

Report # 7-0400-34 Issue 9
Date: July, 1st 1957

C-105 MK 2 Production Aircraft

I N D E X

<u>Sheet #</u>	<u>Content</u>
1-1 to 1-4	Introductory notes and explanations of weight changes.
2-1 to 2-3	Weight and C.G. Summaries.
3-1	Horizontal C.G. Envelope for Aircraft Flight Conditions using fuel sequencing, C.G. controlled to approximately 31% M.A.C. until Damping System requirements are proven (ref. Avro Spec. E-503).
3-2	Horizontal C.G. Envelope for Aircraft Flight Conditions using fuel sequencing to achieve approximately 34% M.A.C. at Combat Weight (Alternate Sequencing Spec. E-503).
4-1 to 4-	I.B.M. Detail Sheets of Weights and C.G.'s.

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Classification cancelled / changed to: UNCLASSIFIED

By authority of: DRDA 7/DARET 5-8/DAS Eng 6-4-5

Date: 5 Nov 1992

Signature: B. Ambrose
Unit / Rank / Appointment: DSIS/3, Secretary CRAD HQ DRP

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Aircraft: C-105 MK 2
Production Aircraft

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Sheet # 1-1
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INTRODUCTION & WEIGHT CHANGES

The following is a Weight and C.G. Summary of the C-105 MK 2 Production Aircraft based on the latest weight estimates available.

Where no details, of minor changes between MK 1 Aircraft and MK 2 Aircraft, are available allowances have been retained as in MK 1. Some MK 2 estimates are to production drawings some to schemes and some allowances of a very preliminary nature e.g. Structure Aft. of Sta. 803 ins.

All weight & C.G. changes are relative to Issue 8 of June 1st 1957.

GENERAL

- a) Orenda PS 13 Engines comprise the Power Plant (4,500 lb each).
- b) A package containing 4 "semi-submerged" Sparrow 11 Missiles (432 lb each) forms the current armament.
- c) The R.C.A. Radar Astra 1 System is installed - Weight & C.G. Location being to the latest breakdown received from them, dated January 11th 1957. However, the Sparrow 111 Auxiliaries and the Infra-red Tracker System, included in the 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 manufacturers estimates or Avro specification weight requirements. Where these weights apply to the MK 2 Aircraft they have been incorporated into the MK 2 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 (1b)

a) Wing

NO WEIGHT CHANGE

b) Fin and Rudder

NO WEIGHT CHANGE

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INTRODUCTION & WEIGHT CHANGES

1. STRUCTURE

WEIGHT (lb)

c) Structure Fwd. Sta 255"

Navigator's Canopy - redesigned for MK 2 Aircraft with larger windows	+13.33
Radome - Revision of the weights of the light sandwich type radome and initial est. of aft. attach. ring etc.	+ 4.25
Radar Nose Structure - only an allowance previously, now est. to scheme & production drawings.	- 5.56
<u>TOTAL INCREASE FWD. FUSELAGE</u>	+12.02

d) Centre Fuselage Sta 255" to 485"

Dorsal Fairing Sta 268" - 317" - redesigned for MK 2 Aircraft in titanium.	+ 6.66
<u>TOTAL INCREASE CENTRE FUSELAGE</u>	+ 6.66

e) Duct Bay Sta 485" - 591.65"

Side Formers - some redesigned for MK 2 Aircraft	- 1.26
Bottom Formers - some redesigned for MK 2 Aircraft	- 1.90
Floating Duct - This has been extensively redesigned with an articulated adaptor between the floating Duct and Engine, including gills. Drawings are not yet released but a preliminary estimate indicates an increase in the duct Wt. of	+96.00
(N.B. Wt. Change 1st Aircraft = 48.41 due to the deletion of -59.59 from the Engine Group for the adaptor and addition of joint clamp, see Engine Bay + 12.00)	
<u>TOTAL WEIGHT INCREASE DUCT BAY</u>	+92.84

f) Engine Bay Sta. 591.65" - 742.5"

Heavy Formers - miscellaneous minor changes, some production drawing estimates	+ 2.07
Engine Service Doors - deletion of intercostals at # 4 door	- 1.58
Engine Tunnel - lower shroud splice	+ 7.00
Doublers at shroud beams, (titanium were AP) alt. to hinges, seals added etc.	+21.81

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INTRODUCTION & WEIGHT CHANGES

1. STRUCTURE

WEIGHT (lb)

f) Engine Bay Sta. 591.65" - 742.5" (Cont'd)

Titanium & steel used at access doors and seals	+20.00
Joint Engine to Duct - Marmon type clamp introduced	+12.00
<u>TOTAL WEIGHT INCREASE ENGINE BAY</u>	<u>+61.30</u>

g) Rear Fuselage Sta. 742.5" aft.

Tunnel Fixed RF - First est. to MK 2 schemes	+ 2.84
Longerons and Centre Beam - redesigned for MK 2	- 1.09
Rudder Fairing - redesigned for MK 2	+ 0.32
Engine Doors - Stress approval frame Sta. 803	+ 0.54
" " " " 798	- 1.22
Outer Skins Fixed RF - MK 2 redesign	+ 1.01
<u>TOTAL INCREASE REAR FUSELAGE</u>	<u>+ 2.40</u>

h) Fuselage Joints

Joint Sta. 742.5 - revised MK 2 estimate	- 0.25
<u>TOTAL JOINTS DECREASE</u>	<u>- 0.25</u>

<u>TOTAL STRUCTURAL INCREASE</u>	<u>+174.97</u>
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2. LANDING GEAR

NO WEIGHT CHANGE

3. POWER PLANT & SERVICES

Engines - addition of Engine restrictor flaps	+ 2.25
deletion of Adaptor ring (see Engine Bay Structure Group)	-59.59
<u>TOTAL POWER PLANT DECREASE</u>	<u>-57.34</u>

4. FLYING CONTROLS

NO WEIGHT CHANGE

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INTRODUCTION & WEIGHT CHANGES

<u>5. EQUIPMENT GROUP</u>	<u>WEIGHT (lb)</u>
MH64 Damping System - addition of Minneapolis Honeywell damping system and emergency Yaw damping	+60.00
Air Conditioning - previously an allowance only was carried, now fully estimated to initial scheme drawings	-41.00
Missile Pack Air Conditioning - Ducting added for cooling	+ 2.64
<u>TOTAL EQUIPMENT INCREASE</u>	<u>+21.64</u>

SUMMARY

Weight Change - Aircraft Weight Empty

Structure	+174.97
Power Plant	- 57.34
Equipment	+ 21.64
	<u>+139.27</u>

Weight Change - Operational Weight Empty (Aircraft less fuel)

<u>Issue 8</u>	<u>Issue 9</u>	
44,214.53	44,353.80	<u>+139.27 lb.</u>

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WEIGHT & C.G. SUMMARY

Description	WEIGHT lb.	H. ARM ins.	V. ARM ins.
STRUCTURE	18,524.98	564.30	137.67
Wing	9,980.77	642.76	142.21
Fin & Rudder	1,024.00	754.25	209.28
Fuselage Fwd. Sta. 255"	2,493.62	186.93	129.08
Sta. 255"-485"	1,688.44	378.72	129.61
Sta. 485"-591.65"	1,045.19	536.96	105.11
Sta. 591.65" -742.5	1,541.78	660.67	110.61
Sta. 742.5 Aft.	698.85	795.80	129.02
"Marry Up"	52.33	467.60	103.84
UNDERCARRIAGE - RETRACTED	2,551.77	487.22	134.79
Main Undercarriages	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	10,628.54	674.64	121.36
Engines & Accessories PS 13	9,032.78	691.67	121.20
Gear Box & Drives on Fus.	281.84	601.70	102.49
Engine Controls	32.43	375.76	118.61
Gear Box, Starter & Drives on Eng.	315.45	615.98	105.24
Engine Nose Bullet (Orenda sup)	70.00	587.17	116.00
Fire Extinguishing System	70.46	702.44	134.82
Engine Mountings	132.38	666.82	136.52
Fuel System	693.20	530.62	134.87
FLYING CONTROLS GROUP	1,801.45	686.69	140.08
Mechanical Flying Controls	946.48	687.84	148.61
Hydraulic Flying Controls	854.97	685.42	130.63
EQUIPMENT FIXED & REMOVABLE	7,996.30	326.74	112.38
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	23.59	253.72	156.43
Ejector Seats	284.42	202.80	136.25
Air Conditioning System	856.00	333.49	134.98
Hydraulic Main System	609.09	500.86	117.57
Cabin Insulation	14.31	187.48	132.00
Brake Parachute	62.38	769.41	143.24
Electrical System	1,242.38	426.80	112.53

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WEIGHT & C.G. SUMMARY

Description	WEIGHT lb.	H.ARM ins.	V.Arm ins.	M.A.C. %
Low Pressure Pneumatics	55.70	416.79	123.99	
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	
MH64 Damping System	60.00	434.09	134.90	
Radio & Radar removable	1,850.50	178.50	104.46	
" " fixed	621.00	234.04	116.15	
Sparrow Pack Structure	870.70	389.60	96.00	
" " Mechanisms	584.76	377.66	98.93	
" " Hydraulics	331.94	373.52	99.00	
" " Electronics	143.00	332.00	100.00	
" " Electrics	64.10	362.29	95.00	
" " Air Conditioning	2.64	309.93	104.15	
AIRCRAFT BASIC WEIGHT	41,503.04	547.36	128.55	
USEFUL LOAD (LESS FUEL)	2,850.76	372.91	105.43	
Crew	430.00	194.00	136.50	
Oil	138.97	636.92	110.57	
Alcohol	22.00	93.00	138.00	
Engine Fire Ext. 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	259.68	159.91	
Water for Air Conditioning	275.00	268.00	131.75	
U/C Up		536.15	127.06	27.67
Operational Weight Empty	44,353.80			
U/C Down		538.31	123.49	28.26
U/C Up		542.10	128.63	29.31
Op. Wt. Empty Less Missiles	42,625.80			
U/C Down		544.34	124.92	29.93
Normal Combat Mission Fuel * (2026 gals at 7.8 lb/gal.)	15,800.00	542.05	142.30	
U/C Up		537.70	131.06	28.10
Normal Combat Weight	60,153.80			
U/C Down		539.29	128.43	28.53
Half Combat Mission Fuel (1,013 gals at 7.8 lb/gal)	7,900.00	543.20	139.55	

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WEIGHT & C.G. SUMMARY

Description	WEIGHT lb.	H.ARM ins.	V.ARM ins.	M.A.C. %
U/C Up Combat Weight (half mission fuel)	52,253.80	537.22	128.95	27.96
U/C Down Max. Internal Fuel (2492 gals at 7.8 lb/gal)	19,438.00	539.05 541.85	125.92 144.16	28.47
U/C Up A.U.W. Max. Int. Fuel	63,791.80	537.89	132.27	28.15
U/C Down		539.39	129.97	28.56
Max. External Fuel (500 gals at 7.8 lb/gal + Drop Tank)	4,248.20	521.84	60.67	
U/C Up A.U.W. Max. Int. & Ext. Fuel	68,040.00	536.89	127.80	27.88
U/C Down		538.30	125.47	28.26
<p>N.B. 1)* New figures are being prepared by Aerodynamics for Mission fuel in accordance with latest PS13 data.</p> <p>2) Aircraft Datum = 120" above an arbitrarily chosen ground line.</p>				

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Q103 MK 2 PRODUCTION AIRCRAFT

HORIZONTAL C.G. ENVELOPE FOR A/C

FLIGHT CONDITIONS

USING FUEL SEQUENCING CONFIRMING

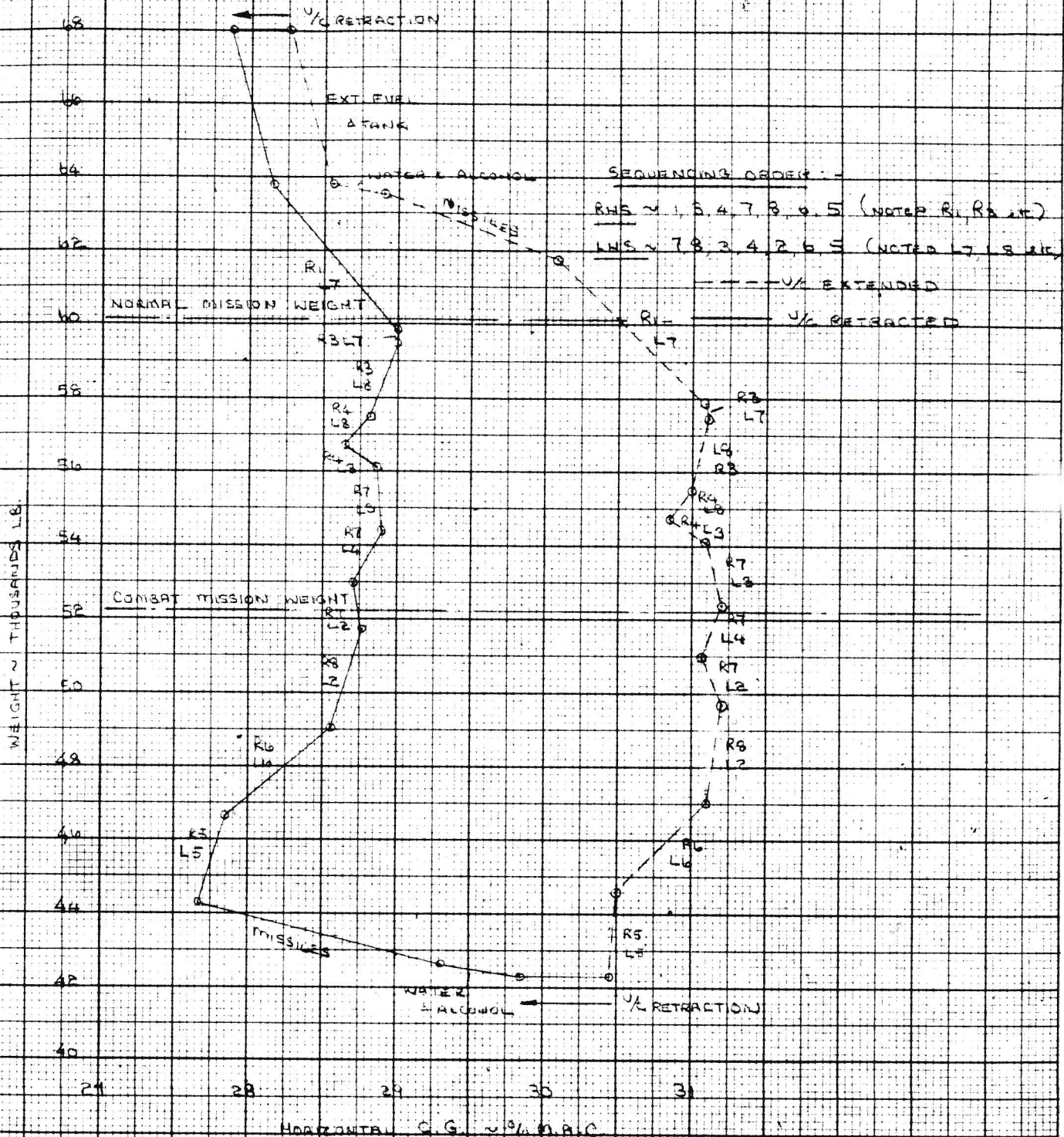
TO AWC (PRELIM) SPEC E 302

(FOR USE UNTIL NECESSITY OF DAMPING SYSTEM PROVEN)

BY: Forbes Lytle

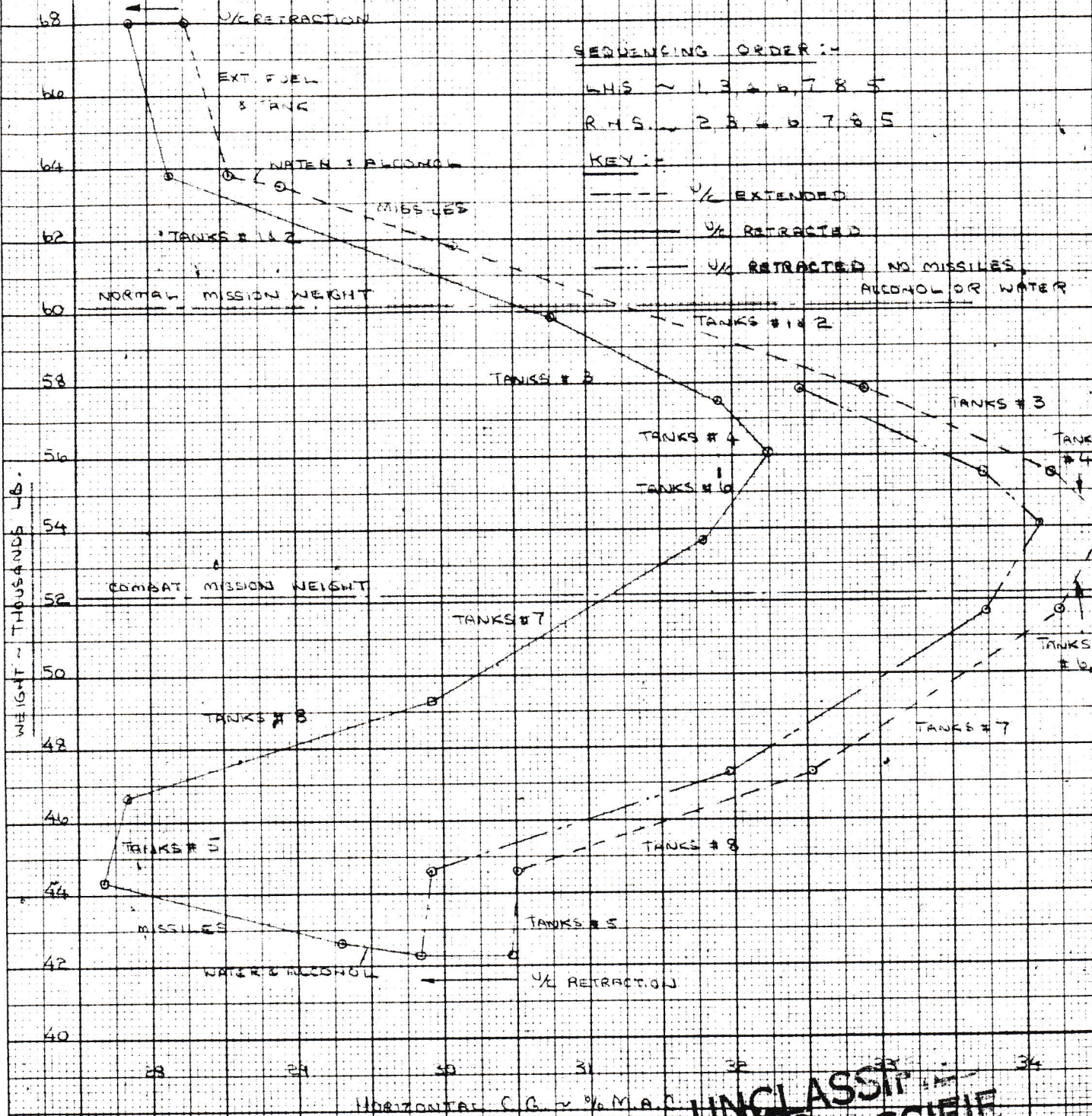
DATE: July 1st 1954

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B1: Kitt's room by Jeff
DA-1: Study 154 1387
SHEET: 3-2



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10 X 10 TO THE 1/2 INCH
MADE IN CANADA