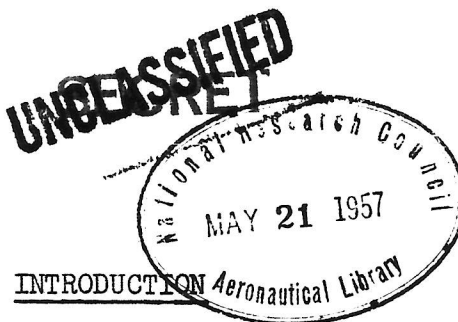


Date: May 1st, 1957  
Aircraft: C-105 MK 2  
Production A/C



74.113-57/65

Report # 7-0400-34 Iss 7  
Sheet # 1-1  
Prepared By: K. Griffin  
Checked By: E. Burnett

The following is a Weight & C.G. Summary of the C-105 MK 2 Production Aircraft. Of necessity some of the figures quoted herein are only of a preliminary nature, especially some systems. e.g. Air Conditioning and Fuel System which have been extensively redesigned but new weight estimates are not yet available.

Weight estimates have been based on the MK 1 Aircraft with relevant changes made to MK 2 Aircraft scheme drawings or to verbally received information. Where no details are 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 & C.G. location being to the latest breakdown received from them, dated January 11th, 1957. However, the Sparrow III Auxiliaries and the Infra-red Tracker System included in the above breakdown have been deleted and some Avro installed antennae added (Total Weight = 2,614.5 lb).
- d) A considerable number of MK 1 parts and assemblies have now been weighed. There have only been very insignificant weight deviations between calculated and actual weights of Structural items, however, bought-out equipment has been fairly consistently in the order of 11% above the manufacturer's estimates or Avro Specification weight requirements. Where these weights apply to the MK 2 Aircraft, they have been incorporated into the MK 2 Aircraft weight records.  
On the I.B.M. sheets, in this report, immediately preceeding the item title, will be found a number varying from 0 to 100. This is the percentage actual weight recorded in that particular report.

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

1. STRUCTURE

WEIGHT (lb)

I/W - Alterations to skins, etc. and new items for redesign front centre Engine mounting (this includes 16 lb transferred from Engine group)	+ 71
I/W Ribs - Actual weights etc. based on MK 1 ribs, some redesign for MK 2 A/C and further reductions are expected.	- 14
I/W Spars - Main Spars - modifications to MK 2 schemes	- 5
C/F/Spar - production drawing estimates, web gauge decrease etc.	- 11
O/Wing - MK 1 O/Wing less Leading Edge & Aileron control Box was weighed - this checked with the calculated weight and is applicable to MK 2 Aircraft.	

Weight Change Increase  
Ref. 2-1

+ 41

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SECRET

4047 46577

UNCLASSIFIED  
SECRET

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

Report # 7-0400-34 Iss 7  
Sheet # 1-2  
Prepared By: K. Griffin  
Checked By: E. Burnett

INTRODUCTION

1. STRUCTURE

WEIGHT (lb)

(b) Fin & Rudder

No Weight Change

(c) Fuselage Fwd. Sta. 255"

Miscellaneous production drawing changes to MK 1 A/C Longerons,  
Shear Panel, Nose U/C Structure etc. incl. some actual weights  
Weight Change Increase

+ 13  
+ 13

Ref. 2-2

(d) Centre Fuselage Sta. 255"-485"

No Weight Change

(e) Duct Bay Sta. 485"-591"

Minor Changes based on MK 1, mostly actual weights of Dive  
Brakes, Beams etc.

Weight Change Increase  
Ref. 2-2

+ 3  
+ 3

The Floating Duct is being extensively redesigned with an articulated adaptor between floating duct & engine, to include gills. No drawings are yet released and it is felt that the weight currently recorded for the duct, together with the Adaptor ring (see Engine Group) will be adequate. An estimate will be made at the earliest opportunity.

(f) Engine Bay Sta. 591.65-742.5"

No Weight Change

(g) Rear Fuselage Aft. Sta. 742.5"

No Weight Change

There is no definite scheme yet for the Tailcones and Stinger structure. The weight currently recorded is as for MK 1 in Titanium, allowances having been made for the increased length of the tailcone, but no other account taken of lines changing or design alterations.

(h) Fuselage Joints

No Weight Change

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TOTAL STRUCTURAL INCREASE

+ 57

Date: May 1st, 1957  
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Production A/C

Report # 7-0400-34 Iss. 7  
Sheet # 1-3  
Prepared By: K. Griffin  
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### INTRODUCTION

#### 2. LANDING GEAR

WEIGHT (lb)

Main U/C Doors & Fairings - door & mechanism estimates revised

- 3

Ref. 2-2

TOTAL LANDING GEAR DECREASE

- 3

#### 3. POWER PLANT & SERVICES

Engine Mounts - some items now in Wing Group

- 16

Ref. 2-2

TOTAL POWER PLANT & SERVICES DECREASE

- 16

#### 4. FLYING CONTROLS

No Weight Change

#### 5. EQUIPMENT GROUP

Cockpit Insulation - first drawings available

Ref. 2-

+ 2

TOTAL EQUIPMENT GROUP - INCREASE

+ 2

#### 6. OPERATIONAL LOAD

No Weight Change

### SUMMARY

#### Weight Change - Aircraft Basic Weight

Structure	+	57
Landing Gear	-	3
Power Plant	-	16
Equipment	+	2
	+	<u>40</u>

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

Issue 6

Issue 7

44,125

44,165

+ 40 lb

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

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Report # 7-0400-34 Iss. 7  
Sheet # 2-1  
Prepared By: K. Griffin  
Checked By: E. Burnett

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

WEIGHT CHANGES

WEIGHT (lb)

Wing:

+ 12.42	I/W Skins - skin thickening etc. around forward centre Engine Mounting	
- 15.20	I/W Centre Line Joints - allowance for centre forward Engine Mounting deleted (see Fus. pick-ups)	- 16.60
	Rear Centre Engine Strut pick-up added	+ 1.40
		- 15.20
+ 91.95	Fuselage Strut Pick-ups - redesign of structure for forward centre Engine Mounting (includes 9.97 lb for outer sleeve deleted from Engine mounts - see Engine Group)	
- 16.10	Structure Aft R/Spar - introduction of honeycomb panels and redesign of engine mounting requirements (includes 6.49 lb deleted from Engine Mounts see Engine Group)	
- 18.66	I/W Spars - Production drawing estimates of Centre Spar Fwd., web .072 was .102 in MK 1 A/C etc. Modifications to Main Spar	- 11.19
	Mods to C/aft Spar for centre forward Engine Mounting	- 4.67
		- 2.80
		- 18.66
- 13.92	I/W Ribs# 1 to 9 - changes due to actual weights etc. in accordance with MK 1 drawings. The ribs are mostly being re-designed for MK 2 A/C and a further reduction is expected, this should be recorded for June 1st, 1957.	
+ 0.21	O/W Skins - Access panel added R.H. only	+ 1.43
	Actual weight bottom main panel	+ 3.34
	Actual weight top aft panel	+ 0.15
	Design changes hardware skin to spar Joints etc.	- 4.71
		+ 0.21

N. B. A complete Outer Wing less Leading Edge and Aileron Control Box was weighed for MK 1 A/C. After adjustments had been made for wiring already installed there, the structural weight was identical with that calculated. This also applies to MK 2 A/C.

+ 40.70



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

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Report # 7-0400-34 Iss. 7  
Sheet # 2-2  
Prepared By: K. Griffin  
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WEIGHT CHANGES TO I.B.M. TABULATED  
DETAILS OF APRIL 1st, 1957

WEIGHT CHANGES

WEIGHT (lb)

Fuselage Fwd. Sta. 255"

+	0.30	Lower Shear Panel - minor MK 1 Production drawing changes	
+	5.52	Miscellaneous Items F.F.,-- Installations of various brackets, internal assy. hardware etc. as MK 1	
+	4.75	Nose U/C Support Structure - some re-estimates, re-design and actual weights as MK 1.	
+	2.14	Top Longerons - Actual weights of welded assys., end fittings, some pressings etc.	
		Re-estimate of Mg. packing etc.	- 1.03
		Addition of bracketry	+ 2.85
			+ 0.32
			+ 2.14
+	12.71		

Duct Bay Sta. 485"-591.65"

+	2.28	Dive Brakes - Actual weights of brakes	+ 0.88
		Re-estimate of Marry-up hardware	+ 1.40
			+ 2.28
+	0.14	Frame Sta. 538.77" - Actual Weights of all machinings	
+	2.28	Longitudinal Beams - Actual weights of I/B & O/B D/B Beams	
-	1.89	Top Longeron - some joint items at Sta. 485" duplicated	
+	2.81		

Landing Gear Group

-	2.56	Main U/C Doors & Fairings - addition of bumper pads	+ 3.64
		Miscellaneous redesign on door	+ 2.83
		Re-estimate of springs, housings etc. earlier allowances too high	- 9.03
			- 2.56
-	2.56		

Power Plant & Services

-	16.46	Engine Mounts - Outer sleeve forward centre Engine Mounting now with Fuselage pick-ups (see Wing Group)	- 9.97
		some rear Engine Mounting items now with Structure Aft R/Spar (Wing)	- 6.49
			- 16.46
-	16.46		

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

Report# 7-0400-34 Iss 7  
Sheet # 2-3  
Prepared By: K. Griffin  
Checked By: E. Burnett

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

WEIGHT CHANGES

WEIGHT (lb)

Equipment Fixed & Removable

+ 2.40 Cockpit Insulation - first information available

+ 2.40

+ 39.60 TOTAL WEIGHT CHANGES

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

# UNCLASSIFIED NON CLASSIFIED

Report # 7-0400-34 Iss. 7  
Sheet # 3-1  
Prepared By: K. Griffin

## WEIGHT & 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	18,327.19	564.51	137.60
Wing	9,970.65	642.88	142.17
Fin & Rudder	1,020.70	754.06	209.27
Fuselage: fwd. Sta. 255"	2,466.44	186.67	128.71
Sta. 255"-485"	1,681.78	379.07	129.47
Sta. 485"-591.65	952.35	533.07	103.64
Sta. 591.65"-742.5"	1,490.70	661.10	109.12
Sta. 742.5 Aft.	691.99	795.69	128.15
"Marry Up"	52.58	468.91	103.89
UNDERCARRIAGE - Retracted	2,551.77	487.22	134.79
Main Undercarriage	1,901.62	539.31	141.00
Main U/C Doors & Fairings	291.80	537.10	138.40
Nose Undercarriage	333.81	170.80	99.70
Nose U/C Door & Fairing	24.54	162.24	88.23
POWER PLANT & SERVICES	10,757.88	673.94	121.47
Engines & Accessories PS13	9,090.12	690.98	121.17
Gear Box & Drives on Fuselage	281.84	601.70	102.49
Engine Controls	32.43	375.76	118.61
Gear Box, Starter & Drives on Engine	315.45	609.12	105.24
Engine Nose Bullet	70.00	587.17	116.00
Fire Extinguisher System	70.46	702.44	134.83
Engine Mountings	140.07	665.17	135.82
Fuel System	757.51	543.10	135.69
FLYING CONTROLS GROUP	1,793.94	686.84	140.05
Mechanical Flying Controls	942.92	688.24	148.66
Hydraulic Flying Controls	851.02	685.29	130.52
EQUIPMENT FIXED & REMOVABLE	7,897.85	326.73	111.79
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	43.44	227.71	142.18
Air Conditioning System	897.00	331.77	133.38
Hydraulic Main System	597.49	498.76	116.66
Cabin Insulation	14.31	187.48	132.00
Brake Parachute	62.38	769.41	143.24
Electrical System	1,224.03	428.64	112.65
Low Pressure Pneumatics	49.30	444.29	125.94
Surface Finish	100.00	591.52	140.20
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	1,850.50	178.50	104.46
Radio & Radar Fixed	621.00	234.04	116.15

continued

DATE: May 1st, 1957  
Aircraft: C-105 MK 2  
Production Aircraft

UNCLASSIFIED  
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Report # 7-0400-34 Iss. 7  
Sheet # 3-2  
Prepared By K. Griffin

WEIGHT & C.G. SUMMARY

Description	WEIGHT lb.	H. ARM ins.	V. ARM ins.	M.A.C. %
<u>Equipment (Fixed &amp; Removable)(Cont'd)</u>				
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	
Sparrow Pack Electronics	143.00	332.00	100.00	
Sparrow Pack Electrics	64.10	362.29	95.00	
AIRCRAFT BASIC WEIGHT	41,328.63	548.09	128.40	
USEFUL LOAD (Normal Combat)	18,635.76	516.40	136.67	
Crew	430.00	194.00	136.50	
Oil	138.97	636.92	110.57	
Alcohol	22.00	93.00	138.00	
Engine Fire Extinguisher 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	15,800.00	542.05	142.30	
Normal Combat Mission U/C Up	59,964.40	538.25	130.97	28.25
U/C Down		539.85	128.33	28.69
Half Combat Mission Fuel (1,013 gals. @ 7.8 lb/gal.)	7,900.00	543.20	139.55	
Combat Weight (Half Combat Mission Fuel) U/C Up	52,064.40	537.85	128.84	28.14
U/C Down		539.68	125.80	28.64
Operational Weight Empty U/C Up	44,164.40	536.89	126.92	27.87
U/C Down		539.06	123.34	28.47
Operational Weight Empty Less Missiles U/C Up	42,436.40	542.90	128.49	29.53
U/C Down		545.15	124.76	30.15
Max. Internal Fuel (2,492 gals. @ 7.8 lb/gal.)	19,438.00	541.85	144.16	
A.U.W. Max. Internal Fuel U/C Up	63,602.40	538.41	132.19	28.29
U/C Down		539.91	129.70	28.71
Max. External Fuel (500 gal. @ 7.8 lb/gal + Drop Tank)	4,226.00	522.34	60.64	
A.U.W. Max. Internal and External Fuel U/C Up	67,828.40	537.41	127.73	28.02
U/C Down		538.82	125.40	28.41

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

2) Revised Fuel Tank capacities in Centre Fuselage tanks for MK 2 A/C are incorporated.



INTERMEDIATE SEQUENCING UNTIL NECESSITY OF DAMPING SYSTEM PROVEN

SHEET 4-1

**G9-12**  
**10 X 10 TO THE 1/2 INCH**  
**MADE IN CANADA**

REPORT NO. 7-0400-34-7

BY: Kathleen Gifford

DATE: May 1st 1954

SHEET: 4-2

## C105 FIVE PRODUCTION AIRCRAFT

## HORIZONTAL C.G. ENVELOPE FOR

## AT FLIGHT CONDITIONS

## USING ALTERNATE FUEL SEQUENCING

AS SUPPLIED TO MINNEAPOLIS HONEYWELL (by AERO SERVICES)

TO ACHIEVE REQUIRED 34% M.A.C. AT COMBAT

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