C-105 MK 1 Report 7-0400-44
J75 P3 Engines Issue 6

WEIGHT & C.G. SUMMARY

N.A.E.

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Report no.: QCX - AVRO - CF105 - R-7-0400-44-Iss.-6

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☒ de-classified

by (Name): Michel W. Drapeau

(Dept): A/DND Coordinator, Access to Information

Date: Dec. 7, 1992

R. Auger
Signature

Date: June 1st, 1957
Aircraft: C-105 MK 1 With
J75 P3 Engines
1st Aircraft.

Report # 7-0400-44 Iss. 6
Prepared By: K. Griffin
Approved By: E. Burnett

I N D E X

C-105 MK 1 With
J75 P3 Engines
1st Aircraft
Date: June 1st, 1957

Report # 7-0400-44 Iss 6
Sheet # 1-1
Prepared By: K. Griffin
Approved By: E. Burnett

INTRODUCTION

The following is a Weight & C.G. Summary for the 1st C-105 Aircraft with J75 P3 Engines, based on the latest weight estimates currently available. All Weight and C.G. changes are relative to Issue 5 of May 1st, 1957.

Note: This summary does NOT apply for the 2nd and subsequent MK 1 Aircraft see context below.

GENERAL

a) Pratt & Whitney J75 P3 Engines comprise the Power Plant for the 1st Aircraft. J75 P5 Engines, which are partially redesigned versions of the P3 Engines, are to be installed on the 2nd and subsequent MK 1 Aircraft.
(J75 P3 Engines = 6,175 lb each; J75 P5 Engines = 5,950 lb each)

b) An Instrument Package carrying Flight Test Instrumentation is installed, this also varies between first and subsequent Aircraft. A preliminary estimate of other flight test installations has also been made, based on there being approximately 250 monitored points throughout the aircraft and that twin shielded wire (27 lb/1000 ft) is used, a tentative figure of 710 lb is now recorded. This will be fully checked when completed details are forthcoming.

c) Emergency jettison for the pack, emergency lowering for the undercarriages and additional fire protection, all to be installed on the 1st Aircraft, are allowed for in this summary.

d) An Interim Radio & Radar System is installed.

e) It should be noted that due to material substitutions and concessions introduced by Planning or Production Departments there is a weight penalty to-date to the structure of 202 lb. This is all recorded in the structural weight breakdown. No account has been taken of variations on machinings etc. nor of shop repair schemes, since it is impossible to assess these.

f) Pending Flight Test requirements a "Buzz Damping" system may be installed on the first Aircraft. Provisions for this installation are already included in the Structural Group as modifications to the Control Boxes. For the first flight the Control Surfaces will be unmodified - however, if the need for Dampers is proven, a modified set of Control Surfaces will be made available. The following weight penalties ensue:

Ailerons	+ 11.68 lb/A/C
Elevators	+ 11.07 lb/A/C
Rudder	+ 8.50 lb
Equipment & Inst.	+ 125.17 lb
	+ 156.42 lb

g) A considerable number of actual weights have now been obtained. Structural weights are showing very insignificant deviations from the calculated weights, but equipment shows a consistent increase averaging about 11% over manufacturers quotations or Specification weights.
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 actual weight recorded within the report.

INTRODUCTION

GENERAL

g)(Continued

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

Structure	-	34.94% Actual Weight
Undercarriage	-	64.60% Actual Weight
Power Plant	-	4.87% Actual Weight
Flying Controls	-	23.28% Actual Weight
Equipment	-	17.38% Actual Weight

i.e. 23.51% of the Basic Weight of the Aircraft.

The above breakdown is for groups as designated on the Weights Summary Sheets.

1. STRUCTURE

a) Wing:

	WEIGHT (lb)
Structure fwd. M/Spar I/W - addition of bumper pads	+ 5
Ailerons - deletion of structural provisions for Buzz Dampers	- 6
Elevators - deletion of structural provisions for Buzz Dampers	- 7
Control Boxes - revised estimate of Damper structural provision	- 4
Actual weights of majority of Centre Joint, skin panels forward Main Spar, O/W Joint items, pump access door etc. etc.	+ 5
WEIGHT CHANGE DECREASE	- 7

Ref 2-1

b) Fin & Rudder

Rudder - actual weight obtained unmodified for Dampers	+ 3
Deletion of Structural provision for Dampers	- 8
Fin - Revised estimate for Damper structural provisions	+ 1
WEIGHT CHANGE DECREASE	- 4

Ref. 2-1

c) Fuselage Fwd. Sta. 255"

Top Longerons - machined packers Al replaces Mg.	+ 4
Windscreen - Actual weight casting	+ 2
Pilot's Canopy - Actual weight casting & glass	+ 4
Navigator's Canopy - Actual weight casting, glass & window frame	+ 5
WEIGHT CHANGE INCREASE	+ 15

Ref. 2-2

d) Centre Fuselage Sta. 255" - 485"

Forward pack inflatable seal now with pneumatics in Equipment group	- 3
WEIGHT CHANGE DECREASE	- 3

Ref. 2-2

INTRODUCTION

1. STRUCTURE (Continued)	WEIGHT (lb)
e) Duct Bay Sta. 485"-591.65"	
Longerons - Actual weight of lower longeron and some re-estimates	- 7
WEIGHT CHANGE DECREASE Ref. 2-2	- 7
f) Engine Bay Sta. 591.65"-742.5"	
No Weight Change.	
g) Rear Fuselage Sta. 742.5 Aft.	
Formers fixed R.F. - miscellaneous minor changes	- 3
WEIGHT CHANGE DECREASE Ref. 2-2	- 3
h) Joints - Fuselage	
No Weight Change	
TOTAL STRUCTURAL WEIGHT DECREASE	- 9
2. LANDING GEAR	
No Weight Change	
3. POWER PLANT & SERVICES	
Miscellaneous production drawing changes and minor revisions to estimates of Nose Bullet, Mountings, piping etc.	+ 8
POWER PLANT INCREASE Ref. 2-2	+ 8
4. FLYING CONTROLS GROUP	
Mechanical Controls - redesign O/B Aileron Control rod etc.	+ 4
Flying Control Hydraulics - miscellaneous design changes	+ 4
FLYING CONTROLS INCREASE Ref. 2-3	+ 8
5. EQUIPMENT GROUP	
Ejector Seats - redsign Martin Baker 80ft/sec. Ejection Seat	+ 76
Oxygen System - some piping changes etc.	+ 3
Air Conditioning - Actual weights of boiler, valves etc.	+ 27
Changes to piping & insulation	+ 23
Additional valve	+ 7
Utility Hydraulics - 200 cu. ins. accumulator replaces 80 cu. ins.	+ 12
Windscreen De-misting - increase in transformer, redesign panel	+ 12

continued.

C-105 MK 1 With
J75 P3 Engines
1st Aircraft
Date: June 1st, 1957

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Sheet # 1-4
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INTRODUCTION

5. EQUIPMENT (Cont'd.)	WEIGHT (lb)
Low Pressure Pneumatics - addition of fwd pack seal	+ 5
Piping changes	- 2
EQUIPMENT INCREASE	+ 163
Ref. 2-4	

6. OPERATIONAL LOAD	
Water - Trapped in Evaporator - no previous allowance	+ 15
OPERATIONAL LOAD INCREASE	+ 15
Ref. 2-4	

SUMMARY

Weight Change - Aircraft Basic Weight

Structure	- 9 lb
Power Plant	+ 8 lb
Flying Controls	+ 8 lb
Equipment	+ 163 lb
	+ 170 lb

Weight Change - Operational Load Less Fuel

Trapped Water - in Air Conditioning	+ 15 lb

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

Issue 5	Issue 6		
46,017 lb.	46,202 lb.	=	+ 185 lb.

C-105 MK 1 With
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1st Aircraft

Report # 7-0400-44 Iss 6
Sheet # 2-1
Prepared By: K. Griffin
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DETAILED WEIGHT CHANGES TO I.B.M.
TABULATED DETAILS OF May 1st, 1957.

WEIGHT CHANGES			WEIGHT (lb)	
Wing:				
-	7.52	Structure for Main U/C I/W - Actual weights of housing and shaft fork ends		
+	4.88	I/W Skins M/S to R/S - error in calcs., now actual weight, of pump access door		
+	17.33	Structure F/S to M/S - Addition of bumper pads	+	5.48
		C/L rib now called up here (see joints)	+	6.02
		Actual weights of skin panels	+	5.54
		Miscellaneous changes, bracketery etc.	+	0.29
			+	17.33
-	2.75	A/C Centre Line Joints - Actual weights obtained of majority of parts, some hardware changes	+	3.27
		Machined rib now in Structure F/S to M/S, see below	-	6.02
			-	2.75
-	1.58	O/W to I/W Joints - Incorporation of approximately 25% actual weights.		
-	17.48	Structural provisions for Buzz Damper - the control surfaces will not be modified on the first flying aircraft, only the Control Boxes, until the necessity for Dampers is proven, hence:-		
		Ailerons, less structural mods.	-	6.30
		Elevators, less structural mods.	-	7.40
		I/Wing - revision of earlier est.	-	3.08
		O/Wing - revision of earlier est.	-	0.70
			-	17.48
-	7.12			
Fin & Rudder				
+	3.30	Rudder - Actual weight of a Rudder unmodified for Buzz Dampers		
+	0.65	Fin - Structural provisions for Buzz Dampers - estimate revised		
-	7.80	Rudder - Structural provisions for Buzz Dampers deleted see Note (f) of Introduction.		
-	3.85			
Fuselage Fwd. Sta. 255"				
+	3.75	Top Longerons F.F. - packing which requires machining has been changes from Mg. to Al.		
+	2.49	Windscreen - Actual weight of the casting, and some hardware alterations.		
+	3.56	Pilot's Canopy - Actual weight of machined castings & glass	+	3.06
		First production drawing ests. of seal	+	0.50
			+	3.56
+	5.35	Navigator's Canopy - Actual weights of casting, glass and window frame	+	2.56

Continued.

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DETAILED WEIGHT CHANGES TO I.B.M.
TABULATED DETAILS OF May 1st, 1957.

WEIGHT CHANGES			WEIGHT (lb)
Fuselage Fwd. Sta. 255" (Cont'd.)			
		detailed estimate of hardware, an allowance was made previously	+ 2.79
			+ 5.35
+	15.15		
Centre Fuselage Sta. 255" - 485"			
-	3.18	Pack mounting structure - forward inflatable seal now called up with Low Pressure Pneumatics (see Equip. group)	
-	3.18		
Duct Bay Sta. 485" - 591.65"			
-	6.56	Longerons D.B. - Actual Weight of lower longerons	- 3.93
		some duplication of parts at Sta. 485"	- 2.63
			- 6.56
-	6.56		
Rear Fuselage Sta. 742.5" Aft.			
-	2.89	Formers Fixed R.F. - miscellaneous production drawing changes, also some duplication of stablizers	
-	2.89		
Engine Group			
+	0.64	Engine Nose Bullet - production drawing changes	
+	0.74	Engines - production drawing changes to installations on Engines.	
+	1.57	Engine Service Accessories - addition of Engine Oil Filler Valve and Drain Valve.	
+	2.98	Engine Mountings - miscellaneous changes	+ 0.24
		Re-estimate of Front I/B Engine Mounting	+ 2.74
			+ 2.98
+	1.91	Engine Mounting Accessories - production drawing changes and re-estimates	
+	7.84		
Flying Controls Group			
+	3.56	Mechanical Flying Controls - redesign O/B Aileron Control Rod	+ 2.24
		addition of stick force transducer	+ 1.00
		Miscelllaneous changes	+ 0.32
			+ 3.56

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DETAILED WEIGHT CHANGES TO I.B.M.
TABULATED DETAILS OF May 1st, 1957.

WEIGHT CHANGES			WEIGHT (lb)
Flying Controls Group (Cont'd.)			
+ 0.33	Flying Controls Hydraulics Rudder - Miscellaneous minor changes.		
+ 3.62	Flying Controls Hydraulics I/W - Jarry hoses replaced by Steel tube	+	1.66
	increase in jack installation hardware	+	1.00
	Miscellaneous alterations to valves etc.	+	0.96
		+	3.62
+ 7.51			
Equipment Fixed and Removable:			
+ 98.42	Ejector Seats - redesign Martin Baker seat, weights quoted by manufacturer	+	76.00
	Emergency oxygen system included with seat (see Oxygen System)	+	22.42
		+	98.42
- 19.85	Oxygen System - Emergency system with Seats (above)	-	20.28
	redesign piping in cockpit	+	0.43
		-	19.85
+ 56.81	Air Conditioning - estimates completely revised to current data.		
	Actual weight of Heat Exchanger was manufacturer's quote previously	+	21.50
	Actual weight of Boiler	+	1.69
	Miscellaneous equipment actual weights	+	3.90
	Addition of Nomalair Valve	+	6.50
	Insulation changes, the three 0.5" layers of Thermacousti before compression, weigh 2 lb/cu.ft. not 0.6 lb/cu.ft. as previously. Also insulation on cold pipes CSI-123 in lieu of CSI-103	+	14.67
	Other changes to piping etc. etc.	+	8.55
		+	56.81
+ 11.60	Utility Hydraulics D.B. - 200 cu. ins. accumulator replaces 80 cu. ins.		
+ 12.00	Windscreen De-misting - Increase in size of transformer (target weight now 18.0 lb)	+	10.00
	Panel E 40 redesigned in association with above	+	2.00
		+	12.00

continued.

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DETAILED WEIGHT CHANGES TO I.B.M.
TABULATED DETAILS OF May 1st, 1957.

WEIGHT CHANGES			WEIGHT (lb)
Equipment Fixed and Removable (Cont'd.)			
+	3.85	Low Pressure Pneumatics - addition of forward pack inflatable seal (see also C.F. Structure)	+ 5.28
		Alterations to pitot system etc.	- 1.43
			+ 3.85
+	162.83		
Operational Load			
+	15.00	Water Trapped in Air Conditioning - no allowance made previously for that water trapped in Evaporator	
+	15.00		
+	184.73	TOTAL WEIGHT CHANGES	

Date: June 1st, 1957
Aircraft: C-105 MK 1 With
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Sheet # 3-1
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WEIGHT & C.G. SUMMARY

Description	WEIGHT lb.	H. ARM ins.	V. ARM ins.
STRUCTURE	18,501.24	562.00	137.59
Wing	9,975.30	642.96	142.24
Fin & Rudder	1,025.85	754.34	209.31
Fuselage fwd. Sta. 255"	2,615.50	181.48	128.14
Sta. 255"-485"	1,647.24	379.60	130.81
Sta. 485"-591.65"	997.30	533.97	104.59
Sta. 591.65"-742.5"	1,418.18	660.80	107.30
Sta. 742.5 Aft.	769.29	800.60	129.11
'Marry-up'	52.58	468.91	103.89
UNDERCARRIAGE - Retracted	2,609.77	488.51	134.93
Main Undercarriages	1,959.62	539.48	141.00
Main U/C Doors & Fairings	291.80	537.10	138.40
Nose Undercarriage	333.81	170.81	99.70
Nose U/C Door & Fairing	24.54	162.24	88.23
POWER PLANT & SERVICES	14,310.35	653.10	120.24
Engines & Accessories J75 P3	12,560.22	664.92	119.78
Gear Box Installation on Fuselage	275.54	601.39	102.98
Gear Boxes and Starters on Engines	259.65	591.55	104.52
Engine Controls	32.43	375.76	118.62
Engine Nose Bullet	71.01	562.74	115.07
Fire Extinguisher System	70.46	702.44	134.83
Engine Mountings	203.64	609.88	123.63
Fuel System	837.40	536.65	136.07
FLYING CONTROLS GROUP	1,827.07	686.88	140.02
Mechanical Flying Controls	946.48	687.84	148.61
Hydraulic Flying Controls	880.59	685.84	130.78
EQUIPMENT - Fixed & Removable	7,969.80	399.85	111.92
Instruments	46.07	163.68	138.70
Probe	18.50	-40.00	108.00
Cockpit Pressure Sealing	5.00	186.00	130.00
Oxygen System	23.59	253.72	156.43
Air Conditioning System	794.82	336.05	134.34
Surface Finish	100.00	591.52	140.20
Hydraulics Main System	609.09	500.86	117.57
Cabin Insulation	14.31	187.48	132.00
Brake Parachute	62.38	769.41	143.24
Electrical System	1,117.89	417.17	112.83
Low Pressure Pneumatics	53.15	427.62	124.55
Intake De-icing Boots	51.84	197.02	118.00
Canopy Actuation	62.05	222.11	154.47
Cabin Consoles	17.45	174.76	124.34
Ejector Seats	284.42	202.80	136.25
Interim Radio & Radar	690.98	322.67	123.64
Radome Anti-icing	8.88	51.49	125.00
Instrument Pack Structure	684.80	385.90	94.71
Pack Instrumentation 1st A/C	2,447.00	389.50	95.00
Flight Test Installations	710.50	570.00	120.00
Additional Fire Protection 1st A/C	154.17	425.05	102.89
Emergency Landing Gear Lowering	12.91	458.83	128.60
AIRCRAFT BASIC WEIGHT	45,218.23	563.06	127.52

Date: June 1st, 1957
Aircraft: C-105 MK 1 With
J75 P3 Engines

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Sheet # 3-2
Prepared By: K. Griffin

WEIGHT & C.G. SUMMARY

Description		WEIGHT lb.	H. ARM ins.	V. ARM ins.	M.A.C. %
USEFUL LOAD (less Fuel)		983.02	353.44	132.63	
Crew		430.00	194.00	136.50	
Oil		134.23	608.92	115.68	
Alcohol - radome de-icing		22.00	93.00	138.00	
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 Usable		140.00	268.00	132.00	
Operational Weight Empty	U/C Up	46,201.25	558.60	127.63	33.86
	U/C Down		560.72	124.13	34.44
Maximum Internal Fuel (2,544 gals. @ 7.8 lb/gal.)		19,843.00	538.88	144.32	
A.U.W. Maximum Internal Fuel	U/C Up	66,044.25	552.68	132.64	32.23
	U/C Down		554.16	130.19	32.63

N.B. 1) Aircraft Datum is considered to be 120" above an arbitrarily chosen ground line.

2) The above figures are for the Aircraft in the unballasted condition.

If the most aft point on the C.G. Envelope is to be ballasted to 31% M.A.C. then 1,355 lb of ballast are necessary on Former 68.5 and the Shear Panel, i.e. 27 lb less than currently designed.

REPORT No: 7-9900-44-10

BY: Kathleen Griffin

DATE: June 1st 1957

SHEET: 4-1

HORIZONTAL C.G. ENVELOPE

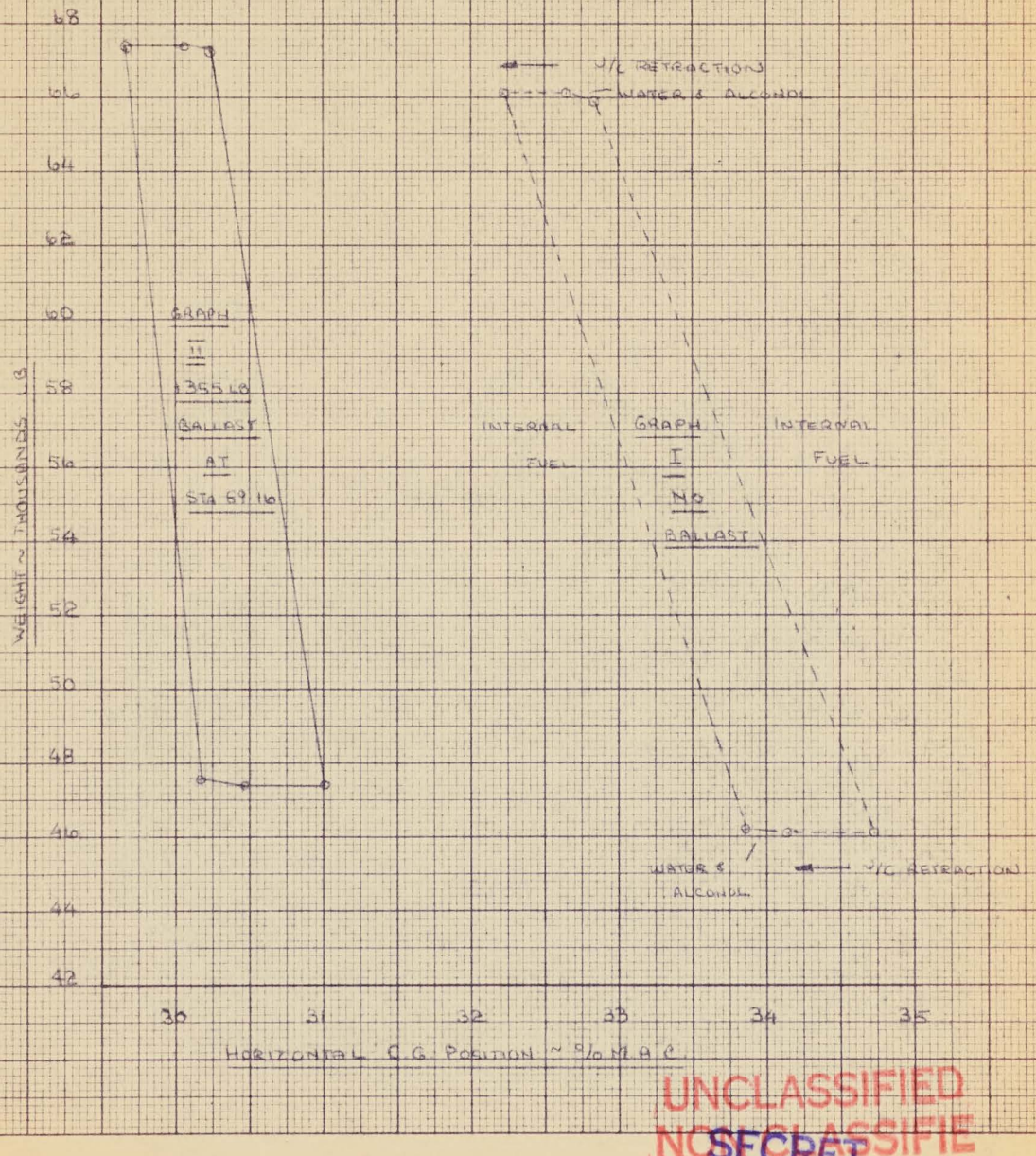
C106 MK. I P/C FLIGHT CONDITIONS

WITH J 18 P3 ENGINES (2ND & SUBSEQUENT A/C J75 P5)

a) INTERIM RADIO & RADAR

b) INSTRUMENT PACK & FLIGHT TEST INSTALLATIONS

c) FUEL SYSTEM PROPORTIONERS



SECRET

REPORT NO: 7-0400-44-6

BY: Kathleen Lynch

DATE: June 15th 54

SHEET 4-2

HORIZONTAL C.G. ENVELOPE

C105 MK1 1ST P/C FLIGHT CONDITIONS

WITH

PROPOSED FUEL SYSTEM SEQUENCING

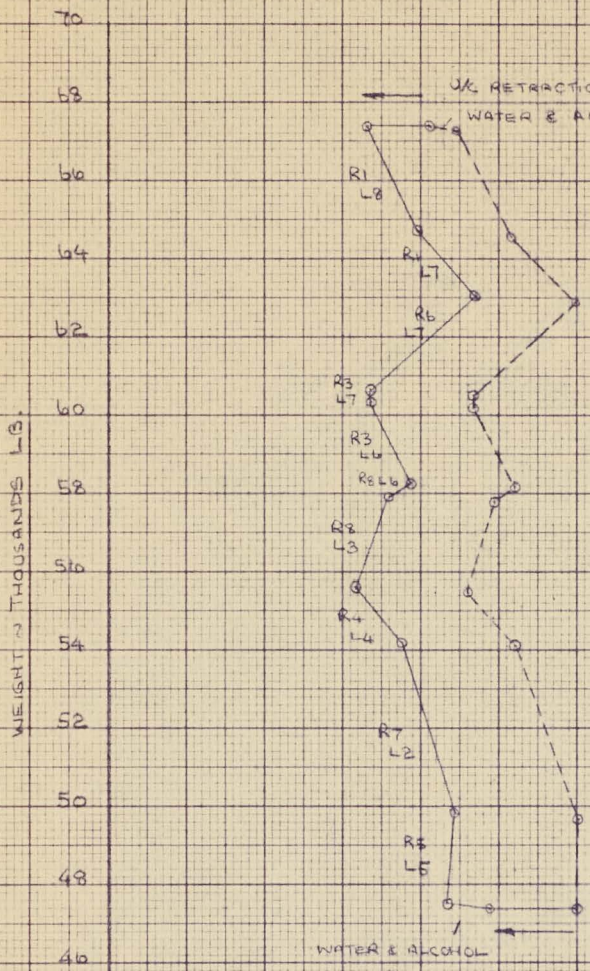
SEQUENCING ORDER: (ING PUMPS)

R.H.S. ~ 1, 6, 3, 8, 4, 7, 5 (NOTED R1, R6 etc)

L.H.S. ~ 8, 7, 6, 3, 4, 2, 5 (NOTED L8, L7 etc)

- - - - - - - U/C EXTENDED

——————— U/C RETRACTED



BALLAST INSTALLED

1353 LB AT STA 89.1 0 INS

SECRET

AVRO AIRCRAFT LTD.
MALTON, ONT.

WEIGHT AND C. OF G BY FUNCTIONAL GR COMPONENT

PROJECT C-105 MK 1

	DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. A
	TOTAL WING GROUP	100000			
	OUTER WING	101000			
100	OUTER WING SKINS	101000164		929107	06
100	POSTS AND INTERCOSTALS	101000264		24367	32
100	OUTER WING SPARS	101000364		392587	01
100	OUTER WING RIBS	101000464		134566	95
18	AILERON CONTROL BOX	101000664		379207	74
100	RIB 12	101000764		76266	48
100	O W AILERON JACK FITTING	101000964		10467	27
	AILERON JOINTS AND FAIRING	10100010		32937	87
	BUZZ DAMP STRUC PROV O W	101000116 4		8007	58
				198745	
	AILERON	102000			
100	AILERON STRUCTURE	102000174		336007	92
				33600	
97	ELEVATOR	103000082		449007	55
97	ELEVATOR MARRY UP	10300000		15977	38
				46497	
	INNER WING	104000			
79	MAIN U C STRUCTURE	104000162		330715	77
51	FRONT SPAR I W	104000262		111048	4
51	MAIN SPAR I W	104000362		151065	65
51	FWD CENTRE SPAR I W	104000462		53646	00
51	AFT CENTRE SPAR I W	104000562		36665	4
51	REAR SPAR I W	104000662		76677	03
32	I W STRUCTURE F S TO M S	104000762		1059184	99
	I W STRUCTURE M S TO R S	104000862		149796	09
	STRUCTURE AFT OF REAR SPAR	104000962		32312	18
11	ELEVATORCONTROLBOX I W	104001062		42717	25
25	TRANSP JOINT MARRY UP	10400011		7065	36
72	CENTRE LINE JOINTS	104001262		63471	62
46	INNER WING SKINS	104001362		2190386	24
	STRUT PICK UP FITTINGS I W	104001462		54225	67
31	RIBS 1 TO 9 INNER WING	104001662		51204	12
	DORSAL FAIRINGS I W	104001762		954	82
100	RIB 10	104001862		10800	36
	FUSELAGE HINGE JOINT I W	104001962		13812	21
25	TRANSP JOINT	104002062		12942	30
	FUSELAGE HINGE JOINT	10400021		3740	27
	BUZZ DAMP STRUC PROV I W	104002262		552	41
	DORSAL FAIRINGS	10400023		5629	57
				665680	

AVRO AIRCRAFT LTD.
MALTON, ONT.

WEIGHT AND C. OF G BY FUNCTIONAL GI COMPONENT

PROJECT_____

DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H A
12 FIN	2010000	83	851707	42
BUZZ DAMP STRUC PROV FIN	2010001	83	18580	3
12 FIN TO WING MARRY UP	2010002		48306	85
			90185	
95 RUDDER	2020000	84	124008	13
			12400	

AVRO AIRCRAFT LTD.
MALTON, ONT.

WEIGHT AND C. OF G BY FUNCTIONAL G COMPONEN

PROJECT_____

	DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. A
	TOTAL FUSELAGE GROUP	3000000			
	FUSELAGE BASIC STRUCTURE	3010000			
	RADOME	3010001	51	17728	37
	RADAR NOSE ACCESS DOORS	3010002	51	8002	95
	RADAR NOSE STRUCTURE	3010003	51	12225	94
	SKIN F F	3010004	52	10949	189
	SKIN C F	3010005	54	21048	376
	SKIN D B	3010006	56	5880	534
3	SKINS E B	3010007	58	17573	669
4	FORMERS F F	3010011	52	10531	181
	FORMERS C F	3010012	54	27786	374
	FORMER D B	3010013	56	7457	531
	LIGHT FORMERS E B	3010014	58	13501	661
13	HEAVY FORMERS F B	3010015	58	21281	662
	LOWER LONGERONS F F	3010016	52	6846	184
	LONGITUDINAL MEMBERS E B	3010017	58	1106	706
	LONGERON E B	3010018	58	6905	650
	TOP LONGERONS E B	3010019	58	638	666
	LOWER SHEAR PANEL	3010020	52	2988	234
	TOP WING LONGERONS D B	3010021	56	498	536
	LONGERONS C F	3010022	52	53	252
	LONGERONS C F	3010023	54	13813	411
43	LONGERONS F D B	3010024	54	1258	487
43	LONGERONS A D B	3010025	56	865	529
	ELECTRONICS BAY STRUCTURE	3010026	54	3570	271
59	LONGITUDINAL BEAMS D B	3010027	56	657	052
	RADAR ACCESS DOOR C F	3010028	54	2108	274
72	MAIN FRAME AT STN 538 77	3010029	56	598	053
	DIVE BRAKE ACCOM STRUCTURE	3010030	56	363	450
20	TOP LONGERONS F F	3010031	52	1857	119
100	DUCT C F	3010032	54	3328	637
	DUCT D B	3010033	56	3150	454
	CANOPY ARCHES	3010034	52	855	227
4	ACCESS PANEL STIFFNERS	3010036	56	386	553
66	NOSE U C SUPPORT STRUCTURE	3010037	52	3343	211
3	CREW BULKHEADS	3010038	52	1227	220
	EQUIPMENT BAY STRUCTURE	3010039	54	615	028
86	WINDSCREEN	3010041	52	1300	313
	SERV ACCESS DOORS AND PNLS	3010042	58	670	466
	TORSION BOX E B	3010043	58	604	261
	DORSAL FAIRING AIR OUTLET	3010044	54	206	129
	INTERMEDIATE FORMERS	3010045	58	516	569
	ENGINE ACCESS DOORS	3010046	58	1465	962
	SEALING MISSILE BAY	3010047	54	69	732
	MISCELLANEOUS ITEMS C F	3010048	54	39	237
	ARMAMENT BAY ROOF	3010049	54	1321	638
	BULKHEAD AT STA 120	3010050	52	306	012
	BULKHEAD AT STA 255	3010051	52	1042	925
	BULKHEAD AT STA 485	3010052	54	1112	948
	ENGINE TUNNEL E B	3010054	58	4676	466

AVRO AIRCRAFT LTD.
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WEIGHT AND C. OF G BY FUNCTIONAL G COMPONEN

PROJECT_____

DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H
INTEGRAL FUS FUEL TANK	30100554		20359	39
COCKPIT FLOOR	30100562		5743	1
CENTRE BEAM 697 28 717 36	30100598		557	71
DORSAL OVER FUEL TANK	30100614		509	741
SHIELD EXHAUST DEFLECTOR	30100624		196	533
SHEAR PANEL BELOW NAV ARCH	30100632		207	425
PACK MTG STRUCTURE	30100644		204	729
ENG ACCESS DOORS R F	30100659		828	477
TUNNEL FIXED R F	30100669		978	977
SKIN AND STIFFENERS R F	30100679		512	277
FAIRING UNDER RUDDER R F	30100689		260	678
FORMERS FIXED R F	30100699		900	177
LONGERONS C BEAM FIXED R F	30100709		279	977
NACELLES REMOVABLE R F	30100719		2798	982
CNTR STRUC STING REMOV R F	30100729		1133	983
MISCELLANEOUS ITEMS E B	30100735		92	366
MTG BRKTS SIDE PANEL D B	30100755		21	352
FORMERS LOWER PANEL D B	30100765		760	654
LOWER PANEL D B	30100775		505	455
JOINT F F TO C F	30100781		85	525
JOINT AIR INTAKES TO F F	30100791		95	222
JOINT C F TO D B	30100801		50	048
JOINT D B TO E B	30100811		25	058
FUS JOINT AT STA 742 50	30100821		443	774
MISC STRUCTURE F F	30100855	52	55	218
			623807	
96 DIVE BRAKES	30200007	2	11150	950
96 DIVE BRAKES C A	30200011		406	848
			11556	
AIR INTAKES	30300000			
18 AIR INTAKES	30301005	5	76248	821
			76248	
PILOTS AND NAVIG CANOPIES	30400000			
76 PILOTS CANOPY	30401005	3	24081	117
			24081	
48 NAVIGATORS CANOPY	30402005	3	14317	23
			14317	

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WEIGHT AND C. OF G BY FUNCTIONAL G COMPONEN

PROJECT_____

	DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H.
	UNDERCARRIAGE UP POSITION	4000000			
	MAIN UNDERCARRIAGE GROUP	4010000			
69	MAIN UNDERCARRIAGE	4010100	92	1959625	53
				195962	
	MAIN U C DOORS FAIRINGS	4010200	62	29180	53
				2918 0	
	NOSE UNDERCARRIAGE GROUP	4020000			
100	NOSE UNDERCARRIAGE	4020100	91	33381	17
				33381	
	NOSE U C DOOR AND FAIRING	4020200	52	2454	16
				2454	

EIGHT AND C. OF G BY FUNCTIONAL GROUP COMPONENT

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	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM	V. ARM	H. MOMENT	V. MOMENT
TION	4000000						
OUP	4010000						
	401010092		195962	539481	41100	105717580	27630642
			195962			105717580	27630642
GS	401020062		29180	537101	3840	15672578	4038512
			29180			15672578	4038512
OUP	4020000						
	402010091		33381	170800	9970	5701475	3328086
			33381			5701475	3328086
RING	402020052		2454	16224	8823	398137	216516
			2454			398137	216516

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WEIGHT AND C. OF G BY FUNCTIONAL C COMPONEN

PROJECT_____

	DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H.
	FLYING CONTROLS GROUP	6000000			
	MECHANICAL CONTROLS	6010000			
	MECHANICAL CONTROLS F F	6010001	52	87591	5
	MECHANICAL CONTROLS C F	6010002	54	88533	
	MECHANICAL CONTROLS D B	6010003	56	35046	
	MECHANICAL CONTROLS FIN	6010005	83	126878	
11	MECHANICAL CONTROLS I W	6010006	62	40884	71
	MECHANICAL CONTROLS O W	6010007	64	30436	77
	MECHANICAL CONTROLS C A	6010008		6467	0
				94648	
	FLYING CONTROLS HYDRAULICS	6020000			
14	FLYING CONT HYDRAULICS D B	6020001	56	26515	7
14	FLYING CONT HYDRAULICS E B	6020002	58	41650	65
14	FLYING CONT HYDRAULICS R F	6020003	59	48	75
60	HYDRAULICS FLYING CONT I W	6020004	62	25628	70
58	HYDRAULICS FLYING CONT O W	6020005	64	12560	74
59	RUDDER HYDRAULICS	6020006	83	5522	75
				88059	

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WEIGHT AND C. OF G BY FUNCTIONAL COMPONE

PROJECT_____

	DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H
	BRAKE PARACHUTE F F	7080001	52	45516	
	BRAKE PARACHUTE R F	7080005	59	56598	2
	BRAKE PARACHUTE I W	7080006	62	12462	
				6238	
	ELECTRICAL SYSTEM	7090000			
	ELECTRICAL WIRING	7091400			
	ELECTRICAL WIRING R N	7091401	51	129	9
	ELECTRICAL WIRING F F	7091402	52	29661	9
	ELECTRICAL WIRING C F	7091403	54	13044	1
	ELECTRICAL WIRING A I	7091404	55	12742	1
	ELECTRICAL WIRING D B	7091405	56	65155	3
	ELECTRICAL WIRING E B	7091406	58	645	9
	ELECTRICAL WIRING I W	7091408	62	89095	4
	ELECTRICAL WIRING FIN	7091409	83	35279	
	ELECTRICAL WIRING N U C	7091410	91	33018	
	ELECTRICAL WIRING ENG	7091411		20025	8
	ELECTRICAL WIRING C A	7091412		137463	3
				37591	
30	ELECTRICS F F	7091500	52	152481	5
				15248	
26	ELECTRICS C F	7091600	54	73594	5
				7359	
85	ELECTRICS E B	7091700	58	6706	7
85	ELECTRICS ENG	7091701		116325	6
85	ELECTRICS C A	7091702		7186	1
				13020	
	ELECTRICS FIN	7091800	83	839	
				83	
	ELECTRICS I W	7091900	62	23366	2
	ELECTRICS C A	7091901		11262	
	ELECTRICS M U C	7091902	92	745	1
				2522	
	ELECTRICS A I	7092000	55	50902	2
				5090	
25	ELECTRICS D B	7092100	56	269895	1
				26989	

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WEIGHT AND C. OF G BY FUNCTIONAL GR COMPONENT

PROJECT_____

	DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. A
	WINDSCREEN DEMISTING	7092200052		3751	201
				3751	
	ELECTRICS R F	7092300059		136	802
				136	
	L P PNEUMATICS	7100000			
12	L P PNEUMATICS F F	7100001152		19	197
12	L P PNEUMATICS C F	7100002254		7	328
12	L P PNEUMATICS D B	7100003356		4	555
12	L P PNEUMATICS E B	7100004458		15	656
12	L P PNEUMATICS FIN	7100005583		5	742
12	L P PNEUMATICS R N	7100006651		1	69
				53	
	INTAKE DEICING	7120000055		51	197
				51	
	RADOME ANTI ICING	7130000051		8	51
				8	
	RADIO RADAR INT SYST R N	7150001151		19	102
	RADIO RADAR INT SYST F F	7150002252		10	189
	RADIO RADAR INT SYST C F	7150003354		3	276
	RADIO RADAR INT SYST I W	7150005562		10	548
	RADIO RADAR INT SYST O W	7150006664			739
	RADIO RADAR INT SYST FIN	7150007783		3	762
	RADIO RADAR INT SYST C A	7150008		11	278
	RADIO RADAR INT SYST D B	7150009959			745
				69	
10	CANOPY ACTUATION	7160000052		62	282
				62	
	CABIN CONSOLES	7170000052		17	174
				17	
	SURFACE FINISH F F	7190001152		3	187
	SURFACE FINISH CANOPY	7190002253			202

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WEIGHT AND C. OF G BY FUNCTIONAL GR COMPONENT

PROJECT_____

DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. A
REMOVABLE EQUIPMENT GROUP	8000000			
EJECTOR SEATS	8010100	52	28442	202
			28442	
RADAR REMOV GROUP	8020000			
98 INSTRUMENT PACK	8050800	54	68480	385
			68480	
INSTRUMENTATION	8050900	54	244700	389
			244700	
FIRE PREVENT FIRST A C CF	8051000	54	140294	09
FIRE PREVENT FIRST A C DB	8051001	56	80654	9
FIRE PREVENT FIRST A C EB	8051002	58	58262	6
			15417	

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	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM	V. ARM	H. MOMENT	V. MOMENT
	9000000						
	90100000	52	43000	194	00 136	50 8342000	5869500
			43000			8342000	5869500
	90200000						
	90200001		88166	1246	121	86 5399447	1074318
G	90200002		17736	2676	116	40 1111245	206377
B	90200035	6	19255	8084	95	55 1118117	183934
8	90200045	8	9095	9928	97	04 544746	88209
			13423			8173555	1552838
	90400000						
	90400015	2	72	2049	3132	00 14755	9504
	90400025	4	12672	6280	161	50 332968	204621
			1339			347723	214125
ICING	90500000	51	2200	93	00 138	00 204600	303600
			2200			204600	303600
	90600000		2500	730	00 129	00 1825000	322500
			2500			1825000	322500
	90700000						
	90700015	4	46803	9424	123	00 1845043	575640
	90700026	2	171605	9755	137	05 10253958	2351778
			21840			12099001	2927418
ONING	91000005	4	12500	2680	0 132	00 3350000	1650000
RCOND	91000015	4	1500	2670	0 127	00 400500	190500
			14000			3750500	1840500