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NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

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TESTS OF A STRESS-CARRYING DOOR IN SHEAR

By Robert Gottlieb

Langley Memorial Aeronautical Laboratory
Langley Field, Va.

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RESTRICTED BULLETIN

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A monocoque box with a stress-carrying door was made and tested in torsion. The details of this box and the location of the applied torques are shown in figure 1. Outside and inside views of the stress-carrying door are shown in figure 2.

The results of the torsion tests are presented in figures 3, 4, and 5. In figure 3 are plotted torque-twist curves for the case of cut-out, cut-out with door, and no cut-out. These curves show that a large part of the torsional stiffness lost by making a cut-out can be recovered by use of a stress-carrying door. This fact is more clearly revealed in figure 4 where the slopes of the curves in figure 3, which define the torsional stiffness, are plotted against the applied torque. The ratio b/a in this figure is a measure of the effectiveness of the door in recovering the torsional stiffness lost when the cut-out was made. This effectiveness varies with the applied torque, as shown in figure 5.

If a stress-carrying door and its frame are made sufficiently heavy, the torsional stiffness of the box with the door can be made greater than the torsional stiffness of the box without the cut-out. In the specimen of figure 1, the stress-carrying door was made with the same gage of skin as was used in the box and with stiffeners of less depth than the stiffeners in the box. The smaller stiffeners in the door were used in order to make the total thickness of the door approximately the same as the total thickness of the skin and the stiffeners in the box.

Langley Memorial Aeronautical Laboratory,
National Advisory Committee for Aeronautics,
Langley Field, Va.,

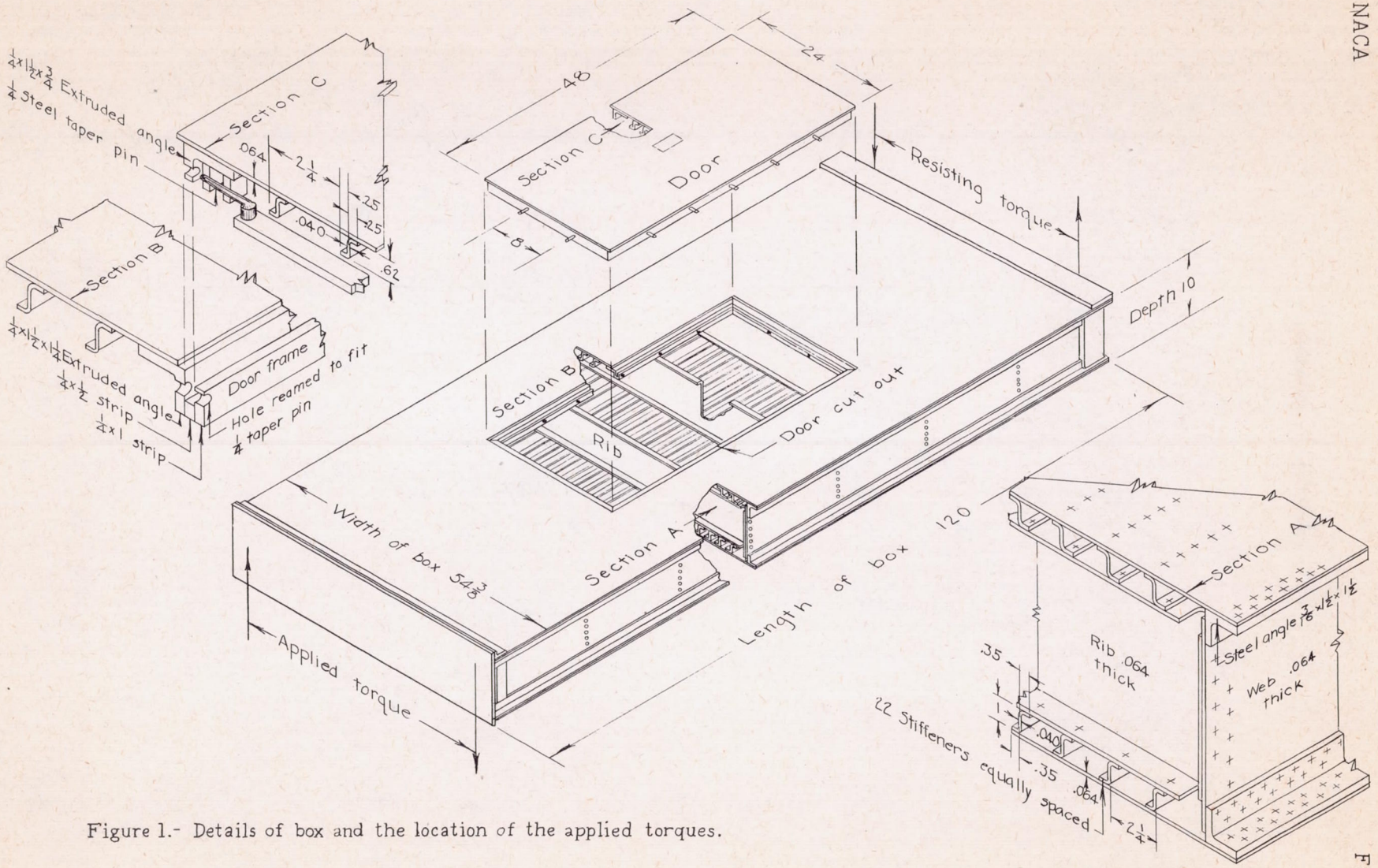
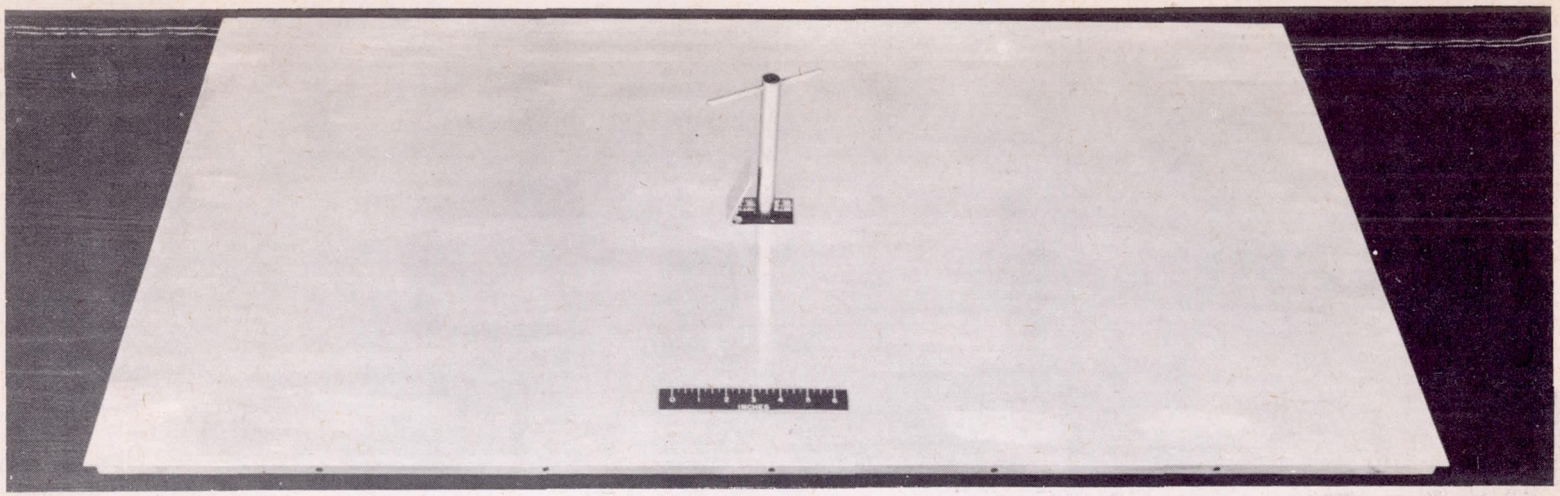
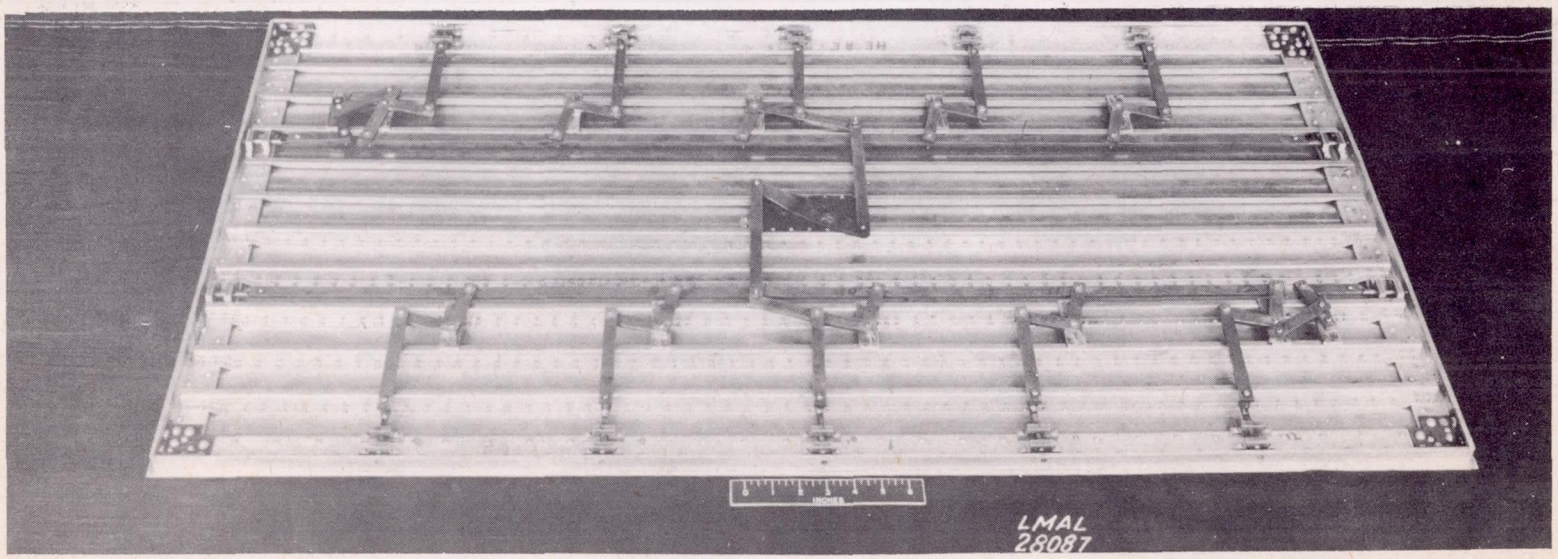


Figure 1.- Details of box and the location of the applied torques.



(a) Outside.



(b) Inside.

Figure 2.- Stress-carrying door.

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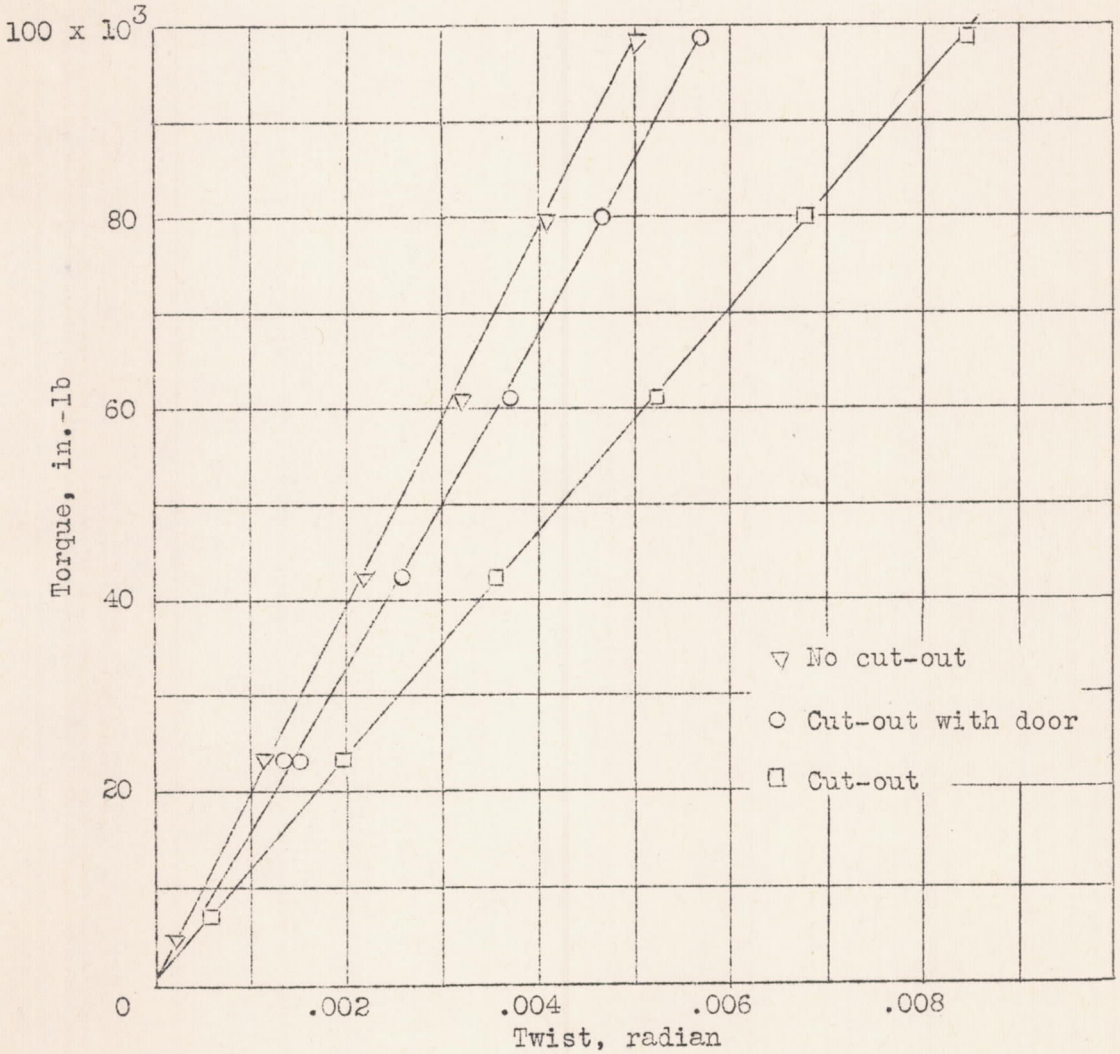

Figure 3.- Torque-twist, curves for box.

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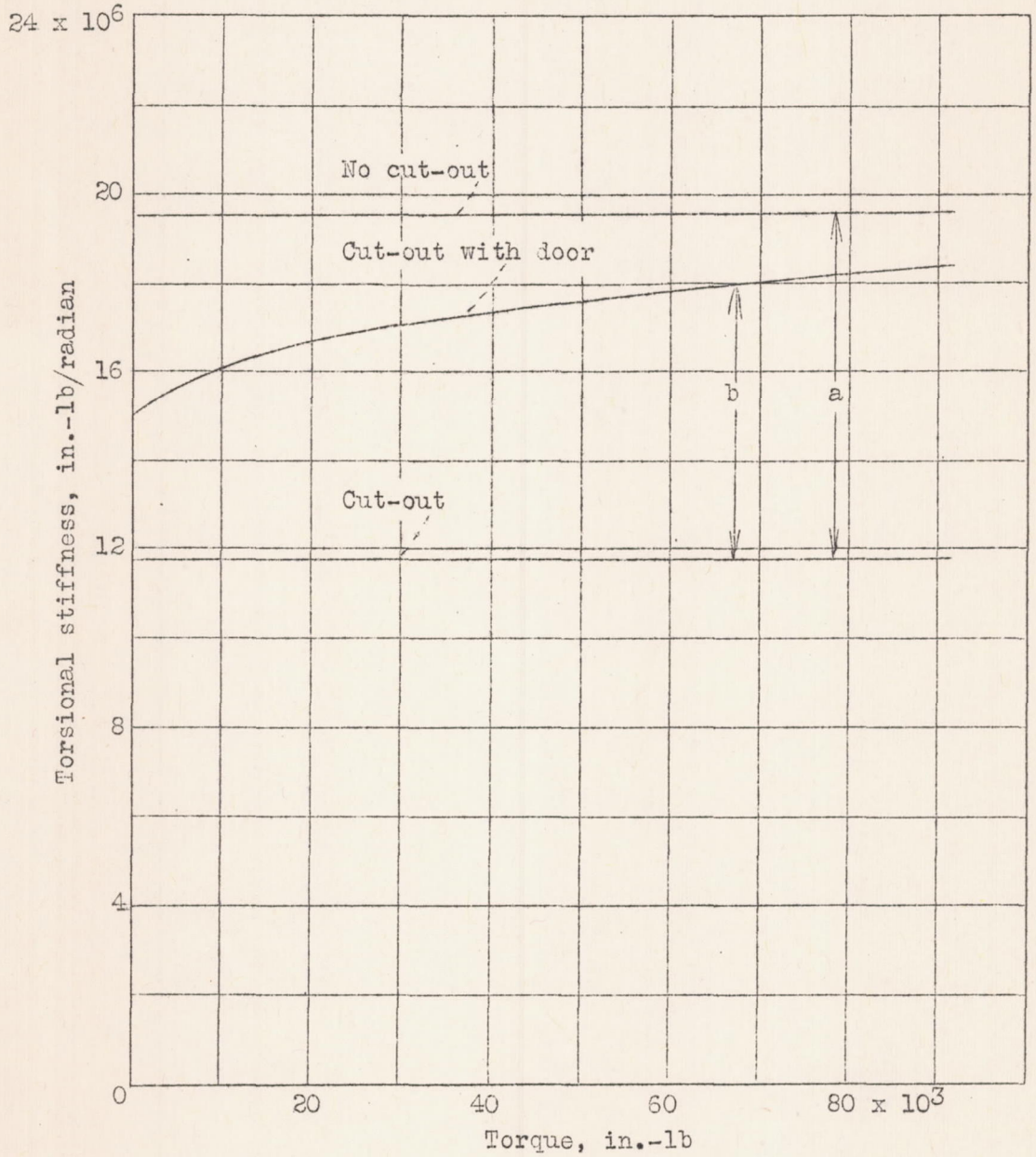

Figure 4.- Torsional stiffness of box.

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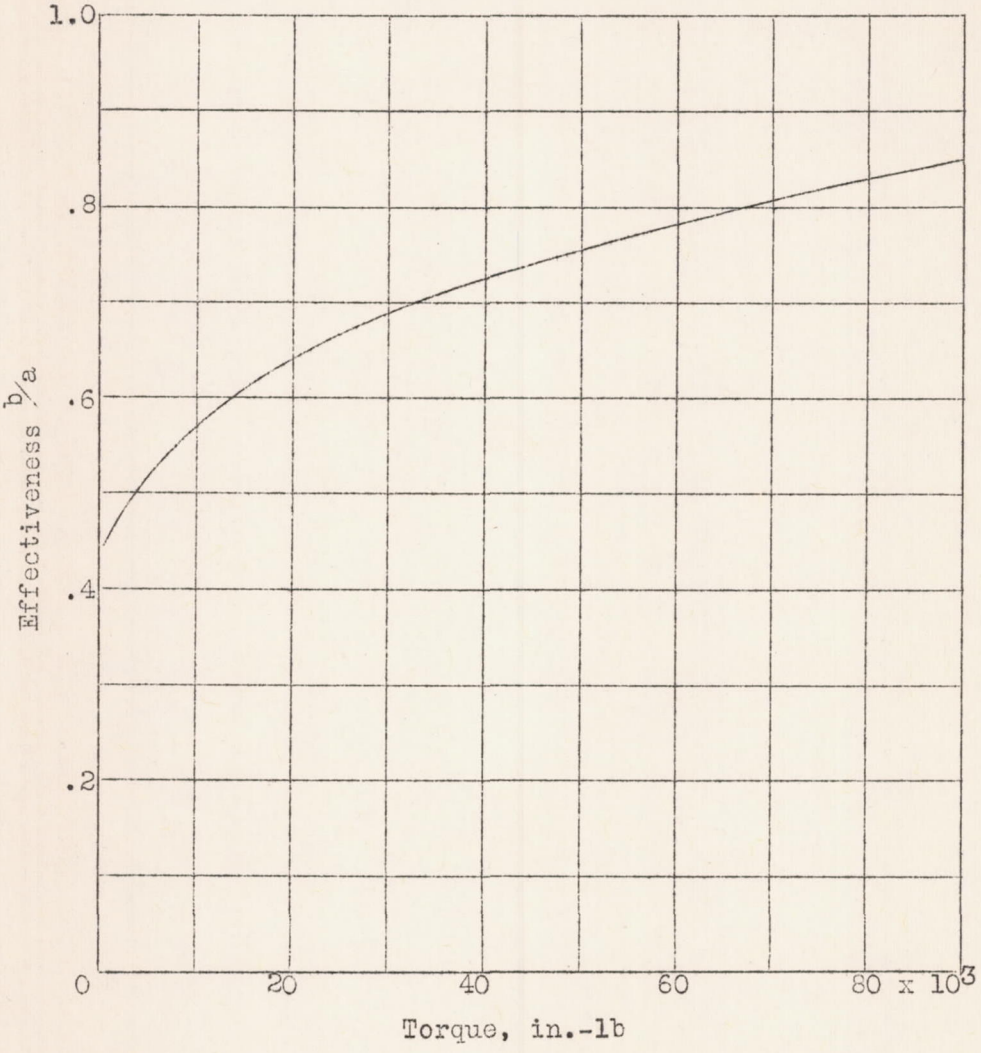

Figure 5.- Effectiveness of door.