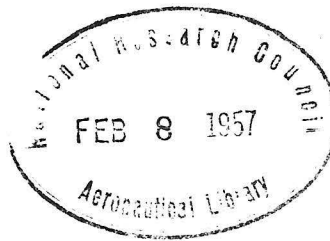


UNCL/SECRET

Date: February 1st, 1957  
Aircraft: C-105 MK 1 with  
J75 P3 Engines  
1st A/C



Report # 7-0400-44  
Sheet # 1 Issue 2  
Prepared By: K. Griffin  
Checked By: E. Burnett

## INTRODUCTION

The following is a Weight & C. G. Summary for the 1st C-105 MK 1 Aircraft with J75 P3 Engines based on the latest weight estimates available on January 31st, 1956. All Weight and C.G. changes are relative to Issue 1 of December 1st 1956.

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

## GENERAL

- 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)
- An Instrument package carrying Flight Test Instrumentation will be installed, this also varies between first and subsequent aircraft.
- An interim Radio and Radar System is installed.

## 1. STRUCTURE

### (a) Wing:

WEIGHT -(lb.)

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

- 7.66

Structural provisions for Buzz Dampers - the provisions will be installed in the first A/C as follows:-

Inner Wing	+	8.60
Outer Wing	+	8.70
Elevator	+	7.40
Aileron	+	6.30

Whether on no the system will be installed is still undecided (see also Flying Controls Group).

I/Wing Skins - Actual weights have been checked and the estimates currently recorded tally with the actual weight at nominal thickness. However, some skins notably those machined at AVRO are considerably above nominal tolerances, excess weight being of the order of 6 lb/panel. Thus with a set of 12 similarly machined AVRO manufactured skins excess weight could be as much as 70 lb/A/C.

WEIGHT INCREASE WING

+ 23.34

### (b) Fin & Rudder:

Fin - Addition of dorsal fairing angles	+	3.96
AN373 Nut Plates replace K1100 (not available)	+	4.59
Misc. Structural & hardware changes	+	2.98
Addition of Structural provisions for 'Buzz Dampers'	+	1.20

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Sheet # 2 Issue 2  
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### INTRODUCTION

#### 1. STRUCTURE

(b)	<u>Fin and Rudder</u> (Continued)	<u>WEIGHT (lb)</u>
	Rudder - Addition of structural provisions for 'Buzz Dampers'	+ 7.80
	Joint changes also skin splices added etc.	+ 4.88
	<u>WEIGHT INCREASE FIN &amp; RUDDER</u>	<u>+ 25.41</u>
(c)	<u>Fuselage Fwd. Sta. 255"</u>	
	Radar Nose Access Doors - now entirely estimated to production drawings	- 3.38
	Radar Nose Structure - previous estimate was to non-stress approved schemes - many design changes - fuller information - also includes radome de-icing tank (see also equipment group)	+ 28.76
	Skin F.F. - Material concession allows the use of Al. instead of Mg. on the 1st 5 A/C.	+ 28.55
	Shear Panel Aft Nav. Bulkhead - minor changes to stiffeners etc. production drawing re-issues.	+ 1.84
	<u>WEIGHT INCREASE FRONT FUSELAGE</u>	<u>+ 55.77</u>
(d)	<u>Centre Fuselage Sta. 255" - 485"</u>	
	Electronics Bay Structure - Doppler mounting structure redundant for Interim Radar System	- 1.56
	Equipment Bay Structure - Material concession allows .04 Mg. in lieu of .032 Mg. on 1st. 5 A/C	+ 1.34
	<u>WEIGHT DECREASE CENTRE FUSELAGE</u>	<u>- 0.22</u>
(e)	<u>Rear Fuselage Sta. 485" Aft.</u>	
	Engine Access Doors E.B. - Estimated to production drawings previous estimates had insufficient hardware allowance 8% of Structure weight whereas details reveal 15%	+ 14.70
	Heavy Formers E.B. - minor production drawing changes	+ 1.83
	Engine Tunnel E.B. - O/B Beam was previously omitted	+ 7.70
	Service Access Doors - Transducer support added.	+ 0.49
	Light Formers E.B. - removal of allowance for some stabilizers which do not exist	- 0.17
	Misc. Items E.B. - minor changes to bracketry	+ 0.05
	Engine Access Doors R.F. - Production drawing estimates	+ 10.11
	Nacelles R.F. - now estimated to production drawings, steel replaces titanium for early aircraft, previously too high an allowance was made	- 10.76
	Centre Structure R.F. - Production drawing estimates - previous allowance for steel replacing titanium was too high	- 1.46
	<u>WEIGHT INCREASE AFT FUSELAGE</u>	<u>+ 22.49</u>
	<u>TOTAL STRUCTURAL WEIGHT INCREASE</u>	<u>+ 126.79</u>

Date: February 1st, 1957  
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INTRODUCTION

2. LANDING GEAR

No Weight Change

3. POWER PLANT & SERVICES

WEIGHT (lb)

Engines† - Miscellaneous alterations to airbleed outlet etc.	+	4.61
Engine Service Accessories - Pressure switches now in Electrics	-	2.27
Addition of pneumatic lines	+	3.17
Production drawing estimates of oil breather pipes, nozzle air ejection, oil filler etc.	+	4.37
Gear Boxes & Starter on Engine - Add pneumatic starter connection	+	1.64
Engine Mounting Accessories - "Inconel X" sleeve at rear mounting omitted	+	4.68
Hardware for installation further details available	+	5.45
Engine Controls - Actual weight of tension regulator and throttle box	+	1.78
Fuel System‡ - Actual weights of bulkhead couplings and revision of pump installation	+	7.52
Fire Extinguishing System* - Vendors increase in bottle weight	+	5.00
<u>WEIGHT INCREASE POWER PLANT GROUP</u>		<u>+ 35.95</u>

N.B. 1) † J75 P3 Engines on 1st A/C only, 2nd & subsequent A/C have J75 P5 Engines which are 225 lb/engine lighter than the P3 Version.

2) ‡ The 1st Aircraft will be fitted with fuel proportioners, 2nd Aircraft may have both proportioners and a selection system fitted, though details of the selection system are not yet finite.

3) \* Additional fire protection will be installed in the 1st A/C, the bottles being mounted within the instrument package. For details of the weight involved see Equipment Group.

4. FLYING CONTROLS GROUP

Mechanical Flying Controls - Completely re-estimated to production drawings for the redesigned steel linkage system. Previously weight allowances of 65 lb were carried to cover this redesign.

Now, however, there is a further increase of + 26.09  
Other production drawing changes to system + 6.81

N.B. Pending Flight Test requirements a "Buzz Damping" System may be installed on the first aircraft. Provisions for this installation are already included in the Structure Group. The "Buzz Damper" system weights are not currently recorded but they incur a weight penalty of + 134.3 lb. if necessary.

WEIGHT INCREASE FLYING CONTROLS GROUP

+ 32.90

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Checked By: E. Burnett

# INTRODUCTION

## 5. EQUIPMENT GROUP

## WEIGHT (lb)

Instruments - fully detailed to production drawings some panels now included with Electrics Group	- 7.23
Cabin Consoles - first detailed estimates of Navigator's Consoles	- 3.20
Canopy Actuation - addition of recuperators etc.	+ 7.64
Air Conditioning - production drawing estimate of 'S' duct	+ 12.07
Other ducts, couplings etc.	+ 20.83
Valves & Equipment, actual weights etc.	+ 23.10
Radome Anti-icing - Tank weight now included in nose structure	- 5.00
Wiring & detectors in Electrics	- 2.55
Actual weights of valves, Al. tubing replaces Temflex, general allowances too high	- 7.03
Intake De-icing - this report contains weight of boots only, all equipment, wiring etc. included with general electrical circuits weights	- 34.00
Windscreen Demisting - wiring now in electrical reports	- 5.17
Electrical System - the report system has been entirely changed and the electrics completely estimated to production drawings for the first aircraft. Including the 48.95 lb allowances, deleted above, the electrical group shows an increase in weight of	+ 138.64
Previous allowances for connectors were too low, many more details now available etc.	
Interim Radio & Radar - re-estimated in detail	+ 5.68
Additional Fire Protection - fully estimated to drawings	- 0.83
Radar Access Door Actuation - now included in Interim Radar Wt.	- 10.00

### WEIGHT INCREASE EQUIPMENT

+ 132.95

## SUMMARY

### WEIGHT CHANGE - AIRCRAFT WEIGHT EMPTY

Structure	+ 126.79 lb.
Power Plant	+ 35.95 lb.
Flying Controls	+ 32.90 lb.
Equipment	+ 132.95 lb.
	<u>+ 328.59 lb.</u>

### WEIGHT CHANGE - OPERATIONAL WEIGHT EMPTY (A/C less fuel)

#### Issue 1

#### Issue 2

44,783.07 lb

45,111.66 lb

=

+ 328.59 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	18,453.73	563.95	137.60
Wing	10,012.41	643.87	142.09
Fin & Rudder	1,025.37	754.93	209.68
Fuselage Struct. Fwd. Sta. 255"	2,549.18	180.69	128.59
Sta. 255" - 485"	1,664.68	379.06	130.04
Aft. 485"	3,202.09	654.11	111.60
UNDERCARRIAGE - Retracted	2,612.33	488.81	134.66
Main Undercarriage	1,959.62	539.48	141.00
Main U/C Doors & Fairings	294.36	539.29	136.01
Nose Undercarriage	333.81	170.81	99.70
Nose U/C Door & Fairing	24.54	162.24	88.23
POWER PLANT & SERVICES	14,204.48	654.59	120.23
Engines	12,681.91	663.94	119.75
Gear Box Installation on Fuselage	237.06	603.73	104.00
Gear Box & Starter on Engine	151.82	610.53	96.45
Engine Controls	30.97	366.27	119.61
Engine De-icing	70.37	562.80	115.09
Fire Extinguishing System	75.52	703.76	128.23
Engine Mountings	199.32	635.71	128.02
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
Hydraulic Flying Controls	773.42	687.56	130.81
EQUIPMENT - FIXED & REMOVABLE	7,166.22	384.94	110.52
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	738.02	336.49	134.76
Surface Finish	100.00	591.52	140.20
Hydraulics 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	1,119.35	419.79	112.94
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
Canopy Actuation	62.05	222.11	154.47
Cabin Consoles	17.45	174.76	124.34
Ejector Seats	186.00	201.10	136.25
Interim Radio & Radar	762.38	311.06	122.69
Instrument Pack Structure	670.61	385.90	94.71
Instrumentation - 1st A/C	2,447.00	389.50	95.00
Additional Fire Protection	154.17	425.05	102.89
Radome Anti-icing	8.88	51.49	125.00
AIRCRAFT WEIGHT EMPTY	44,147.48	564.40	127.55

**SECRET**

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 Aircraft: C-105 MK 1 with  
 J75 P3 Engines  
 1st A/C.

**UNCLASSIFIED**  
**NON CLASSIFIED**  
 Report # 7-0400-44  
 Sheet # 6 Issue 2  
 Prepared By: K. Griffin

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>	<u>C.G. POSITION</u> <u>% M.A.C.</u>
USEFUL LOAD (less fuel)	964.18	353.79	132.91	
Crew	430.00	194.00	136.50	
Oil	130.39	609.19	117.17	
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	125.00	268.00	132.00	
Operational Weight Empty U/C Up	45,111.66	559.87	127.66	34.21
U/C Down		562.04	124.07	34.81
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	64,954.66	553.46	132.75	32.44
U/C Down		554.96	130.26	32.86
Max. External Fuel & Tank (500 gals. @ 7.8 lb/gal.)	4,226.00	522.34	60.64	
A.U.W. Max. Internal and External Fuel U/C Up	69,180.66	551.56	128.35	31.92
U/C Down		552.97	126.01	32.31

N. B. 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 the 1,382 lb at Sta. 89.16", as currently provided for on Former 68.5 and the Shear Panel, is necessary plus a further 75 lb on the Shear Panel. (i.e. Total of 1,457 lb)

# SECRET

REPORT NO : 7-0400-44-2

HORIZONTAL C.G. ENVELOPE  
FOR MKI 1ST FA FLIGHT CONDITIONS

BY: Kathleen J. Hall

DATE: Feb 1954

WITH J75P3 ENGINES (2nd & subsequent 1/2 HAVE J75P5 ENGINES)

INTERIM RADIO & RADAR

FUEL SYSTEM PROPORTIONERS

INSTRUMENT PACKAGE (WITH EMERGENCY JETTISON)

