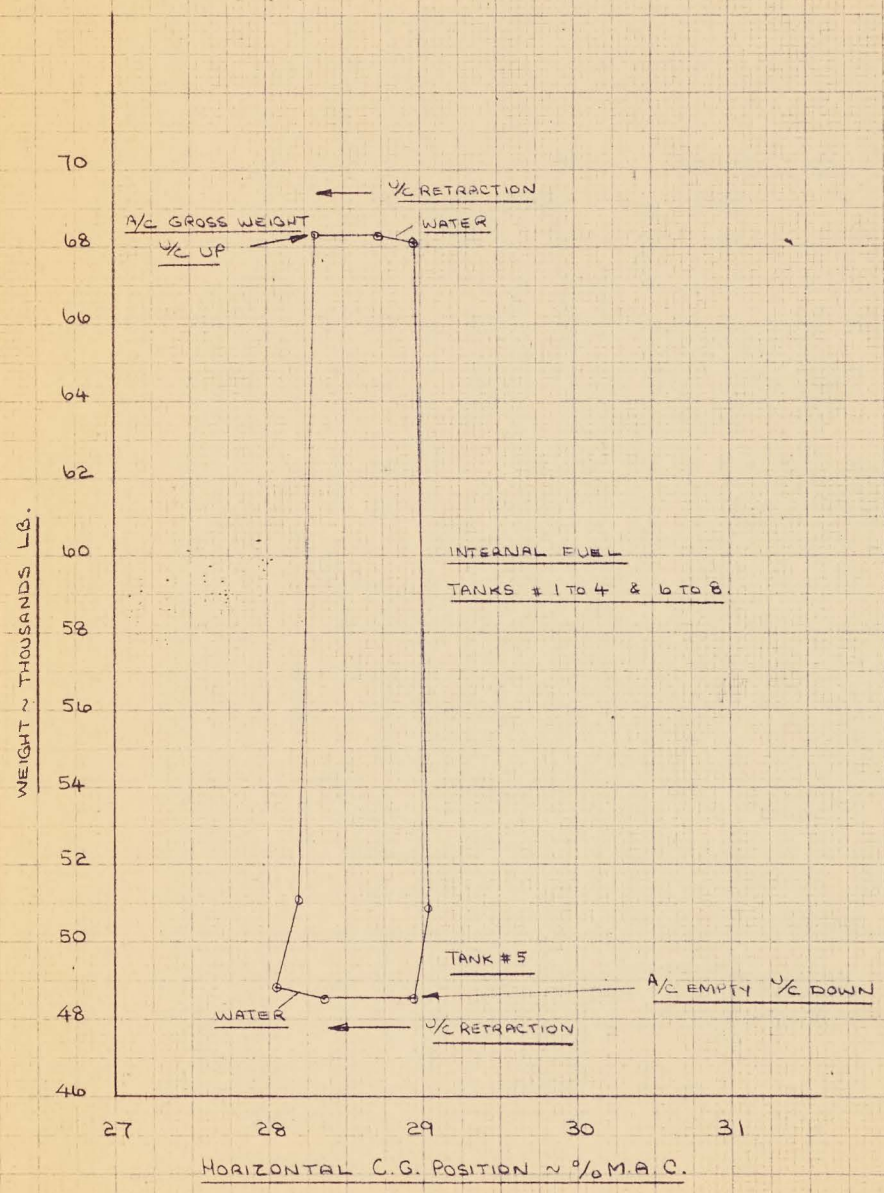
2) The above figures are for the Aircraft in the BALLASTED Condition such that the aft C.G. on the horizontal C.G envelope, using fuel proportioners, does not exceed 31% M.A.C. i.e. 1,057 lb distributed on the Shear Panel and on slide rail mtg. brackets between Sta. 67.5 and 96.25.

These figures are theoretical only. 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.

REPORT NO: T-0400-63 ISSUE 1
DATE: June 1st 1958
SHEET: 4-1
BY: Kathleen Griffin

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

A/C WITH FULL ASTRA I TRIAL INSTALLATIONS

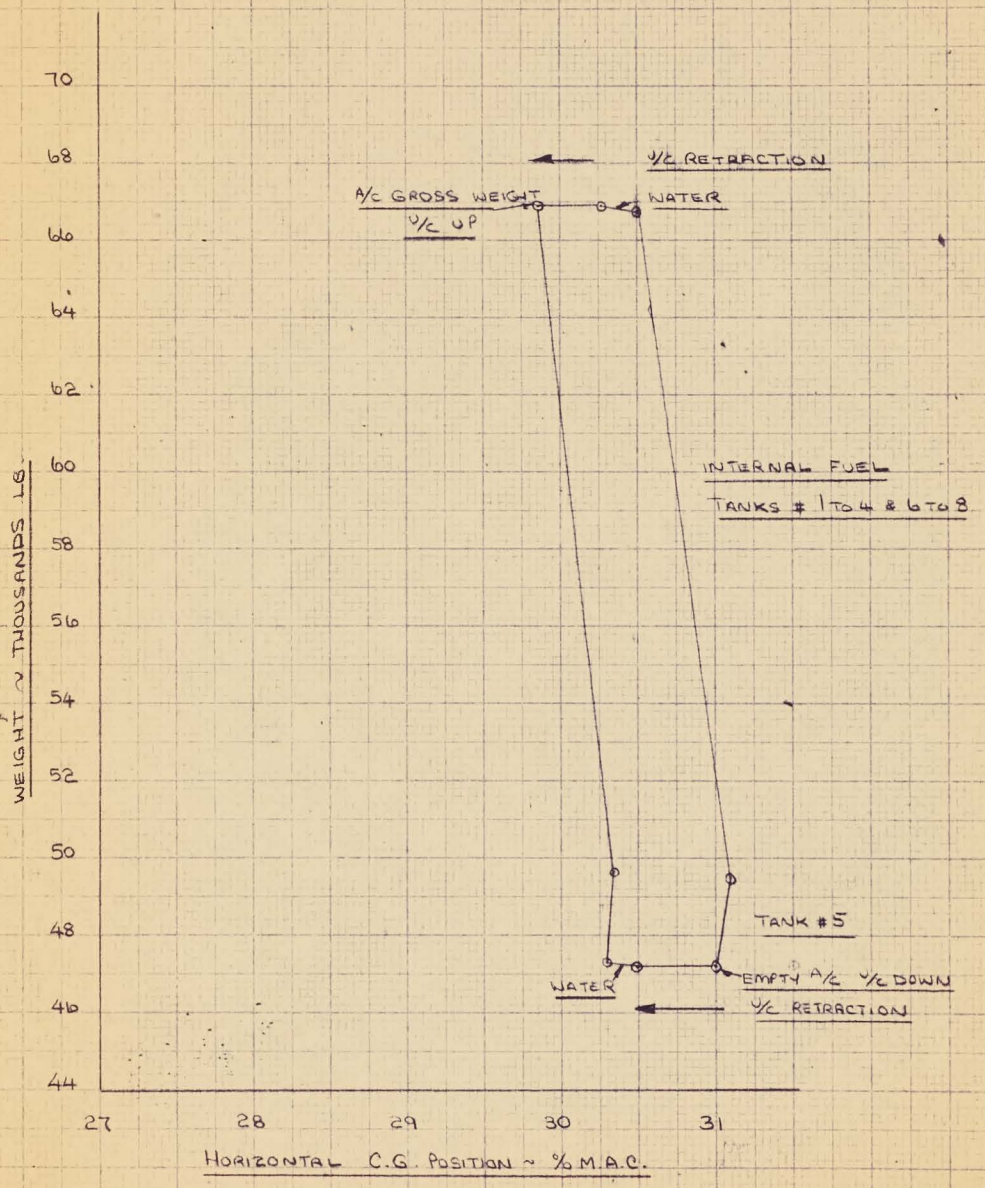


K+E 10 X 10 TO THE 1/2 INCH 359-12 KEUFFEL & ESSER CO.

REPORT NO: T-0400-63 ISSUE 1
DATE: June 1st 1958
SHEET: 4-2
BY: Kathleen Griffin

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

A/C PRIOR TO INSTALLATION OF ASTRA I
I.E. EARLY FLIGHTS WITH BALLAST IN RADAR NOSE etc.



K&E 10 X 10 TO THE ½ INCH 359-12 KEUFFEL & ESSER CO. MADE IN U.S.A.

AVRO AIRCRAFT LTD.
MALTON, ONT.

WEIGHT AND C. OF G BY FUNCTIONAL GR COMPONENT

PROJECT

DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM
100 LEADING EDGE I W	105000062		22138	4684
			22138	
LEADING EDGE O W	106000065		30870	6301
			30870	

AVRO AIRCRAFT LTD.
MALTON, ONT.

WEIGHT AND C. OF G BY FUNCTIONAL GR
COMPONENT

PROJECT

DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM
FIN AND RUDDER GROUP	2000000			
100 FIN	201000083		851707495	
BUZZ DAMP STRUC PROV FIN	201000183		1858030	
12 FIN TO WING MARRY UP	2010002		48306853	
FIN POD FOR I R TRACKER	201000383		10757600	
			91260	
93 RUDDER	202000084		13278	8132
			13278	

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WEIGHT AND C. OF G BY FUNCTIONAL GRO COMPONENT

PROJECT_____

	DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM
	COCKPIT FLOOR	3010056	52	6160	17636
	CENTRE BEAM 697 28 717 36	3010059	58	557	71367
	DORSAL OVER FUEL TANK	3010061	54	5007	41403
	SHIELD EXHAUST DEFLECTOR	3010062	54	1981	33428
	SHEAR PANEL BELOW NAV ARCH	3010063	52	2115	25699
33	PACK MOUNTING STRUCTURE	3010064	54	2119	29285
88	ENG ACCESS DOORS R F	3010065	59	8457	77280
99	TUNNEL FIXED R F	3010066	59	10403	77168
100	SKIN AND STIFFENERS R F	3010067	59	5143	77149
100	FAIRING UNDER RUDDER R F	3010068	59	2616	78134
100	FORMERS FIXED R F	3010069	59	9001	77929
100	LONGERONS C BEAM FIXED R F	3010070	59	2799	77170
	TAILCONES	3010071	59	43984	83168
	CNTR STRUCT STING REM R F	3010072	59	8835	83155
	MISCELLANEOUS ITEMS E B	3010073	58	919	66400
	MTG BRKTS SIDE PANEL D B	3010075	56	243	52514
	FORMERS LOWER PANEL D B	3010076	56	7640	54472
	LOWER PANEL D B	3010077	56	5348	55246
	JOINT F F TO C F	3010078		855	25500
	JOINT AIR INTAKES TO F F	3010079		1092	22000
	JOINT C F TO D B	3010080		520	48500
	JOINT D B TO E B	3010081		2521	58475
	FUS JOINT AT STA 742 50	3010082		443	74250
6	MISCELLANEOUS ITEMS F F	3010086	52	850	19050
				643840	
	DIVE BRAKES	3020000	72	11790	50884
	DIVE BRAKES C A	3020001		406	48794
				12196	
	AIR INTAKES	3030000			
7	AIR INTAKES	3030100	55	77248	21079
				77248	
	PILOTS AND NAVIG CANOPIES	3040000			
76	PILOTS CANOPY	3040100	53	24208	17686
				24208	
100	NAVIGATORS CANOPY	3040200	53	15321	23277
				15321	

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MALTON, ONT.

WEIGHT AND C. OF G BY FUNCTIONAL GRO COMPONENT

PROJECT_____

DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM
FUEL SYSTEM	5080000			
23 FUEL SYSTEM C F	508000154		13483	40781
29 FUEL SYSTEM D B	508000256		17382	53418
16 FUEL SYSTEM E B	508000358		3649	66892
49 FUEL SYSTEM I W	508000462		54349	55563
FUEL SYSTEM ENG	5080005		1648	68563
FUEL SYSTEM C A	5080006		754	61525
			91265	

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
5080000						
508000154		13483	407814	14085	5498502	1899081
508000256		17382	534181	11311	9285117	1966078
508000358		3649	66892	12493	2440889	455870
508000462		54349	55563	14395	30197935	7823539
5080005		1648	68563	8916	1129918	146936
5080006		754	61525	9658	463899	72821
		91265			49016260	12364325

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WEIGHT AND C. OF G BY FUNCTIONAL GROU COMPONENT

PROJECT_____

	DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM
	FLYING CONTROLS GROUP	6000000			
	MECHANICAL CONTROLS	6010000			
50	MECHANICAL CONTROLS F F	601000152		10996	16316
	MECHANICAL CONTROLS C F	601000254		1213	40097
70	MECHANICAL CONTROLS FIN	601000583		12423	78817
72	MECHANICAL CONTROLS I W	601000662		39748	71845
45	MECHANICAL CONTROLS O W	601000764		30237	77068
	MECHANICAL CONTROLS C A	6010008		646	70982
				95263	
	FLYING CONTROLS HYDRAULICS	6020000			
	FLYING CONT HYDRAULICS D B	602000156		3618	56342
	FLYING CONT HYDRAULICS E B	602000258		45384	65157
	FLYING CONT HYDRAULICS R F	602000359		48	75875
77	FLYING CONT HYDRAULICS I W	602000462		27475	70357
66	FLYING CONT HYDRAULICS O W	602000564		13086	74031
63	FLYING CONT HYDRAULICS FIN	602000683		5564	76036
	FLYING CONT HYDRAULICS R N	602000851		3500	11309
	FLYING CONT HYDRAULICS F F	602000952		18615	20510
	FLYING CONT HYDRAULICS C F	602001054		2833	35838
				120123	

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
OUP	6000000						
S	6010000						
S F F	601000152		109961631611391			1794107	1252554
S C F	601000254		121334009711790			486377	143013
S FIN	601000583		124237881722159			9791436	2752813
S I W	601000662		397487184514386			28556951	5718147
S O W	601000764		302377706813562			23303051	4100742
S C A	6010008		64670982 14338			458544	92623
			95263			64390466	14059892
DRAULICS	6020000						
LICS D B	602000156		361856342 10408			2038454	376561
LICS E B	602000258		453846515711020			29570853	5001317
LICS R F	602000359		48758751 0824			36420	5196
LICS I W	602000462		274757035714721			19330586	4044595
LICS O W	602000564		130867403113587			9687697	1777995
LICS FIN	602000683		55647603620808			4230643	1157757
LICS R N	602000851		35001130910513			395815	367955
LICS F F	602000952		186152051010350			3817937	1926653
LICS C F	602001054		283335838 11121			1015291	315058
			120123			70123696	14973087

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WEIGHT AND C. OF G BY FUNCTIONAL GRO COMPONENT

PROJECT

DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM
RADIO AND RADAR FIXED C F	714000354		14155	2760
RADIO AND RADAR FIXED D B	714000456		170	5110
RADIO AND RADAR FIXED FIN	714000583		3200	7618
RADIO AND RADAR FIXED C A	714000 6		19540	2216
RADIO AND RADAR FIXED I W	714000762		2228	5457
			84153	
37 CANOPY ACTUATION	716000052		6586	2220
			6586	
CABIN CONSOLES	717000052		2362	1802
			2362	
SURFACE FINISH F F	719000152		363	1874
SURFACE FINISH CANOPY	719000253		64	2021
SURFACE FINISH C F	719000354		1400	3719
SURFACE FINISH INTAKES	719000455		408	2279
SURFACE FINISH D B	719000556		377	5382
SURFACE FINISH E B	719000658		443	6670
SURFACE FINISH R F	719000759		648	8036
SURFACE FINISH I W	719000862		3151	6014
SURFACE FINISH O W	719000964		1067	7065
SURFACE FINISH O W L EDGE	719001065		319	6394
SURFACE FINISH AILERON	719001174		353	7919
SURFACE FINISH ELEVATOR	719001282		566	7552
SURFACE FINISH FIN	719001383		639	7466
SURFACE FINISH RUDDER	719001484		202	8127
			10000	
FLIGHT TEST INSTALLATIONS	7200000		88678	4681
			88678	

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WEIGHT AND C. OF G BY FUNCTIONAL GRO COMPONENT

PROJECT_____

DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM
REMOVABLE EQUIPMENT GROUP	8000000			
94 EJECTOR SEATS	901010052		34294	2045
			34294	
RADAR REMOV GROUP	8020000			
RADIO AND RADAR REMOV R N	802010151		103930	885
RADIO AND RADAR REMOV F F	802010252		21060	1846
RADIO AND RADAR REMOV C F	802010354		62620	2716
RADIO AND RADAR REMOV D B	802010456		8810	5117
RADIO AND RADAR REMOV F IN	802010583		3500	7300
RADIO AND RADAR REMOV C A	9020106		8230	5513
RADIO AND RADAR REMOV E B	902010758		4500	7350
RADIO AND RADAR REMOV I W	802010862		880	4853
			213530	
DAMPING SYSTEM	8030000			
DAMPING SYSTEM F F	803010152		784	1720
DAMPING SYSTEM C F	803010254		2303	3221
DAMPING SYSTEM E B	803010358		369	6324
DAMPING SYSTEM I W	803010462		6070	5378
DAMPING SYSTEM O W	903010564		95	7485
DAMPING SYSTEM R N	803010651		28	735
DAMPING SYSTEM C A	8030107		856	4797
			18472	
98 INSTRUMENT PACK	805080094		6868	3858
			6868	
INSTRUMENTATION	805090094		20000	3940
			20000	
MISSILE SEEKER AND INST	8060000		12000	5190
			12000	

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WEIGHT AND C. OF G BY FUNCTIONAL GR COMPONENT

PROJECT_____

DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM
OPERATIONAL LOAD	9000000			
CREW MEMBERS	901000052		39000	1940
			39000	
ENGINE OIL	9020000			
ENGINE OIL USABLE	9020001		8816	6124
ENGINE OIL TRAPPED ENG	9020002		1773	6267
ENGINE OIL TRAPPED D B	902000356		1925	5808
ENGINE OIL TRAPPED E B	902000458		909	5992
			13423	
OXYGEN CHARGE	9040000			
OXYGEN CHARGE F F	904000152		72	2049
OXYGEN CHARGE C F	904000254		1267	2628
			1339	
100 ENGINE FIRE EXT FLUID	9060000		2500	7300
			2500	
RESIDUAL FUEL	9070000			
RESIDUAL FUEL C F	907000154		4680	3942
RESIDUAL FUEL I W	907000262		17160	5975
			21840	
WATER FOR AIRCONDITIONING	9100000			
WATER FOR AIRCOND C F	910000154		12500	2680
WATER FOR AIRCOND APF	910000294		12500	3620
UNUSABLE WATER AIRCOND C F	910000354		1500	2680
UNUSABLE WATER AIRCOND APF	910000494		1500	3620
			28000	

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
	9000000						
	9010000	52	39000	19400	13650	7566000	5323500
			39000			7566000	5323500
	9020000						
	9020001		8816	61246	12186	5399447	1074318
ENG	9020002		1773	62676	11640	1111245	206377
D B	9020003	56	1925	58084	9555	1118117	183934
E B	9020004	58	909	59928	9704	544746	88209
			13423			8173555	1552838
	9040000						
	9040001	52	72	20493	13200	14755	9504
	9040002	54	1267	26280	16150	332968	204621
			1339			347723	214125
ID	9060000		2500	73000	12900	1825000	322500
			2500			1825000	322500
	9070000						
	9070001	54	4680	39424	12300	1845043	575640
	9070002	62	17160	59755	13705	10253958	2351778
			21840			12099001	2927418
IONING	9100000						
F	9100001	54	12500	26800	13200	3350000	1650000
PF	9100002	94	12500	36200	10100	4525000	1262500
OND C F	9100003	54	1500	26800	12700	402000	190500
OND APF	9100004	94	1500	36200	10100	543000	151500
			28000			8820000	3254500