

FactSheet

National Aeronautics and
Space Administration

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Research Aims To Prevent Accidents On Hazardous Runways



Runway water, ice, or snow was a factor in more than 50 airplane accidents between 1998 and 2004. Most of those accidents involved fatalities. NASA supports a national safety goal to substantially reduce the fatal aircraft accident rate during ground operations under other than clean and dry conditions.

To help accomplish this ambitious agenda, NASA Langley Research Center has partnered with Transport Canada, the Federal Aviation Administration (FAA), and several European and Asian aviation authorities and organizations in the on-going Joint Winter Runway Friction Program.

The research effort uses instrumented aircraft, friction-measuring ground vehicles, and test personnel from around the world.

Results Will Benefit Aircraft and Airports

The major objectives of the Joint Winter Runway Friction Program include:

- Coordinating different ground vehicle friction measurements to develop a consistent friction scale for similar potentially hazardous runway conditions.
- Establishing reliable correlation between ground vehicle friction measurements and aircraft braking performance.

Accomplishing these objectives would not only give the airport operators a better way to evaluate runway friction and maintain acceptable operating conditions, but would also contribute to reducing traction-related aircraft accidents.

Testing Began in 1996

Since testing started in January 1996, 10 aircraft and 18 ground test vehicles have been evaluated at sites in Canada, the United States, Norway, Germany, Japan, and France. Four government agency aircraft have participated: the Canadian National Research Council's Falcon-20, the FAA's B727, and NASA's B737 and B757. Commercial partners have contributed to testing with four other aircraft: two Dash 8s, an A319, and a 328 twin-turbo prop. The friction-measuring ground devices have come from a number of international partners. Transport Canada's surface friction tester and electronic recording decelerometer, the Scottish GripTester, the French IMAG and IRV, and Norway's RUNAR, ROAR, and airport surface friction tester have all contributed data. So have the FAA's BV-11 trailer, runway and surface friction testers, the American Society for Testing and Materials (ASTM) E-274 skid trailer, and NASA's instrumented tire-test vehicle, diagonal-braked vehicle, and GripTester.

Data collected from 1996 to 2004 includes nearly 500 instrumented aircraft test runs and more than 18,000 ground vehicle runs. Tests were performed on a variety of runway conditions:

- Bare and dry
- Rain and artificially wet
- Artificially flooded
- Loose and compacted snow
- Smooth and rough ice
- Sanded and chemically treated ice
- Slush

Researchers also took manual measurements to monitor conditions before and after a test run series. They recorded ambient temperature; temperatures of pavement surface and snow, slush, or ice; depth of cover material (water, snow, slush, ice); and in the case of snow or slush, density of cover material.

From this substantial friction database, engineers have developed an international runway friction index (IRFI) to standardize friction reporting from different devices and to

assist pilots in making critical takeoff and landing decisions. ASTM has approved an IRFI methodology standard that defines procedure and accuracy requirements.



Researchers take measurements before runway tests.

More Tests Planned

Future test plans include:

- Standard-equipped wide-body aircraft tests at European and Asian airport facilities.
- Additional aircraft and ground vehicle tests at North Bay, Ontario, and Sawyer Airport, Gwinn, Michigan.
- Ground vehicle tests during an annual NASA workshop in Virginia, and at special test tracks in Oslo, Norway, and Nantes, France.

The results from this program will increase aircraft safety and the capacity of airports where winter conditions are severe. Some of the results and test procedures may also apply to highway safety.

For more information, visit the following web sites:

NASA

<http://www.nasa.gov>

NASA Langley Research Center

<http://www.larc.nasa.gov>

Runway Friction Research at NASA Langley

<http://runfric.larc.nasa.gov>