

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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LOW-SPEED WIND-TUNNEL INVESTIGATION TO DETERMINE THE  
FLIGHT CHARACTERISTICS OF A MODEL OF A PARAWING  
UTILITY VEHICLE

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SUMMARY

A low-speed wind-tunnel investigation has been made to determine the flight characteristics of a model of a parawing utility vehicle. Flight tests were made over an angle-of-attack range of the parawing keel from about  $17^{\circ}$  to  $40^{\circ}$ . The model consisted basically of a cargo platform attached to a parawing by means of an overhead truss arrangement and was powered by a pusher propeller located at the aft end of the platform. The parawing was of extremely lightweight construction and was attached to the support structure through a universal joint so that it could be pitched or rolled for control. The flexibility resulting from the lightweight construction led to considerable deflection of the parawing members with aerodynamic loading.

The results of the investigation showed that the model had generally satisfactory longitudinal and lateral stability characteristics over the angle-of-attack range investigated. The control system used on the model proved to be generally satisfactory (except for lateral control at high angles of attack), but these results do not take into account stick forces which the analysis of this investigation has shown could be objectionable in a configuration of this type. The lateral control provided by rolling the wing was satisfactory in the lower angle-of-attack range investigated (keel angles of  $17^{\circ}$  to  $25^{\circ}$ ) but this control became progressively weaker with increasing angle of attack until at angles of attack of the keel above about  $35^{\circ}$  it appeared to be ineffective. Use of a rudder mounted behind the pusher propeller to provide favorable yawing moments resulted in satisfactory flights to a keel angle of attack of  $40^{\circ}$  when the rudder was coordinated with the wing control. Because of the high effective dihedral in the high angle-of-attack range, satisfactory flights could also be made by using the rudder alone for control.