30th October, 1962

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REPORT OF TESTS ON CYLINDER BORE MEASUREMENTS
ON 750 and 700cc CYLINDER BARRELS .

Object of Test

To see whether a 750 cc cylinder barrel bored out .020 in. oversize would distort excessively when pulled down onto the crankcase.

Met hod of Test

A heavy cast iron block was bored out to receive the spigot portion of the cylinder barrel and was provided with five tapped holes to enable a 750 cc cylinder barrel and head to be fitted so that measurements of the cylinder bore could be made after tightening the head nuts to any specified torque figure. A second series of five tapped holes enable a 700 cc cylinder to be fitted.

Measurements were made at the top and bottom of the bore and at intermediate points both at right angles to the gudgeon pin axis and parallel to it.

Measurements were made first with a standard 750 cc barrel and then with one bored out nominally .020 in. oversize. Finally, a standard 700 cc barrel was checked, this having a wall thickness .030 in. greater than the oversize 750 cc barrel.

Results

These are shown on the accompanying sheet which shows graphically the figures obtained from twelve sets of measurements - four from the 750 cc cylinder bored out .020 in. oversize, four from the standard 750 cc cylinder and four from the standard 700 cc cylinder . Each set of four readings consists of two sets of 'fore and aft' readings and two sets parallel to the gudgeon pin axis - one set in each case being with the cylinder head tightened to 22 ft.lbs. torque and the other with the head nuts slack.

Attention must be drawn to the fact that while the vertical scale of the diagrams is approximately 1 : 1 (the cylinders actually measure just under six

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inches in length but are shown for convenience as 6 in.) the horizontal scale is magnified 2,000 times, i.e. 1/10 in. on the diagram represents .0001 in. diametrical measurement or .00005 in. radius assuming that each .0001 in diametrical reading on the gauge is symetrica lly disposed about the axis of the cylinder.

The shaded rectangle in each diagram represents the nominal manufacturing tolerance of .0005 in. or diameter. The full line joins the actual recorded points with 22 ft.lbs. torque on the nuts, the broken line joins the recorded points with the nuts slack.

As an indication of the effect of the 2,000 : 1 magnification, it may be mentioned that while the shaded rectangles represent one wall of the cylinder (within theoretical tolerance) the other wall, at this scale, is some 77 yards away to the right of the diagram !

The lines AA and BB represent respectively the top and base of the cylinders. Only that part of the cylinders between these lines is, therefore, subject to compressive loading from the holding down bolts. One might expect, therefore, that this part of the cylinders would show more signs of distortion under the bolting down stresses than the unstressed portion below BB. In other words, the difference between the full lines and the broken ones might be expected to be greater above the line BB than below it. This, however, is by no means the case except in one of the diagrams (for the standard 750 cc cylinder fore and aft where the effect of the compressive loading appears to be actuall y to straighten the bore). The most general effect of the compressive loading appears to be to cause ovality at the lower end of the bore - always with the major axis 'across' the cylinder. In the upper part of the cylinders, the compressive loading appears to distort the bore slightly out of round rather than to crumple it like a concertina.

In theory, of course, at any rate the broken lines should lie for their whole length within the confines of the shaded rectangles. In only one diagram is this the case - the 700 cc fore and aft - although it is very nearly true in the case of the 700 cc measured across the cylinder.

The 750 cc cylinders depart appreciably from the drawing limits. This, however, appears to indicate inaccuracies in the machining rather than collapse under the bolting down stresses. In particular the boring out to a nominal +.020 in. is actually from 3 to 12 tenths above the top limit even when the head nuts are slack. Tightening the nuts makes the bores no worse - in fact in the case of the standard 750 cc cylinder, the bore is straighter after tightening than when the nuts are slack, particularly in the 'fore and aft' direction.

There is, of course, no guarantee that all the measurements were made at exactly the same points in the bores - either longitudinally or angularly. In

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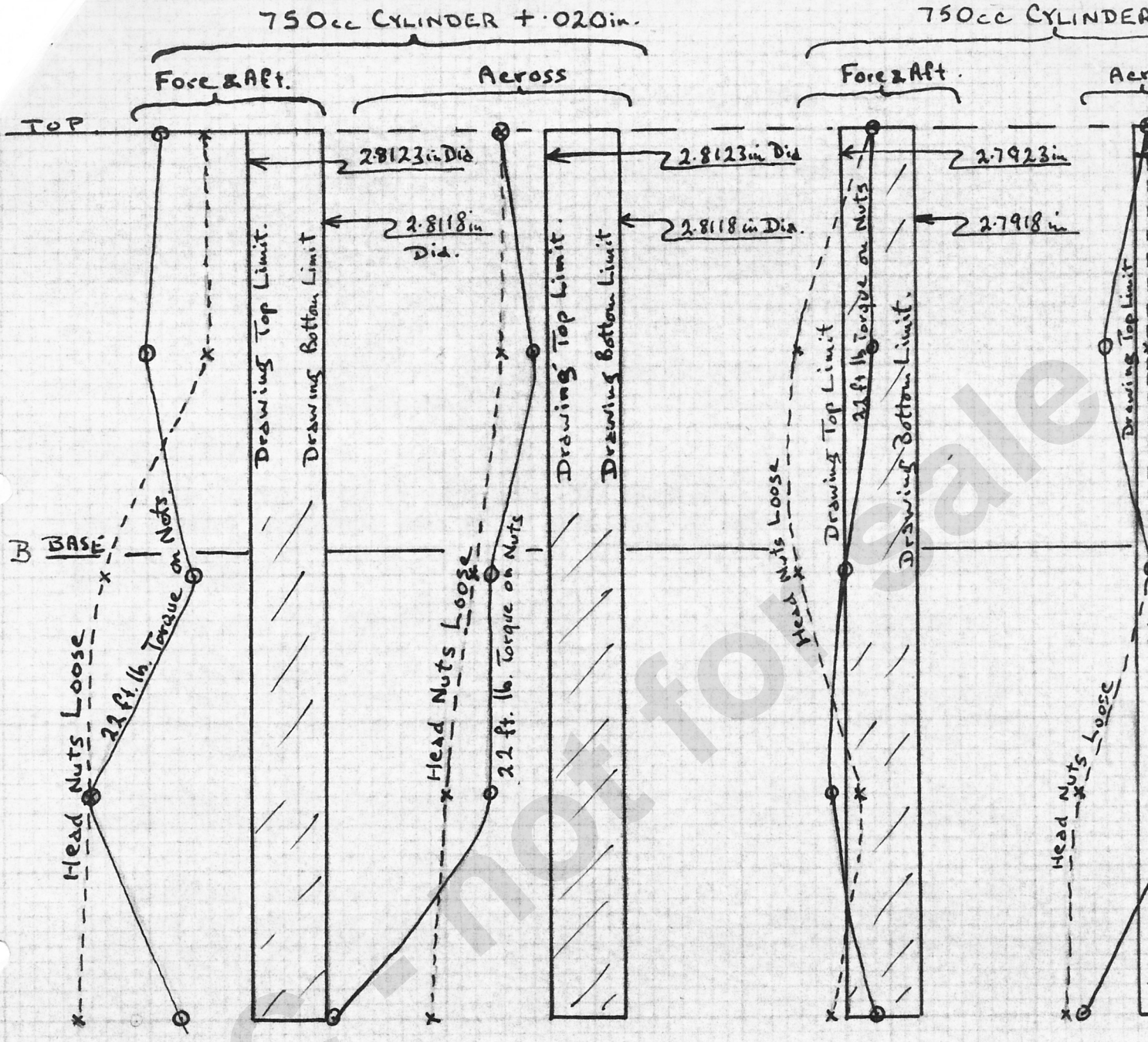
view of this and the very large horizontal magnification, the shapes and sizes of the bores are considered reasonable apart from the "+ .020in. oversize" bore being too large.

It is certainly worth while running a test with oversize pistons as soon as these are available.

.....R.A. Wilson-Jones.....
R.A. Wilson-Jones



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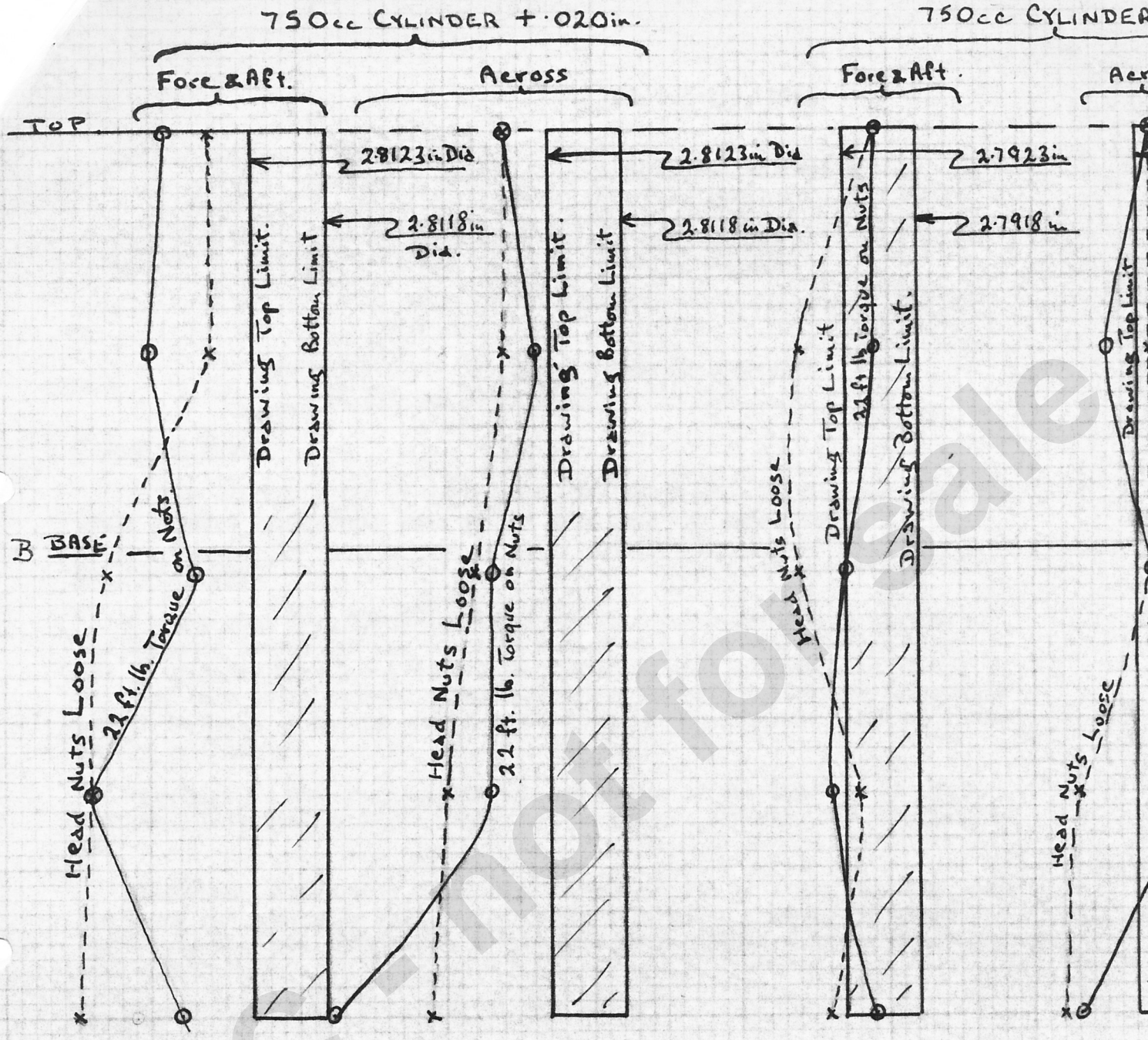
DIAGRAMS SHOWING SHAPE AND DIMENSIONS OF C
STANDARD AND 750cc OVERSIZE CYLINDERS WIT

SCALES :- VERTICAL 1 : 1 APPROX.



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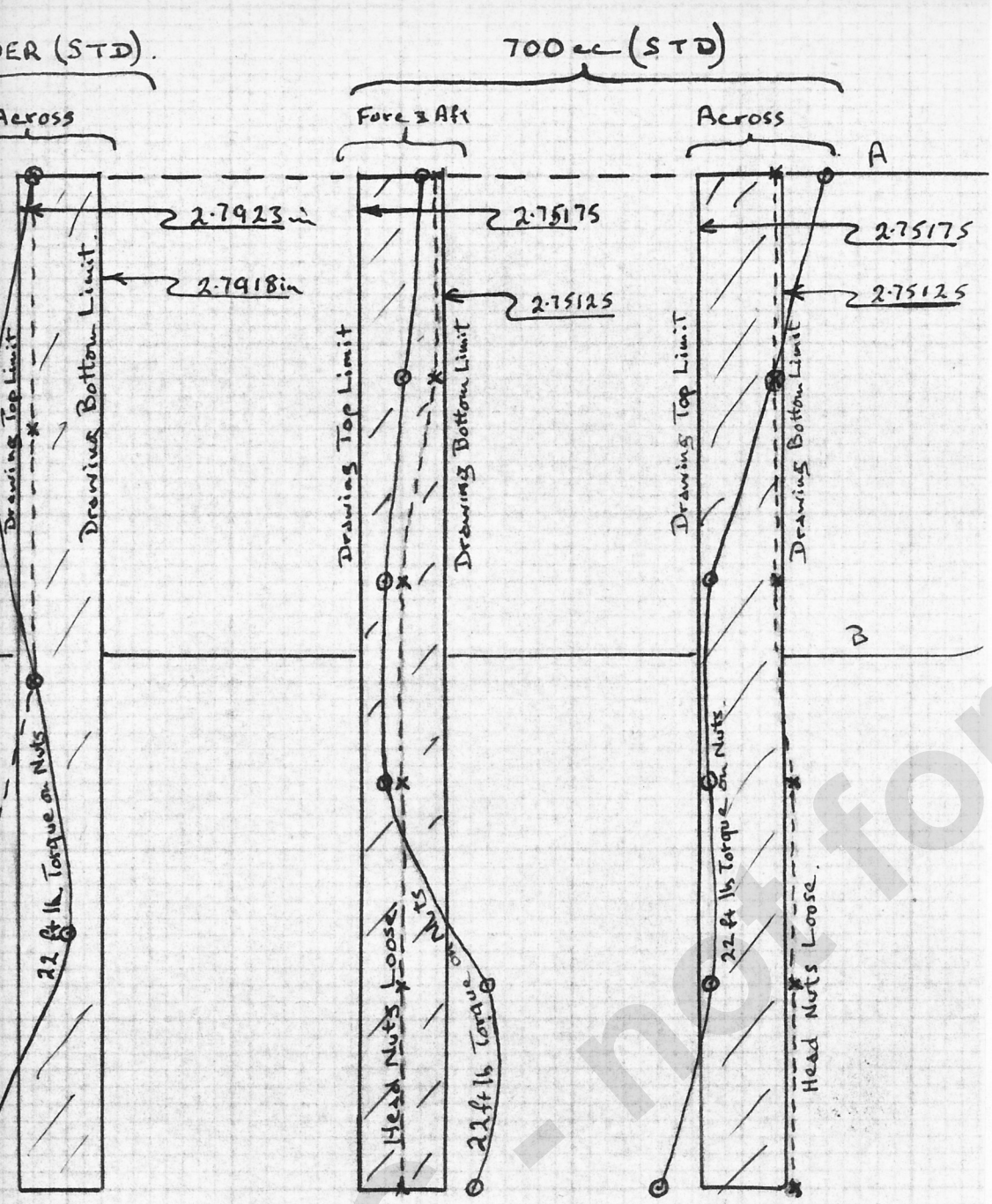

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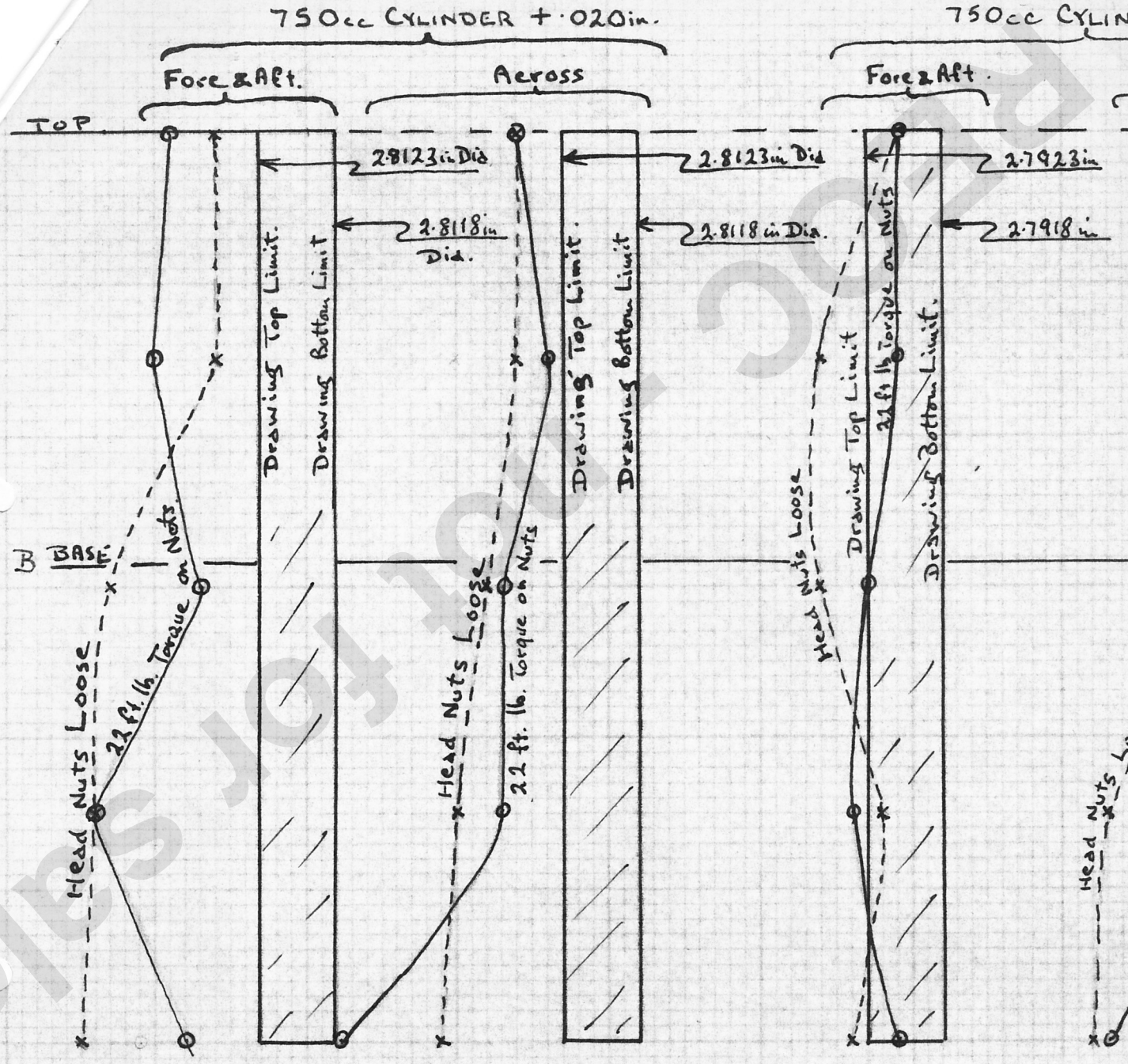

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