

72. 113-57/05
Jenkinson

SECRET

C-105 MK 1 With
J75 P3 Engines
1st. A/C

Report # 7-0400-44-Iss. 5
Sheet # 1-1
Prepared By: K. Griffin
Approved By: E. Burnett

INTRODUCTION

The following is a Weight and C.G. Summary for the 1st C-105 MK 1 Aircraft with J75 P3 Engines, based on the latest weight estimates currently available. All Weight and C.G. changes are relative to Issue 4 of April 1st, 1957.

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

GENERAL

- a) 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)
- b) An Instrument Package carrying Flight Test Instrumentation is installed, this also varies between first and subsequent Aircraft. A preliminary estimate of other Flight Test installations has now been made, information available is far from complete, but based on there being approximately 250 monitored points throughout the aircraft and that twin shielded wire (27 lb/1000 ft.) is used, a tentative figure of approximately 710 lb is now recorded. This will be fully checked when completed details are forthcoming.
- c) Emergency jettison for the pack, emergency lowering for the Undercarriages and additional fire protection, all to be installed on the 1st A/C, are allowed for in this summary.
- d) An Interim Radio & Radar system is installed.
- e) It should be noted that due to material substitutions and shop variations introduced by planning or production departments there is a weight penalty to the structure to-date of 198 lb. This is all recorded in the structural weight breakdown. No account has been taken of concessions on machinings etc. since it is impossible to assess these.
- f) Pending Flight Test requirements a "Buzz Damping" system may be installed on the 1st Aircraft. Provisions for this installation are already included in the Structural group. The "Buzz Damper" system weights are not currently recorded, but they incur a weight penalty of 134 lb if necessary.
- g) A considerable number of actual weights have now been obtained. Structural weights are showing very insignificant deviations from the calculated weight, but equipment shows a consistent increase averaging about 11% over manufacturers quotations or specification weights. Preceding the report titles, on the I.R.M. tabulation sheets, will be found a number varying from 0.10 to 100 this is the percentage actual weight recorded within the report.

Classification cancelled / changed to: UNCLASSIFIED

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



continued.

46576

4048

C-105 MK 1 with
J75 P3 Engines
1st Aircraft
Date: May 1/57

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INTRODUCTION

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Checked By: E. Burnett

GENERAL

g)(Continued)

A Summary of Actual Weights recorded so far is as follows:

Structure	29.20 %	Actual Weight
Undercarriage	64.60 %	Actual Weight
Power Plant	4.80 %	Actual Weight
Flying Controls	18.77 %	Actual Weight
Equipment	10.87 %	Actual Weight

i.e. 19.75% of the Basic Weight of the Aircraft.

The above breakdown is for groups as designated on the Weights Summary Sheets.

1. STRUCTURE

a) Wing:

I/W Ribs - Production drawing changes & actual weights
O/Wing - Actual weight, less Leading Edge and Aileron
Control Box

WEIGHT (lb)

- 14

0

WEIGHT CHANGE DECREASE
Ref. 2-1

- 14

b) Fin & Rudder

No Weight Change

c) Fuselage Fwd. Sta. 255"

Actual weights of fittings, production drawing design changes,
material concessions etc. etc.

+ 17

WEIGHT CHANGE INCREASE
Ref. 2-1

+ 17

d) Fuselage Sta. 255"-485"

No Weight Change

e) Duct Bay Sta. 485"-591.65"

Actual weights of Dive Brakes, machined frames, beams etc. + 3

WEIGHT CHANGE INCREASE
Ref. 2-2

+ 3

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J75 P 3 Engines
1st A/C
Date: May 1/57

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INTRODUCTION

1. STRUCTURE (Continued)

WEIGHT (lb)

f) Engine Bay Sta. 591.65-742.5"

Miscellaneous production drawing changes, none major, some actual weights obtained. This entire structure has been brought in line with current issues of production drawings

+ 16

WEIGHT CHANGE INCREASE
Ref. 2-2

+ 16

g) Rear Fuselage Sta. 742.5" Aft.

No Weight Change

h) Joints - Fuselage

No Weight Change

TOTAL STRUCTURAL WEIGHT INCREASE

+ 22

2. LANDING GEAR

Main U/C Doors & Fairings - addition of bumper pads
other re-estimates and redesign

+ 4

- 7

LANDING GEAR DECREASE
Ref. 2-2

- 3

3. POWER PLANT & SERVICES

Fuel System - Estimates revised of all wing installations increased allowances sealing & insulation tank # 3 etc. etc.

+ 49

N. B. If .035 thick piping replaced .049 for many transfer & pressure pipes, as called for on drawings, approx. 20 lb could be saved. However, .049 thick pipes in stock will be installed on 1st 5 Aircraft.

Accessories Gear Boxes - Actual weights of some boxes and shafts have now been obtained

- 8

POWER PLANT INCREASE
Ref. 2-3

+ 41

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J75 P3 Engines
1st Aircraft
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INTRODUCTION

4. FLYING CONTROLS GROUP

No Weight change

WEIGHT (lb)

5. EQUIPMENT GROUP

Interim Radio & Radar - error in relay weights
Instrument Pack Structure - actual weight
Flight Test Installations - initial preliminary allowance

- 8
+ 14
+ 711

TOTAL EQUIPMENT INCREASE

+ 717

6. OPERATIONAL LOAD

No Weight Change

SUMMARY

Weight Change - Aircraft Basic Weight

Structure	+ 22 lb.
Landing Gear	- 3 lb.
Power Plant	+ 41 lb.
Equipment	+ 717 lb.
	+ 777 lb.

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

Issue 4

Issue 5

45,240 lb.

46,017 lb.

+ 777 lb.

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J75 P3 Engines
1st Aircraft
Date: May 1/57

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

WEIGHT CHANGES

WEIGHT (lb)

Wing:

-	13.92	I/W Ribs # 1 to 9 - Actual weights obtained account for Miscellaneous bracketry added Hardware changes etc.	-	10.22
			+	0.62
			-	4.32
			-	13.92
+	0.21	O/W Skins - Addition of Access Panel R.H. only Design changes to hardware, skin to spar joints etc. Actual weight skin bottom main panel Actual weight skin top aft panel	+	1.43
			-	4.71
			+	3.34
			+	0.15
			+	0.21

N. B. A complete outer wing less leading edge and
aileron control box was weighed. After
allowing for wiring installed there was no
change between calculated weight and actual
weight of structure.

- 13.71

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Fuselage Fwd. Sta. 255"

+	2.14	Top Longerons F.F. - Actual weights of welded fitting, end fittings & some pressings Miscellaneous brackets etc. Mg. Packers, previously estimated before design requirements complete	-	1.03
			+	0.32
			+	2.85
			+	2.14
+	4.75	Nose U/C Support Structure - Drag. strut fitting re- estimated Door jack fitting was omitted Cross beam & U/C pick-up, some redesign, some actual weights etc.	+	0.32
			+	1.66
			+	2.77
			+	4.75
+	5.52	Miscellaneous items F.F. - Internal marry-up hardware, misc. brackets etc. called up on final G.A's		
+	4.20	Intake Ramp - Material concessions Al. replaces Mg. on duct fittings Formers 207.94, 214.43 & 228.0 Stiffeners added Former 207.94 Actual weight Leading Edge Actual weight Former 175.5	+	2.49
			+	0.47
			+	0.18
			+	1.06
			+	4.20
+	0.30	Lower Shear Panel - minor production drawing changes		
+	16.91			

C-105 MK 1 With
J75 P3 Engines
1st. Aircraft
Date: May 1/57

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

WEIGHT CHANGES

WEIGHT (lb)

Duct Bay Sta. 485"-591.65"

+	2.28	Dive Brakes - Actual weight obtained Marry-up (early estimate prior to drawing release)
+	0.14	Frame Sta. 538.77" - Actual weights of all machinings
+	2.28	Longitudinal Beams - Actual weight of I/B and O/B D/Brake beams
-	1.89	Top Longeron - duplication of some joint items at Sta. 485.
+	2.81	

+	0.88
+	1.40
+	2.28

Engine Bay Sta. 591.65"-742.5"

+	6.36	Engine Tunnel - redesign rear centre Engine Mounting Seal Minor production drawing changes
+	1.22	Heavy Formers - some actual weights obtained
+	0.66	Light Formers - minor production drawing changes
-	0.59	Intermediate Formers - boom reductions bottom formers Sta. 712.34
+	1.67	Outer Skin - miscellaneous production drawing changes
+	2.76	Torsion Box - miscellaneous changes, increase in diaph. gauges etc.
+	0.48	Centre Beam Sta. 697-717 - wall thickness increase strut tube Sta. 714 etc.
+	0.80	Engine Access Doors - minor production drawing changes
+	2.50	Service Access Doors - First production drawing estimates # 2 door Minor other changes
+	0.02	Longitudinal Members - minor production drawing change
+	0.06	Miscellaneous Items E B - minor production drawing change.
+	15.94	

+	3.56
+	2.80
+	6.36

+	1.75
+	0.75
+	2.50

Landing Gear Group

-	2.56	Main U/C Doors & Fairings - completely re-estimated to current drawings. Addition of Bumper pads Half hinge & pin (was assumed, incorrectly, to be with surround structure) Miscellaneous redesign on door Springs, housings etc. were estimated initially far too heavy
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+	3.64
+	3.57
+	2.83
=	12.60
-	2.56

2.56

C-105 MK 1 With
J75 P3 Engines
1st A/C
Date: May 1/57

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Prepared By: K. Griffin
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DETAILED WEIGHT CHANGES TO I.B.M.
TABULATED DETAILS OF APRIL 1st, 1957

WEIGHT CHANGES

WEIGHT (lb)

Engine Group

- + 48.84 Fuel System - All estimates revised with results as follows:-
Trial Installation tank unit # 5
Addition of sealing piping
Insulation & sealing tank # 3*
Miscellaneous other changes
- * 1) 20 lb was allowed for all insulation & sealing - this on checking proved inadequate but will be sufficient for tanks # 4 to 8 inclusive, hence above addition
- 2) The above estimate includes many transfer & pressure pipes of .049 wall thickness (in stock for 1st 5 A/C) however, .035 wall thickness may be used as an alternative (now called on drawing as such) with a saving of 20.50 lb.
- 4.60 Accessories Gear Boxes on Fuselage - Actual weights now recorded for some gear boxes and shafts.
Sargents estimates were slightly too high.
- 3.42 Accessories Gear Boxes & Starter on Engine - Actual weights of some items obtained.

+ 3.30
+ 8.54
+ 35.66
+ 1.34
+ 48.84

+ 40.82

Equipment Fixed & Removable

- 8.15 Interim Radio & Radar - error in relay weights
+ 14.19 Instrument Pack Structure - Actual weight obtained - previous estimate was to incomplete early drawings.
- + 710.50 Flight Test Installations - preliminary allowance for approx. 250 monitored points.

+ 716.54

+ 776.75 TOTAL WEIGHT CHANGE

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

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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>
STRUCTURE	18,509.69	562.50	137.44
Wing	9,982.42	643.24	142.11
Fin & Rudder	1,029.70	754.74	209.56
Fuselage fwd Sta. 255"	2,600.35	181.29	127.97
Sta. 255"-485"	1,650.42	379.43	130.83
Sta. 485"-591.65"	1,003.86	533.87	104.55
Sta. 591.65"-742.5"	1,418.18	660.80	107.30
Aft. Sta. 742.5	772.18	800.51	129.11
Marry-Up	52.58	468.91	103.89
UNDERCARRIAGE - RETRACTED	2,609.77	488.51	134.93
Main Undercarriage	1,959.62	539.48	141.00
Main U/C Doors & Fairings	291.80	537.10	138.40
Nose Undercarriage	333.81	170.81	99.70
Nose U/C Door & Fairing	24.54	162.24	88.23
POWER PLANT & SERVICES	14,302.51	653.47	120.31
Engines & Accessories J75 P3	12,557.91	664.92	119.80
Gear Box Installation on Fuselage	275.54	601.39	102.98
Gear Box & Starter on Engine	259.65	591.55	104.52
Engine Controls	32.43	375.76	118.62
Engine Nose Bullet	70.37	562.80	115.09
Fire Extinguishing System	70.46	702.44	134.83
Engine Mountings	198.75	635.50	127.97
Fuel System	837.40	536.65	136.07
FLYING CONTROLS GROUP	1,819.56	687.03	139.99
Mechanical Flying Controls	942.92	688.24	148.56
Hydraulic Flying Controls	876.64	685.72	130.67
EQUIPMENT FIXED & REMOVABLE	7,806.98	402.37	111.46
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	227.72	142.18
Air Conditioning System	738.02	336.49	134.76
Surface Finish	100.00	591.52	140.20
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	1,105.89	419.52	112.93
Low Pressure Pneumatics	49.30	444.28	125.94
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	690.98	322.67	123.64
Instrument Pack Structure	684.80	385.90	94.71
Pack Instrumentation - 1st A/C	2,447.00	389.50	95.00
Flight Test Installations	710.50	570.00	120.00
Additional Fire Protection - 1st A/C	154.17	425.05	102.89
Emergency Landing Gear Lowering	12.91	458.83	128.60

continued.

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

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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>	<u>M.A.C.</u> <u>%</u>
Equipment (Fixed & Removable)(Cont'd.)				
Radome Anti-icing	8.88	51.49	125.00	
AIRCRAFT BASIC WEIGHT	45,048.51	564.38	127.46	
USEFUL LOAD (less fuel)	968.02	354.76	132.64	
Crew	430.00	194.00	136.50	
Oil	134.23	608.92	115.68	
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	46,016.53	559.97	127.57	34.24
		562.10	124.05	34.83
Maximum Internal Fuel (2,544 gals. @ 7.8 lb/gal.)	19,843.00	538.88	144.32	
A.U.W. Max. Internal Fuel	65,859.53	553.62	132.62	32.49
		555.10	130.16	32.89

N.B. 1) A/C datum is considered to be 120" above an arbitrarily chosen ground line.

2) 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 of ballast at Sta. 89.16, as currently provided for on Former Sta. 68.5 and the Shear Panel, is necessary, plus a further 100 lb on the Shear Panel (i.e. Total 1,482 lb)

REPORT No: 1-0400-44-3

By Karlsson Lindgren

DATE: May 15 1964

SHEET - 4 -

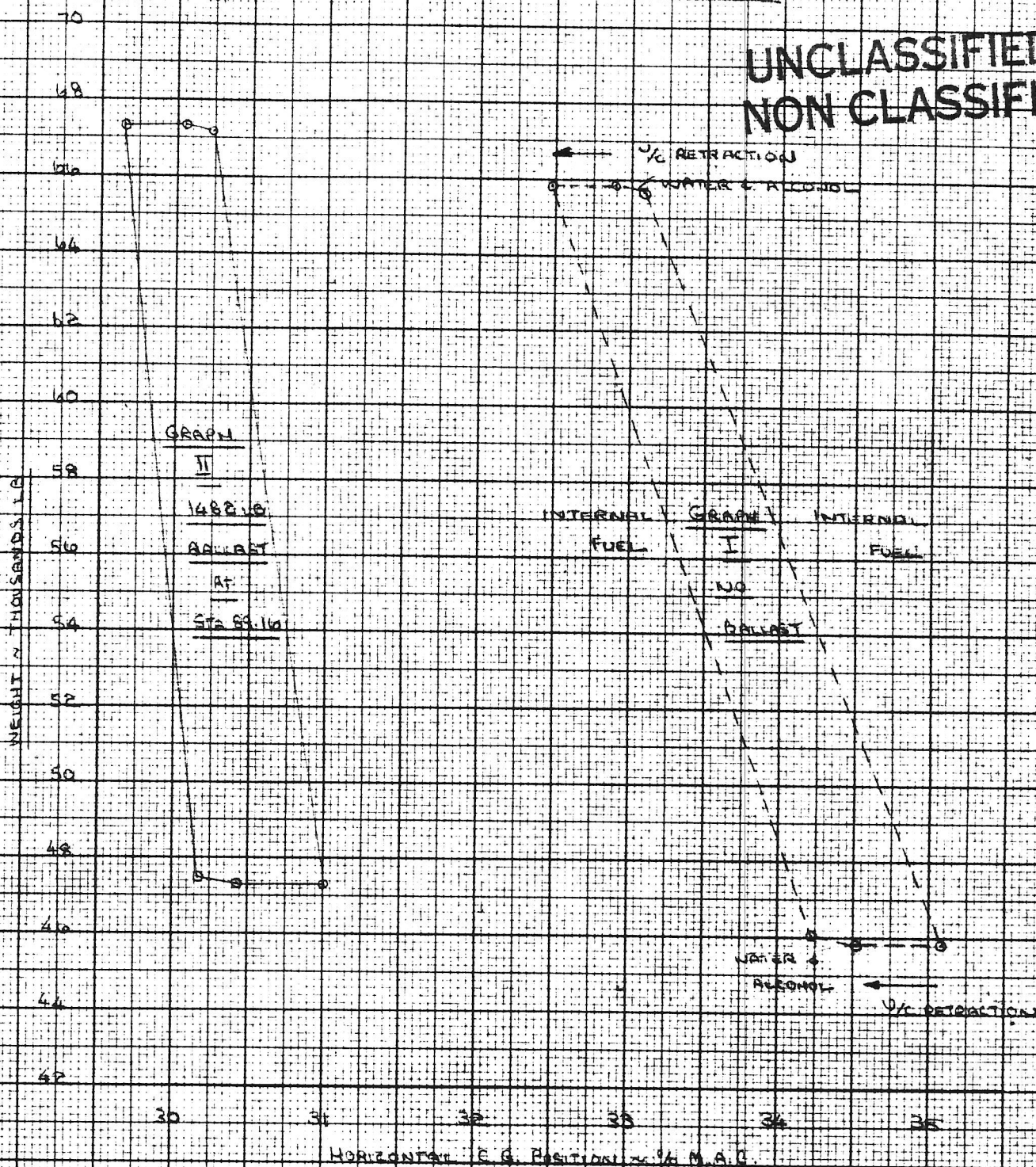
HORIZONTAL C.C. ENVELOPE

C105 MK II A/C FLIGHT CONDITIONS

WITH 175 HP ENGINES (ON A SUBSEQUENT 175 HP ENGINES)

- a) INTERIM RADAR & RADAR
- b) FUEL SYSTEM PROPORTIONERS
- c) INSTRUMENT PACKAGE & FLIGHT TEST INSTALLATIONS

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REPORT No. 1-0400-44-5

By: K. M. Brown

DATE: May 15, 1954

SHEET: 4-2

HORIZONTAL C.G. ENVELOPE

CLOSURE 1ST 1/2 FLIGHT CONDITIONS

WITH:

PROPOSED FUEL SYSTEM SEQUENCING

SEQUENCING ORDER (by P.W.S. 121)

R.H.S. ~ 1, 4, 3, 8, 4, 7, 5 (NOTED R1, R4 etc)

L.H.S. ~ 3, 7, 6, 3, 4, 2, 5 (NOTED L8, L7 etc)

----- 1/2 EXTENDED

===== 1/2 RETRACTED

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FLIGHT CONDITION

10

58

60

62

64

66

68

70

72

74

76

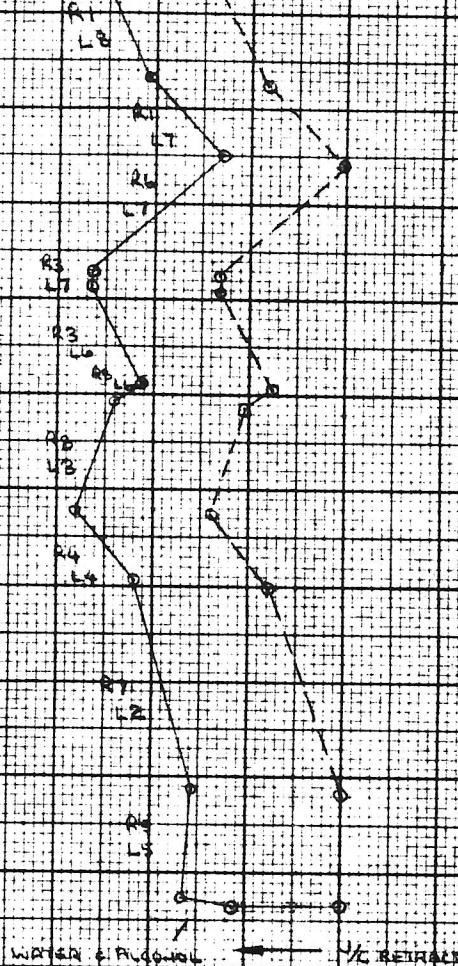
78

80

82

84

1/2 RETRACTION
WATER & ALCOHOL



GAUGE INSTALLED
1002 LB AT 8000 IN

WATER & ALCOHOL 1/2 RETRACTION

HORIZONTAL C.G. POSITION ~ 1/2 M.A.C.