

## JETLINER AIRPORT PROBLEMS THRESHED OUT

Radical changes in the ground handling of aircraft and in pavement construction will be needed when jetliners come into general operation throughout the world in order to mitigate the effects of blast, heat and spillage of jet fuel at airports, discussions at a recent ICAO symposium on airport requirements for jet transports revealed. The group of technical experts, who also attended the ICAO AGA divisional meeting (DAILY, Nov. 28), made the following major points:

Pavements; Jet operation may injure pavements through the effects of blast, heat and spillage of fuel (which evaporates far more slowly than aviation gasoline and therefore has more time to affect the pavement). With the Comet, however, there is no effect from heat and blast as the engines are mounted in the wings and their axis of thrust is parallel to the ground. Although the temperature of the emitted gases is 1,200 deg. F. at the jet orifice, if the engine height is  $3\frac{1}{2}$  times the diameter of the orifice the result on the surface is nil with a horizontally-mounted engine; an objective of jetliner design should therefore be "to keep height and inclination of jet engines at reasonable dimensions."

The U.S. delegate reported that experiments showed that very difficult and serious pavement problems may be created by jet aircraft, particularly by planes with engines mounted close to the ground (such as underwing pod installations). Certain of the U.S. tests resulted in temperatures as high as 400-500 deg. F. at ground surface. If assisted take-off, using rockets, afterburners or some other means of thrust augmentation, becomes necessary, the problem will be even more difficult: core temperatures of assisted take-off devices run from 3,500 to 5200 deg. F. with speed of exhaust gases between 6,000 and 8,000 feet per second; temperatures  $2\frac{1}{2}$  feet below the core and 25 feet away are about 700 deg. F.

Spilled fuel has a softening effect on certain types of non-rigid pavement, although those made of well-compacted, densely-graded materials are less affected because the fuel does not penetrate so deeply (even here, however, the softened surface is then more sensitive to the eroding effects of heat and blast from the gases emitted by the engines). Concrete itself is not affected by spillage, but the bituminous joints between the concrete slabs are affected, and after they are eroded by heat and blast damage to the concrete may follow; research is now under way on the development of jet-resistant joint materials.

Runway Length: Although work is under way to increase the available drag on landing and to develop mechanical assisting equipment and aerodynamic braking, the symposium stressed the necessity for ensuring that runways would have a reasonable coefficient of friction for braking efficiency. British delegates considered that future jets would not need very much longer landing distance than at present despite greater power and higher wing loadings.

Taxiways and Holding Areas: High speed taxiing is necessary in view of the expense of operating a jetliner on the ground (taxiing the Comet uses up as much as 70% of the fuel used in full cruising) and taxiway curves must be such that the aircraft need not decelerate. In Britain, take-off clearance is given before the jetliner leaves the apron and the plane by-passes piston-engined planes stopped at the beginning of the runway for engine-run-up. Holding areas should therefore be provided near the beginning of the runway for piston-engine running-up.

Aprons: Caution must be used in turning a jetliner with engines running anywhere near another aircraft or ground personnel because of blast and heat effects. With the Comet, 140 feet must be allowed between the jet orifice and any object. Aircraft should therefore come in to the apron from the taxiways directly, without turning. Because of the high expense of taxiing, it was suggested that jetliners not be brought to the apron before the passenger terminal for loading. One suggestion included the transfer of passengers to a remote part of the apron where the engines could be started without affecting other aircraft; a second suggestion was that jetliners be parked near the beginning of the runway with passenger transfer by bus; a third was to bring the plane up a slope to the passenger loading ramp, loading passengers, and then, taking advantage of the down slope, for the aircraft to coast to a point remote from the terminal building where the engines could be started.