Federal Aviation Administration

FAA FOD Program Update

Presented to: 2011 NAFPI Conference

By: Dr. Edwin Herricks, University of Illinois

Paul Friedman, FAA, AAS-100

Jim Patterson, FAA, AJP-6311

Date: August 15, 2010

DFW

Overview

- **The FAA FOD Program has multiple dimensions:**
  - **Technology Research and Evaluation**
  - **FAA Advisory Circulars (ACs)**
    - AC 150/5220-24, FOD Detection Equipment
    - AC 150/5210-24, FOD Management
  - **FOD Database and Characterization**
  - **Equipment**
  - **Continuing Safety Improvement**

Technology Research and Performance Evaluations

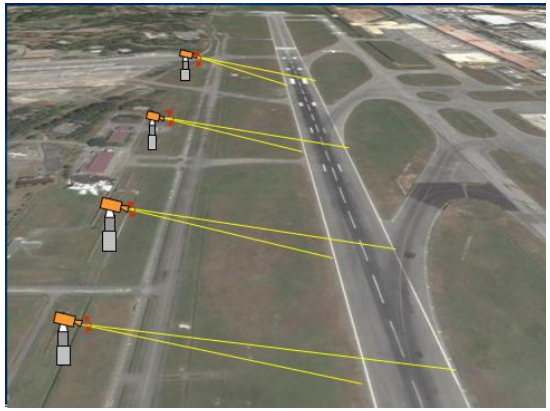
- **Process:**
  - System Assessment
  - Deployment of system
  - Test campaigns under variety of weather / environmental conditions
  - Common evaluation procedure

Technology Performance Evaluations

Performance evaluations of FOD detection technologies, radar, electro-optical, hybrid, and mobile have been completed. The FAA is proceeding with issues of AIP funding and is supporting CEAT in developing information about existing airport installations of these technologies.

FOD Detection Technologies Performance Evaluation - Locations

- Stationary Radar @ PVD
- Stationary Hybrid @ BOS
- Stationary Electro-Optical @ ORD
- Mobile Radar @ ORD, HNL



FOD Detection Technologies Performance Evaluation - Results

- **Reports of the performance assessments are available*:**

  DOT/FAA/AR-10/33 “Performance Assessment of a Radar-Based Foreign Object Debris Detection System” February 2011

  Reports on Electro-Optical and Mobile Technologies are in the final stages of publication; the report on hybrid technologies is with editors.

*** Available at:**
http://www.airporttech.tc.faa.gov/safety/downloads/

Performance Evaluation - Operations

- Continuing Process:
  - Foundation: cooperation with airport personnel
  - Wide range of issues studied:
    - Response time
    - Equipment durability
    - Maintenance requirements
    - Operator interface

FAA R&D Products and Airport Guidance

- Support FAA goals of improving airport, safety, capacity, efficiency, and environment
- Research leads to new or updated Advisory Circulars (ACs), Engineering Briefs (EBs), or other specifications/guidance
- ACs are advisory in nature; recommended practice for airports
- However, airports accepting Federal funds (Airport Improvement Program (AIP) or the Passenger Facility Charge (PFC) Program) to purchase equipment are required to use FAA ACs and specifications.

FAA AC 5220-24: Airport FOD Detection Equipment

- **Scope:**
  - Minimum performance specifications for FOD systems and equipment

- **4 Systems Identified:**
  - Stationary radar;
  - Stationary electro-optical;
  - Stationary hybrid radar and electro-optical; and
  - Mobile radar

- **Published on September 30, 2009**

FAA AC 5220-24:
Airport FOD Detection Equipment

Performance Specifications: Object Detection

- An unpainted, metal cylinder, measuring 1.2 in (3.1 cm) high and 1.5 in (3.8 cm) in diameter,
- A white, grey, or black sphere, measuring 1.7 in (4.3 cm) in diameter (i.e., a standard size golf ball),
- 90% of the following when placed within a 100 ft by 100 ft (30 m by 30 m) square in the desired coverage area. Each item must measure no larger than 4 in (10 cm) in any dimension unless otherwise specified:

A "chunk" of asphalt or concrete,	Fuel cap (aircraft or automotive),
Any portion of a runway light fixture (in-pavement or edge light),	A distorted metal strip (up to 8 in. (20 cm) in length),
An adjustable crescent wrench (up to 8 in. (20 cm) in length),	Hydraulic line (from aircraft or GSE, up to 8 in. (20 cm) in length) ,
A deep socket (at least 2 in. (5 cm) in length),	PVC pipe, white (2 in. (5 cm) in diameter)
A piece of rubber from an aircraft tire,	Lug nut,

- Any two of the objects above, located no more than 10 ft (3 m) apart from each other, identified as separate objects.

FAA AC 5220-24:
Airport FOD Detection Equipment

Inspection Frequency

- Continuous Detection Systems. Provide continuous operation from fixed sensors to allow for the continuous inspection of runway surfaces during flight operations.

- Mobile Detection Systems. Provide a mobile operations capability to enhance mandated airport safety self-inspections (per AC 150/5200-18). The frequency of inspections is dependent on the airport and specified by the user.

FAA AC 5220-24:
Airport FOD Detection Equipment

Detection Response Time

- Systems must have the capability to provide rapid detection of a FOD occurrence in the area being scanned.
- For continuously operating FOD detection systems that are designed to provide between-movement alerts, the system must provide inspection of runway surfaces between aircraft movements.
- For other continuously operating FOD detection systems, the system must provide inspection updates as specified by the airport, generally within 4 minutes of a FOD occurrence.

FAA AC 5220-24: Airport FOD Detection Equipment

Performance in Weather

- Systems must demonstrate the detection performance under both clear and inclement weather conditions.
- Detect objects under rainfall or snow conditions (e.g. having a specific intensity, duration, and frequency) for a two-year category of storm in the local region
- Site-specific performance specifications:
  - performance during clear weather conditions;
  - performance during inclement weather conditions; and
  - provide the user with the amount of time required for the system to recover after a rain or snow storm, that is, to return the performance capabilities of clear weather conditions after adverse weather conditions subside.
- Lighting conditions. All systems must demonstrate detection performance during daylight, nighttime, and dawn/dusk operations.

FAA AC 5220-24: Airport FOD Detection Equipment

Alerts and Alarms

- Systems must be able to alert the system operator to the presence of FOD in scanned areas.
- Alert must provide airport management with enough information to assess the severity of the hazard in order to determine if immediate object removal is necessary.
- False alarms (an alert causing the airport operator to take action to remove a FOD object that does not exist) should be minimized and must not exceed:
  - 1 per day as averaged over any 90 day period, for FOD detection systems with visual detection capabilities, or
  - 3 per day as averaged over any 90 day period, for FOD detection systems without visual detection capabilities.

FAA AC 5220-24:
Airport FOD Detection Equipment

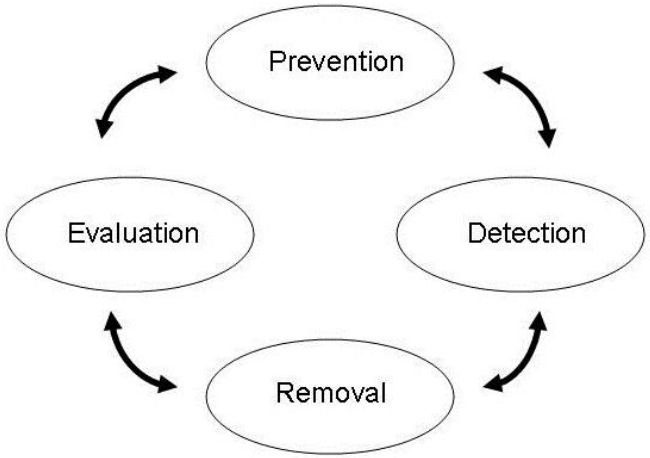
Detection Data

- Systems must automatically provide a data record on detected FOD.
- Records must contains the following information at a minimum:
  - Alert time and date, and
  - Location of FOD object.
- Recommended information, but not required:
  - Description of FOD detected or retrieved (e.g. size, name, type, serial number, etc.)
  - Time and date of FOD retrieval
  - Time and date of disposition of alert
  - Name of personnel detecting / investigating FOD item
  - An image of the FOD object retrieved (if available)
  - Chain of custody information

FAA AC 5210-24: Airport FOD Management

- **Scope:**
  - Guidance for developing and managing an airport FOD program. Also provides minimum specifications for FOD removal equipment. *Cancels AC 150/5380-5B, Debris Hazards at Civil Airports (7/5/96)*

- **4 Program Elements:**
  - Prevention;
  - Detection;
  - Removal; and
  - Evaluation



- **Status:**
  - Published September 30, 2010

FAA AC 5210-24:
Chapter 3: FOD Prevention

- **FOD Program Manager**
  - an accountable staff member to manage the airport's FOD programs and issues (e.g., operations manger, safety manager, etc.).
  - Responsibilities should be clearly defined
- **FOD Committee**
  - Typically include those with a direct relationship to FOD, including: tenant representatives, airlines, airport operations and public safety staff, and contractor representatives, etc.
  - The FOD manager typically chairs the committee.
  - Can perform an evaluation of collected FOD data and determine potentially hazardous FOD situations

FAA AC 5210-24:
Chapter 3: FOD Prevention

Maintenance Programs

- Aircraft servicing
- Aircraft maintenance
- Air cargo
- Construction
- Airfield maintenance operations
- Pavements

FAA AC 5210-24:
Chapter 4: FOD Detection

- **FOD Risk Assessment**
  - Section to be added if / when FAA issues SMS requirements.
- **FOD Detection Operations**
  - Inspection Areas
    - Movement areas (runways and taxiways)
    - Airport apron (terminal gates)
    - Aircraft maintenance and servicing ops.
    - Air cargo ops.
    - Construction ops.
    - Maintenance activities

FAA AC 5210-24:
Chapter 4: FOD Detection

FOD Detection Operations, Methods and Techniques

- At least 1 daily, daylight inspection required
- If continuous systems used, airports should ensure personnel have authority or can communicate with personnel to close runway.
- Flexibility in how airports/airlines implement systems
- Wildlife
  - No uniform categorization.
  - Generally, live = wildlife program, dead = FOD program
  - Programs can overlap, such as when wildlife die or program elements create hazard in the other program

FAA AC 5210-24:
Chapter 4: FOD Detection

FOD Detection Operations, Methods and Techniques

- **Manual Detection**
  - Inspections determined by type of operation and runway availability
  - Construction operations require more inspections
  - Airport encouraged to reach out to airlines / FBOs
  - At least 2 runs on runway, or if only time for 1, then in opposite direction that aircraft land
  - All-hands FOD walks effective to promote, detect FOD
  - FOD containers should be conspicuous and stable
- **Detection Equipment**
  - Specifications in AC 5220-24

FAA AC 5210-24:
Chapter 5: FOD Removal

Mechanical Systems (active)

- **Power sweepers, including tow-behind bristle trailers.**
  - Metal bristles not recommended, and pavement should be checked after removal operation
- **Vacuum systems**
  - Similar to power sweepers, but use air flow as primary means of object retrieval
- **Jet air blowers**
  - A debris retention system is recommended

FAA AC 5210-24:
Chapter 5: FOD Removal

Non-Mechanical Systems (passive)

- **Friction mat sweepers (e.g. FOD Boss)**
- **Magnetic bars**
  - Vehicles should be inspected and bars should be cleaned regularly
  - Cannot pick up common FOD materials such as plastics, stainless steel, and titanium/aluminum alloys
- **Rumble strips**
  - No longer a widely accepted FOD removal system
  - Effectiveness is negligible
  - Can promote FOD if not cleaned/inspected regularly
  - Recommend a checkpoint to inspect vehicles and remove FOD

FAA AC 5210-24:
Chapter 6: FOD Evaluation

Data collection and analysis, Database:

- Disposition of reported information will be based on the airport's FOD management program specifications and support §139.327 certification.
- Records may be required in the event of a formal investigation of an accident or serious incident, and can also be used to identify any trends, repeats, unusual conditions, etc.
- Records can also provide quantitative data for future risk assessment, support the assessment of system operational history and assure operational capabilities
- All records should be maintained for at least 2 years
- FAA currently developing a national FOD database. Airport's collecting high-quality FOD data (showing at least the type, location, and source), are encouraged to submit their data to FAA once the national database is in operation.

FAA AC 5210-24:
Chapter 6: FOD Evaluation

Continuous program improvement

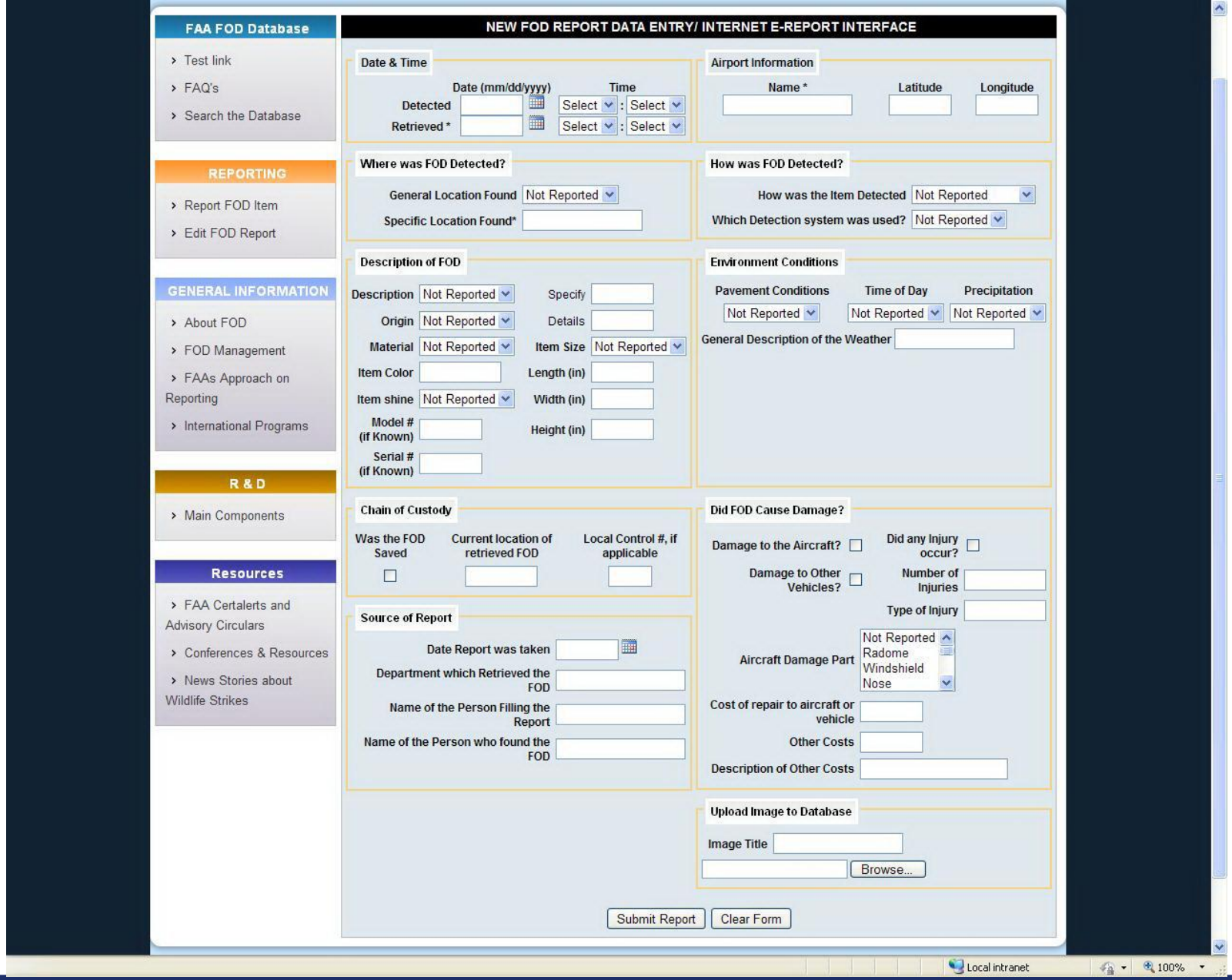
- Through regular review and evaluation, management may revise safety objectives, policies, procedures, and training programs to ensure that the FOD management program remains effective and relevant to the organization's operation.
- The FOD Manager should work with the persons that have direct responsibility for analyzing hazards, identifying control measures derived from that analysis, and ensuring those measures are effective.

2011 Research & Development Efforts

A FOD database is being developed – a major feature will be a web-based reporting system.

In addition, the FAA will be developing a web site solely dedicated to FOD. This will be the home for the database, have reference materials, technical reports, advisory circulars, etc.

The web site should be up before the end of 2011.


FAA FOD Database
Test link
FAQ's
Search the Database
REPORTING
Report FOD Item
Edit FOD Report
GENERAL INFORMATION
About FOD
FOD Management
FAAs Approach on Reporting
International Programs
R & D
Main Components
Resources
FAA Certalerts and Advisory Circulars
Conferences & Resources
News Stories about Wildlife Strikes
NEW FOD REPORT DATA ENTRY/ INTERNET E-REPORT INTERFACE
Date & Time
Date (mm/dd/yyyy)
Time
Detected
Retrieved *
Select : Select
Airport Information
Name *
Latitude
Longitude
Where was FOD Detected?
General Location Found
Not Reported
Specific Location Found*
How was FOD Detected?
How was the Item Detected
Not Reported
Which Detection system was used?
Not Reported
Description of FOD
Description
Not Reported
Specify
Origin
Not Reported
Details
Material
Not Reported
Item Size
Not Reported
Item Color
Length (in)
Item shine
Not Reported
Width (in)
Model # (if Known)
Height (in)
Serial # (if Known)
Environment Conditions
Pavement Conditions
Time of Day
Precipitation
Not Reported
Not Reported
Not Reported
General Description of the Weather
Chain of Custody
Was the FOD Saved
Current location of retrieved FOD
Local Control #, if applicable
Did FOD Cause Damage?
Damage to the Aircraft?
Did any Injury occur?
Damage to Other Vehicles?
Number of Injuries
Type of Injury
Aircraft Damage Part
Not Reported
Radome
Windshield
Nose
Source of Report
Date Report was taken
Department which Retrieved the FOD
Name of the Person Filling the Report
Name of the Person who found the FOD
Cost of repair to aircraft or vehicle
Other Costs
Description of Other Costs
Upload Image to Database
Image Title
Browse...
Submit Report
Clear Form
Local intranet
100%

Federal Aviation Administration

FAA FOD Database

- Test link
- FAQ's
- Search the Database

REPORTING

- Report FOD Item
- Edit FOD Report

GENERAL INFORMATION

- About FOD
- FOD Management
- FAAs Approach on Reporting
- International Programs

R & D

- Main Components

Resources

- FAA Certalerts and Advisory Circulars
- Conferences & Resources
- News Stories about Wildlife Strikes

1 of 1 | 75% | Find | Next

Confimation: KATL-00190-20110610 | Airport ATLANTA INTL Lat. 33.64044 Long. -84.42694 | Detected Wednesday, June 01, 2011 5:15 PM Retrieved Wednesday, June 01, 2011 5:30 PM

Origin	Additional Details		General Location	Specific Location
Not Reported			Runway	runway specific
Was it Stored ☒	Stored At garage	Local Control # (If applicable)		
Description Not Reported	(Please Specify, if Other)	Material Not Reported	Item Color	Item Shine Not Reported
Length Width Height		Item Size Not Reported	Model #(If Known)	Serial #(If Known)

Environment | Pavement conditions Not Reported

Time of Day Not Reported
Percipitation Not Reported
General Weather Description
How FOD was Detected Not Reported
Which system was used? Not Reported

Result

- ☐ Damage to Aircraft
- ☐ Damage to Other Vehicles
- ☐ Did any Injury occur?
- ☐ Number of Injuries
- Type of Injury
- Cost of repair to Aircraft or Vehicle
- Other Costs
- Description of Other Costs

Aircraft Damage Part	
Engine	☐
Fuselage	☐
Landing Gear	☐
Lights	☐
Nose	☐
Not Reported	☒
Other	☐
Propeller	☐
Radome	☐
Tail	☐
Windshield	☐
Wing/ Rotor	☐

Report Date

Department which retreived the FOD | Name of the Person filling Report | Name of Person who found the FOD

FAA.gov Home | Privacy Policy | Web Policies & Notices

Readers & Viewers: PDF Reader | MS Word Viewer | MS PowerPoint Viewer | MS Excel Viewer | WinZip

Local intranet | 100%

2011 R&D – Participation Opportunities

Trials and testing of the new system are just beginning. Jim Patterson is looking for airports willing to work with him on system evaluation.

Jim Patterson, FAA
609-485-4989
Jim.Patterson@faa.gov

2011 R&D – FOD Characterization

Fine: >2000 grams
Small Rocks
Dead Grass
Paint Chips
Bird Shot

Medium: 679 grams
Medium Sized rocks
Screws
Nuts
Cigarette butt

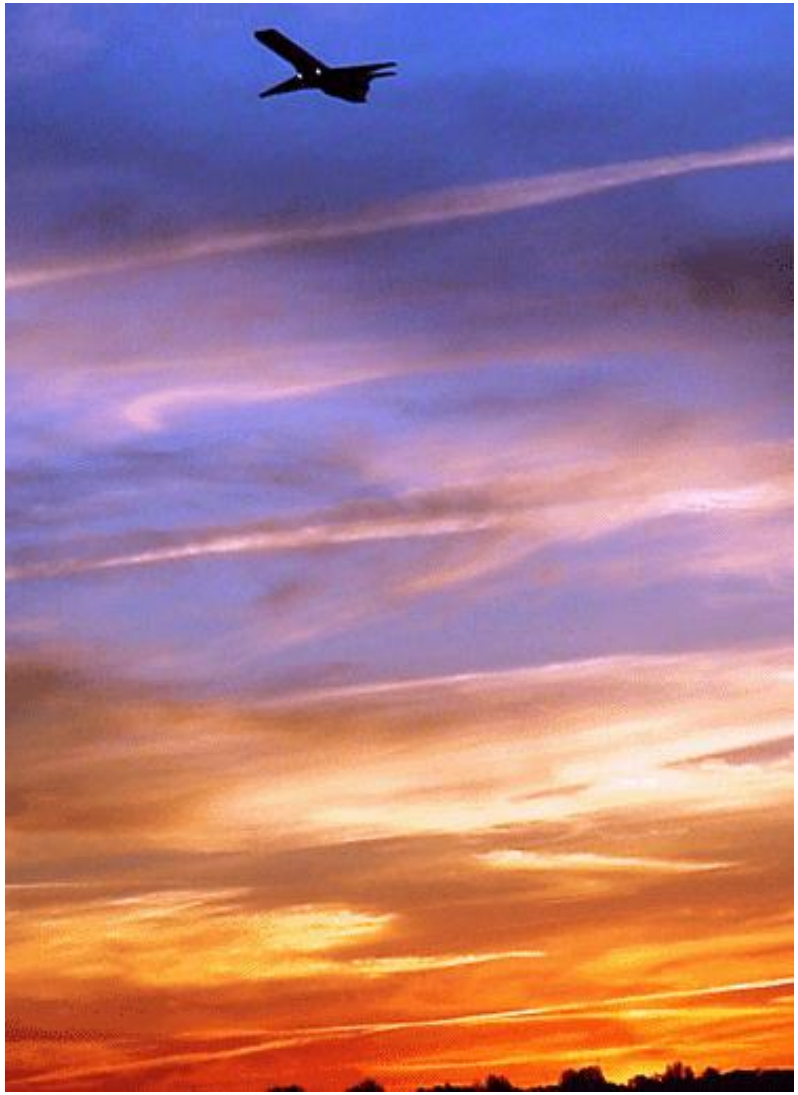
Large: 217 grams
Plastic knife
Bird remnant
Luggage tag
Zipper handle
Coarse aggregate
Concrete /Asphalt

Metal: 48 grams
Sweeper bristles
Spring
Small metal bar
Staples

2011 R&D

CEAT is leading an effort in FOD characterization with methods development at ORD – runway, taxiway, apron, and gate areas will be assessed. If interested, contact Ed Herricks.

Edwin Herricks
University of Illinois
217 621-4129
herricks@illinois.edu



Thank You

Paul Friedman, FAA
202-267-3367
paul.friedman@faa.gov

Jim Patterson, FAA
609-485-4989
Jim.Patterson@faa.gov

Dr. Edwin Herricks
University of Illinois
217-621-4129
herricks@illinois.edu