FAA Office of Airports

Airport Technology R&D Overview

Presented to: JPDO Airport Working Group

By: James White, Deputy Director, Airport Safety and Standards (AAS-2)

Date: February 17, 2009

Airport Technology R&D Overview

- **Internal**
  - FAA WJH Technical Center
- **External**
  - Airport Cooperative Research Program (ACRP)

Airport Technology Research

- **Purpose:**
  - Support FAA goals of improving airport, safety, capacity, efficiency, and environment
  - Research leads to new or updated advisory circulars, engineering specifications, or guidance
  - Airports accepting AIP funds required to use FAA advisory circulars and specifications.
- **Conducted by Airport R&D Branch at FAA Technical Center**
- **Reviewed by FAA RE&D Advisory Committee (REDAC)**

Research, Engineering, and Development Advisory Committee (REDAC), Airport Subcommittee

- Reviews research program (project status and budget requests), makes recommendations to FAA Administrator.
- Meets twice per year at Tech Center
- Members:
  - **Edward Gervais, Chair** *(Technical Fellow, Boeing Commercial Airplane Group)*
  - **Jim Wilding** *(retired MWAA)*
  - **Richard Marchi** *(Senior Vice President Technical and Environmental Affairs, ACI)*
  - **Allen Parra** *(Vice President of Operations, Dallas Fort Worth International Airport)*
  - **Rick Busch** *(Director, Planning & Noise, Denver International Airport)*
  - **Robert Perkins** *(Airport and Ground Environment Chair, ALPA)*
  - **Paul McGraw** *(Managing Director, Airspace Management, ATA)*
  - **Kevin Bleach** *(Manager, Aviation Technical Services, PANYNJ)*
  - **Betty Desrosiers** *(Director, Strategic Projects, MASSPORT)*
  - **Jim White** (*FAA HQ Lead*)

Airport Technology Research

Areas

- Airport Design
- Operation of New Large Aircraft (NLA)
- Wildlife Hazard Mitigation
- Runway Surface Safety & Friction
- Airport Planning
- Airport Lighting and Marking (Visual Guidance)
- Aircraft Rescue and Firefighting (ARFF)
- Pavement and Operation of National Airport Pavement Test Facility (NAPTF)

http://www.airporttech.tc.faa.gov/

Airport Design

- Taxiway Centerline Deviation Study
- Alternate Runway Grooving
- Automated Foreign Object Debris (FOD) Detection
- End-Around Taxiway (EAT) Screen

Taxiway Centerline Deviation

Project Description:

Develop an understanding of the behavior of larger design group aircraft on smaller design group airports, in preparation for arrival of NLA and for consideration of smaller DG airports.

Project Status:

- Boeing submitted results of SFO data analysis, comments returned.
- Assessment and acquisition completed of required equipment to continue research for DG 3 and 4 candidate airports for next study.
- Confirmed participation with ORD, MCO, PBI, and MHT.
- Installation to begin within few weeks at MHT.

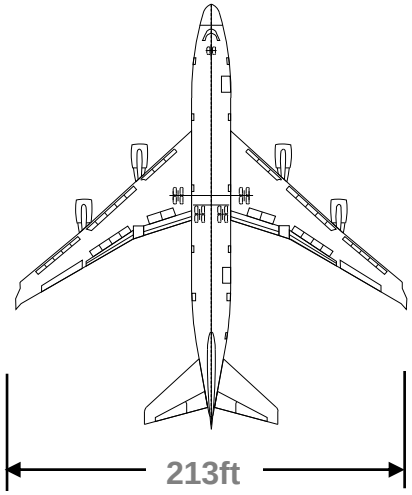
Taxiway Centerline Deviation Study

Airbus A-380 Taxiing

Airport Standards

Group 5

- Parallel taxiways, centerline-to-centerline: 245ft
- Taxiway centerline to runway centerline distance: 400ft
- Taxiway width: 75ft
- Runway width: 100ft
- 171ft to 213ft Wingspan
- Design for B747:



Group 6

- Parallel taxiways, centerline-to-centerline: 298ft
- Taxiway centerline to runway centerline distance: 600ft
- Taxiway width: 100ft
- Runway width: 150ft
- 214ft to 261ft 10in Wingspan
- Design for A380:

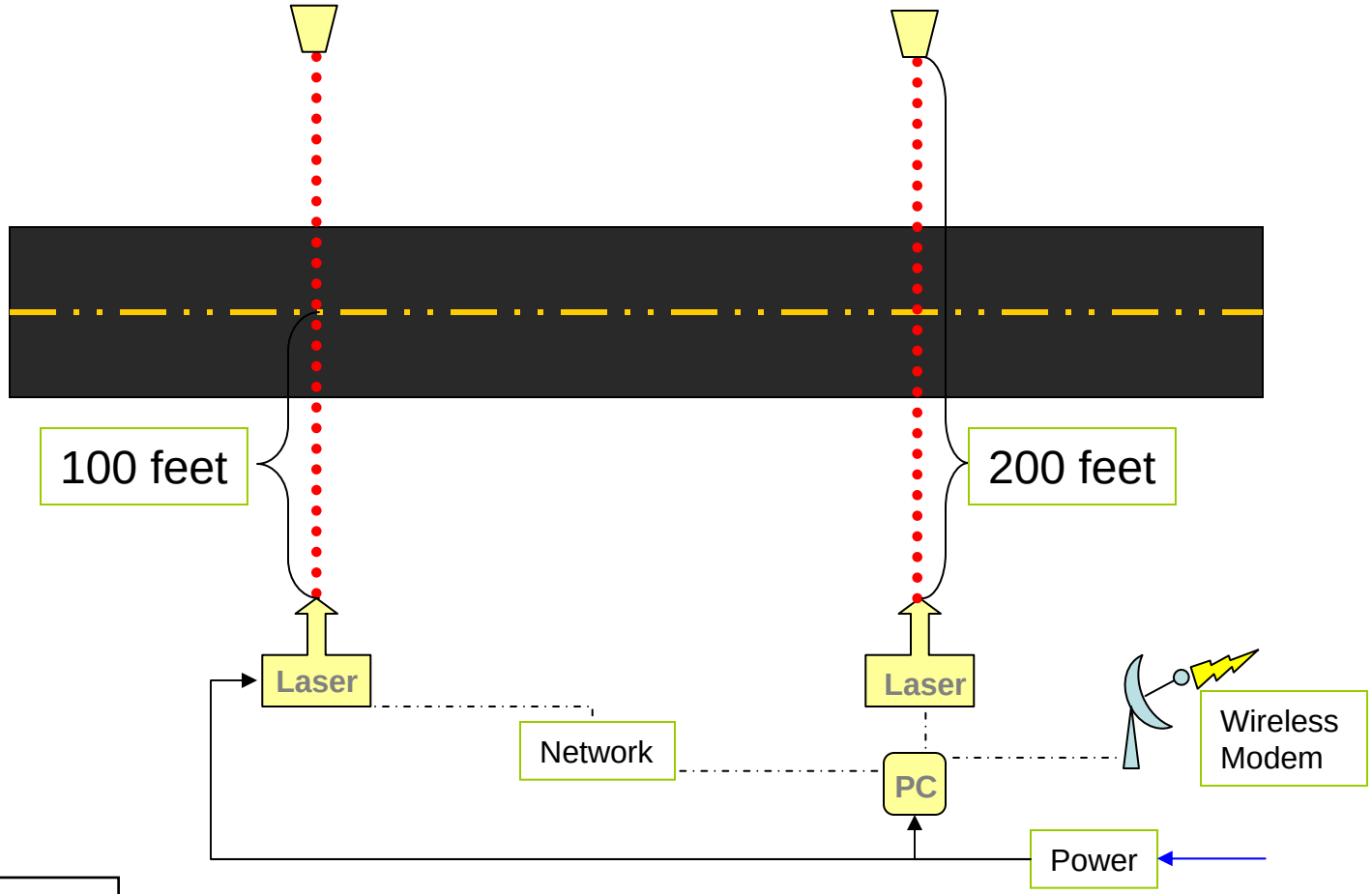
Stakeholder Options

(Airport Owners, Operators and Regulators)

- 1. **Build New Airports,**
- 2. **Upgrade Existing Airport to meet DG6 Standards,**
- 3. **Modify the Standards*, or**
- 4. **A combination of 2 and 3**

* Includes operational restrictions

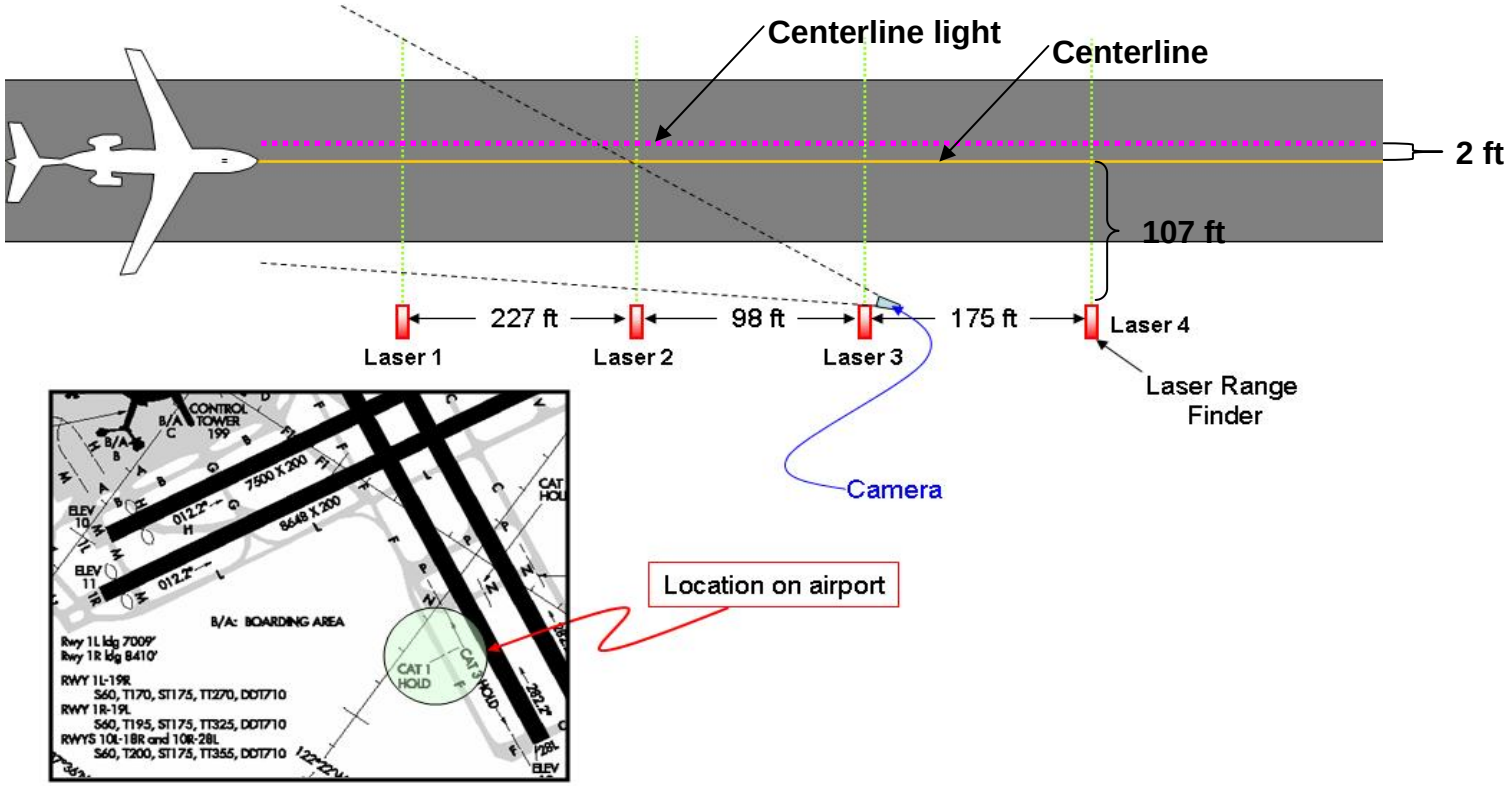
Typical Collection System Layout*



**** Not to Scale***

Data Collection

SFO laser arrangement TWY F



Data Capture

Data Capture

Taxiway Centerline Deviation

Taxiway Centerline Deviation

Next airports to be investigated (2 from each):

- DG 3
  - West Palm Beach, FL
  - Manchester, NH
  - New Bedford, MA
  - Nantucket, MA
  - Syracuse, NY
- DG 4
  - West Palm Beach, FL
  - Chicago O'Hare, IL
  - Memphis, TN
  - Washington Dulles, DC
  - Orlando, FL

Alternate Runway Grooving

Alternate Runway Grooving

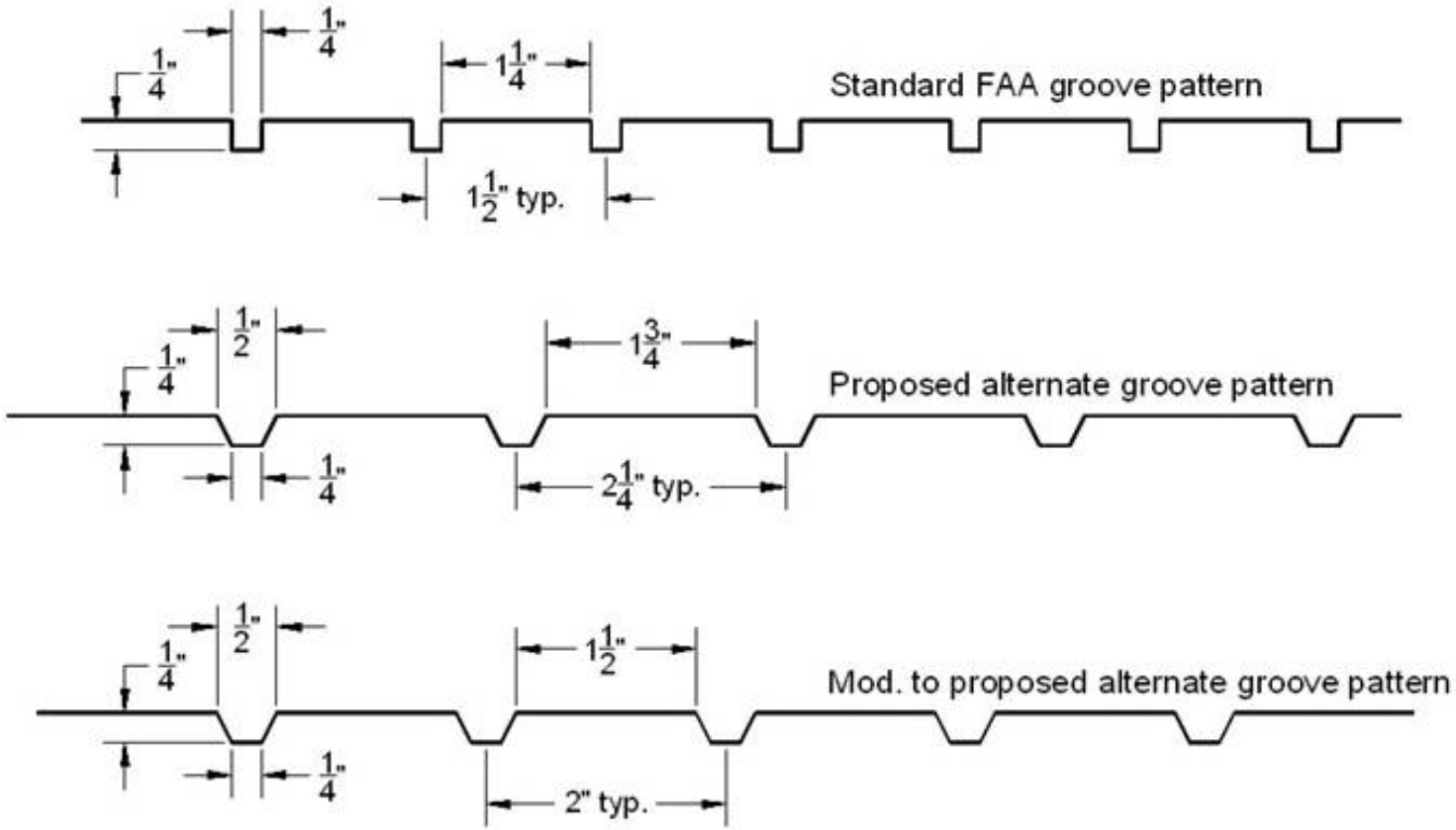
Project Description:

Identify and evaluate the feasibility and potential benefits of using an alternative saw cut grooving technique that creates a trapezoidal groove.

Project Status:

- Draft Technical Note on initial taxiway research completed to date, but will be updated to include current research.
- Conducted second set of friction tests, water displacement comparison, and visual inspection of concrete runway installation at Quantico MCAF, VA.
- Conducted set of friction values on asphalt pavement installation at ORD.
- Collecting data on visual status, rubber contamination, water runoff.
- Goal is to complete data collection by the end of the year – publish Tech Note.

Alternate Runway Grooving



Alternate Runway Grooving

Alternate Runway Grooving

Automated FOD Detection

Project Description:

Evaluate and develop operational performance standards for ground based FOD Detection systems designed to detect foreign object debris (FOD) that is on the surface of a runway or taxiway.

Project Status:

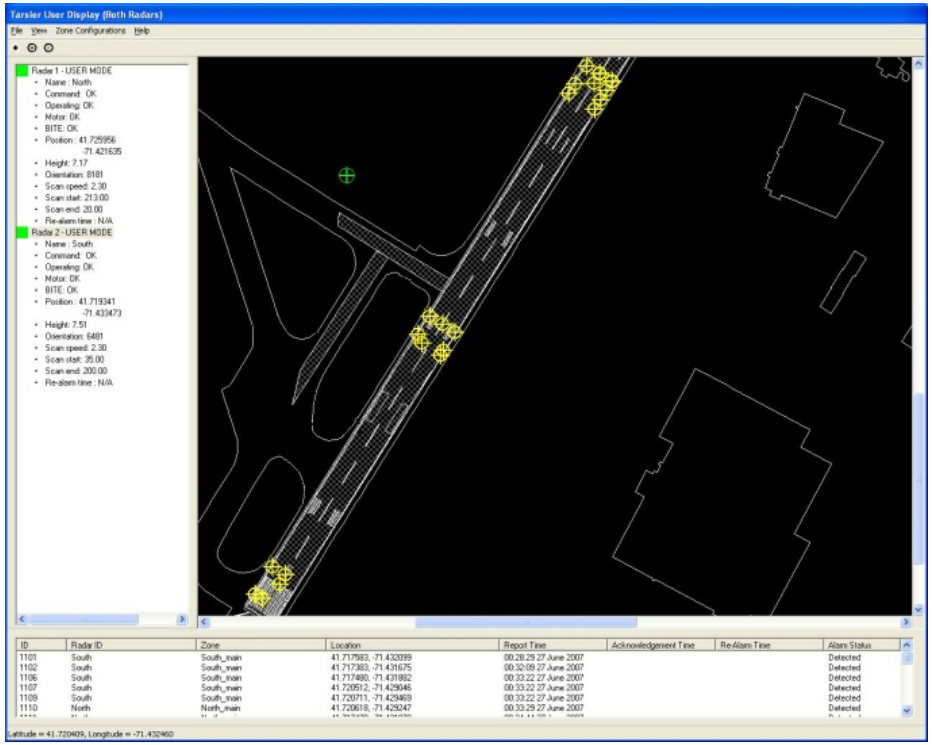
- Continuing evaluation activity through grant with University of Illinois, Center of Excellence for Airport Technology (CEAT).
- Completed evaluation of QinetiQ at PVD – Final report Sept 08.
- Completed 3rd evaluation of X Sight system at Boston.
- Presented research at ACI-NA Spring Conference in Las Vegas.
- Participated in workshop with Eurocontrol in Brussels, Feb 5th and 6th, sent CEAT to June workshop in Brussels.
- Trex and Stratech should start in September/early October.

Automated FOD Detection

- **QinetiQ – Tarsier Radar – Providence, RI (PVD)**
  - Millimeter Wave Radar
  - Mounted on Rigid Towers
- **Stratech – iFerret – Chicago O'Hare (ORD)**
  - High Resolution Camera
  - Mounted on Rigid Towers
- **X-Sight – FODetect – Boston Logan (BOS)**
  - High Resolution Camera and Millimeter Wave Radar
  - Mounted on Airport Lighting Fixtures
- **Trex Enterprises – FOD Finder – Chicago Midway (MDW)**
  - Millimeter Wave Radar and Infrared Cameras
  - Mounted on roof of Airport Vehicle

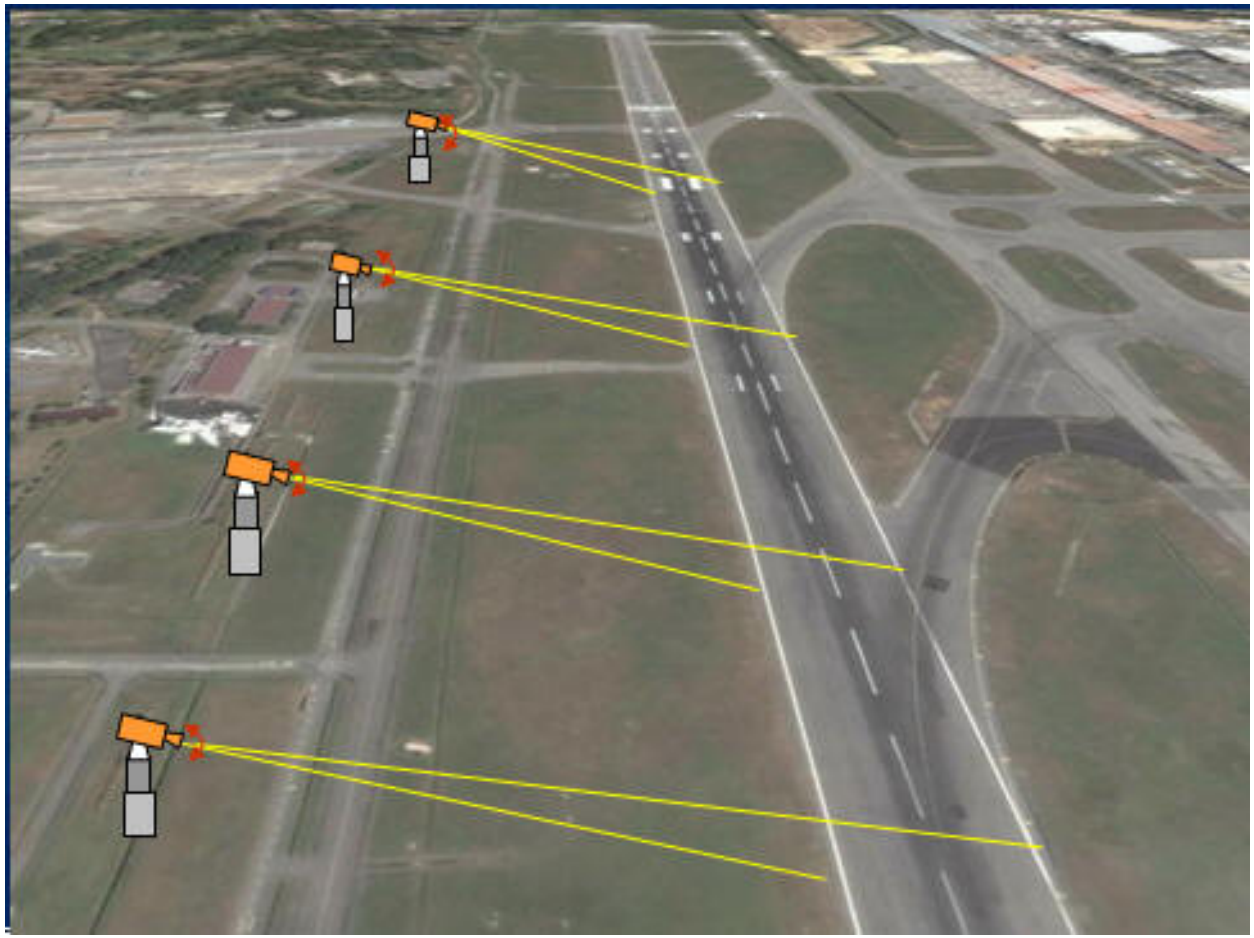
Automated FOD Detection

QinetiQ – Tarsier Radar



Automated FOD Detection

Stratech - iFerret

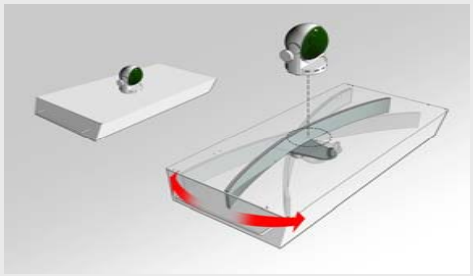


Automated FOD Detection

XSight - FODetect

Automated FOD Detection

TREX Enterprises – FOD Finder



MMW Radar/Optics unit

Driver Display

•Reduce Foreign Object Damage, Liability and Labor
•Improve Safety, Runway Capacity and Operations Efficiency
•Web based & GPS tracked non-compliant CFR PART 139 surfaces and Debris

Automated FOD Detection

Research Process

- **Install systems at US airport.**
- **Work with vendor during installation.**
- **Utilize Center of Excellence for Airport Technology (CEAT) – Univ. of Illinois - for manpower and expertise.**
- **Conduct 12 month evaluation of system, though comprehensive test protocol.**
- **Identify key operational parameters of systems**
- **Draft final reports**
- **Integrate findings into new FAA Advisory Circular**

Automated FOD Detection

FOD Found at PVD

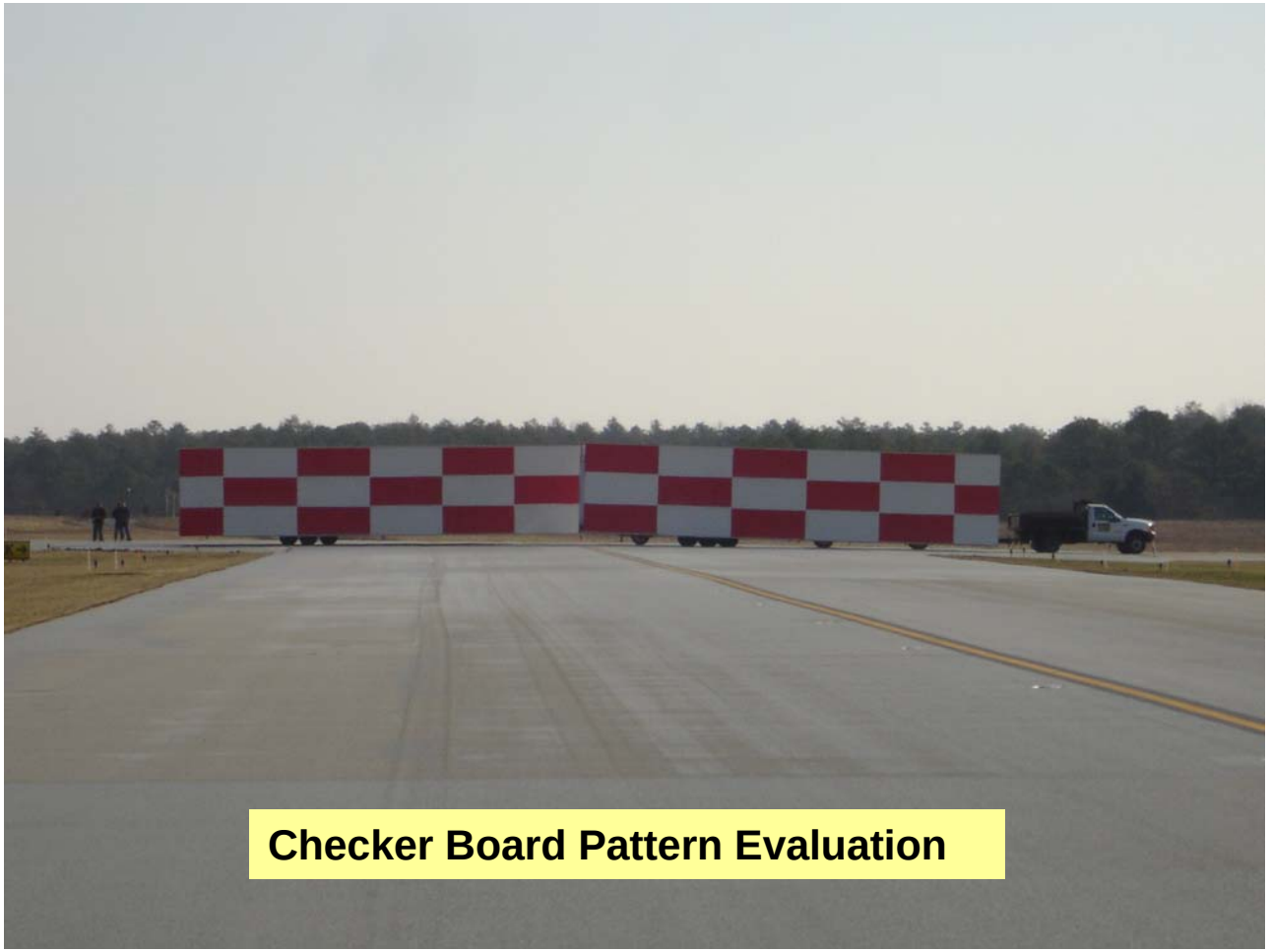
FOD Found at YVR

End-Around Taxiway (EAT) Screen

- **Basic Problem:**
  - Can a pilot tell if an aircraft is crossing the active runway or taxiing on the EAT beyond the end of the runway?
- **General Ideas:**
  - Screen must be solid.
  - Reflective for nighttime use.
  - Must be lit for nighttime use.
  - Lit from top, middle, bottom, or with LEDs.
  - Must be at least 13 feet high.
  - Must be visible from 7900 feet (based on average Vr speed/location).
  - Resist bird roosting.
  - Provide ARFF accessibility.

End-Around Taxiway (EAT) Screen

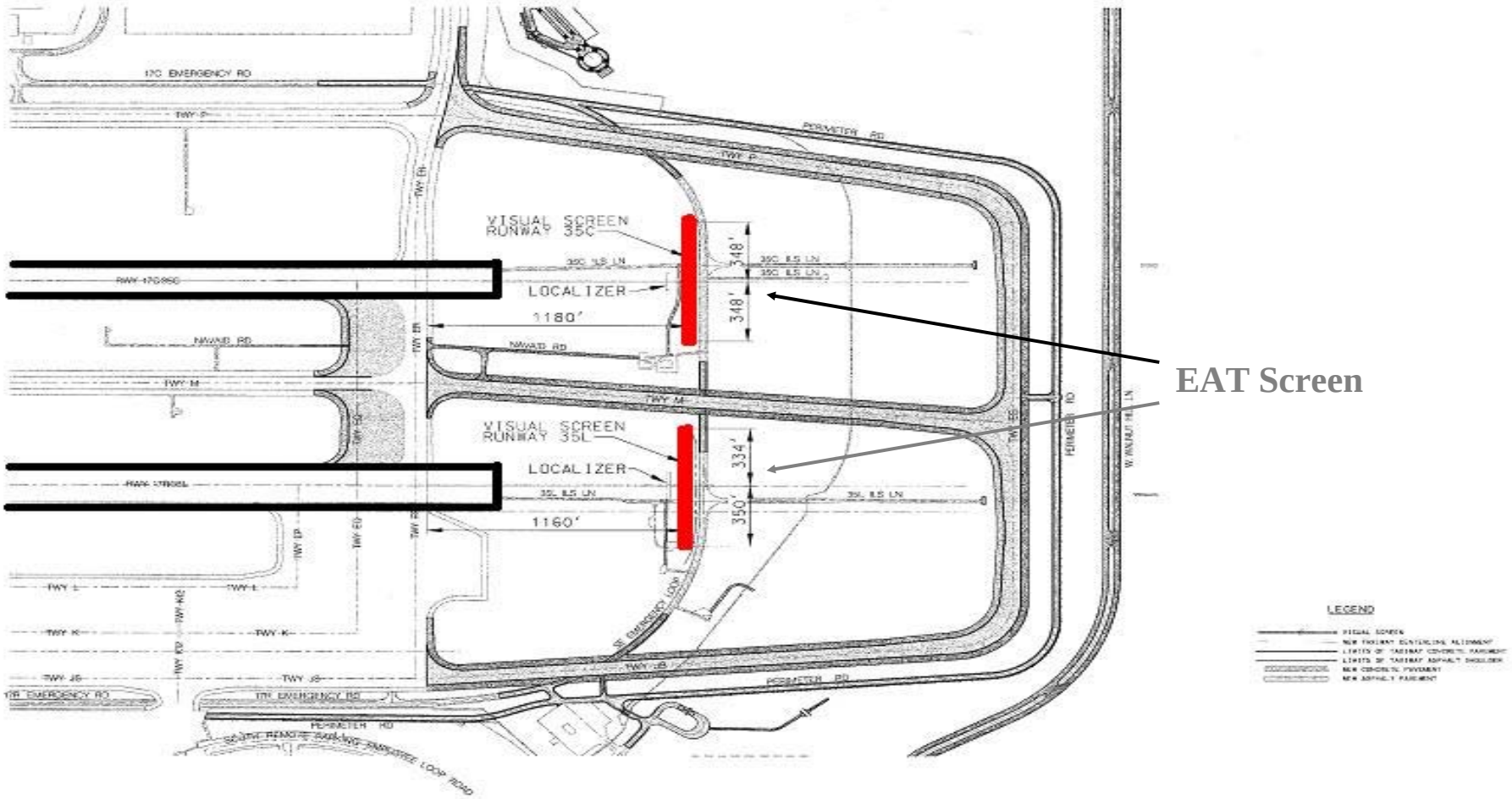
End-Around Taxiway (EAT) Screen



End-Around Taxiway (EAT) Screen

End-Around Taxiway (EAT) Screen

End-Around Taxiway (EAT) Screen



1st EAT Screen Installation @ DFW

Operation of New Large Aircraft (NLA)

- Guidance for NLA ARFF
- Revise TCA/PCA (Adequacy of ff zones)
- Access / Egress?
- Adequacy of Vehicles and Equipment
- Test Mockup
- Calculate Agent Quantities

Operation of NLA

Airbus
A-380

Operation of NLA

- **Potential NLA Problems for ARFF:**
  - Accessibility to upper level
  - Proximity of vehicles to fuselage
  - Increased amount of water and agent
  - Search and Rescue requirements
  - Requirements for supplemental tools/equip
  - Structural Composite Components

Operation of NLA

Current Status:

- Singapore Airlines completed 1,000th flight on August 5, 2008. Now operating 5 in their fleet.
- Emirates accepted delivery of their first A380, started Dubai – JFK flights on August 1st. First scheduled flight to JFK! (Three times weekly.)
- SFO and LAX up next for Emirates!
- A380 orders up from 173, to 189, and now 192. (6 in operation/delivered).
- Singapore added flights to Beijing for Olympics!

- Boeing planning B747-8 (B747-8i and B747-8F)
  - Orders at 78 (Freighters)
  - Freighter released in late 2009 (Cargolux), and Intercontinental (Lufthansa) in 2010.
  - 10 different customers, including Cargolux, Nippon Cargo, Atlas, Emirates, Lufthansa.

Operation of NLA

Adequacy of Agent Quantities

Project Description:

Develop a new equation (methodology) used to calculate agent quantities for the existing types of available agents to combat a major NLA and double-deck airplane fire. (New discharge rate of agent (gallons) per minute, fuselage geometry - elliptical cross section, length, fuel storage locations.

Project Status:

- Developed test plans to begin long process of testing individual items.
- University of Florida conducted modeling of agent quantities – fuselage design - under agreement with Tyndall AFB. Built model, conducted initial computer modeling for A380, B777, and B707. Report due Sept 08.
- Calibration fires completed 5 each at 250, 500, 750, and 1000 gal – final report almost complete.

Operation of NLA

Adequacy of Airport ARFF Service Strategies

Project Description:

Determine new strategic fire fighting techniques and procedures unique to NLA, including double deck aircraft firefighting and composite material fires.

Research to include: Exterior firefighting techniques for double deck designs and effects of 2nd level EVAC slide deployment on aircraft access.

Project Status:

- Test plans nearing completion.
- Developing understanding of key strategies unique to NLA.
- Understanding composite material, slide capabilities, stand off distance, etc.

Operation of NLA

Adequacy of Airport ARFF Service Strategies

Operation of NLA

Adequacy of Specialized ARFF Vehicles and Equipment

Project Description:

Determine and demonstrate platform type vehicle requirements for ARFF service access to upper deck of NLA. Research to include: Ability to evacuate trapped passengers in the event of slide failures. Accessibility of second level to ARFF firefighters.

Project Status:

- Mockup completed with ‘dry side’ to facilitate vehicle testing/demonstration.
- Request for Information (RFI) issued through FAA Contract Office to bring potential new technologies to mockup for demonstration – no replies to date.

Operation of NLA

Adequacy of Specialized ARFF Vehicles and Equipment

FAA NLA Test Section

Operation of NLA

FY09 Planned Activities

- Complete Fire Testing, as required.
- Develop report based on UF Modeling.
- Initiate Phase Two
- Possibly procure stair type access vehicle for internal development.
- Completion of draft training material document for Airport ARFF.
- Discussion about feasibility of using mockup as FAA Training Facility.

Aircraft Rescue and Firefighting (ARFF)

- Composite Materials
- Penetrating Nozzles
- Extendable Turrets
- Vehicle Stability / Rollovers
- Alternative Fire Fighting Agents
- Interior Intervention Vehicle (IIV)
- Driver's Enhanced Vision Systems (DEVS)
- Crash Sim. For Predicting Fuel Release
- NextGen Fire Fighting Technologies

ARFF – Composite Materials

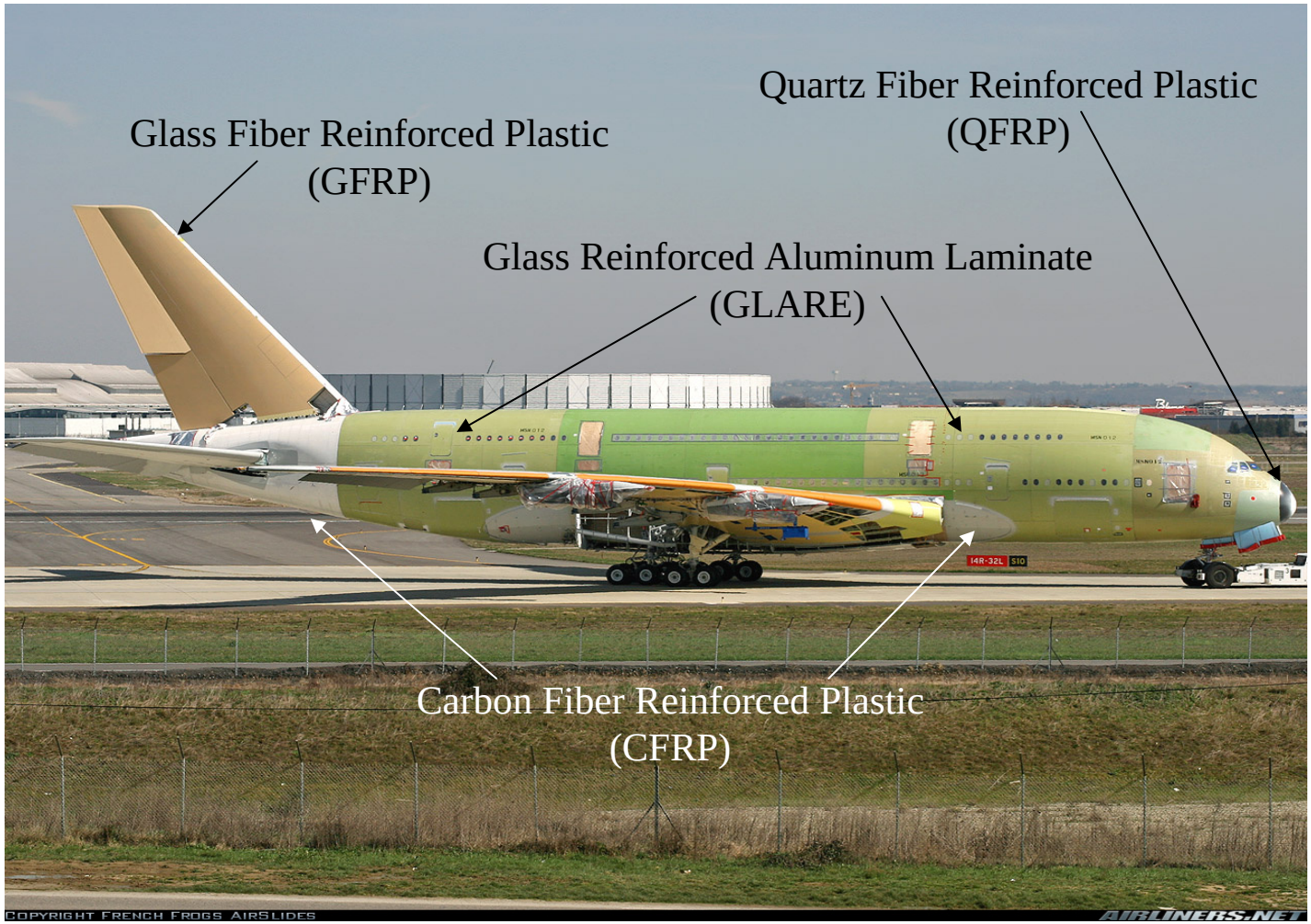
- **Airbus A-380 and the Boeing 747-8 are being constructed with sizeable amounts of new composite materials.**
- **Limited procedures for ARFF personnel to follow when involved with an aircraft comprised of composite materials.**
- **Aircraft structures made of metals are well known and understood on how they burn, however very little information is known on how composite materials burn.**

ARFF – Composite Materials

This research effort will focus on determining some of the unknowns of composite materials burning:

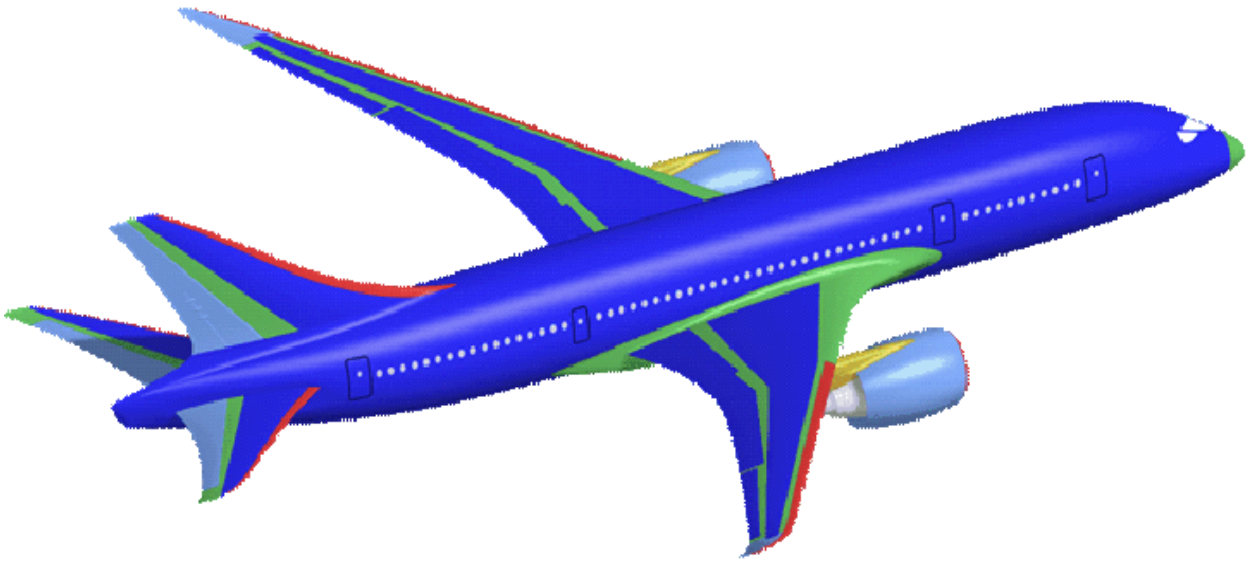
- **Identifying the best extinguishing agent for use on composite material fires.**
- **Identify the best extinguishing method for composite fires.**
- **Determine the time and amount of agent required for extinguishing composite fires.**
- **Identify hazards associated with the toxic fumes and airborne composite fibers on the respiratory systems of both the evacuees and ARFF personnel.**

ARFF – Composite Materials



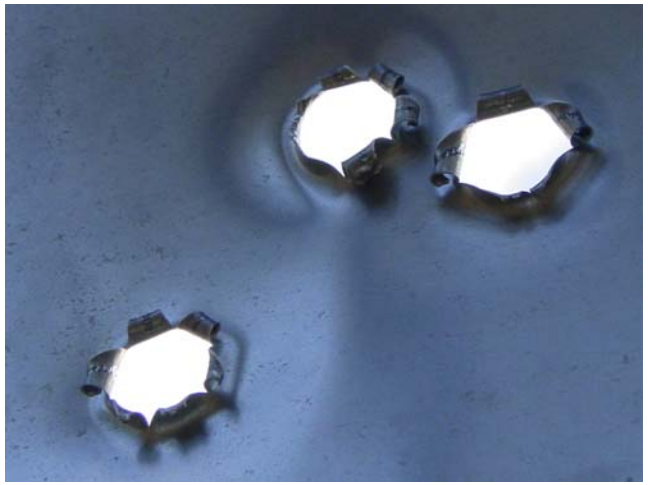
ARFF – Composite Materials

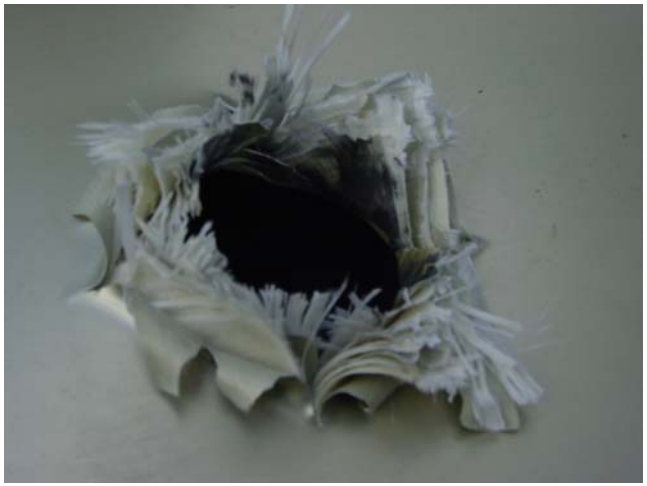
B787 Structure



- Carbon laminate
- Carbon sandwich
- Fiberglass
- Aluminum
- Aluminum/steel/titanium pylons

ARFF – Penetrating Nozzles





ARFF – High Reach Extendible Turret (HRET)

Current Generation

- 2nd level penetration possible, however, vehicle will be too close to burning aircraft and aircraft must be level.
- Penetrating nozzle should be as close to 90 deg. to skin as possible.
- Penetrating nozzle should be in-line with boom arm.

ARFF – High Reach Extendible Turret (HRET)

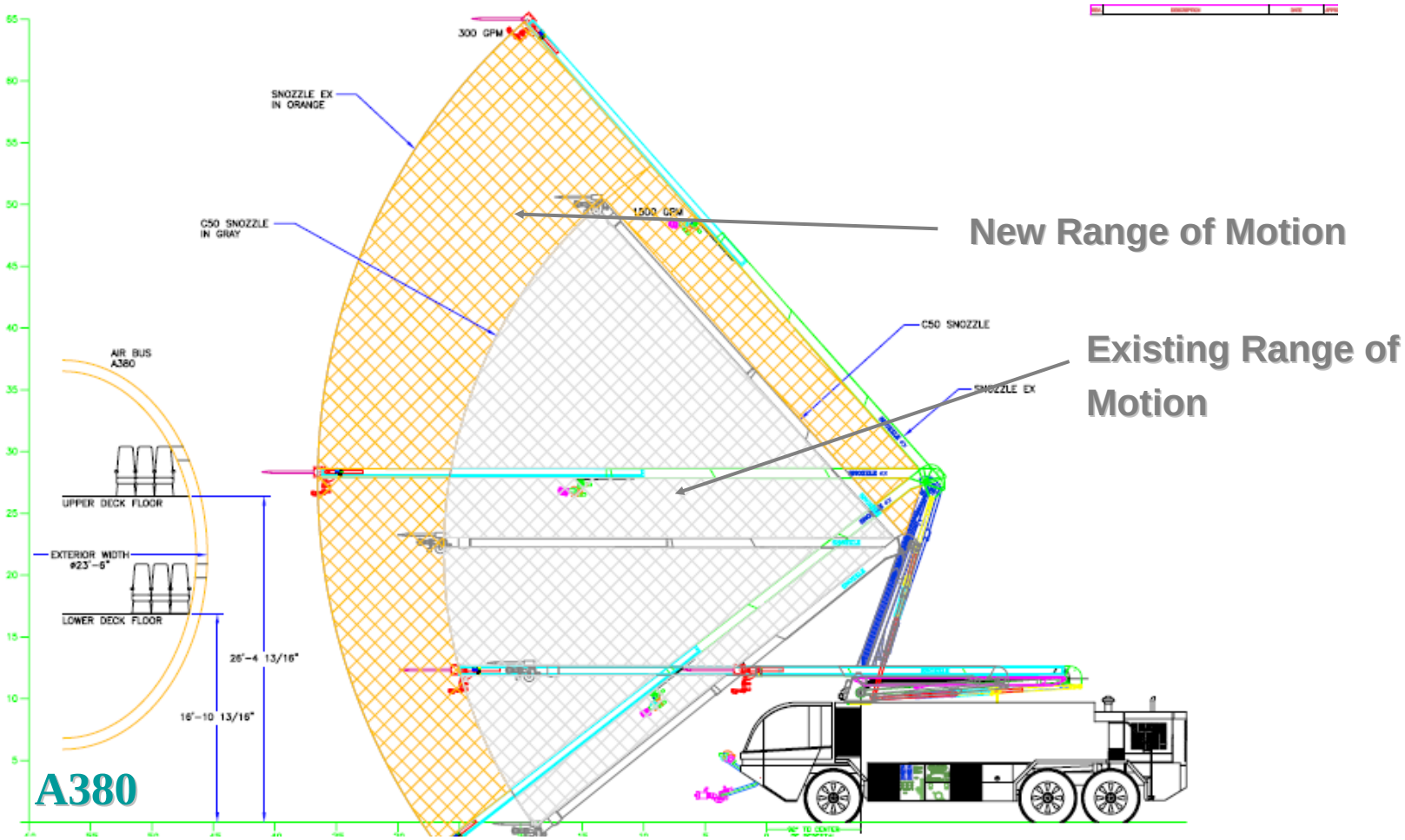
Limited access due to number of slides

Physical and topographical obstructions

ARFF – High Reach Extendible Turret (HRET)

Striker Accel Montage.wmv

Next Generation High Reach Extendable Turret (HRET)



Next Generation High Reach Extendable Turret (HRET)

- **Currently installed on FAA's ARFF Test Vehicle.**
- **Large-scale fire testing began Spring 2007**

Interior Intervention Vehicle (IIV)

Research Objective:

- To aid in passenger evacuation.
- To initiate an effective interior rescue and interior fire suppression.

Experimental Design**:**

- Develop performance standards for design of a new type of ARFF vehicle.

Data Collection:

- Use industry forums to collect data on capabilities needed in IIV design.
- Use computer evacuation modeling to design egress/ingress performance requirements.

Interior Intervention Vehicle (IIV)

Scenarios where an IIV could be used…

Interior Intervention Vehicle (IIV)

Using ground ladders to gain access.

- **August 20, 2007**
- **China Airlines Flt 120**
- **Boeing 737-800**
- **Reported 1+ hour for complete extinguishment.**

Interior Intervention Vehicle (IIV)

Wildlife Hazard Mitigation

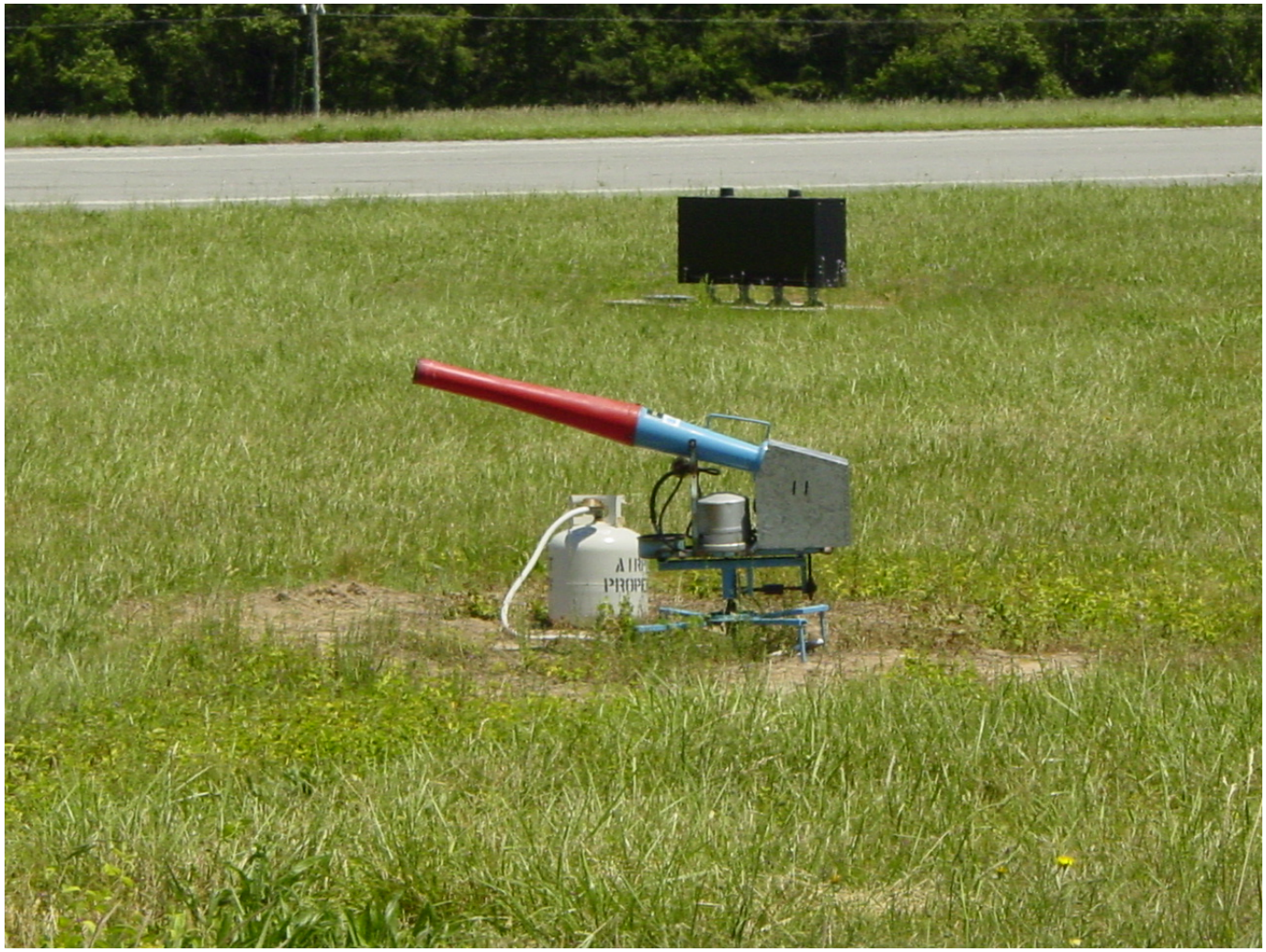
Wildlife Hazard Mitigation

- **Wildlife Hazard Mitigation Manual**
- **Bird Detection Radar**
- **Bird Strike Advisory System**
- **National Strike Database**
- **DNA Analysis / Identification at Smithsonian**

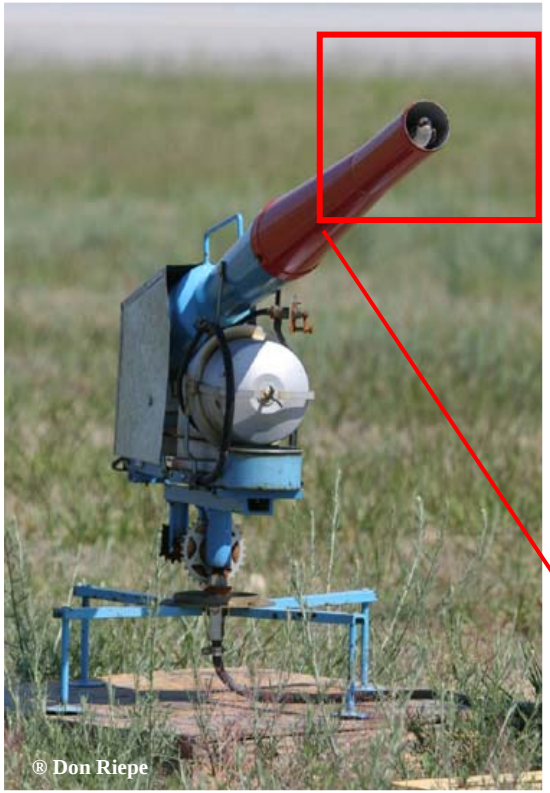
Wildlife Hazard Mitigation

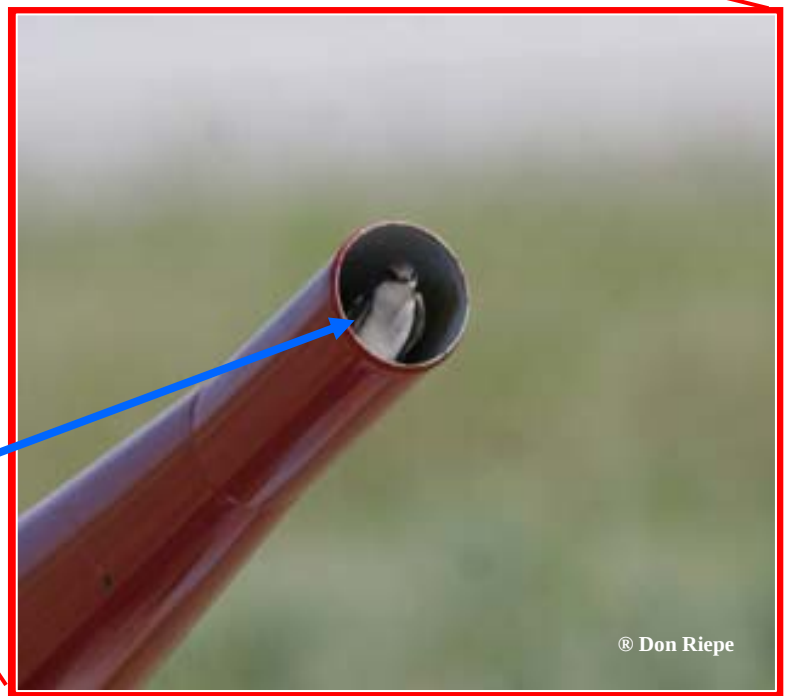
US Airways Flight 1549 – Hudson River, NY

Wildlife Hazard Mitigation



Wildlife Hazard Mitigation



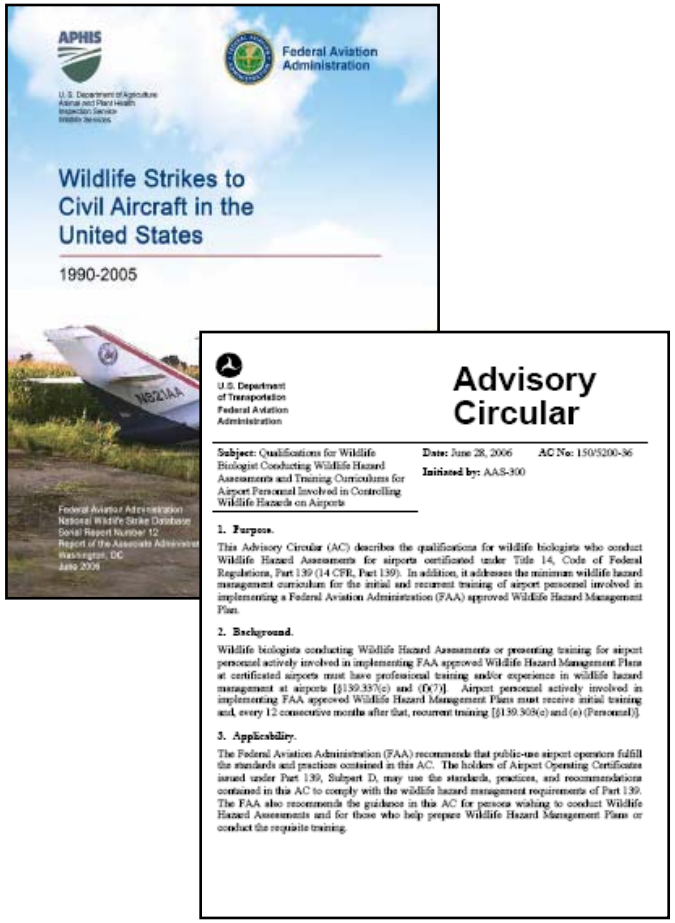


Swallow sitting in barrel of Propane Canon

FAA Wildlife Hazard Mitigation
Cooperative Structure

- Smithsonian Institution Feather ID Lab
- Embry-Riddle Aeronautical University
- US Department of Agriculture Wildlife Services NWRC
- University of Illinois – CEAT
- US Military

FAA Wildlife Hazard Mitigation Publications



- **Wildlife Hazard Management at Airports, a Manual for Airport Operators**, (2nd Ed. 2005) (1st ed. 1999 available in English, Spanish, French, Chinese)
- **AC 150/5200-33A** Hazard Wildlife Attractants on or Near Airports, (July 04)
- **AC 150/5200-34A** Construction or Establishment of New Landfills Near Public Airports, (Jan. 06)
- **AC 150/5200-36** Qualifications for Wildlife Biologist Conducting Wildlife Hazard Assessments and Training Curriculums for Airport Personnel Involved in Controlling Wildlife Hazards on Airports, (June 06)

http://wildlife-mitigation.tc.faa.gov/public_html/index.html

FAA Wildlife Hazard Mitigation
Bird Detection RADAR

- University of Illinois Urbana-Champaign, Center of Excellence for Airport Technology (CEAT)
  - Deployment of Avian Radars
  - Management of Deployed Radars

- GIS for Wildlife Hazard Management and Control

FAA Wildlife Hazard Mitigation

Bird Detection RADAR – Deployment Sites

- **Seattle – SEA TAC Airport & Oak Harbor – Whidbey NAS**
  - AR-1/2 in operation, collecting data
- **New York – JFK Airport**
  - AR-1 deployed as a mobile system, support WHM ops.
  - AR-2 to scan departure and approach corridors
  - Deployment in Mar-May, 2009
- **Dallas/Ft. Worth – DFW Airport**
  - Multiple "Merlin" systems in multiple locations
  - Lease agreements under negotiation with mfr.
  - Deployment in Mar-May, 2009
- **Chicago – ORD**
  - Same plan as JFK
  - Deployment in Feb-Mar, 2009

FAA's National Wildlife Aircraft Strike Database

- **105,956 Total Strike Reports**
  - ~ 90% Civil
  - ~ 10% Military (Joint Sites)
- **439 Species in DB**
- **Latest Update May 31, 2008**

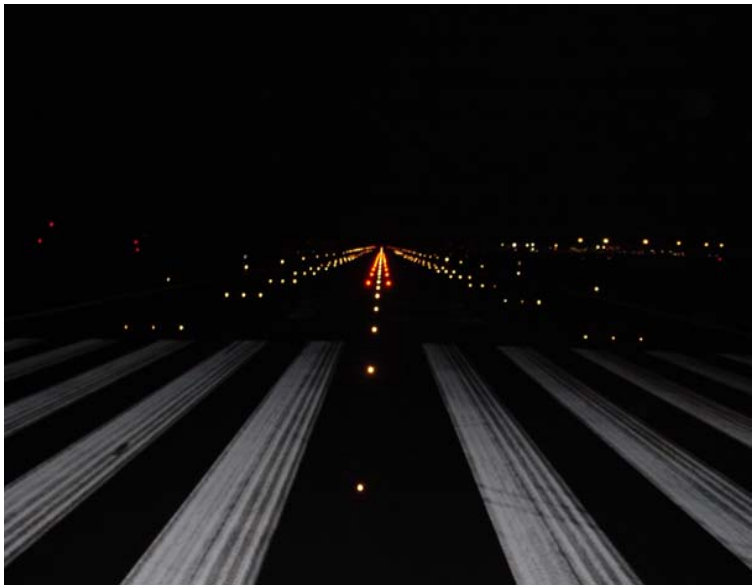
56,000 On-Line Queries Processed July 22, 2002 to-date

Wildlife Analysis and Identification

- **Smithsonian Institution, Feather Lab – Strike Species ID**
- **5 year Interagency Agreement funded at ~ $100K per year**
- **No-Cost Extension through Sept 2008**
- **2007 Bird Strike Species Identification**
  - 562 Separate Civil strikes totaling 589 IDs.
  - In 2003 only 57 cases were submitted
  - 53% increase in IDs over 2006
- **New 5 year IA established – begins Oct 1, 2008**

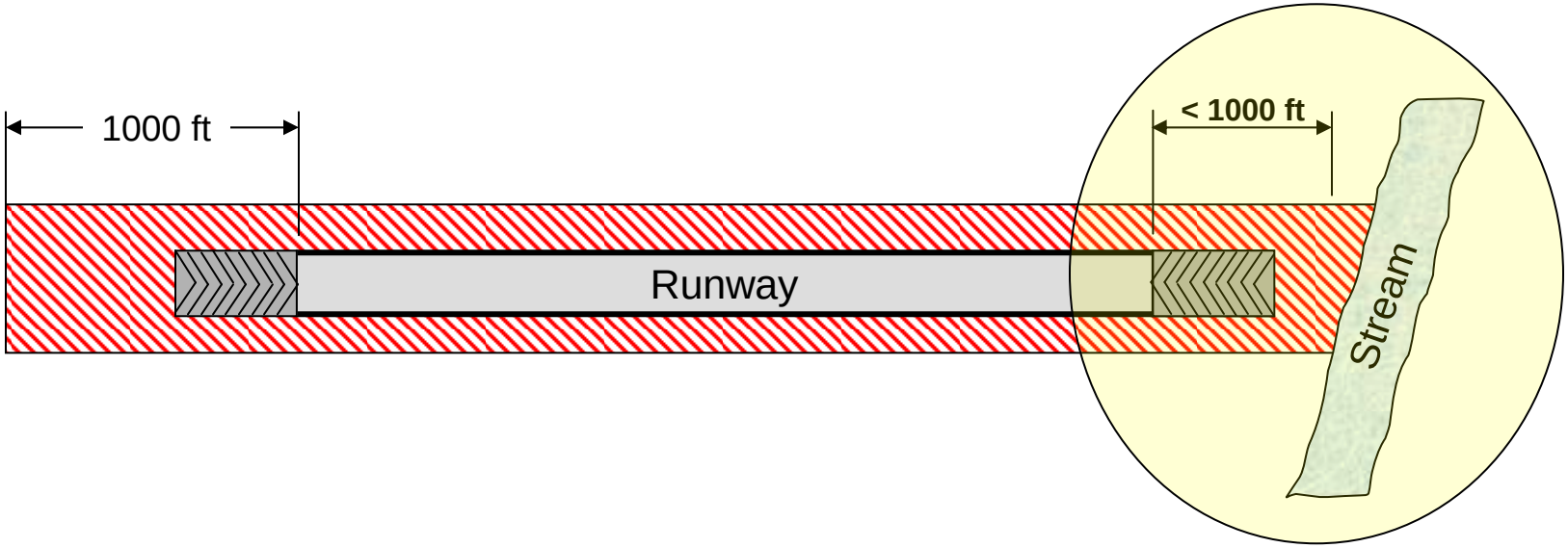
Runway Surface Safety & Friction

- **Engineered Materials Arresting Systems (EMAS)**
- **Runway Friction**
- **Take-Off Hold Lights**
- **Runway Entrance Lights**



Runway Safety Area (RSA)

Concept: The Runway Safety Area (RSA) enhances the safety of airplanes which undershoot, overrun, or veer off the runway and is designed to reduce the risk of damage to airplanes. The RSA also provides greater accessibility for firefighting and rescue equipment during such incidents.



Engineered Material Arresting System (EMAS)

An EMAS is designed to stop an overrunning aircraft by exerting predictable deceleration forces on its landing gear as the EMAS material crushes. It must be designed to minimize the potential for structural damage to aircraft, since such damage could result in injuries to passengers and/or affect the predictability of deceleration forces.

Engineered Materials means high energy absorbing materials of selected strength, which will reliably and predictably crush under the weight of an aircraft.

AC No: 150/5220-22

Engineered Material Arresting System (EMAS)

Successful EMAS Capture

Saab 340 Arrested at the end of Runway 4R after overrun. JFK, 1999

Successful EMAS Capture

Cargo MD-11 Arrested at the end of Runway 4R after overrun. JFK – May 30, 2003

Successful EMAS Capture

Cargo B-747 Arrested at the end of Runway 4R after overrunning during landing in snow storm.
JFK – January 22, 2005

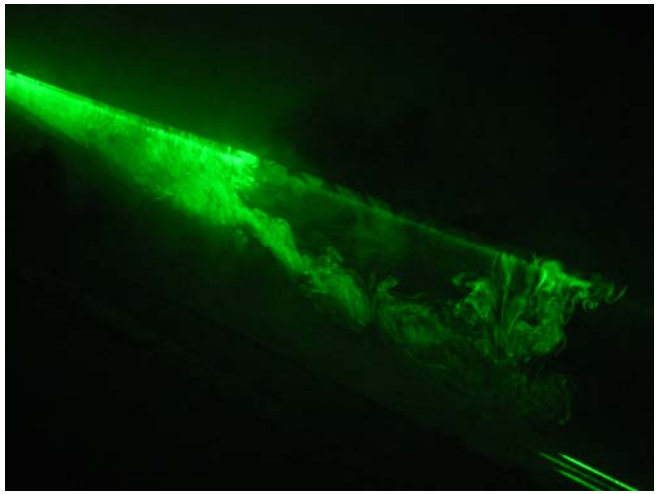
Successful EMAS Capture

EMAS capture of a Falcon 900 at Greenville Downtown Airport, SC, July 17, 2006

Airport Lighting and Marking (Visual Guidance)

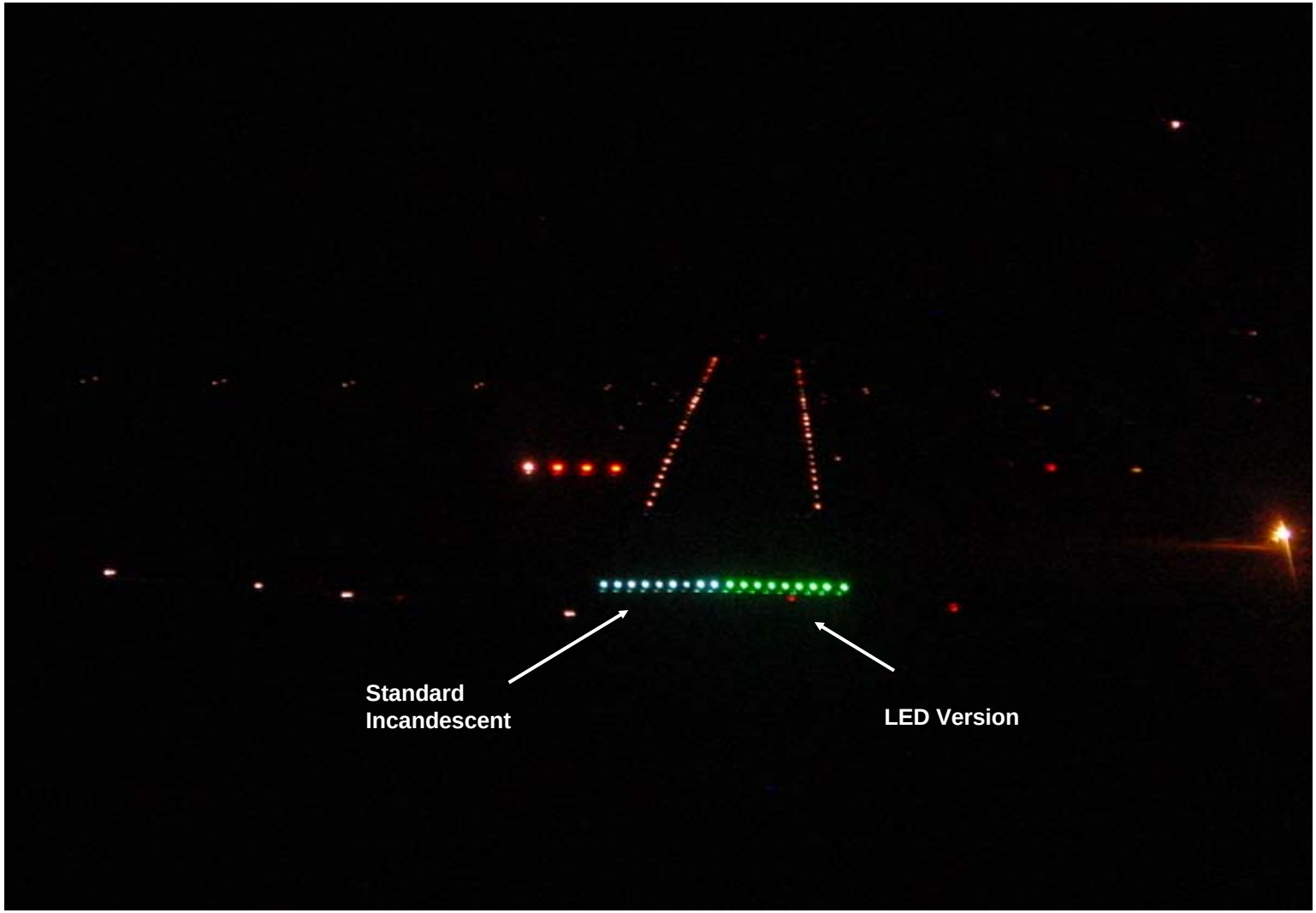
- LED and Fiber Optics Applications
- Vertical Flight Visual Guidance
- Alternative Paint Marking Materials
- Taxiway/Runway Identification
- GA Infrastructure
- Enhanced Hold lines
- Obstruction Lighting

Laser Illuminators for Airfield Applications



In-Pavement LED Linear Sources

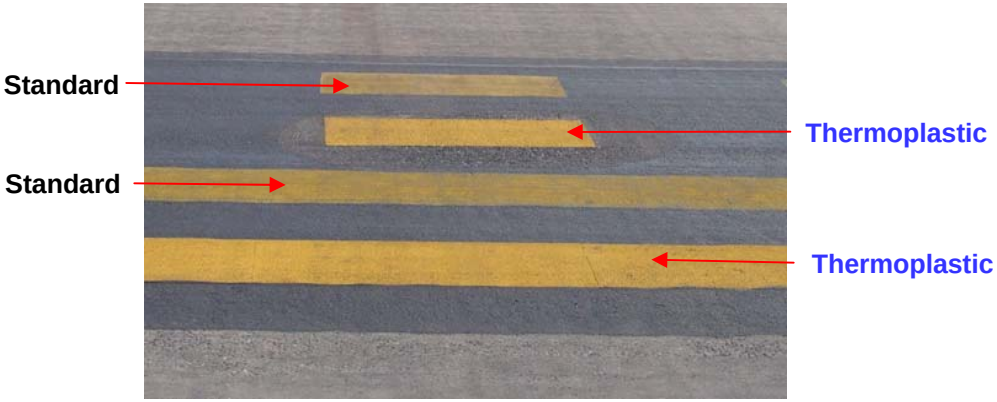
LED Threshold Lighting



Alternative Marking Materials
Thermoplastics

Fast Application

Improved Performance



After 11 Months:

Standard

vs.

Thermoplastic

Obstruction Lighting for Wind Turbine Farms

Obstruction Lighting for Wind Turbine Farms

Obstruction Lighting for Wind Turbine Farms

Test Site – Lawton, OK

Future Visual Guidance Test Bed

Background:

- Our nation's airport visual guidance infrastructure has become very old, operates very inefficiently, and is based on operational data and technologies that are now decades old.
- A significant amount of electrical energy is needed to power these systems costing airport operators a significant amount of money.
- Compounded with the aging equipment, wiring, and connections, the cost to maintain the systems becomes very significant.

Future Visual Guidance Test Bed

Goal:

- Develop a state of the art visual guidance technology test bed that would enable visual guidance engineers an opportunity to design, install, test, monitor new technologies and a new visual guidance infrastructure.

Future Visual Guidance Test Bed

Research Plan:

- Phase 1:
  - **Determine the requirements of the test site, perform coordination with an existing airport for cooperation, site surveying, etc. At the end of this phase, the proposed system layout would be fully completed, with the site selected, with a schedule of installation complete.**
  - **Estimated funding for FY-2010: $1.6M.**

- Phase 2:
  - **Material, equipment, contractors, etc would be procured to perform the required duties required to construct the test site.**
  - **At the conclusion of this phase, the site would be complete with all wiring, conduit, access holes, fixtures, paint markings, etc. in place.**
  - **Estimated funding for FY-2011: $4M.**

- Phase 3:
  - **Data acquisition systems, monitoring equipment, etc. would be procured and installed to complete the test site, giving researchers sufficient data tools to operate and monitor the various technologies that were installed.**
  - **Estimated funding for FY-2012: $3M.**

Future Visual Guidance Research

Marking Materials

- Conduct Research on Alternative materials as Identified.

Lighting Technologies

- Continue to study technologies that meet small airport needs with emphasis on NEXGEN suitable airports.

- Chromaticity Boundary for Aviation White
  - Conduct research to determine if current color boundaries should be adjusted to allow this more conspicuous light source.

- Investigation of DC & AC LEDs for Airports

Pavements and Operation of the National Airport Pavement Test Facility (NAPTF)

- **Full-Scale Testing**
  - Pavement Instrumentation
  - Demolition and Reconstruction
  - Data processing and Database Management
  - Maintenance and Equipment Upgrades
- **FAARFIELD Software**
- **Flexible / Rigid Pavement Modeling**
- **Workshops and Training**

NAPTF Test Vehicle

Instrumented Test Track at the NAPTF, FAA Technical Center

http://www.faa.gov/airports_airtraffic/airports/construction/pavement_design/

NAPTF Test Vehicle

NAPTF Test Vehicle

Pavement Failure

Pavement Software Products

2006	**FAARFIELD**	**FAA R**igid and **F**lexible **I**nteractive **E**lastic **L**ayer **D**esign: Fully tested design procedures incorporating **3D Finite Element** responses for rigid..
2003	**FEDFAA**	**Beta** design program incorporates **3D Finite Element** response model for rigid pavement, **LEAF** for flexible pavement.
2003	**FEAFAA**	**3D Finite Element** analysis of rigid pavements, runs on desktop PC.
2003	**LEDFAA version 1.3**	32-bit program uses LEAF for layered elastic analysis. Updated aircraft library includes A380. Incorporated in AC 150/5320-6D, Change 3.
2002	**BACKFAA**	Backcalculation of elastic properties using LEAF. Also used for LEAF development.
2002	**COMFAA**	Computes pavement strength and thickness by ACN and FAA methods.
2001	**LEAF**	**L**ayered **E**lastic **A**nalysis – **F**AA: Layered elastic analysis program for 32-bit Windows, replaces JULEA.
1995	~~**LEDFAA version 1.2**~~	**L**ayered **E**lastic **D**esign – **FAA**: ~~Pavement design program for Windows, uses JULEA for layered elastic analysis. Part of AC 150/5320-16 (Pavement Design for B-777)~~. Program and AC cancelled April 30, 2004.

All programs for use on desktop PCs

NAPTF Results

- Savings from reduced thickness requirements.
- Savings from avoidance of pavement strengthening.
- Guidance for ICAO ACN for six-wheel gears.
- Guidance for runway shoulder conversion for Group 6 aircraft (FAA Engineering Brief 65)

Test Vehicle Modification for 8 and 10 Wheel Gear Aircraft

- **Existing aircraft are primarily cargo and military aircraft**
- **Complex gear geometries proposed for civil transport aircraft**

- **Additional wheels allow:**
  - Testing of complex gear configurations:
    - 8 to 10 wheel gears proposed for the BWB
    - 8 wheel gears proposed for advanced supersonic commercial transports
  - Ability to simulate cargo aircraft that are landing at civilian airports:
    - Antonov 124 and 225
    - C-5 Galaxy

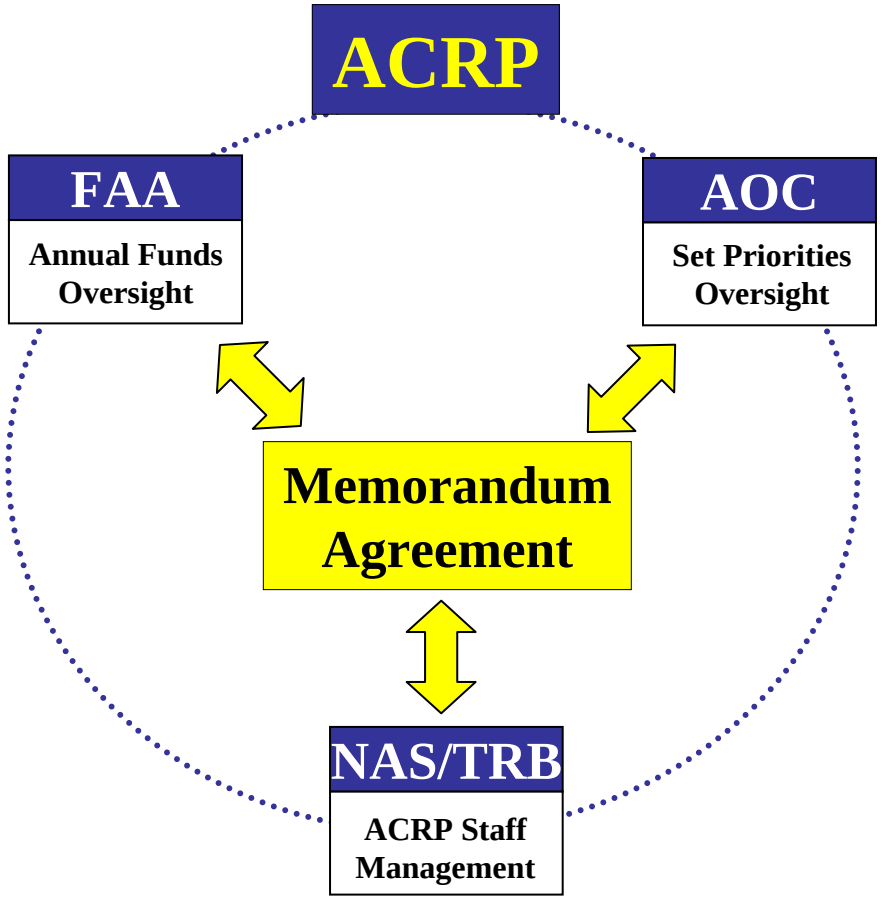
Test Vehicle Modifications

Test Vehicle Future Gear Capability

Airport Cooperative Research Program (ACRP)

- Purpose:
  - To carry out applied research on problems that are shared by airport operating agencies and that are not being adequately addressed by existing federal research programs.
- Focus on Solving Current Problems
- Industry / Governing Board Drives Research Priorities
- Typical Project: 18mo / $300k

ACRP Organization



FAA's Role: Funding & Oversight

- FY '05 $ 3 Million
- FY '06 $10 Million
- FY '07 $10 Million
- FY '08 $10 Million
- FY '09 $15 Million (ant)

ACRP Research Areas

01. Administration
02. Environment
03. Policy and Planning
04. Safety
05. Security
06. Human Resources
07. Design
08. Construction
09. Maintenance
10. Operations
11. Special Projects
    - 11-01 Legal Aspects of Airport Programs
    - 11-02 Quick Response for Special Needs
    - 11-03 Synthesis of Information Related to Airport Problems
    - 11-04 Graduate Research Award Program

Program Status

- **Sep. 2005:** Memorandum of Agreement executed
- **Jan. 2006:** 1st ACRP Oversight Committee (AOC) meeting, 29 projects initiated
- **July 2006:** 2nd AOC meeting, 26 projects initiated
- **Jan. 2007:** 3rd AOC meeting, 12 projects initiated
- **July 2007:** 4th AOC meeting, 27 projects initiated
- **Jan. 2008:** 5th AOC meeting, 1 project initiated
- **July 2008:** 6th AOC meeting, 23 projects initiated
- **Jan. 2009:** 7th AOC meeting, 1 project initiated

Total Program Progress (since Sep. 2005)

Funds Awarded:	$38 Million
Projects Initiated:	119, 52 in progress
Projects Completed:	42
Publications:	30

ACRP/NextGen Related Projects

- Fast, Flexible, and Efficient
  - Aviation Capacity in Coastal Mega-Regions
  - Enhancing Airport Land-Use Capabilities
  - Software Solutions for Airport Management and Budget

- Clean and Quiet
  - Airport Related Hazardous Air Pollutants
  - Airport Implications of Climate Change
  - Evaluation of Alternative Aviation Fuels
  - Local Air Quality Impacts from Airport-Related Emissions

- Human-Centered Design
  - Airport Passenger Movement and Queuing Behavior
  - Airport Passenger System Usage/Throughput

ACRP/NextGen Related Projects

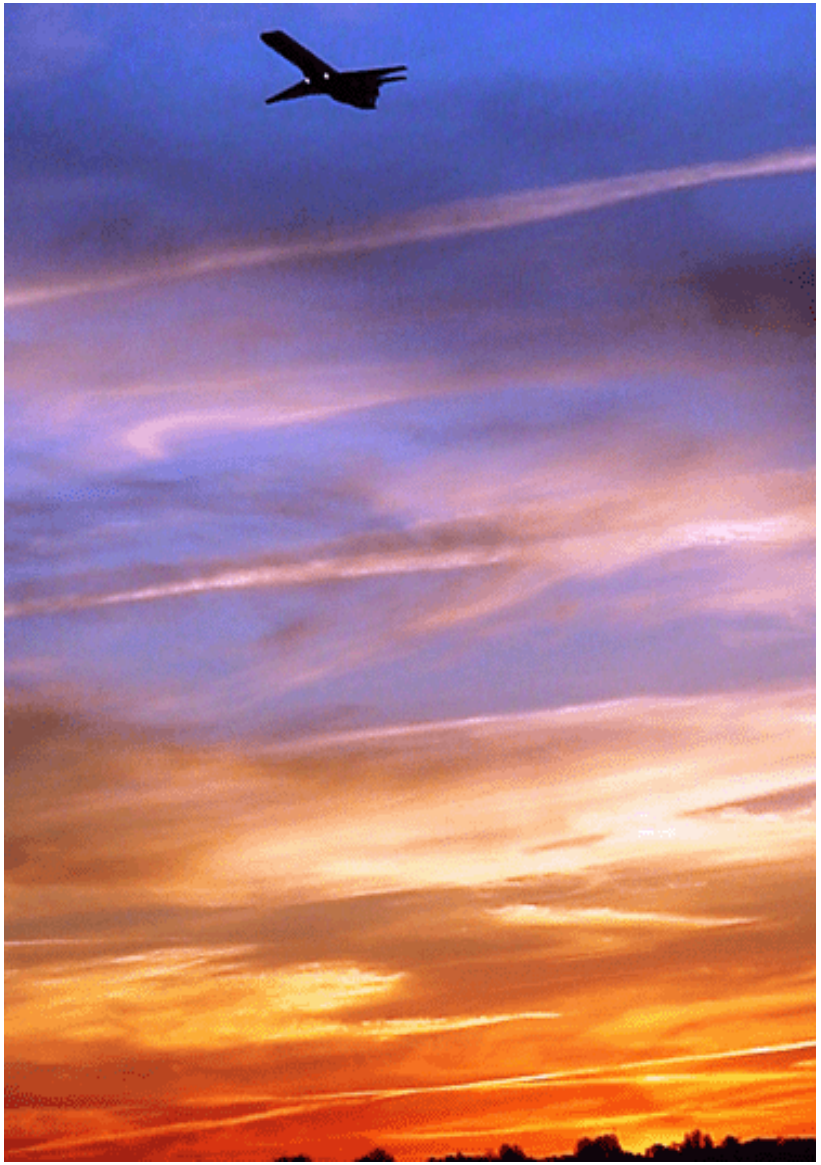
- Human Protection
  - Lightning-Warning Systems for Airports
  - Runway Approach Lighting Hazard Analysis
  - Improved Civil Aircraft Arresting Systems
  - Improved Aircraft Evacuation Slides

- Situational Awareness
  - Airspace Analysis Tools for Airport Planning
  - Airport Signage and Wayfinding Guidelines
  - Preventing VPDs During Winter Operations

- System Knowledge
  - Guidebook for Airport Safety Management Systems

ACRP - Publications

- ACRP Project Reports
  - **http://www.trb.org/news/blurb_browse.asp?id=136**
- ACRP Synthesis Reports
  - **http://www.trb.org/news/blurb_browse.asp?id=138**
- ACRP Research Results Digests
  - **http://www.trb.org/news/blurb_browse.asp?id=139**
- ACRP Legal Research Digests
  - **http://www.trb.org/news/blurb_browse.asp?id=140**



Thank You

Please visit:

http://www.faa.gov/airports_airtraffic/

For more information