CONTINENTAL AIRCRAFT ENGINE COMPANY

DETROIT, MICHIGAN

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2 Sheets

CONTINENTAL O-1430-1 ENGINE

REDUCTION GEAR AND PROPELLER SHAFT

BEARING LOADS

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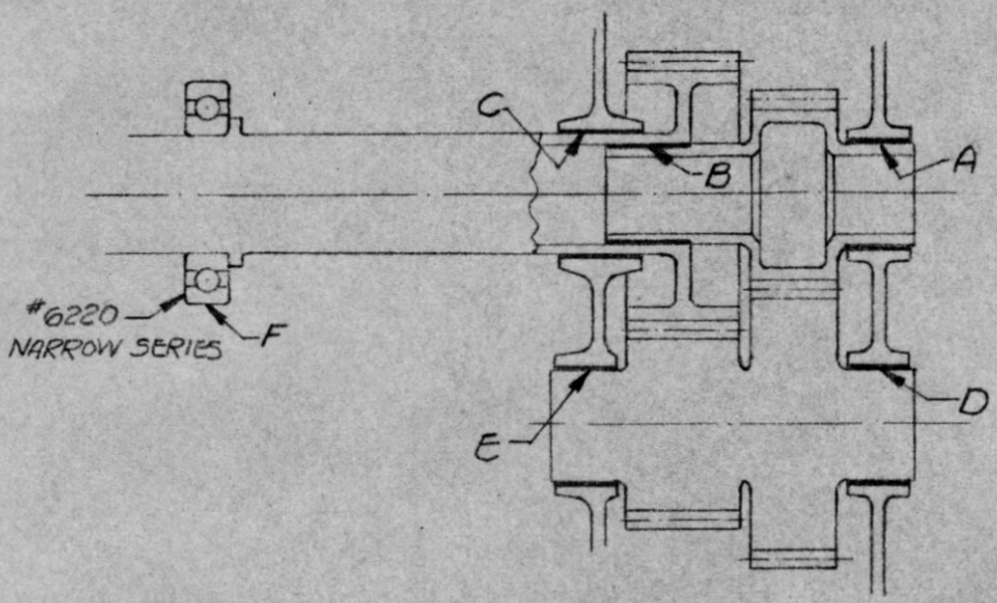
REDUCTION GEAR AND PROPELLER SHAFT BEARING LOADS.

References:- SKF Engineering Data Sheets #205C dated 10/2/32.
Continental O-1430-1 Engine Design Report #56 dated April 3, 1934.



BEARING	BEARING DIM.-IN.		PROJ. AREA SQ.IN.	SPEED OF SHAFT R.P.M.	RUBBING VELOCITY FT/SEC	RESULTANT FORCE LBS.		MEAN UNIT PRESSURE #/□"	MEAN PV RUBBING FACTOR LBS-FT/SEC
	LENGTH	DIA.				MAX	MEAN		
A	1.750	3.312	5.80	3,000	43.2	5,820	4,850	836	36,150
B	2.000	3.250	6.50	1500*	21.2	4,680	3,900	600	12,700
C	2.125	4.500	9.56	1500	29.4	11,500	9,580	1000	29,400
D	1.750	3.187	5.57	2070	28.8	4,250	3,540	636	18,300
E	1.750	3.187	5.57	2070	28.8	8,160	6,800	1220	35,170

* RELATIVE SPEED

The above loads are all calculated for 2:1 gear reduction only

Propeller Thrust Bearing "F"

$$\text{Propeller Thrust in Pounds} = \frac{\text{H.P. x Prop. eff. x 375}}{\text{Speed (miles per hr.)}}$$

Assuming a slow speed bomber equipped with a propeller having an efficiency of 80%, cruising at 150 miles per hour, with the engine delivering 80% power the thrust would be:-

$$Tr = \frac{800 \times .80 \times 375}{150} = 1600\#$$

Assuming full power in a climb at a speed of 100 miles per hour

$$Tr = \frac{1000 \times .80 \times 375}{100} = 3000\#$$

The maximum radial load on bearing "F" at full power = 3110#.

The mean radial load = $\frac{3110}{1.2}$ = 2600#.

At 80% power and 87% speed this load would be 2390#.
Total load at full power (100% thrust + 100% radial) =
2600 + 3000 = 5600#.
At cruising speed total load = 2390 + 1600 = 3990#.

Instantaneous take off thrust load will be in the neighborhood of 3500#.
Total load at take off = 3500 + 2600 = 6100#.

From SKF data sheets page 12, rating on bearing #6220.

At 1300 R.P.M. is 4500# for minimum of 500 hour life.
At 1500 R.P.M. is 4300# for minimum of 500 hour life.

Life of bearing in climb.
Load factor = $\frac{4300}{5600}$ = .769 which should give a minimum life of 200 hrs.

Life of bearing at take off loads.
Load factor = $\frac{4300}{6100}$ = .705 which should give a minimum life of 150 hrs.

Life of Bearing at cruising loads and speed.
Load factor = $\frac{4500}{3990}$ = 1.13 which should give a minimum life of 700 hrs.

It will be noted that the cruising load is calculated at 80% power, which is greater than used in calculating the life at cruising speed for the reduction gears given in Wright Field, Engineering Section Memo Report E-S7-341-1 dated January 25, 1934. This thrust value of 1600# at cruising speed was assigned us unofficially as a basis for this bearing calculation; which results in less than the 1200 hour life suggested. On the basis of 67% power at cruising speed the life of this bearing would be in excess of 1200 hours.