

ACG/AIR CONSULTING

**WE CARE FOR
SAFETY AND SIMPLICITY**

FOD & REASONS FOR MAGNETIC SWEEPING ROUTINE



FOD / Seasonal and regional contamination

**PAVEMENTS WITH WATER
CONTAMINANTS**



**PAVEMENTS WITH SAND /
DUST CONTAMINANTS**



FOD / Seasonal contamination

Friction values drop –
contaminants make the surfaces
dangerously slippery



friction testing (+ surface conditions safety
assessment)

surface maintenance - sweeping with brushes,
magnetic sweepers, sweeping mats / vacuum
cleaning / water jetting **to renew appropriate friction
values**



FOD / Seasonal contamination

**3 OVERRUNS WITHIN 4 YEARS...
At some airport in Central Europe**

2013 : B737 - 800



2017 : Beech 400 A



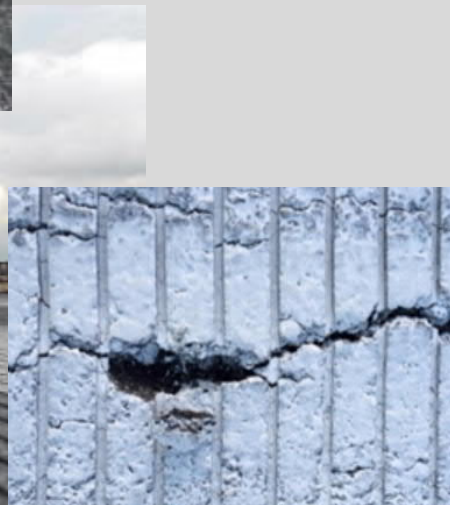
2017 : Eurofighter



FOD / Seasonal contamination



(METAL) FOD EASILY CONCEAL / STUCK IN
PAVEMENT GAPS OR STICK TO SURFACE
NATURAL CONTAMINATION



detail of released expansion
joints between runway panels



FOD / Specific conditions



FOD / Specific conditions



FOD / Specific conditions



(Metal) FOD is present on public roads

(Metal) FOD is present on in - house roads (of airports, ports or factories)

FOD PHENOMENON / Definiton

FOD DEFINITION

- FOD >> (Foreign Object Debris / Damage)
- FOD >> anything present on the airport movement areas that can cause hazardous situation to persons, aircraft or airport vehicles, equipment and systems
- FOD >> from vehicles, aircraft, persons, external environment

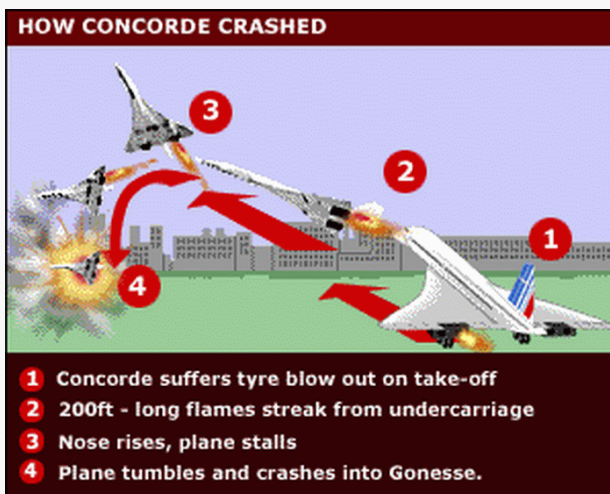
Photos: Watch: Alaska airport removes massive seal from runway using sled



FOD PHENOMENON / Concorde story

WHEN FOD BECOMES A KILLER

- Air France Concorde jet (flight no. 4590) with 113 casualties
- The tire disintegrated in seconds, sending shards of rubber into the fuel tanks and causing a catastrophic fire



FOD PHENOMENON / Contributors

VISIBLE – visible for FOD automated detection systems or by eye sight during regular airport inspections

NEARLY INVISIBLE (hard to detect) - corroded metal fragments and dust hidden in pavement texture, runway grooving, expansion joints etc.

METALLIC – HIGHEST RISK

NON-METALLIC: sand, stones, fragments of pavement, chocks, polly bristles



FOD PHENOMENON / Contributors

SIZE, SHAPE AND SHARE OF IRON ON TOTAL MASS:

GROUP 1: easy to attract (e.g. BRUSHES WIRES, METAL SHAVINGS, GRINDING METAL DUST)

GROUP 2: not easy / shape (e.g. SMALL SPRINGS)

GROUP 3: not easy / ratio of non - ferromagnetic materials (e.g. SOME COINS, THUMB TACKS)

Notice: ONLY iron, nickel, cobalt and specific alloys are ferromagnetic.

GROUP 1 – LIGHT OBJECTS (1, 2, 3, 4, 5, 6)



GROUP 2 – OTHER OBJECTS (7, 8, 9, 10, 11, 12)



FOD PHENOMENON / Contributors

FOD CAN BE SOURCED ANYWHERE ... from

operators, service providers, unauthorized persons
force majeure, and the most commonly from
operations of old GSE equipment in intense traffic



FOD PHENOMENON / Contributors

REAL CHALLENGE: DETECT AND COLLECT

O'Hare Airport Chicago
4 terminals, 8 runways
2 700 aircraft
operations per day (now)
3 800 operations per day
(modernization plan)



FOD PHENOMENON / Contributors



Airports in need of appropriate FOD
CLEANING performance in m^2 / h

REAL CHALLENGE: DETECT AND COLLECT



**The longest paved runway
in the world is at
the Chinese Qamdo Bamda Airport
and is about 3.4 miles
(5500 meter, 18045 ft) long.**

FOD PHENOMENON / Contributors



Old towing bars = ? source
of metal FOD (pins, bolts,
nuts..)



Or modern GSE equipment
needing no towing bars !!



Towing with a LEKTRO - FOD safe



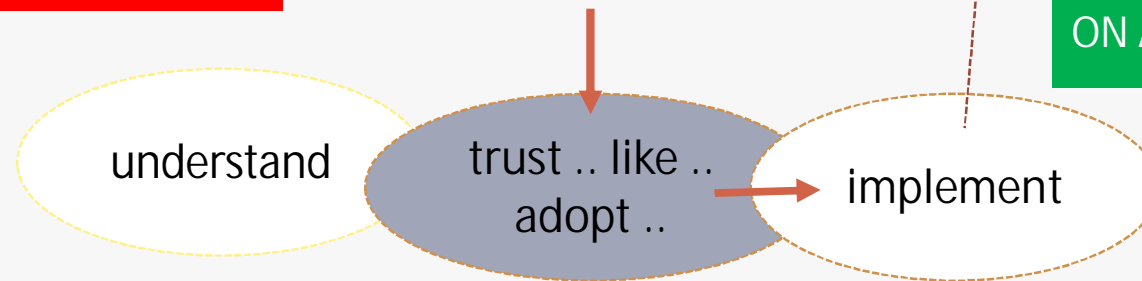
Towing with a conventional bar
(FOD risk)

FOD PHENOMENON / Contributors

**MAIN REASON FOR FOD
IS IGNORING AND
NEGLIGENT PERSONNEL
AND MANAGENT**

FOD INFRASTRUCTURE
(PROGRAMS, EQUIPMENT,
TRAINING, AWARENESS)

**FOD IS MANAGED.
ON ACCEPTABLE LEVEL**



FOD PHENOMENON / Local assessment

3 CAUSES OF THE SERIOUS OCCURRENCES:

I DIDN'T THINK

I DIDN'T SEE

I DIDN'T KNOW

[FOD during taxi - video](#)



FOD / Life and property at risk

FOD MITIGATION ... SUPREME PREVENTION ACTIVITY

Hard to catch or even investigate the crime perpetrator

- Airline ??
- Airport ??
- GHA ??
- Passenger ??
- Terrorist ??



FOD PHENOMENON / Local assessment

- FOD IS PERMANENTLY PRESENT
- FOD IS 99 % PREVENTABLE if:
 - equipment, staff, policies are applied
- STAFF = AWARE OF AND MOTIVATED



FOD PHENOMENON / Local assessment

How much FOD **really** remains daily on your airport?

Do you **really** have control & mitigate FOD?



WHAT IS ACCEPTABLE RISK?

WHAT ARE THE TOOLS & PROCEDURES TO USE ?

DO WE NEED FOD MANAGEMENT ?

Every airport ?

FOD PHENOMENON / Local assessment



? YES - runway inspections **mitigate FOD**

? NO - runway inspections **don't mitigate FOD**

ICAO requirement in year 2020 stays **unchanged since 1944**
- minimum inspections 1 / 4 (cat.1,2 / cat. 3,4 airports)

**// BUT the most bussiest airports has changed dramatically & airport inspections
last just few minutes of a car drive !!**

FOD PHENOMENON / Methods and equipment

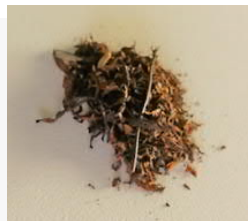
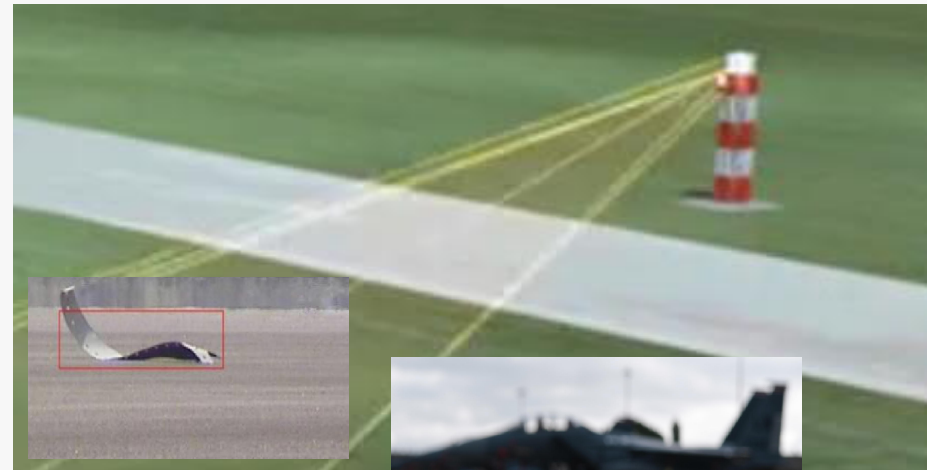


METHODS AND EQUIPMENT

CLEANING >>> vacuum cleaning, blowing out of runway, conventional sweeping, sweeping with mats, magnetic sweeping

DETECTION >>> visual detection (runway inspections, FOD walks), automated systems of detection

FOD / Life and property at risk



MAGNETIC SWEEPING FOD AUTOMATED DETECTION SYSTEMS

FOD / Life and property at risk

FOD AS SECURITY THREAT !!

.. if dropped on the surface by drones
or shot over the perimeter fence



FOD / Life and property at risk

hex wrench was found
inside of engine



US Navy A-6E
crash

Catastrophic events > due to
small piece of metal FOD

fastener with bolt head

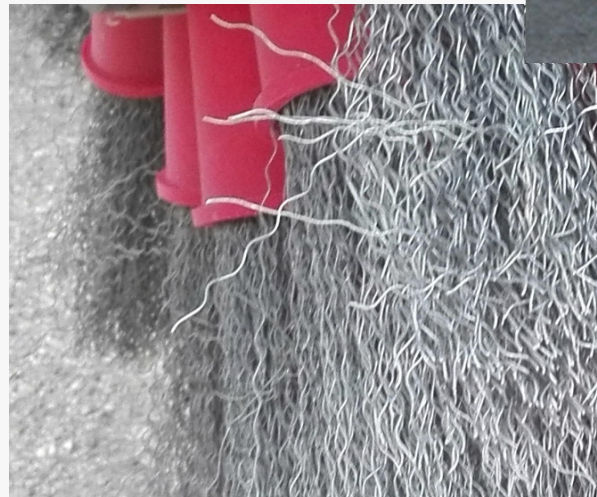


US Marine
Harrier crash

FOD / Life and property at risk

**BOTH AIRCRAFT AND
AIRPORT VEHICLES USE ...
EXPENSIVE TIRES**

Tiny fragments of sweeper
brushes make tires worn and
pierced



FOD / Life and property at risk

Embraer ERJ-135 16,5 mil. USD

Boeing 737-800 89 mil. USD

Airbus A330 214 mil. USD

Set of engine fan blades
..... USD 25 000

NOTE: Damage of single
blade causes complete
replacement of all engine
blades.



compliance solutions from
the Czech Republic

**Twenty-Two Nighthawks. Total Cost:
\$2,446,400,000.**



FOD / Life and property at risk

F-35 Lightning II
237 mil. USD

WHO HAS THE SAFETY KEY ?



FLIGHT SAFETY

starts and ends on the ground

FOD / Life and property at risk

Delta Airlines spent \$16M on FOD damage in 2006
Direct/In-Direct FOD costs - \$445,867 per 10K movements

Estimated FOD costs per flight (USA survey made in 2008)

\$26 - aircraft and equipment repairs (body, tires, blades and engines)

\$312 - indirect costs (flight delays, plane changes, increased insurance, injuries, death, loss of trust.

FOD AVIATION COSTS

\$13 BILLION USD PER YEAR IN DIRECT PLUS INDIRECT FOD COSTS.



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