Cleared for Takeoff!
Airport Inspection and Ramp Safety Practices

May 10, 2012
Today’s Agenda

1) Introductions
2) Presentations
3) Q & A
4) Close
Spring 2012 ACRP Webinar Series

• May 10 - Cleared for Takeoff! Airport Inspection and Ramp Safety Practices

• June 5 - Aviation Fuel Costs and Alternatives

• TBD - A Whole New Climate: Helping Airports Implement Greenhouse Gas Reduction and Sustainable Construction Strategies
Today’s Speakers

Moderated by Freddie James, Airport Certification Safety Inspector, FAA

1) Overview of Synthesis 26: Current Airport Inspection Practices Regarding FOD (Foreign Object Debris/Damage)
   • C. Daniel Prather of Prather Airport Solutions

2) Overview of Synthesis 29: Ramp Safety Practices
   • Joanne Landry of Landry Consultants
   • Shane Ingolia of Ricondo & Associates

3) Overview of Research Results Digest 15: Use of Towbarless Tractors at Airports—Best Practices
   • Colleen Quinn of Ricondo & Associates
What is the Airport Cooperative Research Program (ACRP)?

- Industry-driven, applied research program that develops near-term, practical solutions to problems airport operators face.
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- Sponsored by the Federal Aviation Administration.
- Research is conducted by you—individuals and firms selected on the basis of competitive proposals.
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ACRP Synthesis 26: Current Airport Inspection Practices Regarding FOD (Foreign Object Debris/Damage)

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Principal Investigator  

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- Former Associate Professor of Aerospace at Middle Tennessee State University  
- Former Assistant Director of Operations at Tampa International Airport
ACRP Synthesis 26 Topic Panel

Michael J. Begier, U. S. Department of Agriculture
Kevin B. Bleach, Port Authority of New York and New Jersey
Christine Gerencher, Transportation Research Board
Edwin E. Herricks, University of Illinois – Urbana-Champaign
John Ostrom, Metropolitan Airports Commission – Minneapolis – St. Paul International Airport
Brett Patterson, Vancouver International Airport Authority
Stephen M. Quilty, SMQ Airport Services
Ryan E. Rocha, San Antonio Airport Systems
Tricia Halpin, FAA (Liaison)
Richard Marchi, ACI-NA (Liaison)
Presentation Agenda

• What is FOD?
• What are the sources of FOD?
• What are the types of FOD?
• How serious is FOD?
• How was the study conducted?

Results
• Inspection
• Detection
• Removal
• Documentation
• Training and Promotion

• Concluding thoughts
What is FOD?

“A substance, debris, or article alien to a vehicle or system which would potentially cause damage.” ~NAFPI

“Any object, live or not, located in an inappropriate location in the airport environment that has the capacity to injure airport or airline personnel and damage aircraft.” ~FAA

“Any object that is left in an area where it could possibly cause damage.” ~AAGSC
What are the Sources of FOD?

- Personnel
- Airport infrastructure
- Environment
- Equipment operating on the airfield
What are Types of FOD?

- Aircraft and engine fasteners
- Aircraft parts
- Mechanics tools
- Catering supplies
- Flight line items
- Apron items
- Runway and taxiway materials
- Construction debris
- Plastic and/or polyethylene materials
- Natural materials
- Contaminants from winter conditions
How Serious is FOD?

- **FOD can cause**
  - Damage to aircraft.
  - Injury to personnel.
- **FOD can cost**
  - Directly, $474 million annually (U.S.) & $1.26 billion annually (Globally).
  - Indirectly, $5.2 billion annually (U.S.) & $13.9 billion annually (Globally).
How was the Study Conducted?

- Literature review
- Survey instrument – “Airport Survey of Inspection Practices”
  - Sent to 56 airports (U.S., military and non-U.S.)
  - 50 airports responded
- Survey instrument – “Survey of Manufacturers/Suppliers of Airport Inspection Technology/Equipment”
  - Sent to all manufacturers and/or suppliers of equipment and technology considered useful to airports in this area
  - 7 manufacturers/suppliers responded
Results
Inspection Continuum

Manual
Vehicle with manual checklist

Vehicle with electronic checklist

Technology-assisted Manual
Vehicle with GPS/GIS-based inspection and database application
Inspection Practices

- Most airports rely on human/visual inspection for FOD.
- Most airports inspect movement areas (runways and taxiways) more frequently than non-movement areas.
Detection Continuum

**Manual:**
Vehicle with human operator

**Supplemental:**
Human-operated camera (on vehicle or building), mobile sensors

**Automated:**
Radar, Electro-optical, Hybrid
Detection Practices

- Most airports rely on manual detection of FOD by human/visual means, without any type of FOD technology in use.
- Most airports have some type of FOD management program in place.
- Those few airports with some sort of FOD detection technology in use believe that the benefits either exceed or are worthy of the cost.
Successful Airport Practices

• Inspection and Detection
  • FOD checklist
  • FOD event/incident form
  • Integration of FOD management with Wildlife Hazard Mgt Plan and SMS
  • Regular, proactive FOD inspection focusing on movement and non-movement areas
  • Reactive inspections as FOD is reported by pilots, ATC, etc.
  • Supplemental manual inspections with automated detection technology
Removal Continuum

Non-mechanized:
- Tow-behind friction mats
- Magnetic bars
- Rumble strips

Mechanized:
- Power sweepers
- Vacuum systems
- Jet air blowers
Removal Practices

- Most airports use both human/visual means and either mechanized or non-mechanized means to remove FOD.
- Of the mechanized means in use, most airports use power sweepers and vacuum systems. Of the non-mechanized means in use, most airports use magnetic bars.
- Of those airports using mechanical means to remove FOD, most believe these means are very useful.
- The most common type of FOD removed on paved movement areas is runway and taxiway materials, including concrete chunks, rubber joint materials, and paint chips.
- The most common type of FOD removed on ramp areas is apron items, including paper and plastic debris, luggage parts, and debris from ramp equipment.
Successful Airport Practices

• **Removal**
  - FOD containers placed throughout ramp/gate areas
  - Closure of pavement as necessary to prevent aircraft operations on a contaminated surface
  - Proactive removal of FOD with the use of non-mechanized equipment such as tow-behind friction mats and magnetic bars or mechanized equipment such as power sweepers and vacuum system
Documentation Continuum

- **Fully manual:** Hard copy form filed in folder
- **Computer form electronically filed**
- **In-house, electronic database**
- **Stand-alone FOD specific software program**
- **Fully computerized:** Database as part of FOD detection system
Documentation Practices

• Most airports document FOD most of the time FOD is removed.
• When documenting FOD, most airports record the location of FOD, the date and time FOD were detected and/or retrieved, a description of the FOD, and the name of personnel investigating and removing FOD.
• Most airports do not currently utilize an electronic database for documenting FOD.
• Of those airports that do utilize an electronic database, the most common criterion for analysis is location of FOD.
Successful Airport Practices

- **Documentation and Analysis of Data**
  - Electronic database with records of FOD removed from movement areas
  - Photographs of FOD removed from movement areas
  - Regular analysis of data to reveal trends in types of FOD, locations of FOD, and possible generators of FOD, as well as any reductions in FOD removed.
Training and Promotion

- Human Factors
- Culture
- Training
- Promotion
  - Commitment
  - Visibility
  - Awareness
Training and Promotion Practices

• Most airports utilize FOD letters, notices, and/or bulletins to enhance awareness of their FOD management program.

• According to participating airports, only airport operations personnel, airport maintenance personnel, and airport management place a high level of importance on FOD management.

• At most airports, air carriers (if present) and FBOs play an active part in FOD management. At most airports, the FOD management program is handled by someone as part of their existing job duties. Most airports do not have a formal FOD training program.
Training and Promotion Practices cont.

- Most airports ensure the quality of their FOD management program by the use of management oversight.

- If additional resources were made available for FOD management, most airports would acquire equipment/technology for the detection and/or removal of FOD.

- When asked to share thoughts on how FOD management could be improved at their airport, most airports would like to see a better structured FOD management program, as well as the acquisition of technology to aid in FOD detection.
Awareness Programs and Practices

- FOD letters, notices, bulletins: 52%
- Method to exchange info with airport: 36%
- FOD bulletin boards, safety reporting: 30%
- FOD lessons-learned: 22%
- Tenant meetings: 10%
- FOD walks: 8%
- FOD seminars: 8%
- New hire training: 6%
- Ops/staff meetings: 4%
Successful Airport Practices

- Training and Promotion
  - Commitment from management to the FOD management program and the goal of continuous improvement
  - Tenant involvement and participation
  - FOD committee, with regular meetings, to establish policy, guidelines, and goals.
  - Regular FOD walks, with refreshments, photos, and awards
  - Promotional and awareness program involving posters, t-shirts, bulletins, banners, and activities
  - Training of personnel in good housekeeping practices and FOD prevention
Concluding Thoughts

- FOD is a significant concern for the aviation industry.
- Airports can play a key role in reducing the effects of FOD by
  - Developing a comprehensive FOD management program
  - Conducting regular FOD inspections
  - Acquiring equipment/technology to enhance the FOD inspection/detection/removal/documentation process
  - Promoting FOD awareness/prevention airport-wide
  - Studying successful practices on this issue at peer airports
For additional information:

ACRP Synthesis 26: *Current Airport Inspection Practices Regarding FOD*

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Mr. Randall Berg – Director of Airport Operations, Salt Lake City
Mr. Thomas Duffy – President, Safegate Airport Systems, Inc.
Ms. Lynda Foley – Mgr. Technical Training and Dev., Dallas Fort Worth
Mr. Gregory B. Haug – Airport Manager, Bismarck Municipal
Mr. Paul Khera – Airport Safety and Security Officer, Alaska DOT
Mr. Robert Royal – Mgr. Safety & Reg. Compliance, Delta Global Services
Mr. Shawn M. Schroeder – Asst. Director Aviation, Springfield-Branson
Ms. Chunyan Yu – Associate Professor, Embry Riddle Aeronautical
Mr. Bruce Landry – FAA Liaison
Mr. Patrick Rogers – FAA Liaison
Ms. Christine Gerencher – TRB Liaison
Objective = identify and describe the current state of ground handling practices, focusing on safety measures and training used at U.S. airports.

- Investigate literature on ramp safety operations and training.
- Review past ramp safety surveys (ACI)
- Conduct surveys/interviews of commercial airports, airlines, and Ground Service Providers (GSPs)
- Identify duties and responsibilities
- Provide overview of stakeholders’ roles in safety
- Discuss current ramp safety baseline and future trends such as technology, SMS, ISAGO, and airports as GSPs
Research Approach / Participants

- Small survey group of GSPs and Airlines
- Electronic surveys using web-based tool
- Three representatives interviewed
- Industry-wide literature search
- ACI ramp surveys reviewed
- Human factors research
- Training programs review

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<td>87%</td>
<td>100%</td>
<td>50%</td>
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Key Findings

- Ramp areas are busy, congested, and complex
- No formal U.S. standards exist for markings or operations
- No standard or regulation exists for training and safety
- Training is primarily from Airlines and GSPs
- Airports train airside driver and some safety orientation
- FAA has Indirect oversight under Parts 119, 121, 135, 139
- Responsibility is managed by agreements, leases, licenses
- Lack of consolidated data
Airport Responsibilities

- Airside driver training
- Some (limited) safety orientation
- Rules and Regulations and compliance
- Some ramp/safety committees
- Accident/incident investigation

“Does your airport require airside safety training for tenants (not including AOA or AMA driving)?”
Airline and GSP Responsibilities

- Extensive skills based training
- OJT supervision and team safety leaders
- Non-punitive reporting systems
- OSHA compliance
- Best practices
- Collaboration with GSPs/Airlines
- Markings and standards at gates

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<td>Aileron and tab assembly</td>
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Source: Boeing Commercial Airplanes Group, CASA 2002
Industry Trends

- Outsourcing core GSP services appears to increase risks
- Fewer airport operations staff (for oversight / compliance)
- Higher volumes of flights and larger aircraft
- Increased accidents and incidents
- Increased congestion
- Cost cutting in training, equipment maintenance, and staff supervision
- Lack of safety culture
- Safety data indicates upward trends
- Ground is more dangerous than air

FSF discovered that the largest proportion – 43% – of ramp accidents happen in the “gate stop” area. Next is the gate entry and exit area with 39%, and the remaining 18% happen between gate entry/exit and the runway. There are far more incidents involving damage to stationary aircraft than to moving ones, and even more incidents – in simple numbers rather than value – are “equipment-to-equipment” damage (Learmount 2005).
Industry Suggestions

1. Safety Committees
   a) Safety culture changes

2. Promotion and Training
   a) Standardized licensing, training, and certification
   b) Reporting near misses

3. Data Management and Reporting
   a) FAA consolidated data
   b) Airport/Airline/GSP Collaboration

4. Operational Improvements
   a) Ramp Towers

5. Standards, Policies, Controls, Audits
   a) Minimum standards for ramp operations
   b) Safety Management Systems
   c) More in-depth ramp inspections
Possible FAA Initiatives

- October 7, 2010 – NPRM to include SMS on non-movement areas
- February 1, 2011 – NPRM entitled Safety Enhancements Part 139, Certification of Airports that requires safety training for airside access

*NPRM Safety Enhancements Part 139, Certification of Airports*
Non-Movement Area Safety Training – “The FAA has concluded non-movement area safety can be improved with increased training. Airport workers must be knowledgeable and aware of the various activities that take place in the non-movement area.”
For Additional Information:

ACRP Synthesis 29:
Ramp Safety Practices


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ACRP 04-07A
Research Results Digest 15:
Use of Towbarless Tractors at Airports
- Best Practices

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- David Lotterer, FAA Liaison
- Paul McGraw, Air Transport Association Liaison
- Mike R. Salamone, ACRP Senior Program Officer
ACRP 04-07A Origin

ACRP 04-07, Comparison of Airport Apron Management and Control Programs with and without Regulatory Oversight

ACRP 04-07A, Best Practices for Managing the Use of Towbarless Tractors at Airports
ACRP 04-07A Research Results

• Research Results Digest 15: *Use of Towbarless Tractors at Airports – Best Practices*
• Provides understanding of the operational and training issues associated with TBLT operations
• Provides industry-wide guidance for consideration by airports and operators considering the management or initiation of towbarless tractor operations
• Supports level of standardization in operations
• Does not replace existing FAA, airline, airport, or equipment manufacturer guidance
• Published March 2012
Introduction

• Background
  • Increased use of Towbarless Tractors (TBLT) also TLTV
  • Lack of industry-wide guidance on the use of TBLTs
  • Growth in TBLT use expected

• Uses of TBLTs
  • Dispatch towing (towing fully loaded revenue airplane to location near departure runway end)
  • Pushback towing (towing revenue airplane from parked position to taxiway)
  • Maintenance Towing (towing airplane for maintenance or remote parking purposes, typically unloaded)
  • Empty (operating without an airplane in tow)
Introduction (cont’d)

- Advantages of TBLT Operations
  - Higher operating speeds than conventional towbar tractors
  - Increased maneuverability
  - Energy and environmental conservation
  - Standardization of equipment (eliminates need for aircraft-specific towbars)
  - More secure control of aircraft and greater responsiveness
Purpose of TBLT Best Practices

• Developed as a reference that is useful to airports and aircraft operators
• Provides practical guidance to assist airports and aircraft operators develop training programs for the safe use of TBLTs
• Provides practical guidance to assist airports and aircraft operators in developing and implementing standard set of guidelines for safe operations of TBLTs
• Increases awareness of safety considerations associated with TBLT operations
Research Process

- Collect and Analyze Data and Information
- Define Applicable Regulatory Guidance
- Define Best Practices

**Information Sources**
- Airlines using TBLTs
- Airports at which TBLTs are in use
- Aircraft manufacturers
- Aviation industry organizations
- Airport safety working groups involved with TBLT operations
Use of Towbarless Tractors at Airports - Best Practices Overview

- Requirements
  - TBLT Operator Requirements
  - TBLT Vehicle Requirements
  - Aircraft-Under-Tow Requirements
- TBLT Practices
- Communication
- Responsibilities
- Weather Considerations
- Emergency/Abnormal Procedures
Definition of Terms

- ATC
- ATCT
- Airport Markings
- AOA
- Apron
- ASDE
- ATIS
- Dispatch Towing
- Empty
- Escort
- Flight Deck Observer
- FOD
- “Hold Short”
- Light Gun
- LOS
- Lost Communications
- Maintenance Towing
- Monitor
- Movement Area
- Night
- Non-movement Area
- NOTAMs
- Oversteer
- Pushback Towing
- Runway Incursion
- Ramp Control
- Read Back
- Route
- RVR
- Situational Awareness
- Super Tug
- Tail Walker
- Taxi
- TLTV
- TBLT
- Visibility
- Wing Walker

Update to critical definitions.
TBLT Operator Requirements

- TBLT Operator: that individual(s) operating a TBLT to move an aircraft, whether employed by an airline, airport, or service provider

- Credentials
  - Background checks and screening
  - Valid state-issued driver’s license
  - Valid airport security badge/identification
  - Airport driving privileges

- Training
  - Airport driver and airport movement area training
  - TBLT manufacturer training specific to equipment
  - Knowledge of airport rules and regulations
TBLT Vehicle Requirements

• Minimize potential for tractor condition or equipment to contribute to an incident or affect safety of personnel or aircraft
• Movement Area Access – Airport and ATC procedures
• Mechanical – vehicle and accessories inspection
• Communication – intercom and two-way radios
TBLT Vehicle Requirements (cont’d)

- Lighting – mounted and turned on when in operation
- Painting – international orange and reflective tape
- Markings – unique ID number clearly displayed; company/operator logo
- External Elements Protection – vehicle cab
  - Weather protection
  - Noise protection
- Equipment/Accessories – radios, seatbelts, placards, etc.
Aircraft-Under-Tow Requirements

- Safety – identify, eliminate, control, document hazards (consistent with SMS approach)
- Mechanical
  - Braking system available at all times
  - Adherence to towing speeds (manufacturer, airline, etc.)
- Lighting – on (unless otherwise specified)
Aircraft-Under-Tow Requirements (cont’d)

• Communications
  • Flight deck observer (primary)
  • TBLT operator (secondary)
• Equipment/Accessories – airfield map, placards, backup communication
• Personnel
  • Flight deck observer for communications and emergency braking
  • Other
TBLT Practices

- Before Start – review procedures with flight deck observer
- Aircraft Pushback – wing/tail walkers, push straight back
- Aircraft Towing – ATC, hold short procedures, speeds, brakes
- Repositioning – “TBLT operating empty” use of service roads
- Dispatch Towing – towing revenue airplane
Communication

- Requirements – tow team must remain in constant contact with flight deck observer
- Flight deck observer: primary communicator / TBLT operator: secondary communicator
- Establish and follow appropriate procedures (aviation phraseology, read back procedures, etc.)
- Contingencies and emergency procedures
TBLT Operator Responsibilities

- TBLT Owner – establishes guidance, procedures, training
- Flight Deck Observer – Pre-start briefings, checklists, communications
- TBLT Operator – Pre-start briefings, checklists, primary communication
- Escorts – poor weather, emergencies, review route, communication
- Wing/Tail Walkers – hand/wand signals, distance, line-of-sight
- Weather – escort, SMGCS plan, taxi speeds, lost communication procedures
Weather

- Can affect the safety and efficiency of TBLT operations
- Consider use of escort
- Towing during low visibility is discouraged
- Familiarization with SMGCS Plan is critical
- TBLT tire chains may be considered in slush/icy conditions
- Reduce speeds during poor visibility
- Disconnect headset during lightening conditions
- TBLT operations restricted during high winds
Emergency/Abnormal Procedures

- Lost Communications
- ATC Light Signals
- Disabled Aircraft
- Escorts
- Tow Disconnect
- Oversteering
- Aircraft Chocks
- Weather Conditions

Graphic??
Future TBLT Operations

• Technology
  • Semi-robotic tractor (pilot steers via towbarless system)
  • Reduction in emissions

• Future Standards?
  • Widening/strengthening service roads for TBLT
  • TBLT painting and lighting
  • Communication
  • Training
  • Reporting of TBLT incidents/accidents
Critical TBLT Practices

- Communication.....communication.....communication
- More
- More

Consider deleting slide or combining with next.
Application of Research Results

- Advance awareness of operational, safety and training issues as TBLT operations are introduced (airlines, airport operations, air traffic control, service providers, etc.)
- Support development of standard procedures for TBLT operations in movement areas
- Develop effective TBLT operational and training program that reflects the unique combination of physical, operational, meteorological, and regulatory characteristics of each airport
Reference Material

- IATA Airport Handling Manual
- FAA Cert Alert 08-06
- SAE Aerospace Recommended Practice: TBLT Vehicle Operating Procedure
- TLTV Industry Working Group
- FAR Part 91
- FAR Part 91.209 Aircraft Lights
- FAR Part 91K Fractional Ownership Operations
- FAR Part 121
- FAR Part 125
- FAR Part 129
- FAR Part 135
- FAR Part 139.303, Personnel
- FAA AC 00-65 Towbar and Towbarless Movement of Aircraft
- FAA AC 150/5210-5, Painting, Lighting, and Marking of Vehicles Used on an Airport
- FAA AC 150/5210-20, Ground Vehicle Operations on Airports
ACRP Research Digest 15: Use of Towbarless Tractors at Airports – Best Practices

http://www.trb.org/Publications/Blurbs/166829.aspx

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