

Date: February 1st, 1957
Aircraft: C-105 MK 2
Production A/C



72.113-57/02
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NON-CLASSIFIED
Report # 72-113-57/02
Sheet # 1 Issue 4
Prepared By: K. Griffin
Checked By: E. Burnett

INTRODUCTION

The following is a Weight and C.G. Summary of the C-105 MK 2 Production Aircraft. Of necessity the figures quoted herein are only of a preliminary nature, particularly in the case of the Rear Fuselage, Engine Installation and some systems which are being extensively redesigned.

Information has been based on the J75 MK 1 Aircraft with relevant changes made, sometimes to preliminary scheme drawings augmented by verbally received facts. Where no information has been available allowances have been retained as in the MK 1 Aircraft.

GENERAL:

- (a) Orenda PS 13 Engines comprise the Power Plant (4,500 lb each).
- (b) A package containing 4 "semi-submerged" Sparrow II Missiles (432 lb each) is currently carried.
- (c) The R.C.A. Radar Astra I System is installed - Weight and C.G. location data being to the latest breakdown received from them, dated November 5th, 1956. However, the Sparrow III auxiliaries included in the above breakdown have been deleted and some AVRO installed Antennae added (Total Weight = 2,681.75 lb.)

N.B. It should be noted that the 1st MK 2 Aircraft will not be as this summary designates, but will be a Flight Test version with Instrumentation replacing the Missile Package etc.

1. STRUCTURE

a) Wing:

C/L Joints I/W - Elevator jack fitting Al. not Steel as in MK 1

WEIGHT
lb.

- 31.90

Transport Joint I/W to O/W - this has been entirely re-estimated to MK 1 production drawings the hardware allowances were previously too high

- 7.66

There will be other changes to the Inner Wing, I/B Ribs, Centre Trailing Edge etc., associated with redesigned engine mounts etc., however, no details of these alterations are yet available and weight allowances will remain as in the MK 1 A/C.

WEIGHT DECREASE WING

- 39.56

b) Fin & Rudder

Fin - Addition of Dorsal Fairing angles

+ 3.96

AN 373 Nut plates replace K1100 (unavailable)

+ 4.59

Miscellaneous structure and hardware changes

+ 2.98

Rudder - Joint changes etc. as MK 1

+ 4.88

WEIGHT INCREASE FIN & RUDDER

+ 16.41

44265

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INTRODUCTION

1. STRUCTURE

N.B. In the MK 1 Structural Changes are made to the Wing, Fin & Control Surfaces to accommodate the possible necessity of installing a "Buzz Damping" System. These allowances will not be made on the MK 2 Aircraft until the requirements for Damping are confirmed, pending flight test of MK 1 A/C.

c) Fuselage Fwd. Sta. 255"

	<u>WEIGHT</u> <u>lb.</u>
Radome - an estimated weight of the laminate structure has been received from Zenith Plastics	+ 20.21
Radar Nose Structure - This will be entirely redesigned; the MK 1 Structure estimated to production drawings is approx. 200 lb. 180 lb will be allowed for MK 2 which will have a shorter shear panel, Mg. skins etc. This allowance is heavier than that previously carried by	+ 3.11
Shear Panel Aft Nav. Bulkhead - minor changes to MK 1 production drawings.	+ 1.84
<u>WEIGHT INCREASE FRONT FUSELAGE</u>	<u>+ 25.16</u>

d) Centre Fuselage Sta. 255" - 485"

Electronics Bay Structure - addition of Jury struts to side access doors	+ 0.50
Bulkhead Sta. 485" - Provisions for Drop Tank Mounting.	+ 12.22
<u>WEIGHT INCREASE CENTRE FUSELAGE</u>	<u>+ 12.72</u>

e) Rear Fuselage Sta. 485" Aft.

Structure for Mtg. Drop Tank - fore and aft centre beam added for mtg. requirements	+ 8.53
Skins E.B. - Side skin 717.36" to 742.5" .064 was .04 Al. Alterations to access door cut-outs & Engine mtg. door	+ 5.52
Light Formers E.B. - repositioning of doors etc. results in Former Sta. 663.65 new light former also some expected increases aft Sta. 697.28"	- 6.14
Intermediate Formers E.B. - 2 only at Sta. 729.86 & 735.98 were 3 at Sta. 663.65, 712.34 & 717.36	+ 12.27
Centre Beam Sta. 697.28 - 717.36 - not required for MK 2 A/C	- 13.40
Inner Longerons E.B. - includes structure which replaces the torsion boxes	- 5.09
Torsion Boxes - cancelled for MK 2 A/C	+ 33.07
Engine Access Doors E.B. - MK 1 doors were re-estimated, MK 2 doors are entirely redesigned and are of a lighter type but 15% larger, also inner skin .025 titanium in lieu of .016 Al. on MK 1, flappers added on Door # 2 etc. Weight allowance increase over that previously recorded	- 57.66
	+ 13.91

continued

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1. STRUCTURE

-e) Rear Fuselage Sta. 485" Aft. (Continued)

	WEIGHT lb.
Engine Rails - these are fixed in MK 2 A/C	+ 34.81
Engine Tunnel - All aluminum parts in MK 1 A/C are now titanium, shroud is longer (see also floating duct) there is no insulation blanket on upper shroud etc.	+ 96.73
Floating Duct D.B. - Complete redesign - no aft torque box structure etc.	- 60.04
Tunnel Fixed R.F. - gauge increase .025 was .020 titanium	+ 12.46
No rail guides or stops	- 8.46
Engine Access Doors R.F. - MK 1 production drawing estimates resulted in inner skin .025 was .020 titanium	+ 4.04
Nacelles R.F. - 7 $\frac{1}{2}$ " longer, new lines, Weight increased in proportion to increased length etc.	+ 29.00
<u>WEIGHT INCREASE AFT FUSELAGE</u>	<u>+ 109.66</u>
<u>TOTAL STRUCTURAL WEIGHT INCREASE</u>	<u>+ 124.39</u>

2. LANDING GEAR

No Weight Change

3. POWER PLANT & SERVICES

Engines - Fire Can not necessary for PS 13 Engines	- 107.46
Adaptor ring - redesigned	+ 28.89
Can attachments & supports deleted	- 10.97
De-icing control box added	+ 6.00
Fairing & packing deleted	- 10.67
Heat exchanger duct re-designed	+ 0.18
Engine Service Accessories - Bendix fuel control unit added	+ 120.00
Alterations to oil filler etc. etc.	- 13.88
Engine Mounts - preliminary estimates entirely re-designed	- 34.24
Engine Mounting Accessories - preliminary estimates entirely re-designed	+ 1.58
Engine Controls - currently assume as for J75 - these increased by	+ 1.78
Engine Nose Bullet - Bullet longer, but struts no longer required	- 0.37
Starters & Gear Boxes on Engine - reposition boxes; Starter	+ 2.00
Starter shroud added	+ 6.00
Pneumatic starter connection was previously omitted	+ 1.64
Accessories Gear Boxes on Fuselage - repositioned - increased drive shaft	+ 1.70
Fire Extinguishing System - increase in Vendor's Weight of bottle	+ 5.00
Fuel System - the weight carried is as for the MK 1	
1st A/C - Actual weight of bulkhead couplings	+ 7.52
N.B. Although it is fully appreciated that the MK 2 A/C Fuel System will be entirely different from the MK 1	

continued.

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3. POWER PLANT & SERVICES

Fuel System (Continued)

1st A/C Proportioner System, there are currently insufficient details available to evaluate the weight of the MK 2 A/C selection system which will replace the Proportioners.

WEIGHT
lb.

WEIGHT INCREASE POWER PLANT GROUP

+ 4.70

4. FLYING CONTROLS GROUP

Mechanical Flying Controls - these are now fully estimated to MK 1 production drawings of steel linkages etc.

+ 32.90

WEIGHT INCREASE FLYING CONTROLS GROUP

+ 32.90

5. EQUIPMENT GROUP

Radar Removable - latest R.C.A. estimate, no Sparrow III auxiliaries now carried, TACAN which is alternative to Doppler is recorded since this is the heavier (+ 4.5#)	- 51.75
Radar Fixed - latest R.C.A. estimate (Nov. 15th, 1956)	- 37.35
Sparrow Pack Electronics - Sparrow III Auxiliaries deleted	- 79.00
Canopy Actuation - Addition of recuperators etc.	+ 7.64
Radome Anti-icing - Tank weight included with Nose Structure	- 5.00
Wiring & detectors in Electrics	- 2.55
Actual weights of valves etc.	- 7.03
Intake De-icing - this report contains weight of boots only, all equipment, wiring etc. included with general electrical circuit weights	- 34.00
Windscreen Demisting - Wiring now in general electrical circuit wts.	- 5.17
Cabin Consoles - first detailed estimate of MK 1 A/C Navigator's Console Panels	- 3.20
Instruments - estimated to MK 1 production drawings details some panels now included with electrics	- 7.23
Electrics - increases based on MK 1 production drawings re-estimates and including all transfers from above items	+ 138.64
Addition of anti-skid devices	+ 13.50
Alterations to allowances for 40KVA Alternator	- 8.50

WEIGHT DECREASE EQUIPMENT GROUP

- 81.00

6. OPERATIONAL LOAD

Engine Oil Trapped - C.G. Change only
Engine Oil Drainable - Engine tanks capacity 4 Imp. gals. - Accessories gear box oil etc. assumed as MK 1 A/C

+ 4.74

WEIGHT CHANGE - OPERATIONAL LOAD

+ 4.74

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INTRODUCTION

SUMMARY

WEIGHT CHANGE - AIRCRAFT WEIGHT EMPTY

Structure	+ 124.39 lb.
Power Plant	+ 4.70 lb.
Flying Controls	+ 32.90 lb.
Equipment	= 81.00 lb.
	<hr/>
	+ 80.99 lb.

WEIGHT CHANGE - OPERATIONAL LOAD (Less Fuel)

Drainable Oil	+ 4.74 lb.
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WEIGHT CHANGE - OPERATIONAL WEIGHT EMPTY - (A/C Less Fuel)

Issue 3

44,110.86 lb.

Issue 4

44,196.59 lb

= + 85.73 lb.

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WEIGHT AND C.G. SUMMARY

<u>DESCRIPTION</u>	<u>WEIGHT</u> <u>lb.</u>	<u>H. ARM</u> <u>ins.</u>	<u>V. ARM</u> <u>ins.</u>
STRUCTURE	18,211.47	564.46	137.79
Wing	9,949.51	640.84	142.15
Fin & Rudder	1,016.37	754.25	209.38
Fuselage Struct. Fwd. Sta. 255"	2,415.63	186.17	129.37
Sta. 255" - 485"	1,685.09	379.33	129.63
Sta. 485" Aft.	3,144.87	651.24	111.70
UNDERCARRIAGE - Retracted	2,604.33	488.72	134.65
Main Undercarriage	1,951.62	539.57	141.00
Main U/C Doors & Fairings	294.36	539.29	136.01
Nose Undercarriage	333.81	170.80	99.70
Nose U/C Door & Fairing	24.54	162.24	88.23
POWER PLANT & SERVICES	10,846.23	674.83	121.41
Engines PS 13	9,357.12	689.68	120.87
Gear Box & Drives on Fuselage	238.76	604.01	103.94
Engine Controls	30.97	366.26	119.61
Gear Box & Starter on Engines	159.82	628.81	96.25
Engine Nose Bullet	70.00	587.17	116.00
Fire Extinguishing System	75.52	703.76	128.23
Engine Mountings	156.53	666.00	136.69
Fuel System	757.51	543.10	135.69
FLYING CONTROLS GROUP	1,710.72	687.58	140.35
Mechanical Flying Controls	937.30	687.59	148.22
Flying Control Hydraulics	773.42	687.56	130.81
EQUIPMENT - FIXED & REMOVABLE	7,991.85	326.86	110.87
Instruments	46.07	163.68	138.70
Probe	23.00	9.74	108.00
Cockpit Pressure Sealing	5.00	186.00	130.00
Oxygen System	43.44	227.72	142.18
Air Conditioning System	897.00	331.77	133.38
Hydraulic Main System	588.36	501.22	117.38
Cabin Insulation	11.91	179.24	130.00
Brake Parachute	69.69	784.88	131.17
Electrical System	1,237.49	428.79	112.67
Low Pressure Pneumatics	39.01	478.47	127.28
Oil & Hydraulic Fluid Cooling	22.00	579.50	92.00
Intake De-icing Boots	51.84	197.02	118.00
Radome Anti-icing	8.88	51.49	125.00
Canopy Actuation	62.05	222.11	154.47
Cabin Consoles	17.45	174.76	124.34
Radar Door Actuation	10.00	268.00	95.00
Ejector Seats	186.00	201.10	136.25
Radio & Radar Removable	1,950.05	180.79	103.26
Radio & Radar Fixed	634.00	236.60	109.71
Sparrow Pack Structure	850.00	390.84	96.00
Sparrow Pack Mechanisms	625.32	376.67	99.22
Sparrow Pack Hydraulics	350.19	368.83	99.00

continued.

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WEIGHT AND C.G. SUMMARY

DESCRIPTION	WEIGHT lb.	H. ARM ins.	V. ARM ins.	C.G. POSITION % M.A.C.
<u>Equipment - Fixed & Removable - Cont'd.</u>				
Sparrow Pack Electronics	99.00	332.00	100.00	
Sparrow Pack Electrics	64.10	362.29	95.00	
Surface Finish	100.00	591.52	140.20	
AIRCRAFT WEIGHT EMPTY	41,364.60	547.82	128.20	
USEFUL LOAD	17,931.92	513.03	136.13	
Crew	430.00	194.00	136.50	
Oil	135.13	638.13	111.87	
Alcohol - Radome De-icing	22.00	93.00	138.00	
Engine Fire Extinguishing Fluid	25.00	730.00	129.00	
Residual Fuel	218.40	553.98	134.04	
Missiles	1,728.00	389.29	88.30	
Oxygen Charge	13.39	259.69	159.91	
Water for Air Conditioning	260.00	268.00	132.00	
Fuel for Combat Mission	15,100.00	539.26	141.90	
Normal Combat Mission U/C Up	59,296.52	537.29	130.61	27.98
U/C Down		538.93	127.89	28.44
Half Combat Mission Fuel (968 gals. at 7.8 lb/gal.)	7,550.00	540.98	144.27	
Combat Weight (Half Combat Mission Fuel) U/C Up	51,746.52	537.26	129.31	27.97
U/C Down		539.14	126.20	28.49
Operational Weight Empty U/C Up	44,196.52	536.62	126.75	27.80
U/C Down		538.82	123.10	28.41
Operational Weight Empty (less Missiles) U/C Up	42,468.52	542.61	128.31	29.45
U/C Down		544.90	124.52	30.08
Max. Internal Fuel * (2,544 gals. @ 7.8 lb/gal.)	19,843.00	538.88	144.32	
A.U.W. Max. Internal Fuel U/C Up	64,039.52	537.32	132.19	27.99
U/C Down		538.84	129.68	28.41
Max. External Fuel (500 gal. at 7.8 lb/gal. + Drop Tank)	4,226.00	522.34	60.64	
A.U.W. Max. Internal and External Fuel U/C Up	68,265.52	536.39	127.76	27.74
U/C Down		537.82	125.40	28.13

N.B. 1) Aircraft Datum = 120" above nominal ground line.

* 2) Max. Internal Fuel will change slightly in the future when the redesign of the upper portion of tanks # 1 & 2 is finalized to accommodate the re-routed Air Conditioning lines.

10 X 10 TO THE 1 1/2 INCH
KEUFFEL & ESSER CO.

359-12
A. L. U. S. A.

HORIZONTAL - C.C. - FINE FLOOR

FOR A/C FLIGHT CONDITIONS

THE SYSTEM OF REPORTING AND ASSUMED

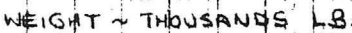
UNTIL DETAILS OF SEQUENCING AVAILABLE)

BY KATHLEEN J. GIBB
DATE: FEB 15 1987

at Kaffianah

REPORT NO: 71046054

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