APPENDIX

ESTIMATIONS OF HINGE-MOMENT AND STICK-FORCE CHARACTERISTICS OF A PARAWING UTILITY VEHICLE

Because of the unusual nature of the parawing utility vehicle investigated, it appeared advisable to give some attention to the hinge-moment and stick-force characteristics involved in a configuration of this type. Since it was possible to obtain some preliminary information based on the force-test data presented, a few simple calculations were made to determine stick-force characteristics by using some assumed full-scale dimensional and mass characteristics. A brief analysis of these calculated results is presented in the following paragraphs.

Longitudinal Characteristics

In order to obtain some indication of the longitudinal stick forces involved, calculations were made in which it was assumed that the longitudinal stick force required for trim could be represented by the following equation:

$$\text{Stick force} = \frac{(C_m)_p q S c_k}{G l} \tag{1}$$

where $(C_m)_p$ is the pitching-moment coefficient about the wing pivot point (and therefore is equivalent to the hinge moment of the wing about this point) and G and l are the longitudinal gearing ratio and stick length, respectively. If $(C_m)_p$ is replaced by $\left(C_{m_o} + \frac{\partial C_m}{\partial C_L} C_L\right)_p$ and W/SC_L is substituted for q, equation (1) then becomes

$$\text{Stick force} = \left(\frac{C_{m_o}}{C_L} + \frac{\partial C_m}{\partial C_L}\right)_p \frac{W c_k}{G l} \tag{2}$$

From equation (2) it is apparent that $\left(C_{m_o}\right)_p$ determines the stick-force gradient with speed and therefore the stick force per g relationship in a configuration of this type. In order to show more clearly the effects of these parameters on stick-force characteristics