C65-7869

NASA FILE COPY
Return to
NASA HQ. LIBRARY (ATSS-10)
WASHINGTON, D.C. 20546 STOP 85

~~CONFIDENTIAL~~

SID 63-143-16

40

PREFLIGHT REPORT

COMMAND MODULE BOILERPLATE NO. 6A

AIRPLANE DROP - PARACHUTE TEST

CONTRACT NAS 9-150
(U)

18 JUNE 1965

Exhibit I, Paragraph 8.10

Prepared By

Weight Control

RECEIVED
AUG 10 1965
NASA
DOCUMENT
CENTER

CLASSIFICATION CHANGE
To UNCLASSIFIED
By authority of G. H. Miller Date 1/31/72
Changed by L. Shirley
Classified Document Master Control Station, NASA
Scientific and Technical Information Facility

"THIS DOCUMENT CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, TITLE 18, U.S.C. SECTIONS 793 AND 794. ITS TRANSMISSION OR THE REVELATION OF ITS CONTENTS IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW."

~~CONFIDENTIAL~~

NORTH AMERICAN AVIATION, INC.
SPACE and INFORMATION SYSTEMS DIVISION

DOWNGRADED AT 3 YEAR INTERVALS
DECLASSIFIED AFTER 12 YEARS
DOD DIR 5200.10

FORM M158-D-3 ... UM REV. 2-61

TABLE OF CONTENTS

Segment	ASPO-PS5-13-12 Reference Paragraph	Page
Title Page and Table of Contents	2.4.5.1	ii
Introductory Summary	2.4.5.2	
Introduction		1
Module Mass Properties Summary		2
Summary Weight Statement	2.4.5.3	
Command Module		3
Weight and Balance Log	2.4.5.4	
Total Weight and C. G. Derivation		4
Horizontal Weighing - Position 1		5
Horizontal Weighing - Position 2		6
Mass Distribution	2.4.5.6	
Command Module		7
Descend Phase Curves	2.4.5.7	
Command Module		8-13

[redacted]

INTRODUCTION

This preflight report (field weighing) is submitted per paragraph 2.4.5 of NASA Requirements Document ASPO-PS5-13-12 as deviated by attachment "A" of enclosure to NAA letter 65MA5254 dated 7 May 1965.

The Command Module Boilerplate No. 6A actual weight and balance determination was conducted by the Weight Control Group personnel at the El Centro Naval Air Center in El Centro, California.

The weight, center of gravity and inertia summary presents data for the following conditions:

1. The initial condition after the module is dropped from the airplane.

2. After forward heat shield is jettisoned and the drogue chute and fittings deployed.

3. After the pilot and main chutes are deployed.

The weight, balance and inertia summary on page 2 presents the actual weight and balance data and known modifications, shown on page 4, to bring the Command Module to the initial condition for the first airplane drop. Further weight adjustments will be made in the field for additional drops and therefore, additional actual weight and balance determinations will be made at various times. This information will be incorporated as an appendix to this report.

The weight distribution curve page 7 and the descend phase curves pages 8 through 13 are presented in this report. All inertia values are calculated.

Boilerplate Command Module No. 6A is ballasted to obtain a weight of 11,000 pounds with the apex cover deployed and chutes in stowed position. This condition simulates the maximum Block I Command Module descending weight for parachute design.

[redacted]

[redacted]

MODULE MASS PROPERTIES SUMMARY

ITEM	WEIGHT	CENTER OF GRAVITY*			MOMENTS OF INERTIA**		
		X	Y	Z	Ixx	Iyy	Izz
COMMAND MODULE - INITIAL	11440	1043.3	0.3	4.8	6397	5303	5630
LESS: FORWARD HEAT SHIELD	-455	1097.4	-0.1	0.5	-375	-221	-273
C/M PRIOR TO DROGUE CHUTE DEPLOYMENT	10985	1041.1	0.3	5.0	6315	4954	5272
LESS: DROGUE CHUTE	-51	1088.8	0.0	-21.8	-7	-1	-6
LESS: DROGUE DISCONNECT	-6	1105.5	0.0	-18.1	0	0	0
C/M PRIOR TO MAIN CHUTE DEPLOYMENT	10928	1040.8	0.3	5.1	6305	4915	5240
LESS: MAIN CHUTE	-410	1090.2	-1.0	7.4	-55	-18	-46
C/M AT IMPACT	10518	1038.9	0.4	5.0	6249	4672	4970

NOTES: *Centers of gravity are in the NASA reference system except that the longitudinal (X) has an origin 998.7 inches below the tangency of the Command Module mold line.

**Moments of inertia units are slug feet squared about the center of gravity.

[redacted]

~~CONFIDENTIAL~~

SUMMARY WEIGHT STATEMENT

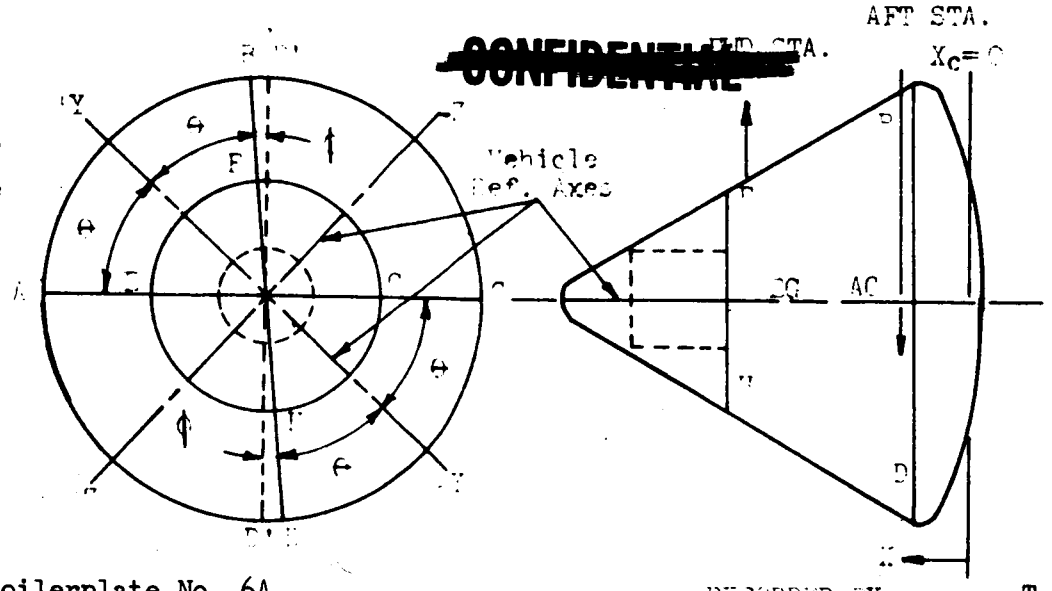
Structure	(10438)
Basic Body Structure	6293
Secondary Structure	
Lower Equipment Bay Section	151
Ballast - Internal	3994
Stabilization & Control	(10)
Earth Landing System	(733)
Instrumentation	(39)
Electrical Power System	(152)
Communications	(68)
COMMAND MODULE	11440

~~CONFIDENTIAL~~

WEIGHT AND BALANCE CALCULATION SHEET

COMMAND MODULE

[redacted]



θ = 42°-45'-17.25"
φ = 4°-29'-25.50"

VEHICLE NO: Boilerplate No. 6A

LOCATION: El Centro

RECORDED BY: T. N. Hunt

DATE PERFORMED: 13 May 1965

DESCRIPTION	REFERENCE	WEIGHT	X	WX	LAT	LAT.	VERT	MOM.
CELL LOCATION	E	*2608.4	79.81	208176	3.42	8921		
CELL LOCATION	G	*2616.1	79.81	208791			3.42	8947
CELL LOCATION	A	4192.9	28.44	119246	76.75	321805		
CELL LOCATION	B'	3921.0	28.44	111513			-76.75	-300937
CELL LOCATION	C	3895.8	28.44	110797	-76.75	-299003		
CELL LOCATION	D'	4159.4	28.44	118293			76.75	319234
GROSS(as weighed)	E+A+B'	10697.1	40.97	438219	2.97	31723		
	G+C+D'	10696.5	41.00	438597			2.55	27244

TRANSFER TO VEHICLE REFERENCE AXES (L = LAT. ARM, V = VERT. ARM)

$$Y = L(\cos\theta - \sin\theta \tan\phi) - V\frac{\sin\theta}{\cos\phi} = \underline{0.29}$$

$$Z = \left[L - \left(\frac{V + L\sin\phi}{\cos\phi}\right)\tan\theta\right]\sin\theta + \left(\frac{V + L\sin\phi}{\cos\theta\cos\phi}\right) = \underline{4.06}$$

$\sin\theta = .67886$
$\cos\theta = .73426$
$\tan\theta = .92454$
$\sin\phi = .07829$
$\cos\phi = .99693$
$\tan\phi = .07853$

DESCRIPTION	WEIGHT	X	WX	Y	WY	Z	WZ
TRANSFERRED GROSS(as weighed)	10696.9	40.99	438466	0.29	3102	4.06	43429
LESS: AFT JACK PADS	-47.3	28.44	-1345	0.00	-	0.00	-
PLUS: Air Bouyancy	3.5	40.99	143	0.29	-	4.06	14
NET (as weighed)	10653.1	41.05	437264	0.29	3102	4.08	43443
PLUS: Shortages							
N/V ELS	544.3	88.28	48051	-0.09	-49	2.48	1350
Stab. Chute Disconnect	42.4	27.67	1173	0.00	-	0.00	-
Drogue Disconnect	7.2	105.50	760	0.00	-	0.00	-
Swimmer Umbil. Mock-Up	2.0	83.00	166	10.40	21	-22.20	-44
Ballast	190.6	41.68	7945	2.75	524	52.20	9949
CORRECTED WEIGHT & C.G.	11439.6	43.30	495359	0.31	3598	4.78	54698

*32.6# of Fittings Deducted

WEIGHT AND BALANCE DATA SHEET

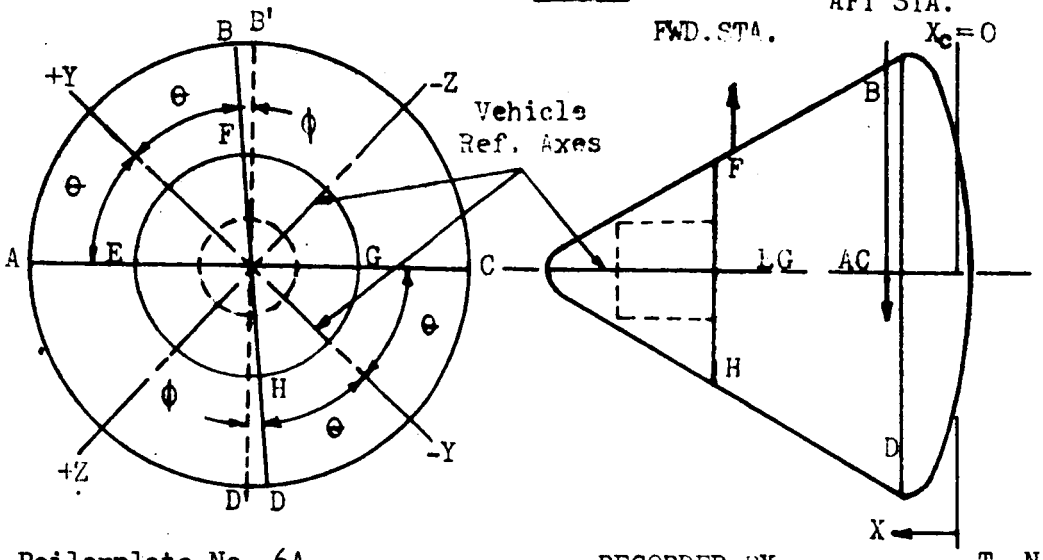
COMMAND MODULE

POSITION NO. 1

~~CONFIDENTIAL~~

θ = 42°-45'-17.25"

ϕ = 4°-29'-25.50"



VEHICLE NO: Boilerplate No. 6A

RECORDED BY: T. N. Hunt

LOCATION: El Centro

DATE PERFORMED: 13 May 1965

REACTION POINT F (Tension)

DETERMINATION NUMBER	LOAD CELL COLOR	GROSS READING	ZERO CORRECTION	CORRECTED READING	AVERAGE READING
1	Red	10827	-293	10534	
2	S/N 34211	10837	-291	10546	
					10540.0

REACTION POINT A (Compression)

DETERMINATION NUMBER	LOAD CELL COLOR	GROSS READING	ZERO CORRECTION	CORRECTED READING	AVERAGE READING
1	Yellow	16936	-282	16654	
2	S/N 34218	16992	-329	16663	
					16658.5

REACTION POINT C (Compression)

DETERMINATION NUMBER	LOAD CELL COLOR	GROSS READING	ZERO CORRECTION	CORRECTED READING	AVERAGE READING
1	Blue	15799	-307	15492	
2	S/N 34213	15805	-309	15496	
					15494.0

WEIGHT DERIVATION

REACTION POINT	LOAD CELL COLOR	AVERAGE READING	GROSS WEIGHT	TARE	WEIGHT
F	Red	10540.0	2641.0	-	2641.0
A	Yellow	16658.5	4192.9	-	4192.9
C	Blue	15494.0	3895.8	-	3895.8

~~CONFIDENTIAL~~

VERIFIED BY: [illegible] 7/6/65

SID 63-143-16

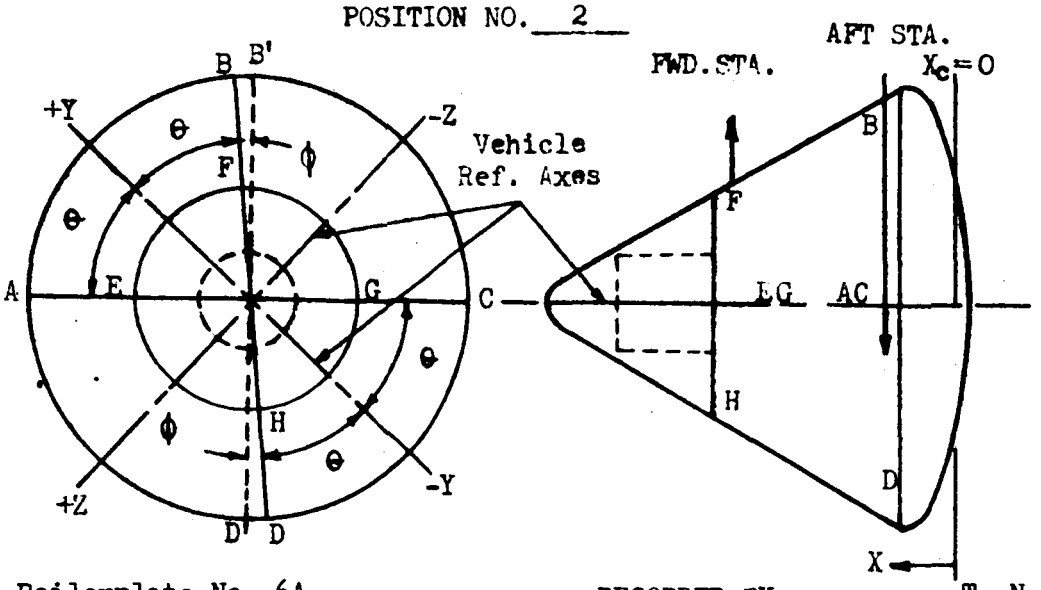
WEIGHT AND BALANCE DATA SHEET

COMMAND MODULE

POSITION NO. 2

~~CONFIDENTIAL~~

θ = 42°-45'-17.25"
ϕ = 4°-29'-25.50"



VEHICLE NO: Boilerplate No. 6A

RECORDED BY: T. N. Hunt

LOCATION: El Centro

DATE PERFORMED: 13 May 1965

REACTION POINT G (Tension)

DETERMINATION NUMBER	LOAD CELL COLOR	GROSS READING	ZERO CORRECTION	CORRECTED READING	AVERAGE READING
1	Red	10881	-313	10568	
2	S/N 34211	10864	-290	10574	
					10571

REACTION POINT B' (Compression)

DETERMINATION NUMBER	LOAD CELL COLOR	GROSS READING	ZERO CORRECTION	CORRECTED READING	AVERAGE READING
1	Blue	15890	-289	15601	
2	S/N 34213	15892	-305	15587	
					15594

REACTION POINT D' (Compression)

DETERMINATION NUMBER	LOAD CELL COLOR	GROSS READING	ZERO CORRECTION	CORRECTED READING	AVERAGE READING
1	Yellow	16835	-312	16523	
2	S/N 34218	16846	-316	16530	
					16526.5

WEIGHT DERIVATION

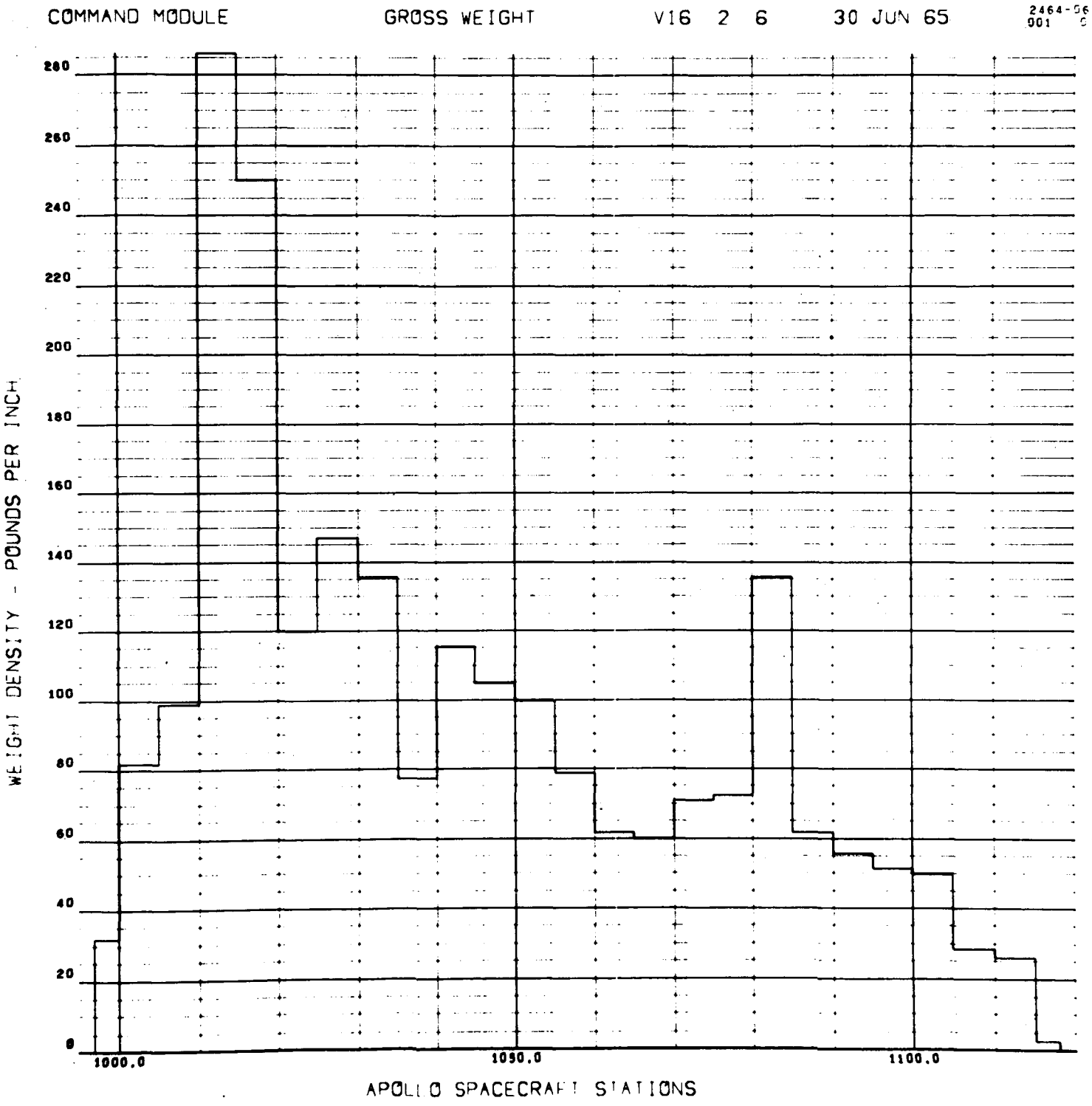
REACTION POINT	LOAD CELL COLOR	AVERAGE READING	GROSS WEIGHT	TARE	WEIGHT
	Red	10571.0	2648.7	-	2648.7
	Blue	15594.0	3921.0	-	3921.0
	Yellow	16526.5	4159.4	-	4159.4

~~CONFIDENTIAL~~

VERIFIED BY: [illegible] 7/6/65

SID 63-143-16

~~CONFIDENTIAL~~

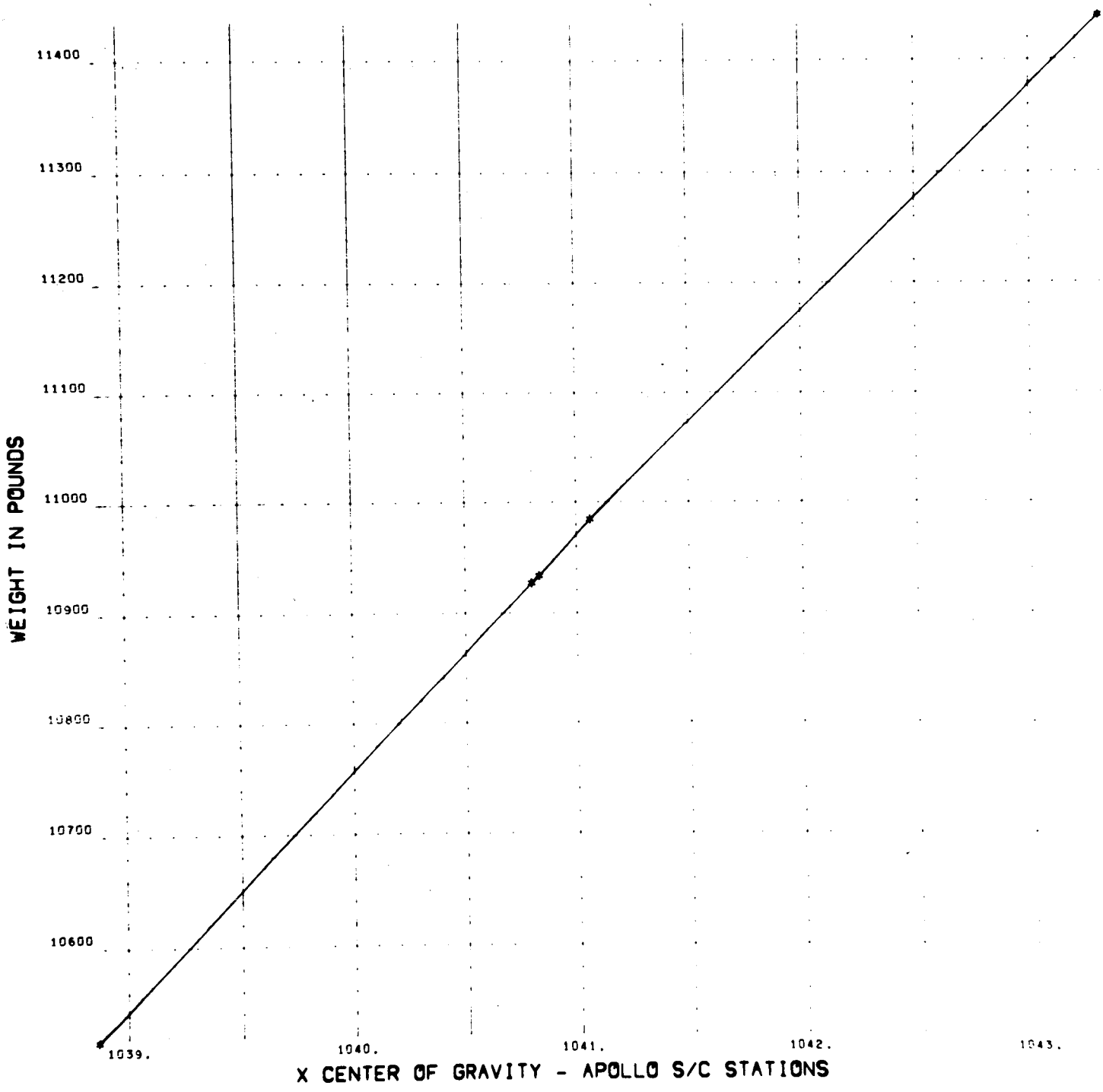


~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

BP 6A COMMAND MODULE DESCEND PHASE 14 JUNE 1965

2464-75
001 000

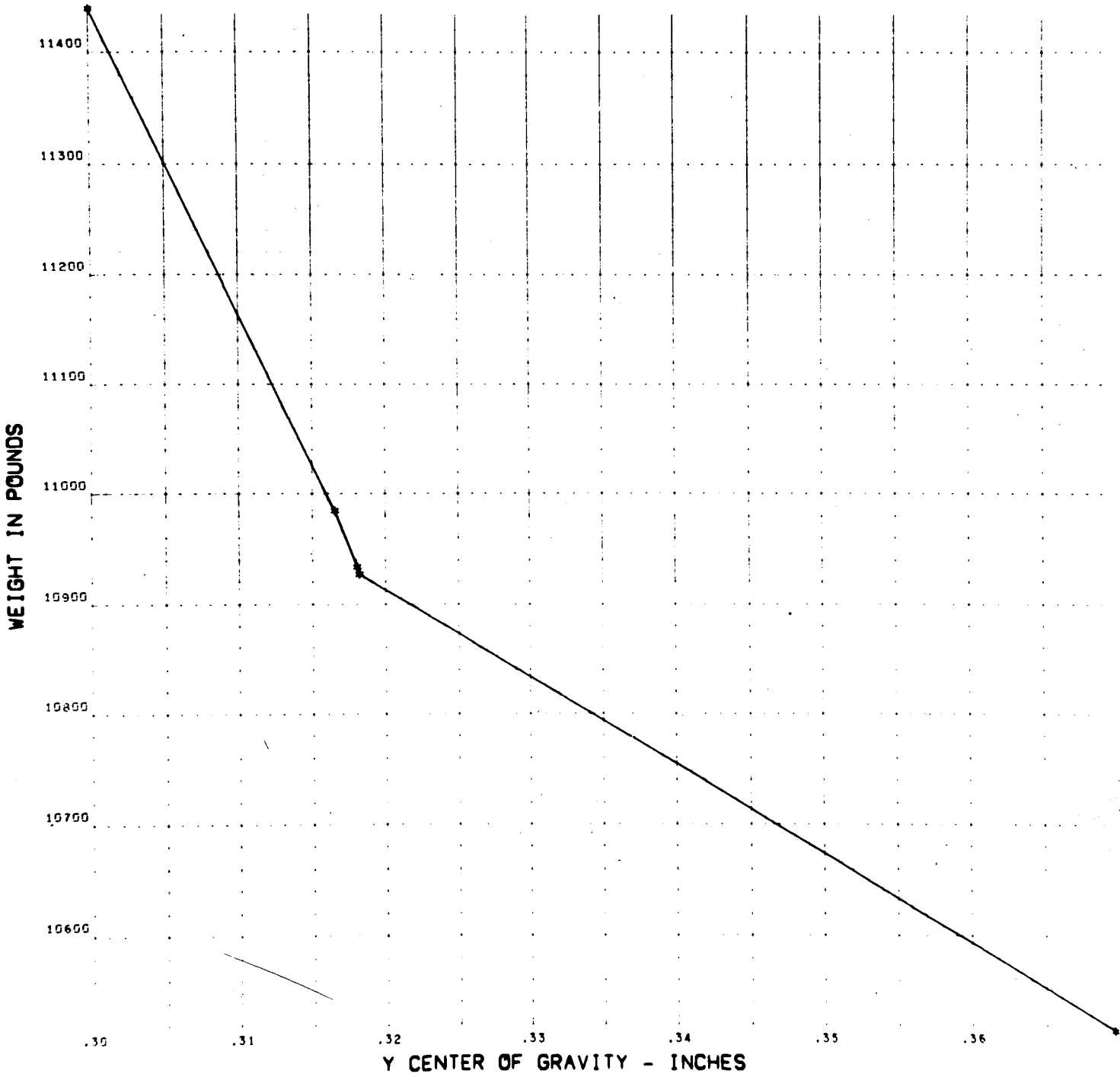


~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

BP 6A COMMAND MODULE DESCEND PHASE 14 JUNE 1965

2464-75
002 000

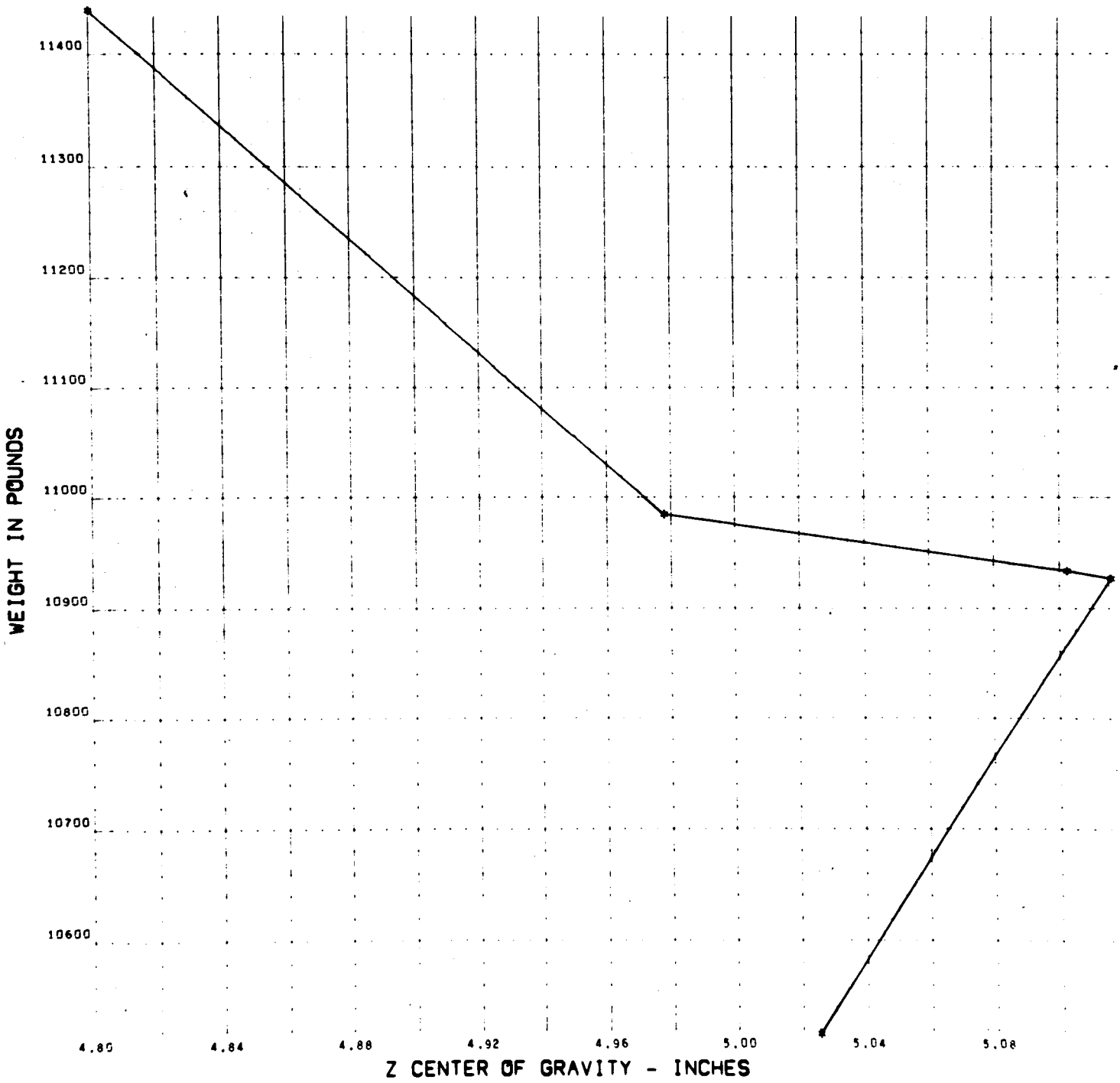


~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

BP 6A COMMAND MODULE DESCEND PHASE 14 JUNE 1965

2464-75
003 000

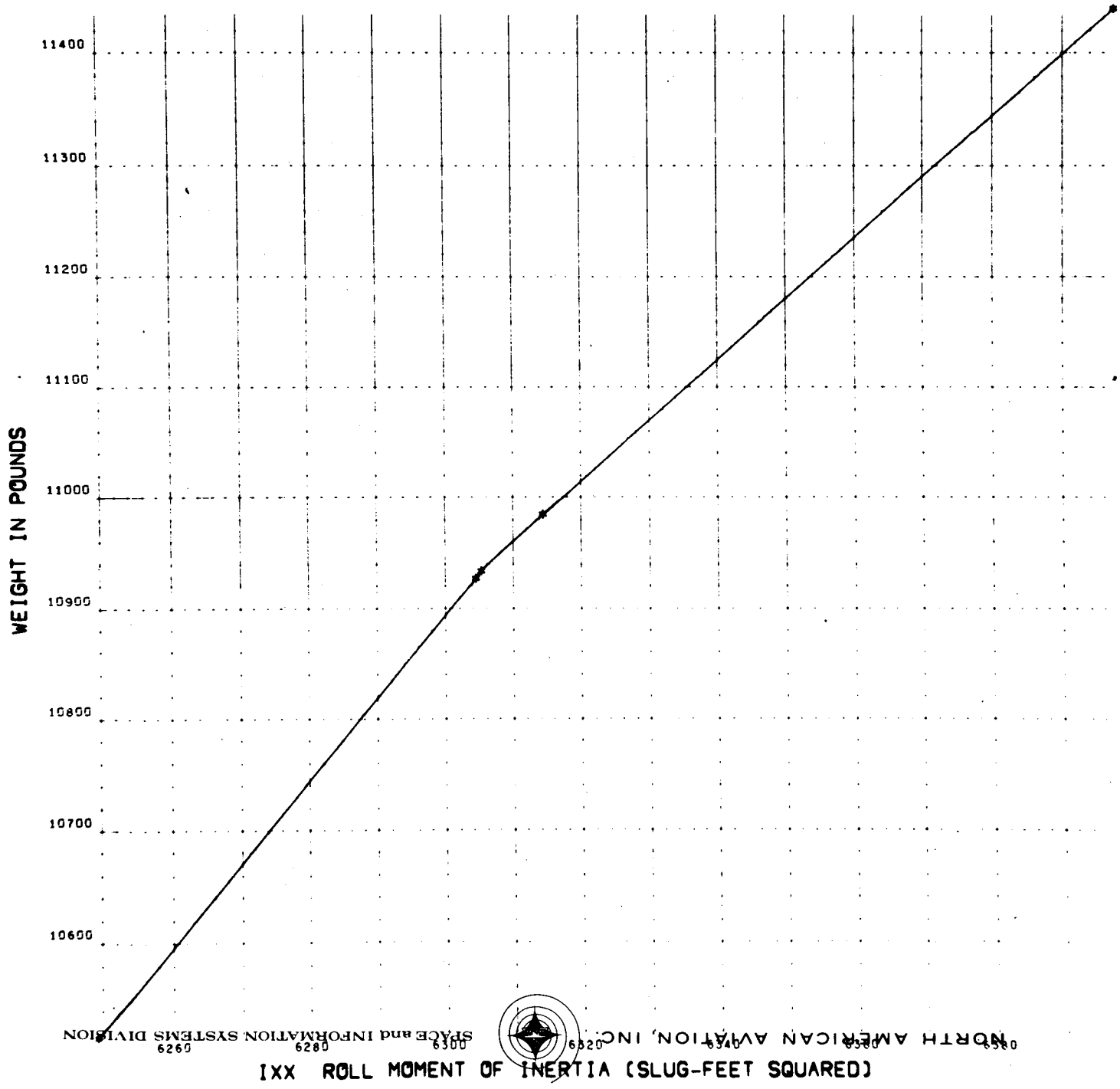


~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

BP 6A COMMAND MODULE DESCEND PHASE 14 JUNE 1965

2464-75
004 900

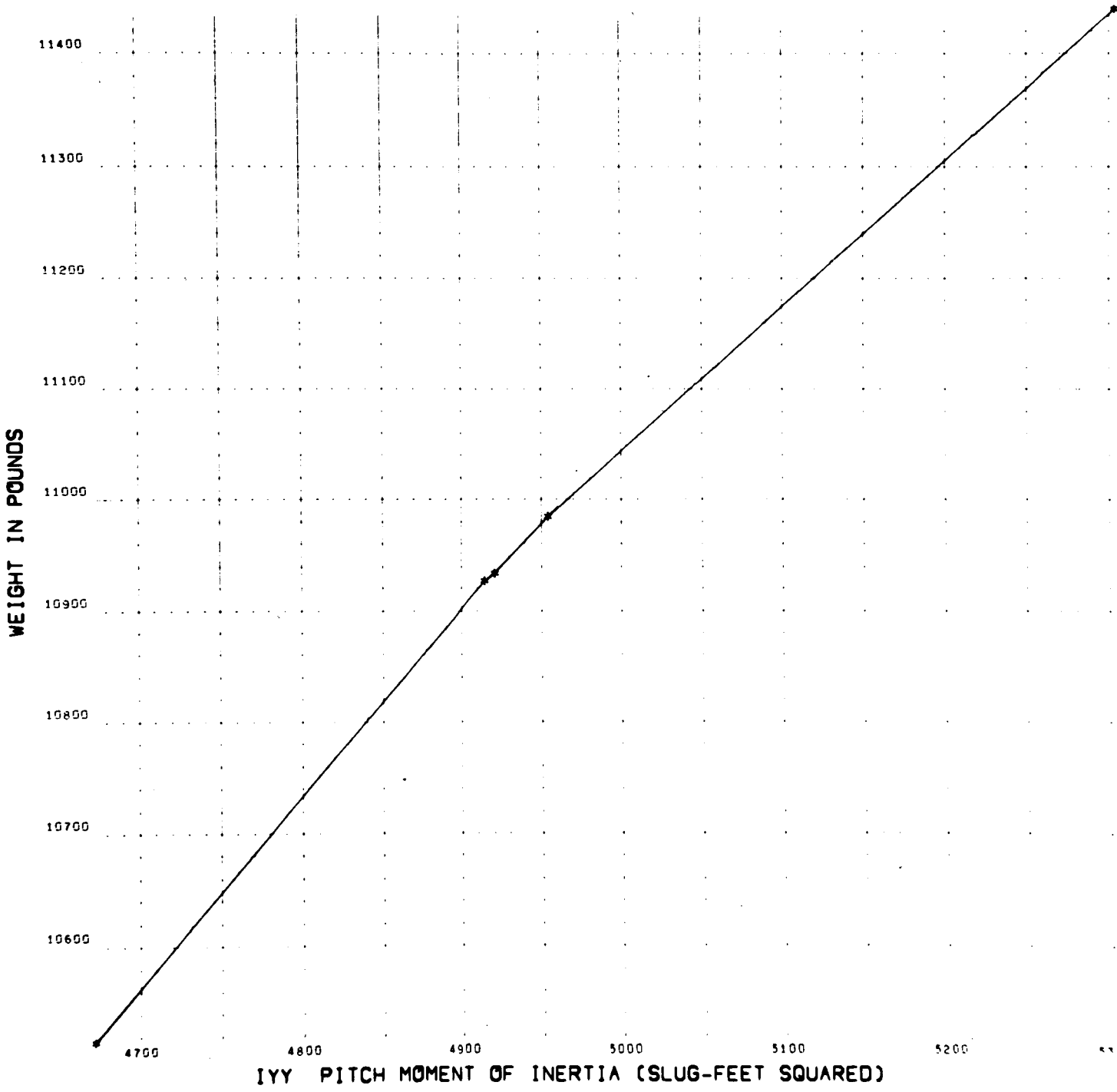


~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

BP 6A COMMAND MODULE DESCEND PHASE 14 JUNE 1965

2464-75
005 000

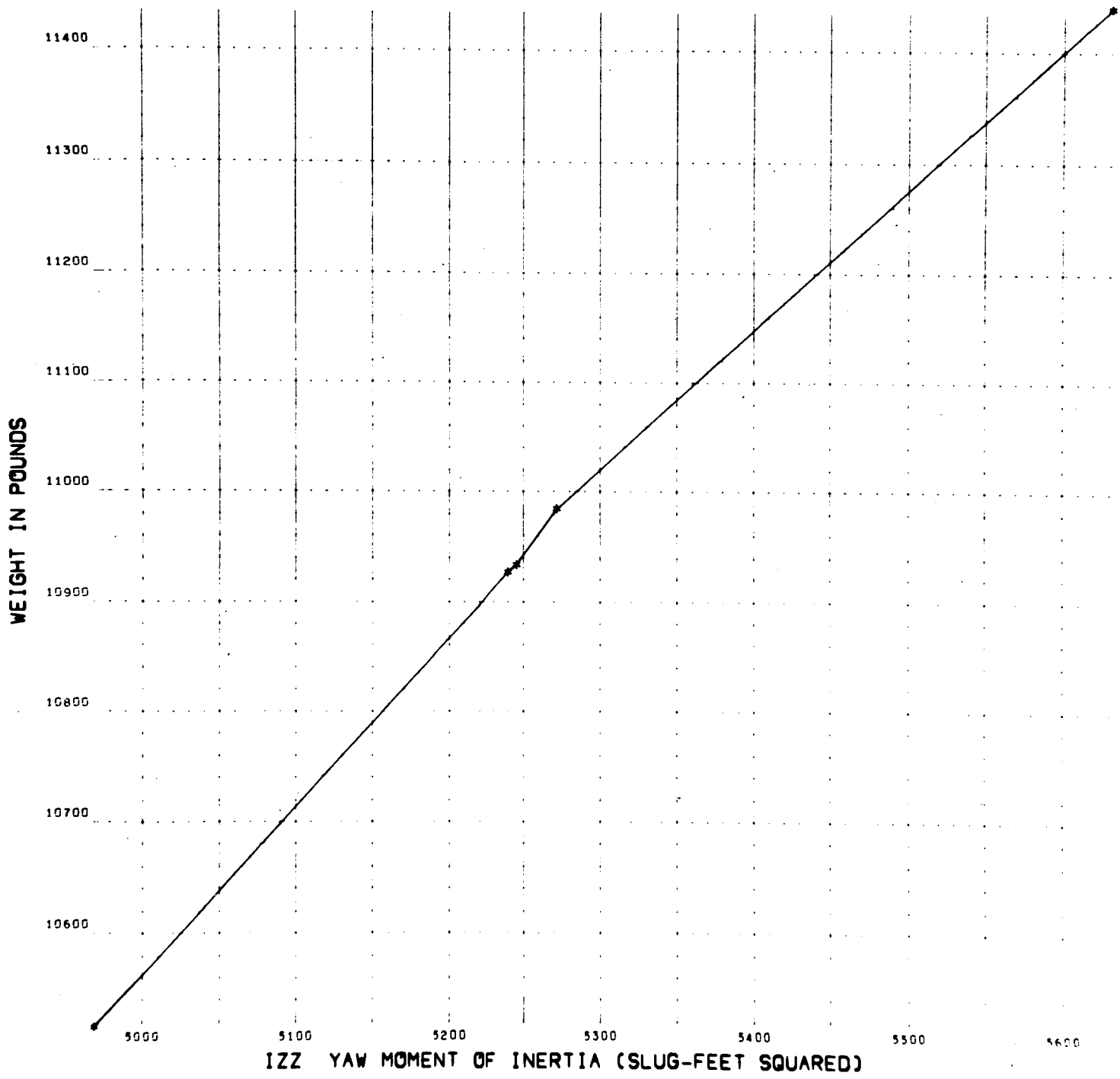


~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

BP 6A COMMAND MODULE DESCEND PHASE 14 JUNE 1965

2464-75
006 000



~~CONFIDENTIAL~~