

Date: April 1st, 1957  
Aircraft C-105 MK 2



TL 113-57/04

Report # 7-0400-34 Issue 6  
Sheet # 1-1  
Prepared By: K. Griffin  
Checked By: E. Burnett

### INTRODUCTION

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 are being extensively redesigned and about which there is as yet very little information available.

Information has been based on the MK 1 Aircraft with relevant changes made sometimes to scheme drawings for MK 2 or to verbal 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 Jan. 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)

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:

#### a) Wing:

	<u>WEIGHT (lb)</u>
I/Wing complete - Actual Weights of spars, rib # 10 etc.	- 9
Miscellaneous other changes to MK 1 drawings	+ 6
Ailerons - Actual Weight of Mk 1 Ailerons not modified for "buzz damper" installation	- 13
Aileron Control Box - some actual weights some re-estimates	- 7
O/Wing - miscellaneous changes etc, actual weights of F/Spar and C/A/Spar	- 9
Weight Change Decrease Ref. 2-1	- 32

#### b) Fin & Rudder:

No weight change, although actual weight of MK 1 Rudder unmodified for "Buzz Dampers" is recorded.

#### c) Fuselage Fwd. Sta. 255"

Miscellaneous changes to re-issues of MK 1 production drawings of Formers, Bulkheads, Longerons etc + 12  
Air Intakes - Redesigned Ramp now estimated to MK 1 production drawings many design changes since early scheme drawing estimate was made. + 26

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Weight Change Increase

Ref. 2-2 4045

+ 38

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INTRODUCTION

WEIGHT CHANGES

WEIGHT (lb)

1. STRUCTURE (cont'd.)

d) Centre Fuselage Sta. 255"-485"

Equipment Bay Structure - redesigned for MK 2 A/C  
Miscellaneous production drawing changes to MK 1 A/C

Weight Change Increase  
Ref. 2-2

+	11
-	2
<hr/>	
+	9

e) Duct Bay Sta. 485"-591.65"

No Weight Change

f) Engine Bay Sta. 591.65"-742.5"

Heavy Formers - deletion of Engine Rail Mounting Brackets  
as carried in MK 1 A/C

Service Access Doors - redesigned Aft of Sta. 664.43  
Structure at Engine Doors - redesign of false door structure

Weight Change Decrease  
Ref. 2-2

-	23
-	6
+	6
<hr/>	
-	23

g) Rear Fuselage Aft Sta. 742.5"

No Weight Change

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

TOTAL STRUCTURAL WEIGHT CHANGE

-	8
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2. LANDING GEAR

No Weight Change

3. POWER PLANT & SERVICES

No Weight Change

4. FLYING CONTROLS

No Weight Change

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### INTRODUCTION

#### 5. EQUIPMENT GROUP

	<u>WEIGHT (lb)</u>
Radio & Radar Fixed - deletion of Radar Homer Antennae	- 10
Radio & Radar Removable - deletion of I.R. Tracker System & J2 Compass flux valve.	- 56
Electrics - Fire detection Wire added in Engine Bay	+ 7
Probe - re-estimated, this may be further redesigned	+ 4
Low Pressure Pneumatics - Piping changes etc.	+ 3
<u>TOTAL EQUIPMENT DECREASE</u> Ref. 2-3	<u>- 52</u>

#### 6. OPERATIONAL LOAD

No Weight Change

#### SUMMARY

##### Weight Change - Aircraft Weight Empty

Structure	- 8 lb
Equipment	- 52 lb
	<u>- 60 lb</u>

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

<u>Issue 5</u>	<u>Issue 6</u>	
<u>44,185</u>	<u>44,125</u>	= <u>- 60 lb</u>

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

WEIGHT CHANGE

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WEIGHT (lb)

Wing:

-	6.23	I/W Spars - Actual Weight of Main Spar	-	3.50
		Actual Weight of machinings of Rear Spar etc.	-	3.80
		F/Spar I/B End design change	+	1.25
		Miscellaneous items	-	0.18
			-	6.23
-	2.44	Rib # 10 - Actual Weight obtained		
+	5.70	Skins M/S to R/S - amendments to MK 1 drawings bracketry and hardware		
-	0.40	Dorsal Fairing I/W - MK 1 production drawing estimates		
-	12.66	Ailerons - Actual Weight obtained of MK 1 Aileron, un- modified for "buzz damper" installations		
+	1.60	Rib # 12 - Miscellaneous design changes to hardware etc.		
-	0.57	O/W Posts & Intercostals - completely checked and re-estimated.		
-	6.74	Aileron Control Box - Actual Weights of hinge spar and Ribs # 2,5,6A and 8	-	3.59
		Addition of nut plates to ribs	+	1.95
		Control box to O/W joint hardware was overestimated	-	4.53
		Miscellaneous changes	-	0.57
			-	6.74
-	10.35	O/W Spars - Actual Weight of Front Spar	-	3.38
		Actual Weight of Centre Spar Aft	-	6.38
		Miscellaneous changes to drawings	-	0.59
			-	10.35
-	32.09			

Fin & Rudder

0.00 Rudder - Actual Weight obtained of MK 1 Rudder un-  
modified for buzz damper installations.

0.00

Fuselage Fwd. Sta. 255"

+	0.80	Canopy Arches - minor design changes based on MK 1 drawings
+	0.55	Lower Longerons - minor design changes based on MK 1 drawings
+	0.11	Bulkhead Sta. 255" - MK 1 production drawing changes
+	1.92	Bulkhead Sta. 120" - MK 1 alterations for mounting radome - This will probably change further when MK 2 details become available.
+	1.48	Pilot's & Navigator's Bulkheads - MK 1 production drawing changes

continued.



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

WEIGHT CHANGES

WEIGHT (lb)

Fuselage Fwd. Sta. 255" (Cont'd)

- + 26.36 Intake Ramp - First estimate to production drawings of MK 1 redesigned Intake Ramp, MK 2 Intake Ramp will weigh approx. the same as MK 1 differences are only minor weightwise.
- + 6.89 Formers F.F. - Formers Sta. 188.4 and 194.9 strengthened, Stress requirement associated with redesigned ramp
- Miscellaneous bracketry changes as MK 1

+ 4.38  
+ 2.51  

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+ 6.89

+ 38.11

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Centre Fuselage Sta. 255" - 485"

- + 0.89 Miscellaneous Items C.F. - Alterations to hardware etc. as MK 1
- 2.92 Missile Pack Mounting Structure - re-estimate to current design.
- + 0.27 Armament Bay Roof - Addition of clips etc. for pack pickups.
- + 10.95 Equipment Bay Structure - Redesign Access Panel  
Redesign Mounting Tray

+ 0.36  
+ 10.59  

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+ 10.95

+ 9.19

Engine Bay Sta. 591.65" - 742.5"

- 23.18 Heavy Formers E.B. - Deletion of Engine Rail brackets and mounting structure as carried for MK 1 A/C
- 3.18 Service Access Doors - completely redesigned aft of Sta. 644.43 (2.62 lb included here that was previously with Light Formers I/B of Inner Longerons)
- 18.34 Light Formers - Lower Formers 596.4 - 692.45 part of false door structure (see below) I/B of Inner Longerons Stas. 702, 707 and 712
- 5.56 Outer Skins - relocation of pressure vents, not part of false door structure.
- 37.60 Engine Access Doors - surround structure removed (see below) report: now contains only Doors # 1 & 2.
- + 65.42 Structure at Engine Doors - 58.88 lb transferred to this new report from above items. Actual increase recorded here of + 6.54 lb to false door structure.

- 15.72  

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- 2.62  

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- 18.34

- 22.44

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

WEIGHT CHANGES

WEIGHT (lb)

Joints Fuselage

- + 0.41 Joint F.F. to C.F. - Straps .04 were .032 Al. due to skin dimpling difficulties (based on MK 1 drawings.

+ 0.41

Equipment Fixed and Removable.

- 10.00 Radio & Radar Fixed - deletion of 4 Radar homer antennae  
- 55.00 Radio & Radar Removable - Deletion of I.R. Tracker system.  
+ 7.18 Electrics E.B. Installation of Fire Detection Wiring in the Duct Bay and Engine Bay.  
- 1.30 J2 Compass - delete flux valve.  
+ 10.29 Low Pressure Pneumatics - piping for machmeter, altimeters rate of climb indicator and pitots added (see below) based on MK 1 drawings.  
- 4.50 Probe - Low Pressure Pneumatics included above Probe and sensor re-estimated to scheme drawings

- 8.00  
+ 3.50  
- 4.50

- 53.33

- 60.15 TOTAL WEIGHT CHANGES

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WEIGHT AND C.G. SUMMARY

DESCRIPTION	WEIGHT lb.	H. ARM ins.	V. ARM ins.
<b>STRUCTURE</b>	12,270.98	564.48	137.62
Wing	9,929.95	642.65	142.18
Fin & Rudder	1,020.70	754.06	209.27
Fuselage fwd. Sta. 255"	2,453.74	186.64	128.79
Sta. 255"-485"	1,681.78	379.07	129.47
Sta. 485"-591.65	949.54	533.12	103.76
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
<b>UNDERCARRIAGE - Retracted</b>	2,554.33	487.53	134.52
Main Undercarriage	1,901.62	539.31	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
<b>POWER PLANT &amp; SERVICES</b>	10,774.34	673.94	121.51
Engines & Accessories PS 13	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 & Drive 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	156.53	666.00	136.69
Fuel System	757.51	543.10	135.69
<b>FLYING CONTROLS GROUP</b>	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
<b>EQUIPMENT FIXED &amp; REMOVABLE</b>	7,895.45	326.76	111.78
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	11.91	179.24	130.00
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
Sparrow Pack Structure	850.00	390.84	96.00
Sparrow Pack Mechanisms	625.32	376.67	99.22

continued.

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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>	<u>M.A.C.</u> <u>%</u>
<u>Equipment (Fixed &amp; Removable)(Cont'd.)</u>				
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 WEIGHT EMPTY	41,289.04	548.14	128.39	
USEFUL LOAD	18,615.76	516.37	136.67	
Crew	130.00	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	15,780.00	542.05	142.30	
Normal Combat Mission	U/C Up 59,904.80	538.27	130.96	28.25
	U/C Down	539.87	128.32	28.69
Half Combat Mission Fuel (1,011.5 gal. @ 7.8 lb/gal.)	7,890.00	543.20	139.55	
Combat Weight (Half Combat Mission Fuel)	U/C Up 52,014.80	537.87	128.83	28.14
	U/C Down	539.71	125.78	28.65
Operational Weight Empty	U/C Up 44,124.80	536.92	126.91	27.88
	U/C Down	539.09	123.32	28.48
Operational Weight Empty Less Missiles	U/C Up 42,396.80	542.94	128.48	29.54
	U/C Down	545.20	124.75	30.16
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 63,562.80	538.43	132.19	28.30
	U/C Down	539.93	129.69	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 67,788.80	537.43	127.73	28.02
	U/C Down	538.83	125.39	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 Aircraft are now incorporated.

C105 MK2 PRODUCTION AIRCRAFT  
HORIZONTAL C.G. ENVELOPE FOR  
A/C FLIGHT CONDITIONS

USING FUEL SEQUENCING ORDER AS

SUPPLIED TO MINNEAPOLIS HONEYWELL (REF. AIRC. SPEC. E503)

ALTERNATE SEQUENCING UNTIL NECESSITY OF DAMPING SYSTEM PROVEN

REPORT NO: 7-0400-34-10

BY: Karlham Lyffin

DATE: April 1st 1957

SHEET: 4-1

SEQUENCING ORDER

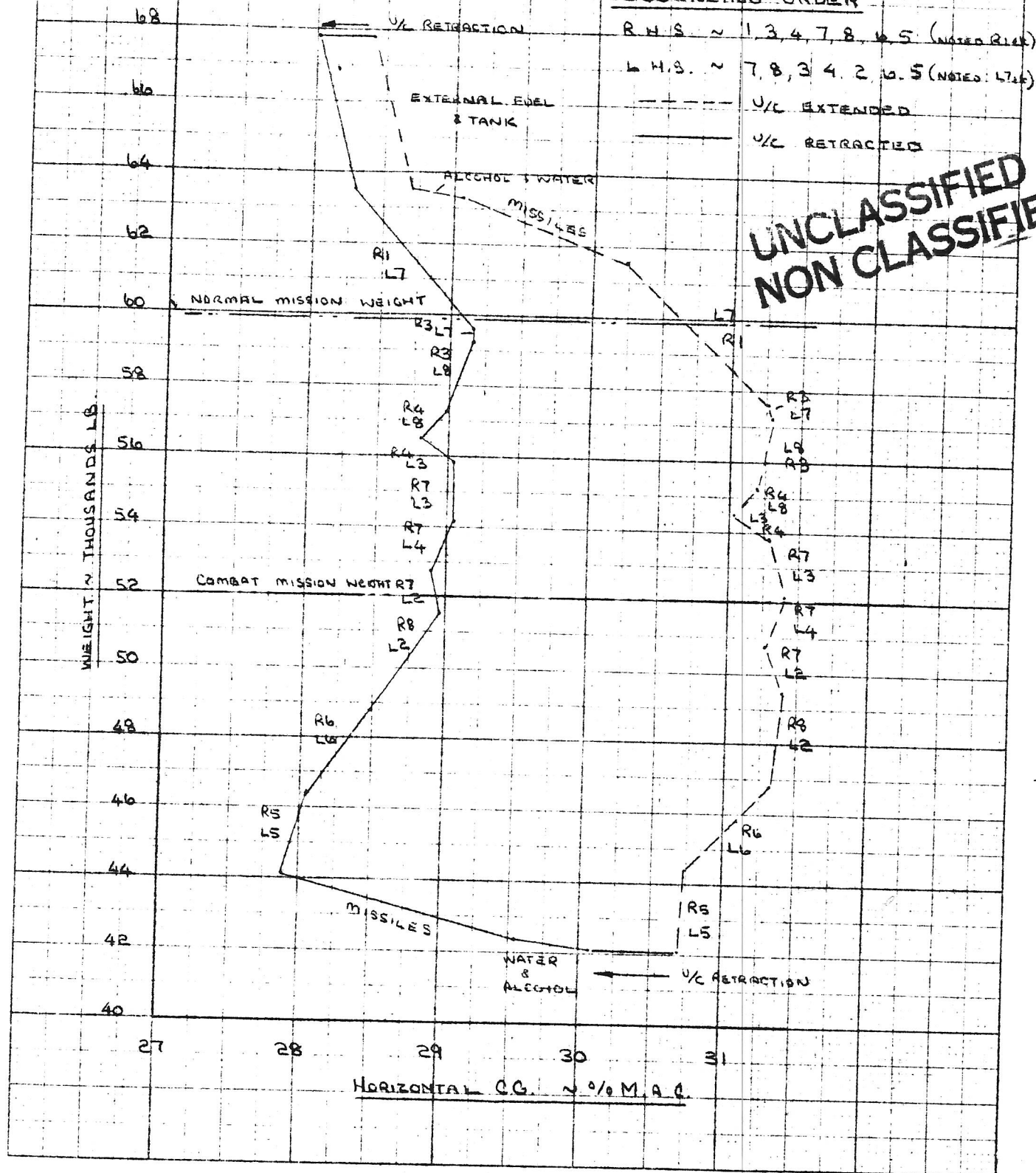
R.H.S. ~ 1, 3, 4, 7, 8, 6, 5 (NOTED: R.H.S.)

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

--- U/C EXTENDED

— U/C RETRACTED

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HORIZONTAL C.G. ~ % M.A.C.



C105 MK2 PRODUCTION AIRCRAFT

HORIZONTAL C.G. ENVELOPE FOR

$\frac{1}{2}$  FLIGHT CONDITIONS

USING FUEL SEQUENCING ALTERNATE

AS SUPPLIED TO MINNEAPOLIS HOWEY (W/ AIRC SPEC #503)

TO ACHIEVE REQUIRED 24% MAC AT COMBAT

REPORT NO. 7-0400-34-2

BY: Robert Giffon

DATE: April 15, 1957

SHEET: 4-2

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