CONTINENTAL AIRCRAFT ENGINE CO.

DETROIT MICH.

CONTINENTAL 0-1430-1 ENGINE

CRANKPIN AND MAIN BEARING LOADS

Prepared by

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Crankpin and Main Bearing Loads.

References: Aircraft Engine Bearing Load Analysis
by Ford L. Prescott S.A.E. Jl. Nov. 1931
Standard Method of Engine Calculations
A.S.I.C. Report No. 421

Reciprocating Weights

Weight of piston assy. (estimated)	5.140	lbs.
Reciprocating weight of blade rod	1.180	lbs.
Reciprocating weight of forged rod	1.307	lbs.
Average Reciprocating weight of rod	1.243	lbs.
Total Reciprocating weight	6.383	lbs.

Rotating Weights

Rotating weight of forged rod (Complete with bearing)	4.566	lbs.
Rotating weight of blade rod	21133	lbs.
Total rotating weight	6.699	lbs.

Length of connecting rod (Center to center) L-	7.750	in.
Crank radius R	2.50	in.
L/R	3.1	
Piston area (5.500 in. bore) A	23.758	Sq. in.

The gas loads are the product of the piston area and the gage pressures taken from the calculated indicator diagram curve No.

The inertia loads are obtained from the following relations.

$F_c = .0000284 \ W_{tor} R N^2 = .0000284 \times 6.699 \times 2.5 N^2 =$

$= .000475 \ N^2$ at 3000 RPM. $F_c = 4275$ lbs.

$F_i = -.0000284 \ W_{rec} R N^2 f_a = .0000284 \times 6.383 \times 2.5 N^2 f_a$

$= -.000452 N^2 f_a$ at 3000 RPM. $F_i = -4070 \ f_a$ lbs.

CRANKPIN BEARING LOADS AND pv VALUES OF AIRPLANE ENGINES.

ENGINE	NO. CYLINDERS	BORE IN.	STROKE IN.	RATED POWER B.H.P.	RATED SPEED R.P.M.	BRAKE MEAN EFFECTIVE PRESSURE LBS. PER SQ. IN.	BEARING DIMENSIONS INCHES		PROJ. AREA SQ. IN.	RUBBING VELOCITY FEET PER SEC.	RESULTANT FORCE LBS.		UNIT PRESSURE LBS. PER SQ. IN.		pv RUBBING FACTOR LBS. FT. PER SEC.
							LENGTH	DIAM.			MAX.	MEAN	MAX. P_m	MEAN P_a	
CURTISS V-1570	12	5.125	6.250	630	2,400	132.4	1.391	2.500	3.28	26.18	7,070	5,200	2,154	1,585	41,500
RANGER V-770	12	4.000	5.125	400	2800	146.4	1.712	2.125	3.653	25.9	5248	3987	1440	1091	28,342
ROLLS ROYCE *	12	6.000	6.600	1470	2300	215			6.65	30.1	19250	8670	2900	1300	39,150
LIBERTY	12	5.000	7.000	420	1,700	119.0	2.187	2.375	5.20	17.60	5,385	3,900	1,035	750	13,200
P. & W. R-1860	9	6.250	6.750	567	1,950	123.0	3.500	2.875	10.06	24.70	20,840	18,450	2,072	1,835	44,900
WRIGHT R-1820	9	6.125	6.875	575	1,900	132.0	3.625	3.250	11.78	26.96	18,050	15,570	1,532	1,322	35,600
NAPIER LION W	12	5.500	5.125	490	2,000	122.0	2.625	2.750	7.22	23.10	9,185	4,935	1,273	683	15,770
CONTINENTAL 0-1430	12	5.500	5.000	1000	3,000	185.0	2.000	2.875	5.750	37.6	13,600	8406	2370	1460	54,800

* NOT STANDARD RATING

MAIN-BEARING LOADS AND pv VALUES OF AIRPLANE ENGINES.

| ENGINE	JOURNAL DIAM., IN.	RUBBING VELOCITY, FEET PER SEC.	CENTER MAIN				INTERMEDIATE MAIN				END MAIN			
			NET PROJ. AREA SQ.IN.	pa LBS. PER SQ.IN.	pm LBS. PER SQ.IN.	pv LB.-FT. PER SEC.	NET PROJ. AREA SQ.IN.	pa LBS. PER SQ.IN.	pm LBS. PER SQ.IN.	pv LB.-FT. PER. SEC.	NET PROJ. AREA SQ.IN.	pa LBS. PER SQ.IN.	pm LBS. PER. SQ.IN.	pv LB.FT. PER SEC.
CURTISS V-1570	3.500	36.70	5.39	1377	1754	50,500	4.52	948	1504	34700	4.52	863	1112	31,600
RANGER V-770	2.75	33.6	4.21	1272	1635	42754	3.437	926	1410	31130	3.256	870	1101	29,261
ROLLS ROYCE		37.6	7.27	1205	1805	45350	6.32	1100	2245	41450	6.32	850	1300	32000
LIBERTY	2.625	19.45	4.27	1,165	1,580	22,650	4.27	720	1,150	14,000	4.27	623	845	12,100
NAPIER LION W		ROLLER MAIN BEARINGS.												
CONTINENTAL O-1430-1	3.125	41.0	5.68	1160	1730	47,500	5.68	1015	1750	41800	5.68	945	1380	38,800
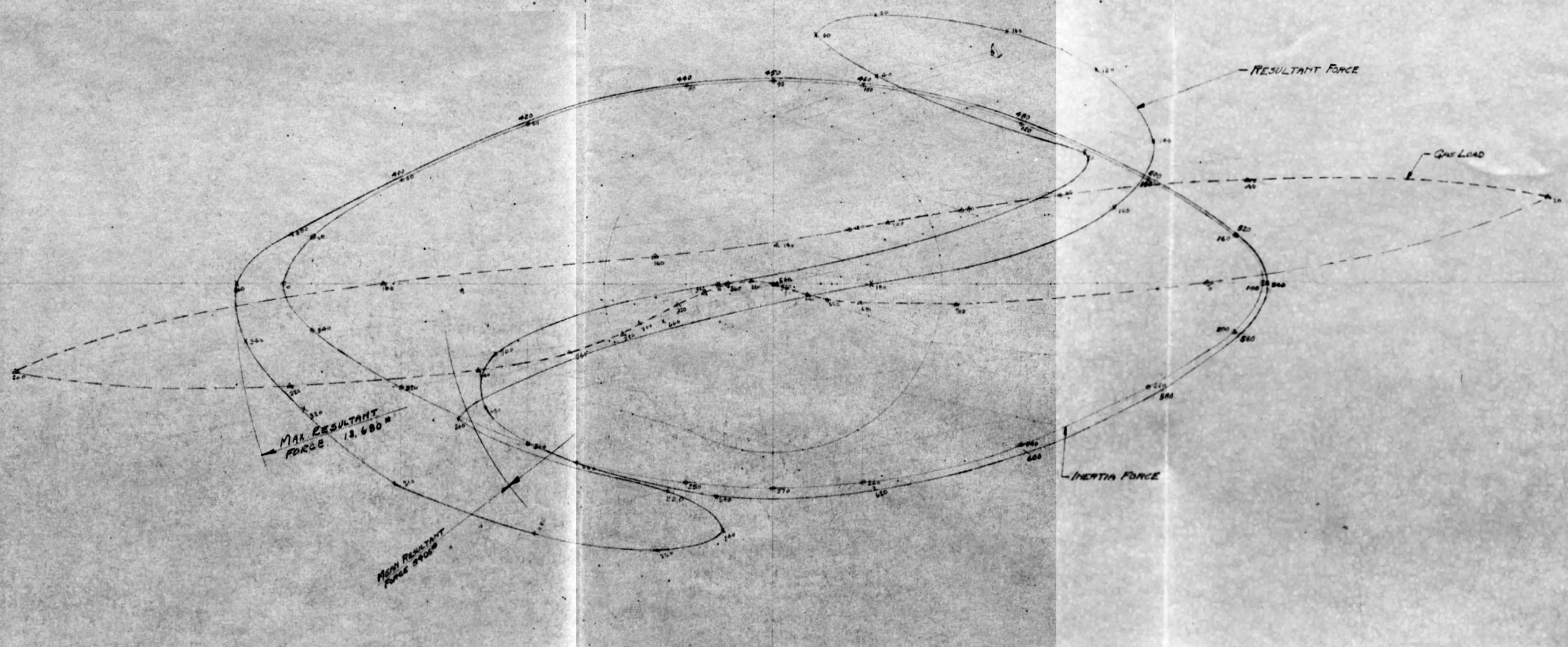
POLAR DIAGRAM FORCES ON CRANKPIN @ 3000 R.P.M.

CONTINENTAL O-1430-1 ENGINE   SCALE 1" = 2000 LBS

J. H. KINNUCAN   FEB 14-34

(PRELIMINARY ONLY)

C-13

Max Load
8600#

Max Load
8000#

With Counterweight

No Counterweight
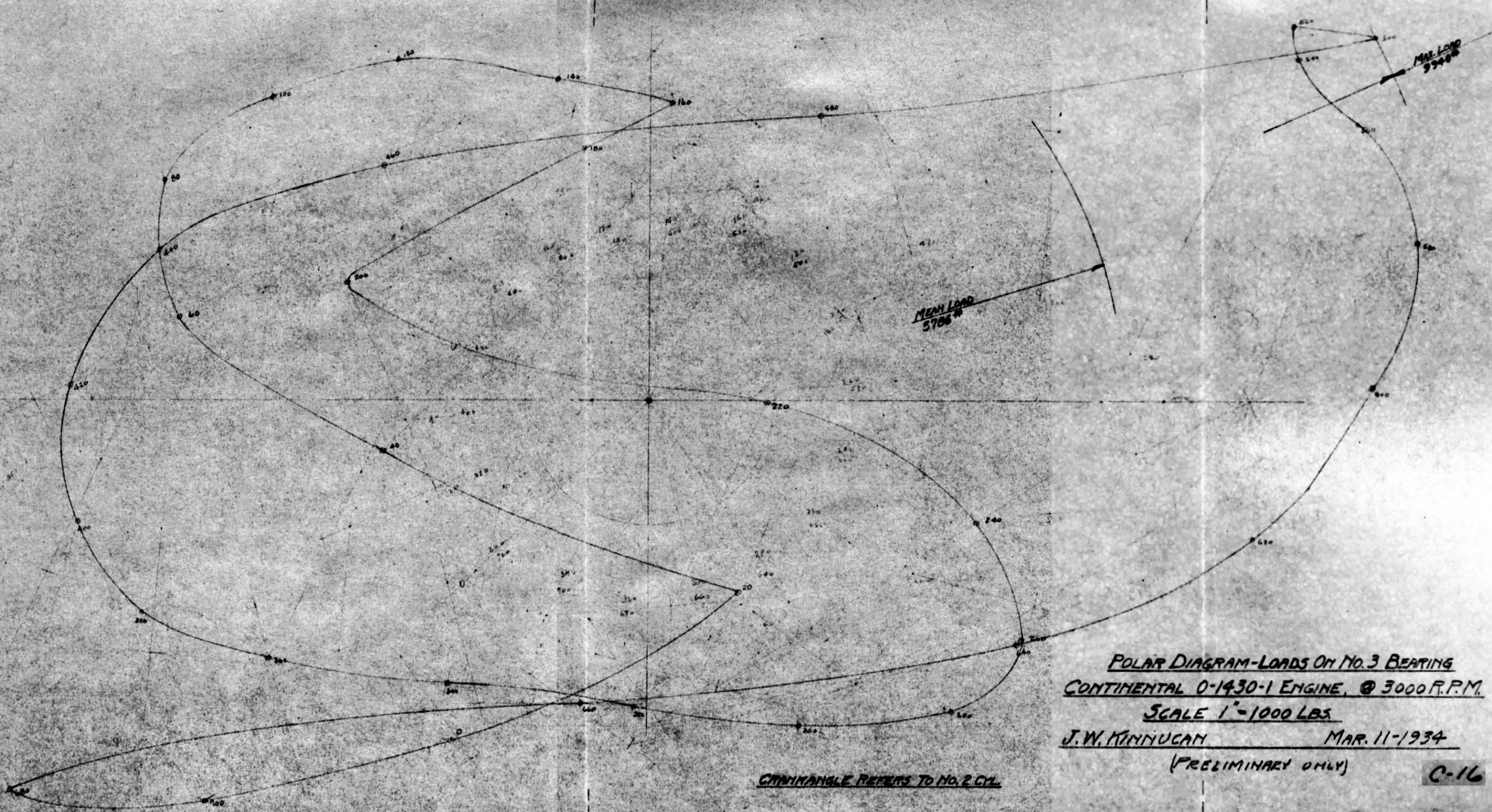
Mean Load No Ctw.
5720#

Mean Load With Ctw.
5370#
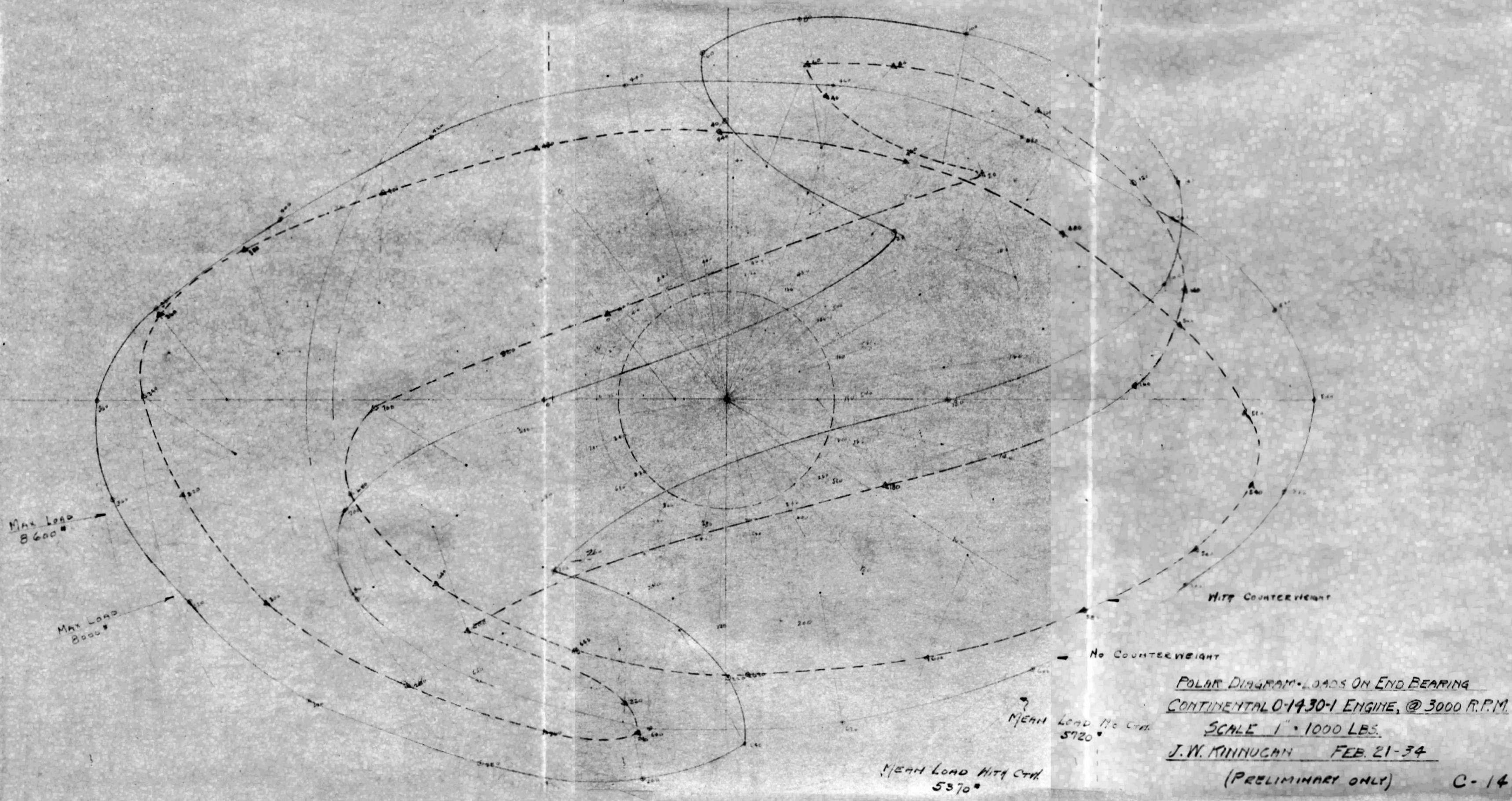
POLAR DIAGRAM - LOADS ON END BEARING
CONTINENTAL O-1430-1 ENGINE, @ 3000 R.P.M.
SCALE 1" = 1000 LBS.
J.W. KINNUCAN   FEB. 21-34
(PRELIMINARY ONLY)

C-14

MAX. LOAD
9470#

MEAN LOAD
3583#
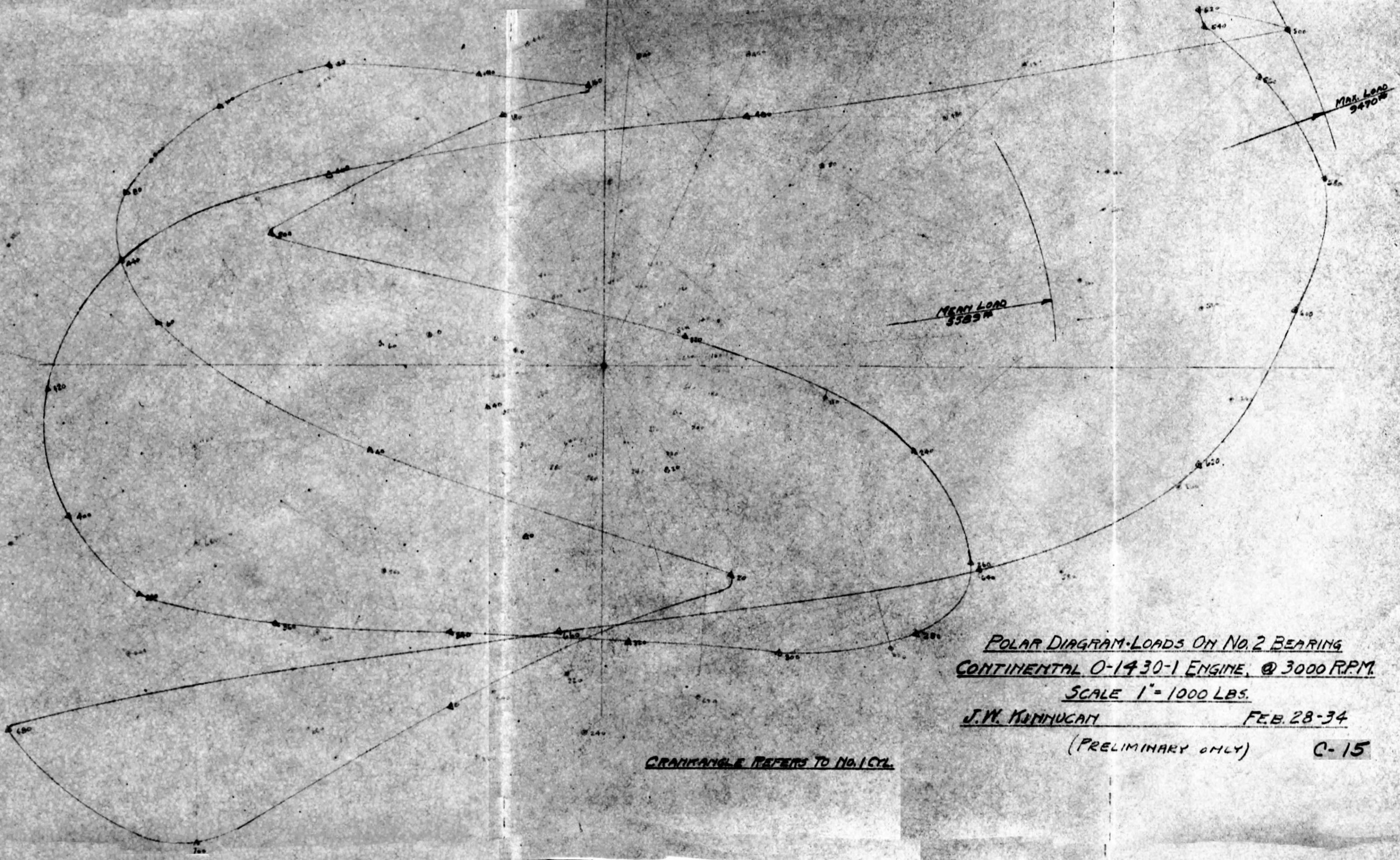
POLAR DIAGRAM·LOADS ON No. 2 BEARING
CONTINENTAL O-1430-1 ENGINE @ 3000 R.P.M.
SCALE 1"= 1000 LBS.
J.W. KINNUCAN   FEB. 28-34
(PRELIMINARY ONLY)   C-15

CRANKANGLE REFERS TO No. 1 CYL.
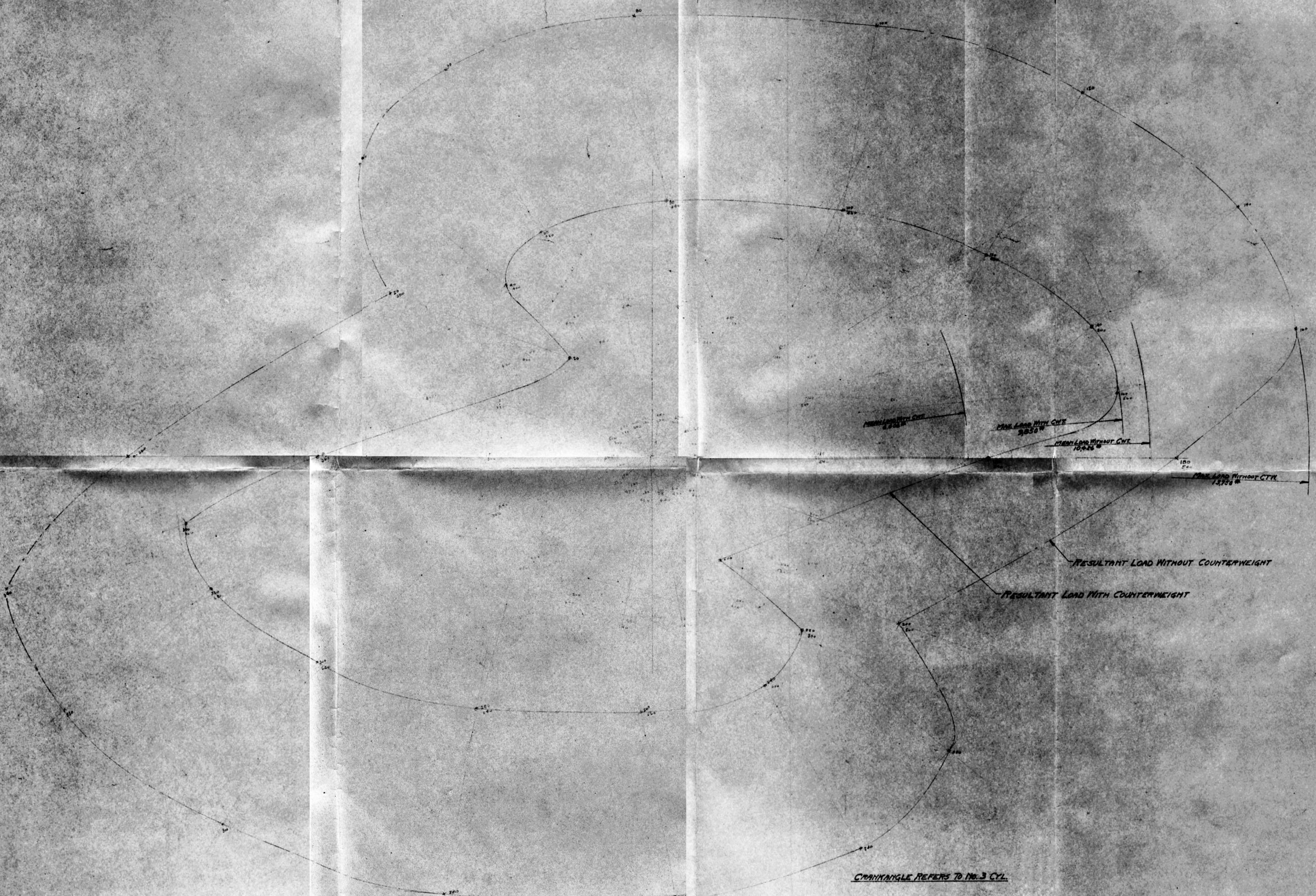
MEAN LOAD
5700 #

MAX. LOAD
9940 #

POLAR DIAGRAM-LOADS ON NO. 3 BEARING
CONTINENTAL O-1430-1 ENGINE, @ 3000 R.P.M.
SCALE 1"-1000 LBS
J. W. KINNUCAN   MAR. 11-1934
(PRELIMINARY ONLY)

C-16

CRANKANGLE REFERS TO NO. 2 CYL.

Max. Load With Cwt.
9,050#

Mean Load With Cwt.
4,905#

Mean Load Without Cwt.
10,466#

Max. Load Without Cwt.
15,950#

Resultant Load Without Counterweight

Resultant Load With Counterweight

CRANKANGLE REFERS TO No. 3 CYL.

POLAR DIAGRAM: LOADS ON BEARING No 4 (CENTER)
— WITH CTW. X—·—· WITHOUT CTW.
CONTINENTAL O-1430-1 ENGINE @ 3000 R.P.M.
SCALE 1" = 1000#   KIMMICAN MAR 12-34   C-17