DOUGLAS AIRCRAFT COMPANY, INC.
GENERAL OFFICES, SANTA MONICA, CALIF.

NEWS

1957

FOR IMMEDIATE RELEASE

SANTA MONICA, Calif., March 20--An ingenious device which prevents jet engines from picking foreign objects off the ground like giant vacuum cleaners has been developed by Douglas Aircraft Company.

It will be used on all DC-8 airliners to avoid the costly damage commonly caused by debris sucked into the rapidly-spinning blades.

Harold Klein, who worked out the apparently simple solution through an application of the principles of aerodynamics, explained the theory and function of his "Blowaway Jet" at a recent meeting of the institute of the Aeronautical Sciences in New York.

Research had shown that a vortex, similar to a tornado, formed ahead of jet engines. Klein said the device breaks up or dissipates the whirling vortex on the ground before it develops power enough to toss stones, nuts, bolts and various other foreign material into the jet inlet.

"It was found that a downward directed jet of air prevented the formation of the vortex responsible for sucking up materials," said Klein. "This appears to provide a satisfactory, safe and economical solution to the problem."

The Douglas aerodynamics engineer said the method has received thorough laboratory tests and will shortly undergo further tryouts on full-scale jet engines in service.

Importance of the research was underscored by Klein's statement:

"Available information indicates that roughly half of all jet engines removed from aircraft for repairs are removed due to foreign

material, and that a majority of jet engines removed from whatever cause are found to have suffered damage from foreign material entering the engines."

A large proportion of present jet airplanes use metallic screens to prevent the ingestion of foreign material, Klein said, adding: "Such screens involve performance penalties and to some extent introduce icing and structural failure dangers of their own."

Douglas began investigating the use of aerodynamic principles for the same purpose in 1953, early in the design study for the DC-8, with a series of small scale tests. These were supplemented in 1955 by reports from the NACA on a series of fullscale engine tests at the Lewis Flight Propulsion Laboratory.

Klein said the characteristics of the inlet vortex were determined from these and subsequent company studies with a 20 percent scale model. This investigation laid the groundwork for tests in 1956 with a 40 percent inlet model.

Experiments with a jet of air which can be bled from the engine established the best angle for directing the "Blowaway Jet." The performance penalty for bleeding the air was described by Klein as "very small, since the airflows required are small."

The Douglas engineer said the principle used in the aircraft application appears to be a fundamental method of dissipating any vortex. Other applications of the principle on which there has been speculation include the dissipation of vortices, formed in emptying tanks of liquid or, conceivably, small tornadoes.