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Worked example of ground-test machine operating on a dry or contaminated runway surface. Application of ESDU 05011



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**WORKED EXAMPLE OF GROUND-TEST MACHINE OPERATING ON A DRY OR
CONTAMINATED RUNWAY SURFACE. APPLICATION OF ESDU 05011**

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WORKED EXAMPLE OF GROUND-TEST MACHINE OPERATING ON A DRY OR CONTAMINATED RUNWAY SURFACE. APPLICATION OF ESDU 05011

An Airport Operator wishes to estimate contaminant depths associated with force measurements made by a ground-test machine.

1. INTRODUCTION

This Data Item forms part of a series of worked examples. These examples illustrate application of the method for estimating resistive forces acting against a single aircraft tyre operating on a dry or contaminated runway surface described in Reference 1. Reference 3 is a worked example featuring a single aircraft tyre operating in linear motion on a runway surface, whilst Reference 6 illustrates how the water content of snow influences the resistive forces acting on a tyre operating in linear motion. A complete description of the mathematical model summarised in Reference 1 is given in Reference 4. Background information relating to the application of the model can be found in Reference 2.

A ground-test machine can be used by an Airport Operator to determine the depth of a layer of contaminant that is covering a runway surface by measuring the resistive forces that act on a specific region of the machine. Not all machines work in the same way and one specific type of machine is illustrated here. It should be noted that the forces measured on the wheel of any ground-test machine may be influenced by the location of the measuring wheel relative to the wheels of the towing or driven vehicle. As a result there will not be a direct correlation between data obtained on the wheels of different ground-test machines; this aspect is not considered in this worked example.

In practice, a range of ambient and runway conditions would be encountered which are much wider than those considered in this Data Item.

2. GROUND-TEST MACHINE INFORMATION

For this worked example, it is assumed that the machine is equipped with:

- free-rolling tyre capable of measuring fluid- and snow-drag forces,
- braked wheel capable of measuring the sum of braking and fluid- and snow-drag forces.

Furthermore, it is assumed that neither the free-rolling nor the braked wheel is subject to a lateral force.

The relevant tyre data are listed in Table 2.1. The tyre is assumed to have a **rib-tread**.

The operator of the ground-test machine is required to specify the form of contaminant, if any, that is covering a runway surface. For example, water, slush, loose snow or ice. The ground-test machine is then operated on the runway surface and the resistive forces acting on the various tyres are measured. An iterative procedure, which incorporates the method outlined in References 1 and 4, is then used to determine, when applicable, the depth and density of the contaminant.