STABILITY OF A GUIDED AIR CUSHION VEHICLE

by

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This project was carried out jointly with Dr. G. Lanzara of the Institute of Transportation, Palermo, Italy. The study is directed at one of the most pressing problems associated with air cushion vehicles; that is, stabilizing the vehicle during turns. It was determined that a vehicle supported on an air cushion could operate with lateral stability if the vehicle operated in a specially formed guide. The guide way could be either open or closed. The vehicle would be capable of speeds from 300 to 400 mph.

It was speculated that for a given range of vehicle rotation, the guide could be designed to provide a restoring moment which would return the vehicle to the upright position. A detailed analytical analysis of the mechanics of the situation showed that a guide way could be designed which would do this. Since the pressure of the air cushion depends on the distance between the jets and the guide, the cushion pressure could be varied in a specified way by controlling the guide geometry. It was found that for a given set of vehicle parameters a number of solutions for guideway geometry which provided vehicle stability were possible. The next step of the research is to investigate these solutions for dynamic behavior. In other words, it is necessary to determine which of the possible stable configurations has the best dynamic characteristics. These characteristics include the magnitude of rotational acceleration and damping properties during a stabilizing maneuver.

Figure 31. Open and Closed Formed Air Cushion Guideways

Figure 32. Notation for Automatic Stability Analysis for Air Cushion Vehicle