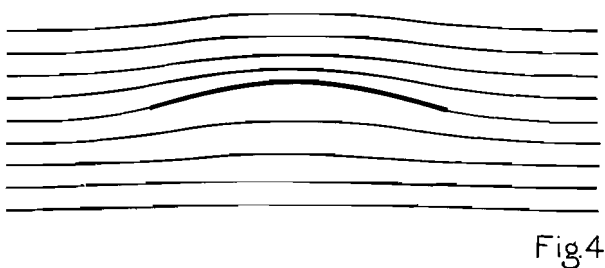


moment will be independent of the lift if it is measured with respect to the balance point. As the leading edge makes the biggest contribution to the lift this balance point is located 25% of the chord aft of the leading edge and it is usually in most aerodynamic calculations to refer pitching moments to this axis.

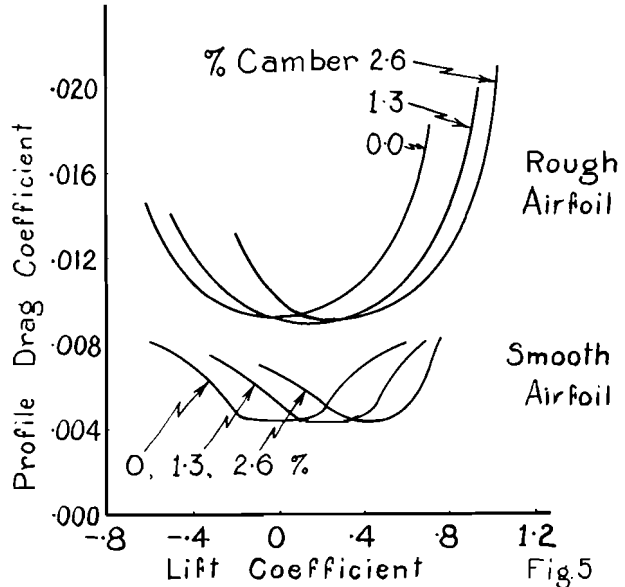
If a more sophisticated mean line shape is adopted, for example the circular arc which was popular with the early experimenters, then the pressures will be obtained by adding the "additional" values, described above to a "basic" distribution, the magnitude of the former depending only on the angle of attack and the latter depending on mean line shape and camber. Fortunately, just as there was a special mean line which eliminated "basic" distributions when we were discussing "additional" effects there is also a special angle of attack for any given mean line which will eliminate "additional" effects when we want to compare "basic" distributions. At zero geometric angle of attack the circular arc is already



producing lift, a marked negative angle is required for zero lift. With the circular arc the zero angle is of interest because the streamlines, which have already acquired an upward component due to the influence of the airfoil in the fluid, are exactly tangent to the leading edge. (Fig. 4). This "smooth entry"

condition reduces losses and produces minimum profile drag. It is gratifying therefore to find that this is the special angle we are seeking and only "basic" pressures are present. For any angle other than optimum, it will be necessary to add or subtract additional pressures which are proportional to the difference between the chosen angle and the optimum.

The optimum lift coefficient is more convenient than the optimum angle, this is the lift coefficient at which minimum profile drag occurs. By varying the camber any required value may be obtained. Typical



results for a family of airfoils are shown in Fig. 5.

The results of tests on a wide variety of mean lines are plotted in Fig. 6 to illustrate the simple relationship between camber and optimum lift. With the exception of mean lines having a reflex near the trailing edge or with the maximum camber position

