

# DEBRIS DANGER

## Foreign object debris at an airport is so dangerous it can kill. *Airports* looks at the hazards debris can pose and ways to dispose of it

In July 2000, an Air France Concorde crashed just minutes after takeoff from Paris en route to New York, killing all 109 people on board and five on the ground. Air France's Accident Investigation Bureau confirmed that foreign object debris (FOD) in the form of a 40cm piece of metal had caused the tragedy.

It's hard to believe that something so simple could create such a disaster. Yet FOD on airport runways cause about US\$4bn worth of damage to aircraft every year.

Because of high kinetic energy levels on active runways, FOD can lead to severe consequences, including potentially the loss of the aircraft and, on extremely rare occasions such as the Concorde tragedy, loss of life.

At most airports, especially those that cater for jets, runway debris can come from jet blast effects, eg an aircraft turning from an active runway onto a narrow taxiway can blow material from the shoulders and in-field areas backwards onto the runway. Items may also fall from aircraft or other vehicles, causing a hazard for subsequent users of the runway.

Debris can take many forms: nuts and bolts, pavement fragments, washers, rivets,

stones, sand and gravel, metal tools, aircraft parts and drink bottles – even birds and animals. All are hazardous to aircraft and need to be removed as quickly as possible.

But an airport's best defence against FOD is good housekeeping. Where debris detection is concerned, there are at least three stakeholders: the operations people who actually perform the sweeps of the runway; the pilots who use the runway; and the air traffic control operators responsible for coordinating runway use.

Off the runway there are other players involved in debris control, such as baggage handlers, catering services and construction workers; they should be made very aware of the need for good housekeeping. After all, the best defence against debris on the pavement is to ensure it doesn't get there in the first place. If the right precautions are taken, foreign objects on the active runway are likely to be debris from aircraft.

At present, FOD is controlled by observation and sweeping activities. However, the area where the risk is greatest – the active runway of a busy airport – cannot be swept on a periodic and frequent basis without reducing the number of aircraft movements.

What is required is an on-condition runway maintenance concept. Periodic sweeping activities would be less frequent and the runway would be continuously monitored by automatic sensors to warn of the appearance of significant pieces of debris. A cost-effective means of automatically and non-intrusively detecting debris on runways will reduce

### IMPLEMENTATION CONTROL METHODS

Ensure you establish and maintain an effective FOD prevention program that is planned and implemented using the 'continuous improvement' approach.

#### Basic elements:

- FOD prevention training
- Early design consideration for FOD prevention, resistance to damage, foreign object entrapment, etc
- Utilise assembly sequencing and maintenance or manufacturing techniques that include proper care and use of assembly/maintenance equipment and protective devices for parts
- Handling of material
- Housekeeping
- Control of tools and personal items
- Control of hardware/consumables
- Measuring techniques for analysis, trending and feedback
- Incident investigation/reporting, 'lessons learned'
- Control of hazardous material
- Access controls
- Awareness/employee feedback

#### Preventative practices:

- Follow procedures
- Practice good housekeeping, 'clean as you go'
- Account for all tools, hardware and equipment at specific intervals
- Use x-ray, borescope and other state-of-the-art equipment to inspect inaccessible areas
- Provide worker awareness of causes of FOD
- Establish designated storage areas for ladders, hoses, tool boxes and other work aids
- Utilise industry feedback through benchmarking proven practices

Source: National Aerospace FOD Prevention



**CONCORDE TRAGEDY, PARIS, 25 JULY 2000**

- Continental Airlines DC-10 takes off from Paris' Charles de Gaulle Airport. A 40cm piece of metal from the cowling of a fan reverser falls from the aircraft onto the runway
- Air France Concorde flight AF4590 bound for New York follows Continental DC-10 and begins its takeoff run. All 100 passengers on board are German tourists. The 40cm piece of metal punctures one of the supersonic jet's tyres and resulting fragments of rubber rupture the aircraft's fuel tank, causing a substantial leak
- Within seconds the leaking fuel creates a fire, causing the loss of thrust in both engines. The fire continues throughout the ill-fated flight
- The flight crew, reportedly doing everything by the book, has no way of knowing about the nature of the fire or any means of fighting it
- The Concorde crashes into the Relais Bleus Hotel in the small town of Gonesse, about 15km north of Paris at 4.44pm local time, killing all on board and five people on the ground
- The crash is the first by Concorde since the aircraft's introduction to service in 1969

the safety risk and aid airport operators in maintaining an expeditious flow of traffic. Of course, operations will still be interrupted when objects are detected, because it will be necessary to retrieve them.

**Sydney Airport radar system trial**

At the end of last year, Sydney Airport, which handles 26 million passengers a year, trialled a runway debris radar system developed by UK-based company QinetiQ. Known as Tarsier, the system can detect small items of potentially dangerous debris on airport runways. QinetiQ was asked to develop the system after the Air France Concorde disaster in 2000.

Representatives from organisations, including Melbourne, Perth, Gold Coast and Auckland airports, Qantas and CASA, were also present at the Sydney trials.

Sydney Airport manager Frank Mondello welcomed the trial and said that safety, including prevention of aircraft damage from runway debris, was a major issue.

"While our safety record is excellent, we are conscious of the need to maintain and improve standards, particularly where new technology is available," Mondello says.

The system, based on high-resolution millimetre wave radar, is able to detect small, potentially hazardous objects on a runway to within an accuracy of three metres at a

## Foreign object debris in the form of a 40cm piece of metal caused an Air France Concorde to crash in July 2000, killing 114 people

range of up to two kilometres. The system is also able to detect a range of different materials, including metal, plastic, glass, wood, fibreglass and animal remains. Images are relayed to a computer that pinpoints the location of the item, while an alarm sounds to alert staff.

Checking for runway debris is currently performed manually, which is time consuming, expensive and open to human error. It can take as long as 45 minutes to check a runway between aircraft movements and this is particularly difficult in bad weather and at night. This can result in runway closures, delays in both arrival and departure slots and, most importantly, could potentially put passenger and staff safety at risk – making debris on runways an issue for both airports and airlines.

"With this technology we can check the runway between every flight," says QinetiQ spokesman Michael Burns. "It scans 24 hours a day, it doesn't worry about fog and other weather or climatic conditions."

**FOD\*BOSS**

In the 1990s, Australian company Aero Sweep developed a speed sweeping system that has grown into arguably the most popular device of its kind in the world.

Known as FOD\*BOSS, the system grew from a product designed to clean and groom suburban tennis courts.

Aero Sweep director Brook Tozer told

*Airports* that the FOD\*BOSS is now in operation at hundreds of airports worldwide and at 70 airports throughout Australia and New Zealand.

Any member of an airport team can operate the FOD\*BOSS with a standard road vehicle fitted with a 50mm tow ball. "It replaces the need for vacuum and sweeper trucks costing hundreds of thousands of dollars," Tozer says. "Most debris collected by the FOD\*BOSS is well under 50mm, so seeing it from a truck cabin or aircraft cockpit is almost impossible. Debris such as wheel nuts, rivets, stones and luggage hardware is all capable of doing massive damage to aircraft engines and tyres or can be blasted by jets, seriously endangering passengers and ground support staff."

**Brisbane Airport**

At Brisbane Airport, runway operations officers conduct inspections four times a day. Extra inspections may also be made at the request of the control tower after adverse weather, on pilot reports, or if anything untoward is noted by officers.

Brisbane Airport operations safety and standards manager John McCaffery told *Airports* that the major reason for such regular runway checks is to enable the "safety of



FOD\*BOSS collects plenty of rubbish...



John McCaffery, operations safety and standards manager, Brisbane Airport

aircraft operations and to ensure the integrity, reliability and consistency of the runway and taxiway systems”.

Two officers, one on each side of the runway centreline, generally conduct inspections, which can take between 20 minutes to over an hour to complete.

“There has been a wide variety of objects found during inspections at Brisbane,” McCaffery says. “We’ve found pieces of aircraft tyre, aircraft components, bolts, pieces of metal, rocks thrown up by mowers, broken lights, hats, grass and soil. The debris is collected and removed by the operations officers, but on occasion the vacuum sweeper is needed to remove large amounts.”

### Gold Coast Airport

Gold Coast Airport trains operational and ground staff to deal with FOD.

By far the most common debris encountered at Gold Coast is associated with ground handling operations. Baggage tickets, locks, paper and other litter is most common.

Ground staff conduct a minimum of two daily inspections plus irregular inspections as required, while the runways, taxiways and apron are swept three times a week using a FOD\*BOSS.

In addition, senior management, including the technical services manager and the operations and security manager, complete runway, taxiway and apron inspections once a week.

Gold Coast is also investigating new technologies, including the Tarsier runway detection radar system, to assist in the identification of debris and to minimise risks associated with FOD.

vacuumed once a month. Technical staff inspect the runways, taxiways and aprons weekly while more detailed inspections are carried out every six months.

### Mt Isa Airport

Like Townsville, Mt Isa conducts runway, taxiway and apron FOD inspections before every jet landing and takeoff. Due to the geographical nature of Mt Isa Airport, the most common form of debris encountered is rocks. The airport trains a safety officer in the hazards and risks associated with FOD.

The apron is swept using a FOD\*BOSS and a sweeper is used on the taxiway and

## An airport’s best defence against FOD is good housekeeping

### Townsville Airport

Townsville carries out runway, taxiway and apron FOD inspections before every jet landing and takeoff, with the most common debris being strapping that comes off cargo and baggage locks.

A combination of contract and full-time staff clear runways and taxiways weekly with a vacuum sweep, while the apron is cleared once a week with a FOD\*BOSS and

runway monthly or as required. Technical inspections of the runway, taxiway and aprons are completed every six months.

Foreign object debris is indeed a danger of which airports must be aware, but with effective housekeeping it be managed. While there are costs involved in conducting this housekeeping, the costs of ignoring it are inevitably far greater. ■




Brook Tozer, Aero Sweep, with the FOD\*BOSS

**THE ULTIMATE FOD SWEEPER**

**PROVEN DESIGN**

- Efficient and fast - up to 25 mph/40kph
- No motors or vacuums
- Maintenance free
- Works in the rain
- Most surfaces
- Easy to use
- Low cost
- Portable
- Reliable




◦ Email now for a Free Demonstration

**DUPLEX**



**TRIPLEX**



**THE FOD\*BOSS**

**AEROSWEEP** [www.aerosweep.com](http://www.aerosweep.com)  
 email: [fodboss@aerosweep.com](mailto:fodboss@aerosweep.com)

This product is suitable for international markets and please apply abroad.