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# Model Tests in the 24-ft Wind Tunnel to Determine the Optimum Angle for Release of a Cockpit Hood

*By*

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COMMUNICATED BY THE PRINCIPAL DIRECTOR OF SCIENTIFIC RESEARCH (AIR)
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*Summary.*—For some time now, it has been recommended that mechanical assistance be incorporated in jettisonable cockpit-hood designs. Some firms have preferred designs in which the hood is constrained to rotate through a definite angle before the final release. A short series of tests has, therefore, been made in the 24-ft Wind Tunnel to determine the optimum angle for release. This was found to be about 10 deg, which is considerably less than has been suggested in the past.

1. *Introduction.*—For some time now, all possible opportunities have been taken to recommend to firms that mechanical assistance be incorporated in new jettisonable cockpit hood designs. The type of mechanism recommended is described in Ref. 1 where it will be seen that the hood is not constrained to release at a definite angle, although an angle of about 30 deg appeared to be satsifactory. It appeared, however, that several firms preferred to design mechanisms which release the hood at a definite angle, and it was felt that further information regarding the optimum angle for release was desirable. A short series of tests was, therefore, made in the 24-ft Wind Tunnel using an existing model aircraft and hood, to provide this information.

2. *Description of Model and Tests.*—In choosing a model, one was adopted in which the hood release was unsatisfactory without assistance. The *Vampire* model of Ref. 2 was chosen. Since some modifications had been made to this model in the meantime, the free release of the modified hood was retested, so that the present tests are complete in themselves.

The variable angle release mechanism for the model is shown in Fig. 1. A pair of arms, suitably shaped at the rear ends, extended backwards from the hood and engaged with a pair of guides attached to the model fuselage. It was shown in Ref. 2 that, with the hood c.g. in its normal (full-scale) position, the jettisoning characteristics were unsatisfactory, but could be improved by a backward movement of the c.g. It was felt that the assisting arms on the present model hood were probably disproportionately heavy, and to avoid an improvement from this source, the c.g. was restored to its normal position by weighting the nose with plasticine. The tunnel speeds were then increased to maintain the normal ratio of aerodynamic forces to gravity forces.

The tests were made in the 24-ft Wind Tunnel and recorded by means of a high-speed ciné camera. The experimental technique is described in Ref. 2. The tests were confined to one tunnel speed (140 ft/sec) which corresponded to 217 knots full scale.

* R.A.E. Tech. Note Aero. 1947—received 21st May, 1948.

3. *Results.*—The paths of the hood c.g. for a range of release angles were plotted from the ciné film records and are shown in Fig. 2. For comparative purposes a test was first made without constraint. This gave a release similar to those obtained in Ref. 2, but with rather more clearance over the tail. Little difference was detected when the variable angle device was fitted and adjusted to release without constraining the hood to rotate (release at 0 deg). With the mechanism set to release the hood after it had rotated 10 deg a great improvement was observed, the hood clearing the tail by an ample margin. Releases at 20 and 30 deg were progressively worse, that at 30 deg being, in fact, slightly worse than without assistance. The reason for this is simply that when the hood is released after rotating through say 30 deg, it has acquired sufficient angular momentum to continue rotating until it is upside down and the upward aerodynamic forces have disappeared, or even become negative.

It is important to obtain the maximum clearance over the aircraft since the clearance is reduced if the hood is released while the aircraft is under positive normal acceleration. Therefore, it is concluded that the optimum angle at which to release the hood is about 10 deg. This figure may be subject to scale, or incidence effects, and will also depend to some extent on the shape of the hood. A slightly larger angle than 10 deg might, therefore, be preferable, since the behaviour deteriorates rapidly at angles less than the optimum.

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| 2 | Fox and Stockes .. .. .. .. | Further Hood Jettisoning Tests on a Model Single-Jet Fighter (Vampire) in the 24-ft Wind Tunnel. R.A.E. Tech. Note No. Aero. 1654. June, 1945. |

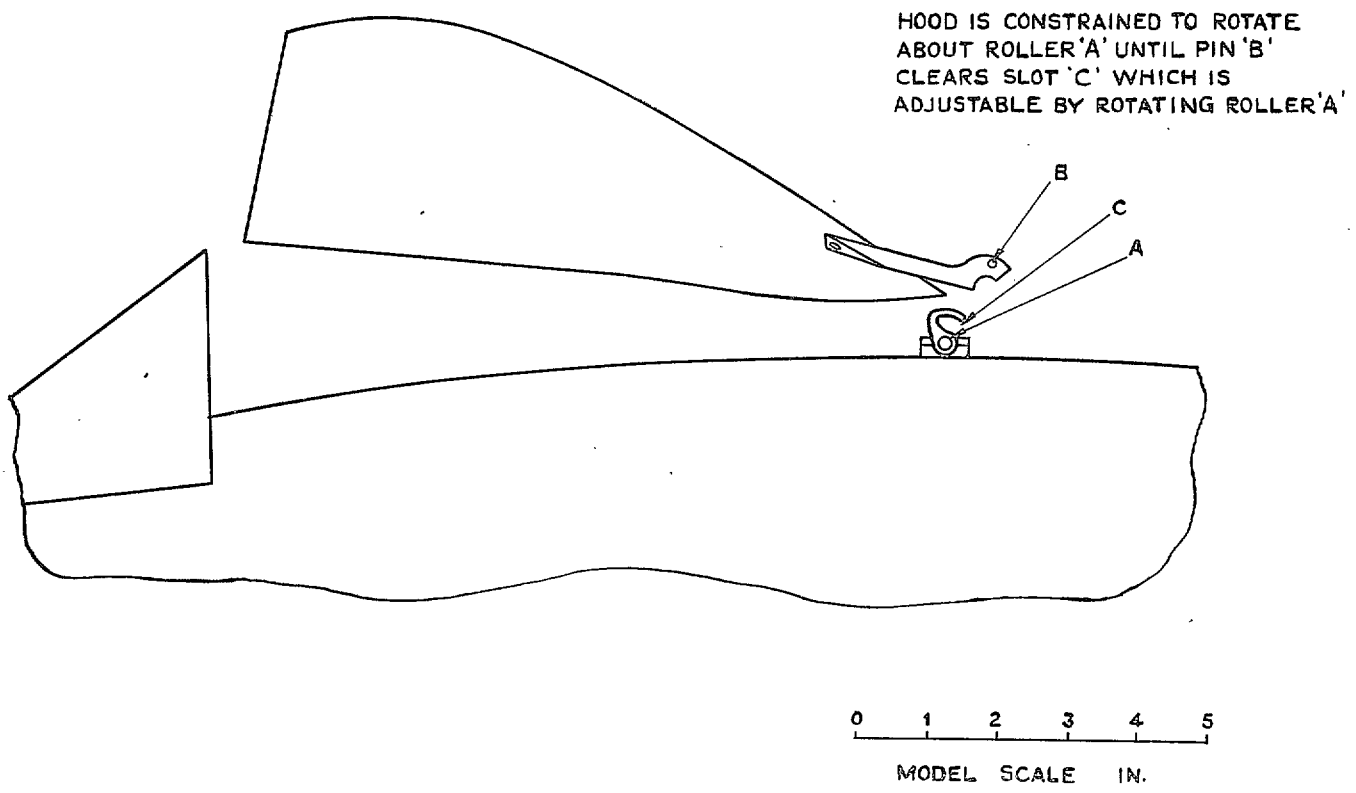


FIG. 1. Sketch of variable angle release mechanism.

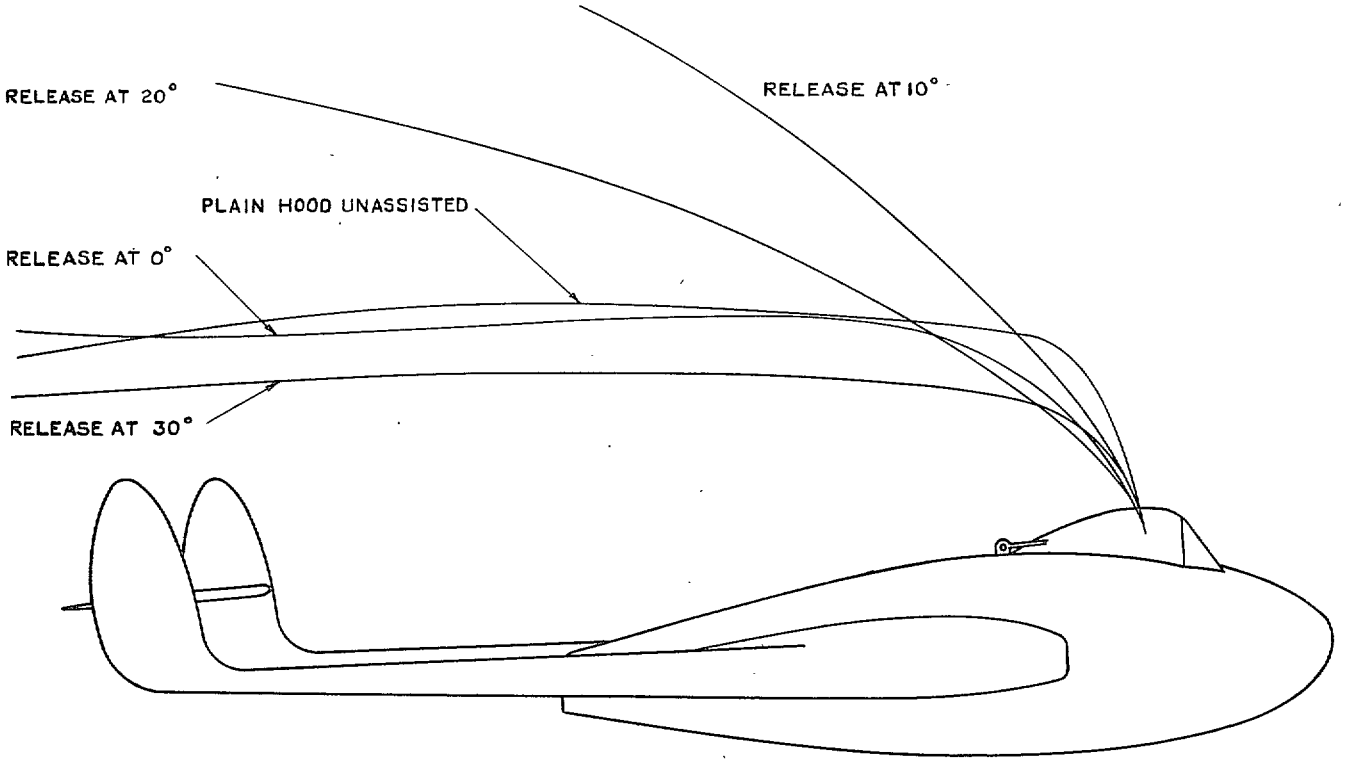


FIG. 2. Paths of hood c.g., full scale E.A.S. = 217 knots.

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