TECHNICAL NOTES.

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

No. 36

N.A.C.A. LANGLEY FIELD WIND TUNNEL APPARATUS.

THE TILTING MANOMETER.

By

F. H. Norton and D. L. Bacon,
Aerodynamical Laboratory, N. A. C. A.,
Langley Field, Va.

January, 1931

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

TECHNICAL NOTE NO. 36.

N.A.C.A. LANGLEY FIELD WIND TUNNEL APPARATUS.

THE TILTING MANOMETER.

By

F. H. Norton and D. L. Bacon,
Aerodynamical Laboratory, N.A.C.A.,
Langley Field, Va.

The following is a description of a tilting manometer designed by the technical staff of the National Advisory Committee for Aeronautics to meet the requirements of a manometer for use in the Wind Tunnel of the Langley Memorial Aeronautical Laboratory.

This gauge was designed to meet the requirements of a manometer for use in connection with a static pressure plate, to indicate the wind speed in the tunnel. These requirements are: first, that the sensitivity of the gauge may be made inversely proportional to the pressure to be measured; second, that the gauge may be accurately and quickly set for any desired pressure; and third, that when set at the desired pressure the extent of variation between the existing and the desired pressures may be readily estimated. As the pressure measured between the static plate in the tunnel wall, and the air

center of rotation. In use the arm is set at an angle, determined from the calibration chart, corresponding to the desired air speed. The propeller is then operated at a speed such that the alcohol again rises to the reference mark.

It will be seen by a moment's consideration that the absolute head may be represented by:

$$h = \ell \sin (\alpha + 3\tfrac{1}{2}^{\circ}) - h_1$$

where h is head of alcohol, ℓ is the distance from the center of reservoir to center of rotation, and h_1 is the vertical distance from the center of the reservoir to the surface of the contained liquid ($h_1 = \ell \sin 3\frac{1}{2}^{\circ}$ = constant); and that the sensitivity, considering a vertical tube as having unit sensitivity, is $\frac{1}{\sin \alpha}$, thus satisfactorily approaching the sensitivity requirements except for the very lowest pressures.

In order that the gauge may be set quickly to any given speed after calibration a number of adjustable stops are placed along the scale at every ten miles per hour so that the arm can be easily snapped into the correct position.

This manometer is quick to adjust, is easy to read, always has the meniscus in the same position, and accurately indicates a large range of air speeds in a comparatively compact instrument.