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Marshall Space Flight Center



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Antiskid Braking System

A report has been published which describes the analytical development and simulation of an antiskid braking system. The system prevents wheels from skidding when brakes are applied, significantly reducing stopping distance. Simulation studies indicate that the system provides shorter stopping distances than presently used antiskid devices which release the brakes on any wheel approaching a lockup.

Basically, the system maintains a maximum frictional force between the tires and the pavement without allowing the wheels to lock up. It does this by controlling the brake pressure on every wheel. The principle of operation is based on the relationship between the frictional force f between the tires and road surface and the coefficient of friction μ :

$$f = \mu gM$$

where gM is the vehicle weight. To provide the maximum f , the system maximizes the coefficient of friction μ through electronic feedback loops which control the brake pressure on each wheel.

The coefficient μ is a function of the wheel slip velocity. It reaches a maximum value just before the wheel is about to lock up. Brake pressure is controlled at that point. A study of the variations of μ as a function of slip velocity is presented in the report.

In addition to the analytical development, the report presents a computer simulation study on this system as applied to an aircraft. The discussion includes strutting dynamics. Simulation results verify the peak-riding property (maximum μ) of the system and its rapid adaptation to different runway surface conditions.

Finally, some other considerations are included, such as the effect of actuator dynamics, perturbation frequency, type and location of sensors, and absence of free wheel. A method by which the pilot's commands can be interfaced with the system is also discussed.

Note:

Requests for further information may be directed to:
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Patent status:

NASA has decided not to apply for a patent.

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