C-105 With J75 Report # 7-0400-05

Production Engines ISSUE 27

UNCLASSIFIED

WEIGHT SUMMARY & C.G. POSITION

NON CLASSIFIED

UNCLASSIFIED

R.C.A.F. Dec. 1/56

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Report no.: QCX-AVRO-CF105- R-7-0400-05-Iss-27

has been ☐ downgraded to : _____

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by (Name): Michel W. Drapeau

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

Date: Dec. 7, 1992

R. Auger
Signature

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Classification ~~cancelled / changed to~~: UNCLASSSIFIED
By authority of: DRDA 7/DARFT 5-8/DAS Eng 6-4-5
Date: 5 Nov 1992
Signature: B Aubrey
Unit / Rank / Appointment: DSIS/3, Secretary CRAD HQ DRP

Date: December 1st, 1956
Aircraft: C-105 With J75 P.5 Engines as Interim Power Plant

Report # 7-0400-05
Sheet # 001-1 Issue 27
Prepared By: K. Griffin
Checked By: E. Burnett

INTRODUCTION

The following is a revised Weight & C.G. Summary for the C-105 Aircraft, based on the latest Weight Estimates available on November 30th, 1956. All Weight and C.G. changes are relative to Issue 26 of May 1st, 1956.

GENERAL

a) As in Issue 26 Pratt & Whitney J75 P5 Engines comprise the Interim Power Plant.

b) A package containing 4 "Semi-Submerged" Sparrow II Missiles (432 lb each) is currently carried.

c) Preliminary Weight Estimates for the R.C.A. Astra I Radar System are now available and are included here together with other allied changes. The Douglas Missile Control System is superseded by Astra I. (Total Weight of the R.C.A. System = 2,731.5 lb + 118.5 lb additional Antennae Avro installed = 2,850 lb.).

1. STRUCTURE

(a) Wing:

The entire Wing has been re-estimated, largely to production drawings with the following results:-

	WEIGHT (lb)	
Elevator - Actual Weight obtained	+	9
Omission of 'Marry-Up' hardware	+	11
Relatively recent redesign of 'Marry-up'	+	9
I/W Structure M/S to R/S - This structure was underestimated and has increased as follows:		
Hardware estimated in detail	+	94
Machined Skins & Doors	+	3
Ribs # 1 to # 10	+	7
Internal Structure details	+	60
Fuselage Strut Pick-ups - some omissions	+	26
C/L Joint I/W - Re-estimate of Centre Joint (excluding transfer of thrust mounting to this report)	+	22
Fuselage to Wing Joint - Re-estimated completely	+	19
Stainless Steel seal added at Fus. Side Rib	+	14
Dorsal Fairing - Previously allowance only, no details	+	13
I/Wing Spars - completely re-estimated	-	11
I/Wing Structure for Main U/C - All attachments underestimated	+	53
Bushings & Bearings Main Pivot	+	28
Main U/C Uplocks - omitted	+	14
Transport Joint O/W to I/W - Allowances made on both Rib #10 and # 12 for buttstraps, other alterations to hardware etc.	-	48
Fairing at Transport Joint allowance was too low	+	18
Leading Edge I/W - Previous allowance was too high	-	15
Structure fwd. M/Spar - Tanks # 3 & 4, internal structure was largely omitted.	+	60
Addition of 2 point refuelling door	+	18
Fixed Structure pivot door was largely omitted	+	45
Miscellaneous changes joints etc.	+	2

continued.

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INTRODUCTION

1. STRUCTURE

a) Wing (Cont'd.)

	WEIGHT (lb)
Elevator Control Box - Production Drawing estimates	+ 5
O/W Leading Edge - Marry-up to F/Spar omitted	+ 5
Allowance was previously too low	+ 30
O/W Skins - Re-estimate of skins, stringers etc.	+ 11
O/W Ribs - Completely re-estimated	+ 13
Aileron Control Box - Production Drawing estimates - too high an allowance for stiffeners, hardware etc.	- 14
O/W Spars - some redesign & refinement of estimate	+ 5
Aileron Marry-up - some redesign & re-estimate	+ 7
Aileron - completely checked - skins underestimated	+ 15
Miscellaneous other changes I/Wing & O/Wing	- 13
Weight Change Increase	+ 515

Ref. 002-1-5

b) Fin & Rudder

Fin - Miscellaneous changes to Production Drawings	+ 4
Weight Change Increase	+ 4

Ref. 002- 6

c) Fuselage to Sta. 255"

Pilot's Canopy - Production Drawings details plus installation	+ 7
Navigator's Canopy - Production Drawings details plus installation	+ 3
Canopy Arches - Production Drawing estimates, steam outlets added etc.	+ 11
Formers & Bulkhead Sta. 255" - many small Production Drawing changes, slinging fittings included (see also C.F.)	+ 11
Intake Ramp - Redesign - previously boundary layer bleed unsatisfactory etc.	+ 110
Nose U/C Structure - Pivot bolts & attachs. now in Nose U/C Group	- 4
Lower Longerons F.F. - many small design changes	+ 15
Weight Change Increase	+ 153

Ref. 002- 6

d) Fuselage Sta. 255" - 485":

Slinging Fittings - These are part of Bulkhead 255" assy. in the Front Fuselage	- 9
Armament Bay Roof - addition of Mounting Brackets etc.	+ 4
C.F. Skins - Aft of 469 now .04 Al. was Mg., Access Door added, wing side rib sealing clips added, alterations to splices Sta. 469 etc.	+ 10

Continued.

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INTRODUCTION

1. STRUCTURE

d) Fuselage Sta. 255" - 485": (cont'd.)

	WEIGHT (lb)
Formers - miscellaneous Production Drawing changes	+ 3
Dorsal Fairings, Equipment Bay, Radar Bay etc. - All estimated to Production Drawings	+ 10
Air Intake Ducts - Actual weight obtained	- 2
Weight Change Increase	+ 16

Ref. 002-7-8

e) Fuselage Sta. 485" Aft.

Duct Bay - Mounting Brackets D.B. - addition of equipment mounting brackets	+ 5
Formers D.B. - redesign of many lower formers & centre beams, all production estimates now, previously many were Non Stress approved schemes.	+ 22
Lower Panel D.B. - Redesign Heat Exchanger Mounting (including 3 lb allowed for previously in equipment)	+ 8
Diaphs., Intercostals, Stiffiners etc.	+ 6
Longerons D.B. - Production Drawing estimates	+ 7
Duct D.B. - Some extensive redesign of Gill doors, torque boxes, pressure seals etc. see weight change sheets for details	+ 61
Dive Brakes D.B. Re-estimate of main lever & bush	+ 2
Engine Bay - Heavy Formers - I/B & O/B rail supports added were in Engine Group	+ 17
Miscellaneous design changes	+ 6
Intermediate Formers - Redesign, heavier gauge webs and lower booms	+ 17
Light Former - Production Drawing estimates	+ 6
Longerons - fuller information available	+ 6
Torque Boxes - completely re-designed	+ 28
Service Access Doors - No. 4 panel larger - re-estimate	+ 10
Production estimate of surround structure	+ 5
Engine Access Doors - completely redesigned	+ 56
Skins - skin splices & manifold added	+ 9
hardware detailed	+ 12
Engine mounting access door	+ 4
Tunnel - increased gauges lower shroud etc.	+ 14
Angle seal attach. added aft.	+ 4
hardware etc. detailed	+ 12
Beam Shroud attach. - gauge increases	+ 3
Pressure vents (partly with skins)	+ 10
Insulation more details, lighter fastener	- 10
Miscellaneous Structure - Mounting Brackets estimate not included elsewhere	+ 9

continued.

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INTRODUCTION

1. STRUCTURE

e) Fuselage Sta. 485" Aft. (Cont'd.)

	WEIGHT (lb)
Removable R.F. - Nacelles - Completely estimated to Production Drawings, gauge increases to formers etc.	+ 15
Fixed R.F. - Minor changes to formers, tunnel etc.	+ 3
Weight Change Increase	+ 347
Ref. 002-9-13	
TOTAL STRUCTURE WEIGHT INCREASE	+ 1,035

2. LANDING GEAR

Main Undercarriage - Increase in Weight Goodyear wheels	+ 8
Increase in leg assy. quoted by Dowty	+ 86
Actual Weight of leg assy. further increase	+ 9
Main U/C Doors & Fairings - Production Drawing estimates	+ 7
Nose Undercarriage - Actual Weight of Jarry supplied parts	+ 11
Actual Weight of Dowty liquid spring	+ 3
Pivot bolts added - see Structure	+ 4
Nose U/C Door & Fairing - redesign of ends of Fairing & Door	- 1
Main U/C Hydraulics - now in Utilities Main System - Equip. Group	- 285
Nose U/C Hydraulics - now in Utilities Main System - Equip. Group	- 99
TOTAL LANDING GEAR DECREASE	- 257
Ref. 002-13	

3. POWER PLANT & SERVICES

Accessories Gear Box (Fuse. & Engine Installations) - Weights obtained from Sargent (manufacturer) for the first time. Installation estimates are to Production Drawings	+ 170
Deareator tanks (transferred from Equip.)	+ 6
Starters etc. installation allowance too high	- 4
Engine Mounts - Duplication of rail aft 742.5"	- 9
Rail supports now on E.B. Heavy Formers	- 13
Engine Mounting Accessories on Engine - Production Drawing estimates	- 5
Engine Anti-icing - Ice detectors & Wiring (in Electrics)	- 5
Production Drawing estimates Fairings & Struts	+ 7
Fuel System - Addition of Fuel Oil Heat Exchanger & installation (was in Equip. Group)	+ 85
Manufacturer's Weight of Fuselage Bag Tanks	+ 11
Flow Proportioner Unit - Manufacturer's & Spec. Weights	- 6
Piping, capacitors etc. etc.	- 12

continued.

INTRODUCTION

3. POWER PLANT & SERVICES (Cont'd.)	WEIGHT (lb)
Engine & Service Accessories - Thermo Couples deleted - these are integral with Engine	- 10
Alternator Drive Oil now in Op. Load	- 5
H/Exch. Exhaust Duct part of Engine installation (was in Equip. Group)	+ 6
Engine Can, Fairing etc. Production Drawing estimate	+ 18
Air-bleed outlet - on engine - allowance was previously with Structure E.B.	+ 4
Adaptor Ring design changes	- 3
Addition of lines for oil pressure filler, Nozzle air injection, oil breather pipes etc. - some items were previously installed by Pratt & Whitney.	+ 29
TOTAL ENGINE GROUP INCREASE	+ 264

Ref. 002 14-15

4. FLYING CONTROLS GROUP	
Mechanical Flying Controls - Steel links replace Al. for Elevator, Aileron & Rudder Controls	+ 65
Auto Pilot Tie-in - Integral part of Astra I System in future, included in Equip. Group	- 108
Dive Brake Hydraulics - considered part of Utilities Hydraulics not Flying Control Hydraulics, hence transferred to Equip. Group (see Hydraulics D.B.)	- 41
Flying Control Hydraulics - completely re-estimated to Production Drawings.	
Heat Exchangers added (see Equip.)	+ 11
Filter Assys. - actual weights	+ 15
Elevator Jacks - actual weights	- 11
Aileron Jacks - actual weights	- 2
Rudder Jacks - actual weights	+ 3
Ground Service connections - Actual Weights	+ 4
Jack Support Bracket for Rudder in Fin Struct.	- 4
Aileron jack attach. bracket in O/Wing Struct.	- 7
Specification Weights of Servos	+ 4
Piping & miscellaneous equip. changes.	+ 19
TOTAL FLYING CONTROL DECREASE	- 52

Ref. 002-16

5. EQUIPMENT GROUP

Note: Preliminary information is now available on the weights of R.C.A. Astra I Radar System. Comparisons are made below to Hughes MX 1179 System.

Continued.

INTRODUCTION

5. EQUIPMENT GROUP (Cont'd.)

		WEIGHT (lb)
Radio & Radar Fixed -	Decrease in cables, mountings etc.	- 55
	Addition of Antennae etc. not R.C.A. supplied	+ 118
Radio & Radar Removable -	Weights of units of Astra I ✱	+ 428
	(N.B. ✱ It should be noted here that 108 lb of Auto Pilot Tie-In were previously included in the F/Controls Group. Therefore actual increase in units is 320 lb)	
Surface Finish -	Aircraft to be painted with 1 coat etch primer 1 coat chromate primer and 2 thin coats of white finish.	+ 78
	Allowance for small quantity of skin filler	+ 22

Sparrow Missile Pack has been completely re-evaluated with the following results, compared to Weight allowances that were previously recorded.

Sparrow Pack Structure -	Estimate to initial schemes (the figures here include 106 lb Sealing.)	- 50
Sparrow Pack Mechanisms -	Previous figure unrealistic - based on 60" launchers etc., these are now 150" and mechanism is redesigned.	+ 300
Sparrow Pack Hydraulics -	Re-evaluation of redesigned system	- 155
Sparrow Pack Electrics -	No previous allowance	+ 64
Electrics for Sparrows -	In basic aircraft, provision for pack	+ 3
Intake De-icing -	Increase due to redesign of Ramp	+ 3
Alternator System -	This remains a 30KVA System with J75 Engines, however, an Emergency Pack has been added.	+ 20
Canopy Actuation -	some redesign of system and actual weights of parts obtained; emergency operation added	+ 8
Windscreen Demisting -	re-evaluated to latest information	+ 4
Low Pressure Pneumatics & Fin Pitot -	estimate to Production Drawings	
	Addition of Pressure Ratio Transducers	+ 16
	Other details of piping etc.	- 6
Air-Conditioning -	Stress approved schemes of exhaust ducts	+ 5
Oil & Hydraulic Fluid Cooling -	some items from this report are now included with their relevant systems	
	Deareator tanks - see Engine Group	- 6
	H/Exch. Mounting allowance - see D.B. Struct.	- 3
	Oil in Exchangers - see Operational Load	- 20
	Fuel Oil Exchanger System - see Engine Group	- 39
	H/Exch. Ducts - see Engine Group	- 5
	Piping allowances deleted - see other groups	- 35

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INTRODUCTION

5. EQUIPMENT GROUP(Cont'd.) — WEIGHT (lb)

Utility Hydraulics - completely re-estimated including Dive Brake, Nose & Main U/C Hydraulics. Total Weight was 657 lb now 588 lb i.e. - 69 lb per Aircraft.

Piping etc. in Wings was overestimated from diagrammatic sketches	- 80
Structure for mounting U/C Door & Gear Jacks is already included in I/W Structure	- 20
Piping etc. in Fuselage underestimated particularly in C.F. & D.B.	+ 55
Installation 80 cu. in. Accumulator was overestimated	- 5
Dive Brake Installation - piping too high allowance	- 5
Installation 200 cu.in. Accumulator - far too high allowance was made - no information	- 43
Pressure Regulator D.B. - no allowance previously	+ 6
Installation of Pumps - target weight reduced	- 4
Many small alterations to valves etc.	+ 4
Total	- 69

However, this section due to transfer of items shows an increase in weight of 588 - 231 (Weight of Utilities System previously) + 357

WEIGHT INCREASE EQUIPMENT + 1,052

Ref. 002-17-20

6. OPERATIONAL LOAD

Oil Usable & Trapped - completely re-estimated; all Oil for Engine and Gear Boxes now included here, previously some was included in Equipment and some in Engine Group. Since 24 lb was transferred from elsewhere Weight change per aircraft is actually 21 lb. + 45

Water for Air-Conditioning - previously water was considered only for special high altitude missions, however, apparently it is a requirement for all missions. The max. for Mach 2 is recorded here + 125

TOTAL OPERATIONAL LOAD INCREASE + 170

Ref. 002-20

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INTRODUCTION

SUMMARY

Weight Change - Aircraft Weight Empty

Structure	+ 1,035 lb.
Landing Gear	- 257 lb.
Power Plant	+ 264 lb.
Flying Controls	- 52 lb.
Equipment	+ 1,052 lb.
	+ 2,042 lb.

Weight Change - Operational Load Less Fuel

Oil	+ 45 lb.
Water	+ 125 lb.

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

Issue # 26	Issue # 27	
44,316	46,528	= + 2,212 lb.

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WEIGHT CHANGES TO 7-0400-05 ISSUE 26
of May 1st, 1956

WEIGHT CHANGES

Wing:

+ 95.01	Structure for Main U/C - Completely re-estimated, previous allowances were unrealistic.		
	Side Stay Attachment		+ 27.54
	Aft Pivot		+ 14.66
	Jack Pick-Up		+ 2.16
	Main Pivot fitting		+ 8.74
	Bushings & bearings main pivot		+ 28.32
	Main U/C Up-locks - omitted		+ 13.69
			+ 95.01
- 15.22	I/W Leading Edge - Completely estimated to Production Drawings		
	An allowance for doublers at O/B end was carried - these do not exist		- 32.00
	Hardware - previous allowance too low		+ 1.42
	Cuff Assy.		+ 0.22
	Stiffeners - Allowance too low		+ 4.88
	Skins - Allowance too low		+ 20.02
			- 15.22
+ 144.51	I/W Structure F/S to M/S - Estimated mainly to Production Drawings.		
	Tanks # 3 & 4 early estimates omitted most of internal structure, trusses etc.		+ 59.97
	2 Point refuelling door added		+ 17.60
	U/C Door Up-locks - allowance was too low		+ 9.46
	Fixed Structure pivot door etc, included F/S Hardware 20 lb of which was deleted from F/Spar (see I/W Spars), largley omitted		+ 64.50
	Joint U/C Fitting L/E & F/Spar added here		+ 17.06
	Fuselage Side Rib - re-estimated		- 13.49
	Aux. Rib A/C C/L, Aux. Spar to Main Spar duplicated in C/L Joints.		- 8.50
	Aux. Spar & Joint to Fuselage side rib re-estimate		- 0.24
	Joint Aux. Spar to Front Spar		+ 1.11
	Joint Aux. Spar at A/C C/Line		+ 4.20
	Other Misc. Changes		- 7.16
			+ 144.51
- 2,581.21	I/W Structure M/S to R/Spar - Skins, ribs & Strut pick-ups are now in separate reports see below, however, remaining structure increased by + 59.64 lb due to underestimation of miscellaneous internal structure.		

continued.

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WEIGHT CHANGES TO 7-0400-05 ISSUE 26
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WEIGHT CHANGES

Wing:

+ 2,179.80	I/W Skins - This is a new report, Skins were in M/S to R/S Structure. The skins have been completely re-estimated to nominal thicknesses, since checked by Actual Weighings.		
	Machined skins - gauge changes	+	10.47
	Access Doors - decrease in gauge of pump doors etc.	-	7.66
	Hardware - previous allowances were far too low, now fully detailed	+	94.12
	Actual Increase in Skins	+	96.93
+ 517.56	I/Wing Ribs # 1-9 - New report were included in M/S to R/Spar Structure		
	Actual Weight Changes are as follows:		
	Rib.# 1 - Included hardware allowance and some strut. pick-ups etc.	-	13.14
	Rib.# 2 - redesigned machined fittings added	+	32.14
	Rib.# 3 - reinforced, capping etc. increased for duct pick-up	+	22.44
	Rib.# 4 - redesigned Aft Web .125 was .156 fwd. web .09 was .12, delete 5.8 lb former pick-up, too heavy hardware etc.	-	36.26
	Ribs. # 5 to 9 - Minor Changes	+	1.29
	Actual Changes	+	6.47
- 31.04	I/W Spars - Re-estimate of Main Spar	-	3.44
	Re-estimate of C/F, C/R, Front and Rear Spars	-	7.60
	F/Spar hardware now in F/S to M/S Structure.	-	20.00
		-	31.04
+ 55.68	I/W Fuselage Pick-Up Brackets - New Report, were included in M/S to R/S Structure.		
	Re-estimate of former pick-ups with Rib.#4.	+	1.72
	Re-estimate of Engine Mounting Pick-Ups	+	4.76
	Marry-Up bolts struts to fittings omitted	+	2.82
	Miscellaneous changes	-	4.02
	Duct Pick-Up brackets - omitted	+	11.96
	Strut Pick-Up at 538.77 - omitted	+	9.02
	Actual Changes	+	26.26

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WEIGHT CHANGES TO 7-0400-05 ISSUE 26
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WEIGHT CHANGES

Wing:

- 347.97	Joints I/W - Delete joint to Fuselage - now separate report see below	- 146.70	
	Re-estimate of C/L Joint including thrust mounting which was in M/S to R/S Structure.	+ 38.13	
	Delete Trans. Joint allowance and Rib.# 10 - now considered separately below	- 239.40	
		- 347.97	
+ 110.44	Rib.# 10 - New report - was included in Wing Joints - see above, completely re-estimated - actual increase	+ 0.44	
+ 179.38	I/W Hinge Joint to Fuselage - New report was in Wing Joints - see above		
	Stainless Steel Seal added at Fus. side Rib.	+ 14.25	
	Hardware allowance was too low	+ 4.58	
	Wing to C.F. Joint - omitted	+ 8.76	
	Joint Aft of R/Spar - omitted	+ 7.70	
	Miscellaneous changes	- 2.61	
	Actual Change	+ 32.68	
+ 29.30	Elevator - An Actual Weight was obtained	+ 9.33	
	Recent addition of adjustment plates etc.	+ 4.52	
	Recent addition of links at attach.	+ 4.00	
	Omission of superseded design Marry-up	+ 11.45	
		+ 29.30	
+ 4.84	I/W Elevator Control Box - Re-estimate some Actual Weights	- 1.34	
	Joint of Centre Box was omitted	+ 6.18	
		+ 4.84	
- 2.39	I/W Structure Aft R/Spar - entirely re-estimated, mainly to Production Drawings.		
+ 57.64	I/W Dorsal Fairing - New report was included with Wing Fairings below. Complete re-estimate to Schemes, previous allowance was 45 lb., hence actual increase	+ 12.64	

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WEIGHT CHANGES

Wing:

+ 99.81	Transport Joint I/W to O/W - Previously titled Wing Fairings		
	Aileron Link fairings now called up with Airleron Marry-up (see below)		- 16.80
	Delete Fairings at Dorsal area (see above)		- 45.00
	Complete re-estimate of Transport Joint	✱	- 143.61
	Fairing at Joint - previous allowance too low		+ 18.00
			+ 99.81

✱ It should be noted here that 71.10 lb butt straps were allowed on Rib.# 12 O/Wing (now deleted - see below) also 121.0 lb on Wing Joints (see above) hence actual decrease of -48.49 lb on complete Transport Joint.

- 69.54	O/W Rib.# 12 - Delete butt straps and hardware now included in Transport Joint (see above)		- 71.10
	Miscellaneous Changes to Production Drawings.		+ 1.56
			- 69.54
+ 125.21	O/W Skins - Completely re-estimated to Production Drawings		
	Addition of stringers (see below)		+ 104.52
	Addition of Attach. to ribs (see also O/W Ribs.)		+ 13.90
	Addition of Hoist fittings		+ 2.32
	Correction to D.O. errors in hardware call up etc.		+ 4.47
			+ 125.21
- 100.27	O/W Posts & Intercostals - this report used to contain stringers now called up with skins		
	Removal of Stringers (see above)		- 97.85
	Re-estimate of Posts		- 1.15
	Re-estimate of Intercostals		- 1.27
			- 100.27
- 11.68	O/W Ribs - Drawings checked to latest Production Issues.		+ 12.68
	Removal of Aileron Jack fitting (see below)		- 10.46
	Skin Attach. now with skins		- 13.90
			- 11.68

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WEIGHT CHANGES

Wing:

+	10.46	Aileron Jack Fitting - New report was previously included with Ribs (see above)	
+	34.56	O/W Leading Edge - Marry-Up to F/Spar omitted	+ 4.59
		Estimated entirely to Production Drawings, previous estimate to early schemes	+ 29.97
			+ 34.56
-	14.18	O/W Aileron Control Box - completely checked to Production Drawings, too high an allowance was previously made for stiffeners and hardware.	
+	5.24	O/W Spars - Spar joints to Rib # 12 omitted	+ 3.20
		Production Drawing estimate of Main Spar	- 6.82
		Production Drawing estimate of C/Spar fwd.	+ 4.36
		Decrease in caps of F/Spar	- 2.89
		Production drawing estimate of C/Spar aft.	+ 1.78
		Rear Spar hardware allowance etc. too low	+ 5.61
			+ 5.24
+	5.96	Aileron - Completely checked, skins were underestimated, many actual weights of parts etc.	+ 14.92
		Marry-up bolts now included separately	- 8.86
			+ 5.96
+	32.93	Aileron Marry-Up - New report includes all bolts and fairings above allowances for which were too low	
+	514.83		

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WEIGHT CHANGES

Fin & Rudder

+ 4.22	Fin - Changes to jacking supports and provision for rudder feel and trim	+ 5.87	
	Miscellaneous change to Production Drawings	- 1.65	
		+ 4.22	
+ 4.22			

Front Fuselage (Fwd. Sta. 255")

+ 7.14	Pilot's Canopy - Detailed estimate to Production Drawings of Canopy and attachments - previously some schemes used.		
+ 3.47	Navigator's Canopy - Installation of attach. bolts to longerons.		
+ 0.41	Windscreen - details of installation		
+ 10.51	Canopy Arches - Entirely re-estimated to Production Drawings.		
	Addition of steam outlets	+ 3.00	
	Addition of switch box	+ 0.49	
	Detailed estimate of hardware	+ 3.39	
	Alterations to some gauges of stiffeners etc.	+ 3.63	
		+ 10.51	
+ 4.95	Formers F.F. - General revisions to angles, doublers etc. on re-issued Production Drawings		
+ 5.54	Bulkhead Sta. 255 - Production Drawing estimate including slinging fittings (see also Centre Fuselage)		
+ 110.05	Intake Ramp - Fwd. of Sta. 201" Structure has been entirely redesigned due to unsatisfactory boundary layer bleed etc.		
- 3.69	Nose U/C Structure - Pivot bolts etc. for assy. of U/C to structure now with U/C see Landing Gear Group.		
+ 14.80	Lower Longerons - Many small design changes to Production Drawings since last scheme estimate was made.		
	Lower Longeron Left Hand	+ 7.74	
	Lower Longeron Right Hand	+ 7.06	
		+ 14.80	
+ 153.18			

Date: December 1st, 1956
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Report # 7-0400-05
Sheet # 002-7 Issue 27
Prepared By: K. Griffin
Checked By: E. Burnett

WEIGHT CHANGES TO 7-0400-05 ISSUE 26
of May 1st, 1956

WEIGHT CHANGES

Centre Fuselage (Sta. 225-485)

-	9.57	Slinging Fittings - These should not have been included in the C. F. since they are part of Bulkhead Sta 255" assy. F.F. and are now included there.	
-	2.02	Radar Access Door - General re-estimate to Production Drawings. Reduction in weight of fastener allowance, Kaylocks replace AN Nuts etc.	
-	2.26	Duct C.F. - Actual weights of Production Aircraft ducts were obtained.	
+	3.45	Formers - Misc. minor Production Drawing changes.	
+	0.79	Sealing Missile Bay - Production Drawing estimate	
-	7.95	Integral Fuselage Tank - Dorsal Angles and Buttstraps. now called up on C.F. Skins	- 13.32
		Addition of Toggle attach. Stiffeners	+ 2.58
		Misc. Production Drawing changes	+ 2.79
			- 7.95
+	0.60	Dorsal Deflector - Shield estimate to Production Drawings	+ 3.19
		Fuse. attach. now with skins	- 2.59
			+ 0.60
+	79.89	C. F. Skins - Completely re-estimated to Production Drawings	
		Stringers now called up on skins (see below)	+ 51.73
		Skins 469" Aft .04 Al. were Mg.	+ 2.31
		Addition of Access Door Aft Sta. 458"	+ 2.15
		Addition of Wing Side Rib Sealing Clips etc.	+ 2.47
		Addition of Dorsal Angle, Longeron etc. (see C.F. Tank)	+ 13.32
		Addition of Steel insert aft end	+ 0.74
		Sta. 469", alterations to splices etc.	+ 7.17
			+ 79.89
-	51.73	Stringers C.F. - Report deleted, now called up with C.F. Skins (see above)	
-	0.49	Dorsal 268" - 317" - Mostly to Production Drawings, redesign of aft end.	
-	1.49	Dorsal Fairings over Fuel Tank - Production Drawing estimates Weight changes due to refinement.	

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WEIGHT CHANGES TO 7-0400-05 ISSUE 26 of May 1st, 1956

WEIGHT CHANGES

Centre Fuselage (Cont'd.)

+	2.13	Equipment Bay Structure - Access Door added on I/Skin	+	0.38
		Addition of cross Strut Sta. 292"	+	1.33
		Addition of Turbine Mounting Brkt.	+	0.42
			+	2.13
-	4.38	Longerons C.F. - Production Drawing estimates		
		Alterations to End Fittings Top Outer Longeron	+	0.82
		Deletion of hardware allowance on Lower Longerons - hardware called up on Skins	-	5.20
			-	4.38
+	3.64	Armament Bay Roof - added equipment, brackets etc.	+	2.40
		Minor alterations to floor	+	1.24
			+	3.64
+	4.20	Structure below Lower Longeron - Production Drawing estimates of panels in Radar Bay many small changes		
+	1.45	Bulkhead Sta. 485" * - Revision to re-issue of Production Drawings	+	3.52
		Stabilizers at Stringers # 13 & 15 now on Skins	-	2.07
			+	1.45
+	16.26			

* Although Bulkhead Sta. 485" was previously always considered to be in the C.F. for the Weights Component breakdown, in Summaries up to Issue 26 the Bulkhead was included with the Duct Bay at Stress Office request. Now, however, it will be transferred to the C.F. as it is called up and assembled with this component. This results in a further apparent increase in the C.F. of + 109.84 lb and a corresponding decrease of -109.84 lb in the Aft Fuselage - in the Weight and C.G. Summary only.

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WEIGHT CHANGES TO 7-0400-05 ISSUE 26
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WEIGHT CHANGES

Aft. Fuselage (Sta. 255" Aft.)

+	7.26	Longerons D.B. - Production Drawing estimate, alterations to extrusion since last estimate	+ 4.74
		.072" thick plate has been widened	+ 0.58
		Detailed estimate of hardware	+ 1.94
			+ 7.26
+	0.21	Dive Brake Accommodations - Addition of Mounting Brackets to decking.	
+	1.96	Dive Brakes - Re-estimate of main lever and bushing	
-	0.16	Longitudinal Beams D.B. - Re-issue Production Drawings fore and aft beam	
+	2.13	Mounting Brackets Side Panels D.B. - new report to cover misc. mounting brackets for Air-Conditioning etc.	
-	5.00	Stringers D.B. - This allowance is now absorbed in the lower panel assy. Weight.	
-	24.37	Skin D.B. - Lower Panels removed and included with lower panel assy.	- 25.64
		Misc. changes due to detailed information	+ 1.27
			- 24.37
-	69.99	Formers D.B. - Now side members only, for convenience all lower beams and formers are now included in a separate report	
+	76.06	Formers Lower Panel D.B. - New report, these formers include some items previously designated on schemes as heat exchanger mountings. Actual increase in formers (20 off) is	+ 22.39
+	62.85	Lower Panel D.B. - New report to include all mounting brackets, intercostals, diaphs. etc.	
		Addition of equipment mounting brackets	+ 3.14
		Redesign of heat exchanger assy.	+ 8.39
		Diaphragms, intercostals, stiff.etc.	+ 6.95
		Actual Increase	+ 18.48

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Report # 7-0400-05
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Checked By: E. Burnett

WEIGHT CHANGES TO 7-0400-05 ISSUE 26
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WEIGHT CHANGES

Aft. Fuselage (Cont'd)

+	60.83	Duct D.B. - Production Drawing estimates have now been made, incorporating many design changes. .051" Al. aft skin now spliced at Sta. 540.2" was at Sta. 545.35	+	2.04
		Addition Splice ring & packing at 540.2"	+	4.00
		Splice Strap at Sta. 510.4 .04 Al. was .032"	+	0.47
		Gill Doors redesigned	+	12.34
		Attach. struts heavier fork ends etc.	+	4.80
		Side Torque boxes and attach. beams - redesign end fittings, pick-ups etc.	+	14.37
		Pressure Seal - increase in brackets, retainer CSE772 was CSE639, extruded lower seal added etc.	+	6.08
		Addition of Spring Retainers for Door	+	0.91
		Addition of ⊓ Stiffs. near side torque boxes	+	1.62
		Redesign of aft Torque Box - larger cross section etc.	+	8.92
		Increase in number of diaphs; gussets added etc.	+	5.28
			+	60.83
+	4.55	Longerons E.B. - Estimated now to Production Drawings previous estimate made to incomplete information on splice plates, finger plates etc.	+	6.55
		Delete hardware allowance now with skins	-	2.00
			+	4.55
+	0.07	Top Longerons E.B. - Production Drawing estimate		
+	27.66	Torsion Box E.B. - Some redesign, estimates now made to Production Drawings; the previous allowance made was too low.		

continued.

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WEIGHT CHANGES

Aft Fuselage (Cont'd.)

+	15.14	Service Access Doors E.B. - Production Drawing estimates		
		No. 4 panel increased in size	+	3.49
		Beam I/B Longeron omitted	+	2.32
		Increase in hinges etc, some now called up here that were with Engine Doors	+	4.55
		Estimate of structure for Doors # 3 & 4 (includes 4.49 lb of structure at press vents # 7 & 8 See also Tunnel)	+	4.78
			+	15.14
+	56.42	Engine Access Doors E.B. - Engine Access Doors # 1 & 2 have been completely redesigned at R.C.A.F's request.		
		Engine Door # 1	+	34.00
		Engine Door # 2	+	23.80
		Surround Structure Door # 1	+	4.00
		Hinges now with Torsion boxes etc.	-	5.38
			+	56.42
+	6.48	Light Formers E.B. - Production Drawing estimates of formers	+	4.68
		Splices at Longerons now included	+	1.80
			+	6.48
+	58.08	Skins E.B. - Completely estimated to Production Drawings		
		Skin splices & Manifold access hole added	+	8.61
		Skins - more details cut-outs etc.	-	2.87
		Hardware allowance was too low	+	11.54
		Pressure Vents added here (see Tunnel)	+	21.56
		Engine Mounting Access Doors (See Intermediate Formers)	+	8.77
		Air Bleed Outlet (see Tunnel)	+	6.97
		Misc. Production Drawing changes	+	3.50
			+	58.08
+	11.76	Intermediate Formers E.B. - Redesign and re-estimate of formers 712.34, 717.36 & 663.65 Webs .064 were .04, lower booms .125 were .064 etc.	+	16.59
		Wing Attach. Brackets 712.3 & 717.3 now called up with Engine Mtg. Access Door (see skins)	-	4.83
			+	11.76

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WEIGHT CHANGES

Aft. Fuselage (Cont'd.)

+ 1.30	Tunnel Fixed R.F. - Addition of stops on I/B Rail	
+ 15.18	Nacelles R.F. - Completely estimated to Production Drawings incorporating some design changes and increases in former gauges since last scheme drawing estimates were made.	
+ 346.95		

Landing Gear Group:

+ 103.38	Main Undercarriage - Wheels increase in Weight (Goodyear)	+ 7.60
	Dowty Increase in leg Assy.	+ 86.50
	Actual Weight Dowty parts by Avro resulted in further increase	+ 9.28
		+ 103.38
- 284.84	Main U/C Hydraulics - now included with Main Hydraulic System - see Equip. Group	
+ 7.04	Main U/C Doors & Fairings - Completely re-estimated to Production Drawings	
+ 18.34	Nose U/C - Actual Weights of Jarry supplied parts	+ 10.55
	Actual Weight of Dowty liquid spring assy.	+ 3.13
	Pivot added- previously included in the basic structure	+ 4.66
		+ 18.34
- 1.38	Nose U/C Door and Fairing - Fairing links now with U/C	- 0.84
	Redesign of Fairing end	- 0.44
	Door addition of angles etc.	+ 0.90
	Jack pick-up fitting on door	- 1.00
		- 1.38
- 99.55	Nose U/C Hydraulics - now included with Hydraulic Main System - see Equip. Group	
- 257.01		

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Prepared By: K. Griffin
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WEIGHT CHANGES TO 7-0400-05 ISSUE 26
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WEIGHT CHANGES

Power Plant & Services

+	87.06	Accessories Gear Box Fuselage - There has been a considerable increase in weights supplied by Sargent, previously 150 lb was allowed for the engine installation - this report now contains only that part mounted on the fuselage (237.06 lb). Deareator tanks (6 lb) have been transferred from Oil & Hydraulic Fluid Cooling report.		
+	98.18	Gear Boxes & Starters on Engine - This report previously only contained the Starters now includes that part of the Gear Boxes which is mounted on the Engine (includes re-estimate of piping for Drives 10 lb was previously allowed on Engine)		
-	77.30	Engine Mounts - Items included on Engine now in a separate report (see below)	-	55.53
		Duplication of rail aft Sta. 742.5 also included in R.F. Tunnel assy.	-	9.60
		Rail Supports now on Heavy Formers (see also Structure Sta. 485" Aft)	-	13.02
		Production Drawing estimates	+	0.85
			-	77.30
+	50.42	Engine Mounting Accessories - new report - see above completely re-estimated.		
		Housing assy. centre fitting redesign	+	3.36
		Engine Brackets (4) gauge decreases	-	1.93
		Bearings - type changed	-	3.57
		Roller bolts etc. more details	-	2.97
		Actual change	-	5.11
+	2.27	Engine Anti-icing - Ice detectors & wiring are included in electrics	-	5.00
		Production Drawing estimates of Fairings	+	4.19
		Production Drawing estimates of Struts	+	3.08
			+	2.27

continued.

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WEIGHT CHANGES TO 7-0400-05 Issue 26
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WEIGHT CHANGES

Power Plant & Services (Cont'd.)

+	152.38	Engine Service Accessories - New report for recording convenience including drives, pipes etc.		
		Oil Breather pipe - no allowance	+	2.14
		Nozzle Air Ejection primary no allow.	+	14.25
		Systems disconnect bracket and cover	+	3.47
		Altenator Drives (4.5 lb Oil now in Operational Load, 10 lb piping in Engine Gear Boxes (see above))	-	14.50
		Actual change	+	5.36
-	127.85	Engines - Constant Speed Drives now in Engine Accessories (see above)	-	138.50
		Addition of Pressure Oil Filler liners were previously installed by Pratt & Whitney	+	4.80
		Lower Engine Can attachement - re-design etc.	+	5.85
		Engine Can - increase in stiff. gauges etc.	+	9.46
		Adaptor Ring - Skin decrease .04 to .032 etc.	-	3.30
		Thermocouples - inclusive with Engine Weight	-	10.00
		Heat Exchanger Exhaust Duct - now part of Engine Assy. was with Oil & Hydraulic Fluid Cooling (see Equip. Group)	+	6.07
		Brackets Fire Can Support - no allowance	+	2.52
		Fairing - Production Drawing Estimate	+	0.38
		Oil Filler & Pressure Switch - with accessories (see above)	-	8.52
		Misc. changes packing etc.	-	0.39
		Air-Bleed outlet - that part of assy. on Engine added, was previously on Tunnel	+	3.78
			-	127.85
+	78.49	Fuel System - Addition of Heat Exchanger & Control Valves (see Oil & Hydraulic Fluid Cooling)	+	70.90
		Addition of Mtg. Casting for H/Exch.	+	6.90
		Revised Weight of Fuselage Bag Tanks	+	11.32
		Capacitor Units - actual weights	+	2.05
		Condensate drains - revised estimate	+	1.47
		Piping etc. excluding H/Exch. inst.	-	15.31
		Piping etc. H/Exch. inst. added (22.5 lb. was allowed in Oil & Hyd. Fluid Cooling - equip.)	+	7.09
		Flow Proportioners Unit - Mnfg.& SpecWts	-	5.93
			+	78.49
+	263.65			

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WEIGHT CHANGES TO 7-0400-05 ISSUE 26
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WEIGHT CHANGES

Flying Controls Group

+	65.00	Mechanical Flying Controls - Steel links replace Al. links for Elevator, Aileron & Rudder controls, due to difficulties encountered with bearings & expansion problems.	
-	41.00	Dive Brake Hydraulics - deleted from this group, now Integral part of Utilities System (see Equip.)	
-	12.01	F/C Hydraulics I/Wing - Elevator jacks, previous estimate was based on prototype jacks	- 10.98
		General piping changes etc.	- 1.03
			- 12.01
-	4.07	Rudder Hydraulics - Jack support bracket with Fin	- 3.76
		Jack & Linkage - actual weight	+ 2.58
		Piping etc. - Production Drawing estimate	- 2.89
			- 4.07
-	16.20	F/C Hydraulics O/Wing - Aileron jack attach. bracket duplicated - already in O/W Structure	- 7.25
		Filters & fluid - too high allowance	- 5.12
		Jacks - actual weight	- 2.48
		Misc. re-estimate to Production Drawings	- 1.35
			- 16.20
+	63.79	F/C Hydraulics Main System - Heat Exchangers added were with Oil & Hydraulic Fluid Cooling equip. group.	+ 11.30
		Filters - Actual weights, allowance too low	+ 15.22
		Ground Service Connectors - Actual Weight	+ 3.78
		Pumps, compensators etc.	+ 4.77
		Spec. Weights of Servos incorp.	+ 3.50
		Miscellaneous changes added piping D.B., flex hose replaces Al. tube etc. etc.	+ 25.22
			+ 63.79
-	108.00	Auto Pilot & Tie-in - Forms an integral part of the R.C.A. System and will in future be considered part of the Equipment Group see note ✱ in that Section.	
-	52.49		

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WEIGHT CHANGES

Equipment Group

+	3.22	Intake De-icing - Increase due to redesign of Intake Ramp.	
-	0.16	Oxygen System - Convertor - Manufacturer's Weight	+ 2.50
		Addition Manual Controls on Seat	+ 0.92
		Piping etc. on seats	- 0.58
		General piping re-estimates	- 3.00
			- 0.16
+	20.00	Alternator System - This is a 30KVA system, the weight increase is due to addition of an emergency pack.	
+	7.61	Canopy Actuation - Actual Weight of Martin Baker Jacks	+ 1.75
		Actual Weight of Sequence Valves	+ 0.94
		Plumbing now Steel was Al. & flexible tubing.	+ 2.42
		Miscellaneous changes links re-place shock absorbers etc.	+ 0.15
		Addition of Emergency Operation	+ 2.35
			+ 7.61
+	3.78	Windscreen De-misting - re-estimated, increase mostly due to cable weights.	
-	12.30	Fin Pitot System - Weights now included in Fin Structure and low pressure pneumatics.	
+	22.41	L. P. Pneumatics - addition of Pressure Ratio Transducers	+ 15.68
		Addition of Diff. Pressure Switch	+ 2.41
		Addition of Pitot lines, fin etc.	+ 7.28
		Cockpit windscreen press. seal pipes removed.	- 2.96
			+ 22.41
+	4.93	Air Conditioning - Stress approved Schemes of Exhaust ducts now estimated.	
-	108.00	Oil & Hydraulic Fluid Cooling - Various items are being called up with their respective systems and are removed from this report.	
		Fuel Oil Exchangers now in Fuel System	- 26.00
		Control Valves now in Fuel System	- 13.30
		Oil in Exchangers now in Op. Load	- 20.25
		Deareator tanks - see Engine Group	- 6.00

continued.

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WEIGHT CHANGES TO 7-0400-05 ISSUE 26
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WEIGHT CHANGES

Equipment Group(Cont'd.)

Oil & Hydraulic Fluid Cooling (Cont'd.)

H/Exchanger Mounting allowance - see D. B. Structure	= 2.90
H/Exchanger Ducts - see Engine Group	= 5.00
4 Air Oil Exchangers now with Flying Control Hydraulics & Main System, allowances were however too low and remaining 4 show an increase in weight over previous allowance for 8	+ 0.60
Piping Mountings etc. absorbed in various other reports	= 35.15
	= 108.00

- 231.00 Utility Hydraulics - This report is deleted and a new set of reports instituted (see below) incorporate Dive Brake, Main & Nose U/C Hydraulics as an integral part of Main Utilities System.

+ 85.35 Utility Hydraulics F.F. - New report see Introduction for explanation of weight changes (see also Landing Gear Group)

+ 43.33 Utility Hydraulics C.F. - New report - See above

+ 228.29 Utility Hydraulics D.B. - New report - See above

+ 73.28 Utility Hydraulics E.B. - New report - See above

+ 158.11 Utility Hydraulics I/Wing - New report - See above

* A Weight Breakdown has now been received from R.C.A. quoting preliminary weights of the Astra I System. This will merely be sub-divided into fixed and removable equipment - no attempt will be made at this stage to further sub-divide into various sub-systems, except for the Missile Auxiliaries to be housed within the Sparrow package, hence the following cancellation of detailed Radar reports temporarily until more information is available.

+ 1,078.60 Radio & Radar Removable - incorporates all units for the entire R.C.A. Astra I System, except the Missile Auxiliaries in the Missile Package.

continued.

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Checked By: E. Burnett

WEIGHT CHANGES TO 7-0400-05 ISSUE 26
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WEIGHT CHANGES

Equipment Group(Cont'd.)

+	62.94	Radio & Radar Fixed - Based on the weight breakdown from R.C.A. there is a weight decrease of	- 55.41
		Addition of Antennae not included in R.C.A. weight	+ 118.35
			+ 62.94
-	329.00	Radar Power Supplies - Report deleted - see note * above	
-	48.00	Radio Removable - Report deleted - see note * above	
-	15.00	Interphone - Report deleted - see note * above	
-	65.20	ARN 6 Compass - Report deleted - see note * above	
-	119.70	I.F.F. - Report deleted - see note * above	
-	70.00	OMNI-DME - Report deleted - see note * above	
-	68.00	Data Link - Report deleted - see note * above	
-	15.50	Flare-out Altimeter - Report deleted - see note * above	
-	48.00	Electronic Missile Control - Report deleted - see note * above	
+	3.14	Electrics for Sparrow Pack - New report for circuits in the Aircraft to the pack disconnects and pertaining to it.	
-	50.00	Sparrow Pack Structure - Completely re-estimated, previously only an allowance was made (Pack sealing absorbs 106 lb of the weight included here)	
+	300.32	Sparrow Pack Mechanisms - entirely re-estimated, previous figure was known to be unrealistic and was based on 60" launchers etc., these are now 150" long and mechanism has been entirely redesigned.	
-	155.46	Sparrow Pack Hydraulics - System completely redesigned since last estimate made. Previous system included 2 accumulators at 100 lb each that are now obselete etc.	
+	64.10	Sparrow Pack Electrics - New report for switches, relays, cable etc. installed within the pack.	

Continued.

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Sheet # 002-20 Issue 27
Prepared By: K. Griffin
Checked By: E. Burnett

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WEIGHT CHANGES

Equipment Group (Cont'd.)

+	128.00	Sparrow Pack Electronics - R.C.A. propose to house 178 lb of Missile auxiliaries & installation within the pack, previously only 50 lb of cable was allowed here.
+	100.00	Surface Finish - 1 coat etch primer, 1 coat chromate primer and 2 coats finish, plus allowance for skin filler.
+	1,052.09	

Operational Load:

+	34.02	Oil Usable - The trapped and usable oil for the Engine Oil System and the Gear Box Oil System has been completely re-estimated. Only allowances were previously carried, some in Oil Hydraulic Fluid Cooling (Equip. Group) some in Engine Installation with Drives (Engine Group) etc. Weight removed from other groups 34.50 lb.
+	11.29	Oil Trapped - See note above. Weight change per Aircraft for Total Oil System = (34.02 + 11.29 - 34.50 = + 10.81 lb.)
+	125.00	Water For Air-Conditioning - Now a requirement for all missions. Figure quoted is for Mach. 2.
+	170.31	
+	2,211.99	TOTAL WEIGHT CHANGES

Date: December 1st, 1956
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Report # 7-0400-05
Sheet # 003-1 Issue 27
Prepared By: J. Struik
Checked By: K. Griffin

WEIGHT AND C.G. SUMMARY

REF No.	DESCRIPTION	WEIGHT lb.	H. ARM ins.	V. ARM ins.
	STRUCTURE	18,087.08	565.39	137.29
1000000	Wing	9,989.07	643.60	141.93
2000000	Fin and Rudder	999.96	754.27	201.96
3000000	Fuselage Structure Fwd. 255"	2,390.47	187.41	129.61
	255" to 485"	1,672.37	378.59	129.82
	Aft. 485"	3,035.21	646.37	110.90
4000000	UNDERCARRIAGE - Up Position	2,604.33	488.72	134.65
4010100	Main Undercarriage	1,951.62	539.57	141.00
4010200	Main U/C Doors and Fairings	294.36	539.29	136.01
4020100	Nose Wheel Undercarriage	333.81	170.80	99.70
4020200	Nose U/C Doors and Fairings	24.54	162.24	88.23
5000000	POWER PLANT & SERVICES	13,718.53	656.23	120.23
5010000	Engines J75	12,222.03	666.05	119.76
5020000	Acc. Gear Box and Oil Lines	237.06	603.73	104.00
5030000	Engine Controls	29.19	377.46	118.91
5040000	Engine Gear Box and Oil Lines	150.18	610.55	96.37
5050000	Engine De-Icing	70.37	562.80	115.09
5060000	Fire Extinguishing System	70.52	701.99	127.72
5070000	Engine Mountings & Brackets	189.19	633.40	127.82
5080000	Fuel System	749.99	542.97	135.70
6000000	FLYING CONTROL GROUP	1,677.82	688.36	139.58
6010000	Mechanical Flying Controls	904.40	689.05	147.08
6000000	Flying Controls Hydraulics	773.42	687.56	130.81
	EQUIPMENT - FIXED & REMOVABLE	7,747.86	315.57	110.60
7010000	Instruments	53.30	153.98	140.27
7010003	Probe	23.00	9.74	108.00
7020000	Cockpit Pressure Sealing	5.00	186.00	130.00
7030000	Oxygen System	43.44	227.72	142.18
7040000	Air-Conditioning System	712.69	327.16	133.26
7050000	Hydraulics Main System	588.36	501.22	117.38
7070000	Cabin Insulation	11.91	179.24	130.00
7080000	Brake Parachute	69.69	784.88	131.17
7090000	Electrical System	958.34	402.76	116.20
7100000	Low Pressure Preumatics	39.01	478.47	127.28
7110000	Oil & Hydraulic Fluid Cooling	22.00	579.50	92.00
7120000	Intake De-Icing	85.84	206.52	118.79
7000000	Radio & Radar Fixed	671.35	230.67	108.98
7130000	Radome Anti-Icing	23.46	62.92	126.04
7160000	Canopy Actuation	54.41	222.04	154.40
7170000	Cabin Consoles	20.65	117.37	125.23
7180000	Radar Door Actuation	10.00	268.00	95.00
7190000	Surface Finish	100.00	591.52	140.20
8010100	Ejector Seats	186.00	201.10	136.25
8020000	Radar & Radio Removable	2,001.80	178.02	103.53
8050100	Sparrow Pack Structure	850.00	390.84	96.00
8050200	Sparrow Pack Mechanisms	625.32	376.67	99.22

continued.

Date: December 1st, 1956
Aircraft: C-105 With J75
P5 Engines as

Report # 7-0400-05
Sheet # 003-2 Issue 27
Prepared By: J. Struik

WEIGHT AND C.G. SUMMARY

REF. No.	DESCRIPTION		WEIGHT lbs.	H. ARM ins.	V.ARM ins.	C.G. POSITION % M.A.C.
	Equipment (Fixed & Remov.)(Cont'd.)					
8050300	Sparrow Pack Hydraulics		350.19	368.83	99.00	
8050400	Sparrow Pack Electronics		178.00	332.00	100.00	
8050500	Sparrow Pack Electrics		64.10	362.29	95.00	
	AIRCRAFT WEIGHT EMPTY		43,835.62	549.82	127.16	
9000000	USEFUL LOAD		18,717.18	515.79	136.87	
9010000	Crew		430.00	494.00	136.50	
9020000	Oil		130.39	609.19	117.17	
9050000	Alcohol For Radome De-Icing		22.00	93.00	138.00	
9060000	Engine Fire Extinuisher Fluid		25.00	730.00	129.00	
9070000	Residual Fuel		218.40	553.98	134.04	
9090000	Fuel For Combat Mission		16,025.00	539.18	142.35	
9030000	Missiles (Armament)		1,728.00	389.29	88.30	
9040000	Oxygen Charge		13.39	259.69	159.91	
9040006	Water for Air-Conditioning		125.00	268.00	132.00	
	Normal Combat Mission	U/C Up	62,552.80	539.64	130.07	28.63
		U/C Down		541.20	127.50	29.06
	Half Combat Mission Fuel 1,022 Gal. @ 7.8 lb/gal		8,012.00	540.80	139.55	
	Combat Weight (Half Combat Mission Fuel)	U/C Up	54,539.80	539.95	127.85	28.72
		U/C Down		541.73	124.90	29.21
	Operational Weight Empty	U/C Up	46,527.80	539.79	125.84	28.67
		U/C Down		541.88	122.38	29.25
	Operational Weight Empty (Less Missiles)	U/C Up	44,799.80	545.60	127.29	30.27
		U/C Down		547.77	123.69	30.87
	Maximum Internal Fuel 2,544 gal. @ 7.8 lb/gal.		19,843.00	538.88	144.32	
	A.U.W. Max. Internal Fuel	U/C Up	66,370.80	539.52	131.36	28.60
		U/C Down		540.99	128.93	29.00
	Max. External Fuel 500 gal. @ 7.8 lb/gal. and Drop Tank		4,226.00	522.34	60.64	
	A.U.W. Maximum Internal and External Fuel	U/C Up	70,596.80	538.49	127.13	28.31
		U/C Down		539.87	124.85	28.69

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WEIGHT AND C. OF G BY FUNCTIONAL COMPON

PROJECT C-105

	DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT
	FIXED EQUIPMENT GROUP	7000000		
	INSTRUMENTS	7010000		
59	INSTRUMENTS F F	7010001	52	5130
	PROBE SERVICES	7010003	51	800
106	NAVIG TABLE AND STOWAGE	7010004	52	200
				6130
3	COCKPIT PRESSURE SEALING	7020000	52	500
				500
	OXYGEN SYSTEM	7030000		
63	OXYGEN SYSTEM F F	7030001	52	2279
63	OXYGEN SYSTEM C F	7030002	54	2065
				4344
	AIR CONDITIONING SYSTEM	7040000		
65	AIR CONDITIONING SYSTEM FF	7040001	52	10259
65	AIR CONDITIONING SYSTEM CF	7040002	54	47483
65	AIR CONDITIONING SYSTEM DB	7040003	56	5260
65	AIR CONDITIONING SYSTEM EB	7040004	58	5199
66	WINDSCREEN DEMISTING	7040005	52	3068
				71269
	HYDRAULICS MAIN SYSTEM	7050000		
57	UTILITY HYDRAULICS F F	7050001	52	8078
57	UTILITY HYDRAULICS C F	7050002	54	4333
57	UTILITY HYDRAULICS D B	7050003	56	22829
57	UTILITY HYDRAULICS E B	7050004	58	7328
57	UTILITY HYDRAULICS I W	7050005	62	12861
57	UTILITY HYDRAULICS F F	7050006	91	457
57	UTILITY HYDR MAIN U C	7050007	92	2950
				58836
69	CABIN INSULATION	7070000	52	1191
				1191
	BRAKE PARACHUTE	7080000		
39	BRAKE PARACHUTE F F	7080001	52	239

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WEIGHT AND C. OF G BY FUNCTIONAL COMPON

PROJECT C-105

	DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	
60	FUEL VALVE CONTROL C F	7090602	54	1260	4
60	FUEL VALVE CONTROL D B	7090603	56	296	4
60	FUEL VALVE CONTROL I W	7090604	62	160	5
				1891	
	ENGINE SERVICES ELECTRICS	7090700			
60	ENGINE SERVICES F F	7090701	52	585	2
60	ENGINE SERVICES C F	7090702	54	365	4
60	ENGINE SERVICES D B	7090703	56	198	4
				1148	
60	CANOPY ACTUATION ELECTRICS	7090800	52	370	1
				370	
60	COCKPIT LIGHTING ELECTRICS	7090900	52	1614	1
				1614	
	FLIGHT SERVICES ELECTRICS	7091000			
60	FLIGHT SERVICES F F	7091001	52	1715	1
60	FLIGHT SERVICES D B	7091002	56	20	4
				1735	
60	FUEL CAPACITANCE	7091100	52	346	1
				346	
	FIRE DETECTION ELECTRICS	7091200			
60	FIRE DETECTION F F	7091201	52	405	1
60	FIRE DETECTION C F	7091202	54	750	4
60	FIRE DETECTION D B	7091203	56	289	5
60	FIRE DETECTION E B	7091204	58	417	6
				1861	
	STARTING AND IGNITION ELEC	7091300			
60	STARTING AND IGNITION F F	7091301	52	250	1
60	STARTING AND IGNC F	7091302	54	230	4
				480	
	ELECTRICAL WIRING	7091400			
60	ELECTRICAL WIRING F F	7091401	52	10313	1
60	ELECTRICAL WIRING C F	7091402	54	8261	3
60	ELECTRICAL WIRING D B	7091403	56	6420	5
60	ELECTRICAL WIRING E B	7091404	58	403	6
60	ELECTRICAL WIRING F IN	7091405	83	154	7
60	ELECTRICAL WIRING I W	7091406	62	1708	5
60	ELECTRICAL WIRING O W	7091407	64	114	6
				27373	

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WEIGHT AND C. OF G BY FUNCTIONAL COMPON

PROJECT C-105

DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT
62 SURFACE FINISH 2NTAKES	7190004	55	4082
62 SURFACE FINISH D B	7190005	56	3775
62 SURFACE FINISH E B	7190006	58	4436
62 SURFACE FINISH R F	7190007	59	6488
62 SURFACE FINISH FIN	7190013	83	6397
62 SURFACE FINISH RUDDER	7190014	84	2028
62 SURFACE FINISH AILERON	7190011	74	3537
62 SURFACE FINISH ELEVATOR	7190012	82	5667
62 SURFACE FINISH I W	7190008	62	31516
62 SURFACE FINISH O W	7190009	64	10677
62 SURFACE FINISH O W L EDGE	7190010	65	3196
			10000