FAA Airport Design Competition for Universities

by

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Presentation to

International Modeling and Simulation Conference

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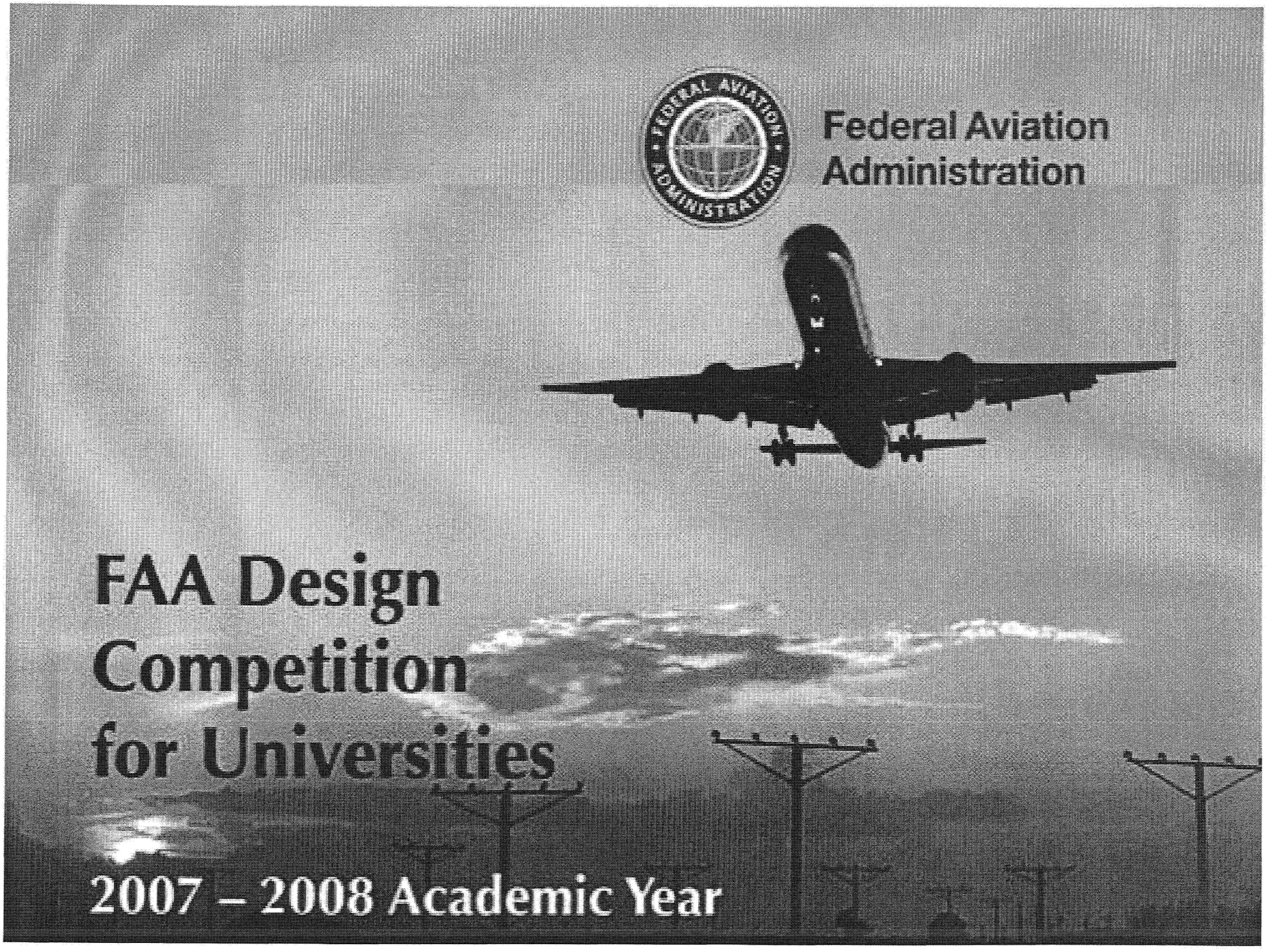

Federal Aviation
Administration
FAA Design
Competition
for Universities
2007 – 2008 Academic Year

FAA Competition Goals

- *Raise awareness of the importance of airports to the National Airspace System infrastructure.*
- *Increase the involvement of the academic community* in addressing airport operations and infrastructure issues and needs.
- *Engage U.S. students* in the conceptualization of applications, systems and equipment capable of addressing related challenges in a robust, reliable and comprehensive manner.
- *Encourage U.S. undergraduate and graduate students to contribute innovative ideas and solutions* to airport and runway safety issues.
- Provide the framework and incentives for *quality educational experiences* for university students.
- Develop an awareness of and an interest in airports as a vital and interesting area for engineering and technology *careers*.

FAA Competition Partners

- ***The American Association of Airport Executives*** is sponsoring the award ceremony and providing a forum for winner presentations as well as advice, expert links for teams, assistance in dissemination of the competition opportunity to its members, and participation in design reviews.
- ***The Airport Consultants Council*** is providing advice, expert links for teams, assistance in dissemination of the competition opportunity to its members and participation in design reviews.
- ***The Airports Council International*** is providing advice, expert links for teams, assistance in dissemination of the competition opportunity to its members and participation in design reviews.
- ***The National Association of State Aviation Officials*** is providing advice, expert links for teams, assistance in dissemination of the competition opportunity to its members, and participation in design reviews.

Competition Elements

- Individuals or teams
- Undergraduates and Graduates eligible
- Must have faculty mentor
- Multidisciplinary, multi-departmental or multi institutional teams an option
- Good vehicle for collaboration among institutions
- A worthwhile aeronautics project for design courses or independent study or student chapters of professional societies
- Allows for interdisciplinary approach and solutions
- Real world applications

Connections with Airport Operators

- Linkage with an airport operator is required to obtain expert advise and ensure the viability of the proposed approach.
- Competition website has links to experts with FAA, Partner Organizations and the AAAE is connecting students to airport operators.

Awards

First place: $2500; Second place: $1,500;Third place: $1,000

- Prizes are awarded to individuals or divided equally among team members.
- Team representatives for first place awards will be invited to accept their award and present their design at the American Association of Airport Executives Annual Conference and Exposition, June 8 – 11, 2008 in New Orleans.
- A travel allowance of up to $2,000 per award will be provided for two individuals (two students or one faculty advisor and one student) from each first place award winning team.

Faculty Focus Group

- Joe Rule, Professor and Associate Dean, College of Science, Old Dominion University
- Bill Mason, Professor, Mechanical Engineering, Virginia Tech
- Jim McDaniel, Professor, Aerospace Engineering, University of Virginia
- Steve Landry, Assistant Professor, Industrial Engineering, Purdue University
- Mike Myers, Professor, Civil Engineering, Georgia Tech

Reviewed Guidelines to ensure viability for undergraduates and graduates in engineering and science disciplines.

Competition Website

http://www.faa.gov/runwaysafety/design_competition.htm

- **Detailed competition background and guidelines.**
- **Links to publications and resource documents in each of the broad challenge areas -- a starting point for students and faculty.**
- **Venue for submitting questions and required Notice of Intent to propose.**
- **Final proposals submitted electronically through the website.**
- **Detailed evaluation criteria.**
- **Links to expert resources and airport operators.**
- **Access to 2006 – 2007 Winning Proposals**

FAA Competition
Design Challenge Categories

- Airport Operation and Maintenance
- Runway Safety/Runway Incursions
- Airport Environmental Interactions

Note: Safety risk assessment is an element in each challenge

Airport Operation and Maintenance Challenges

Exploring new methods for design and maintenance of pavement surfaces. Ideas include but are not limited to:

- **Methods for innovative pavement repair.**
- **Innovative pavement materials, installation and maintenance techniques, including non-destructive evaluation methodologies.**
- **Improved approaches to rubber removal/surface restoration due to aircraft tire friction.**
- **New or improved techniques for ice removal from runways.**
- **Improved methods for foreign object detection and removal from runway surfaces.**

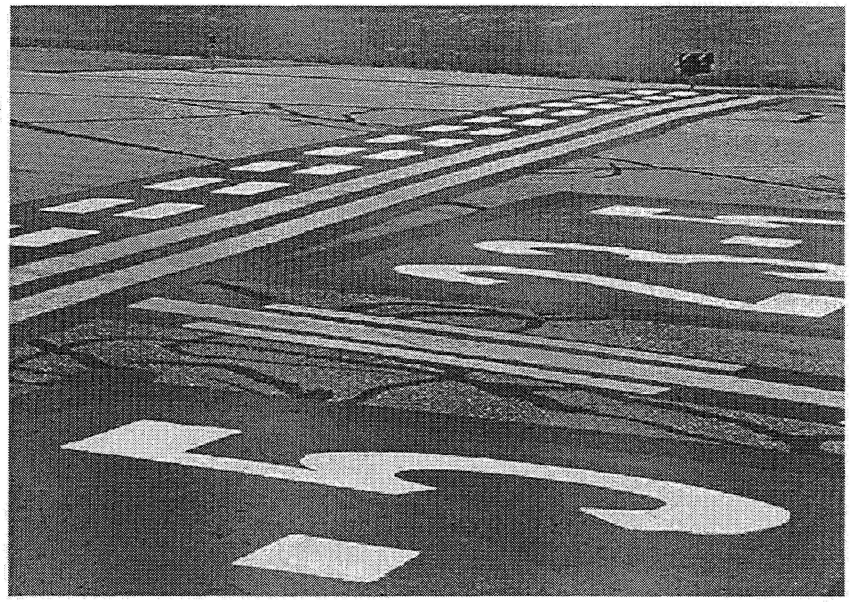
Mod/Sim and Airport Operations

- Engineering type simulations to address pavement options. Could simulate stresses and strains without having to build a physical model.
- Predictive models of how long pavement will last with respect to weather impacts.

Runway Safety/Runway Incursion Design Challenges

A. Expanding situational awareness of pilots and ground operators on the airfield. Ideas include, but are not limited to:

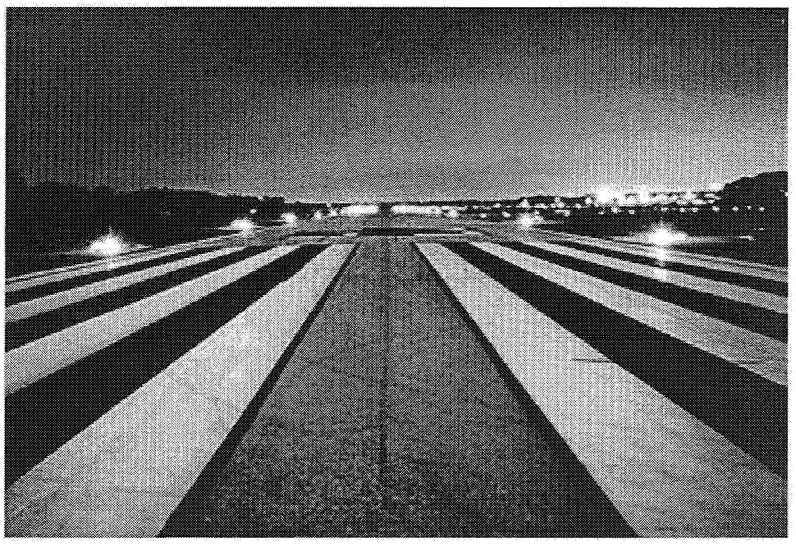
- Direct warning systems to alert pilots that they are approaching a runway and if the runway is occupied.
- Development of innovative techniques to record, analyze and display annotated spatial data for improved situational awareness of ground operations.



Runway Safety/Runway Incursion Design Challenges

B. Enhancing Airport Visual Aids

- Improved lighting, marking, and signage for runways, taxiways and the airport apron
- Lighting other than traditional incandescent
- Providing surface navigation guidance to pilots in the cockpit via electronic alternatives in limited visibility conditions (in lieu of outside cues)



Mod/Sim and Runway Safety

- Runway Safety challenge offers many applications for modeling and simulation
- Enhancing situational awareness - could simulate displays, collect data and do analysis on effectiveness for pilots. Could expose pilot to new aids and get verbal or measure reaction time, eye movement, brainwaves.
- Create different types of visual aids and have pilots interact in visual environment

Airport Environmental Interactions Design Challenges

A. **Making snow and ice removal more environmentally friendly. Both chemical and non-chemical options can be considered. The FAA is seeking designs that offer:**

- Improved means and methods of complying with aircraft and airfield anti- and de-icing requirements
- Environmentally safe aircraft and airfield de-icing/anti-icing products that are compatible with both aircraft structures and airport pavements
- Improved containment and cleanup of de-icing products

Airport Environmental Interactions Design Challenges

B. Improving methods for containment and cleanup of fuel spills.

- Bioremediation techniques for fuel spill cleanup.
- Techniques/substances for neutralization of toxic components of fuel
- Techniques/substances that delay the biological and chemical breakdown of fuel, allowing cleanup to occur without causing rapid decreases in dissolved oxygen in receiving waters that result from biological and chemical degrading of the fuel
- Techniques for prevention of percolation of fuel into ground water

Airport Environmental Interactions Design Challenges

C. Increasing energy efficiency in the management of airfields. (This challenge specifically excludes consideration of terminal and other airport buildings.) Topics that might be considered include:

- Alternative energy/energy efficient airport equipment such as tow vehicles, emergency generators, power units, heating systems, etc. for use in airfield areas.
- Alternate energy sources and approaches to providing lighting at remote airports that don't have access to electrical power.

Mod/Sim and Environmental Interactions of Airports

- Modeling of various airport components that rely on energy
- Comparative analysis for cost savings of different types of energy sources
- Modeling of environmental impacts of fuel spills

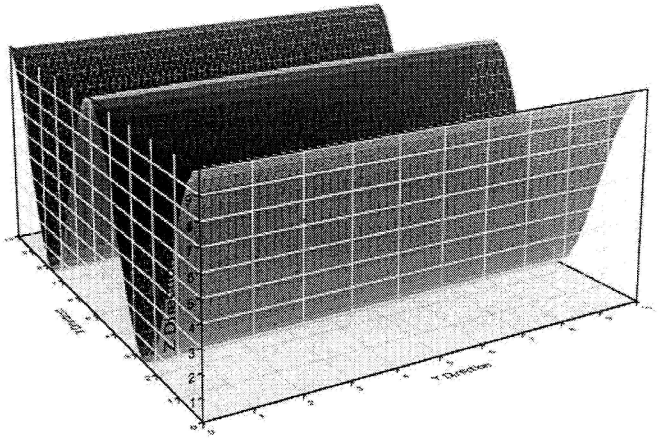
FAA University Design Competition for Airports Key Dates

- **Competition Announcement:** August 2007
- **Notice of Intent:**
  a. NOI strongly suggested and anticipated prior to start of design process
  b. Fall semester deadline -September 28, 2007
  c. Note: NOI's involving fall work will still be accepted through the Spring semester deadline, which is January 31, 2008
- **Design Submittal Deadline**: 5 p.m. Eastern Daylight Time, April 18, 2008
- **Winners Announced:** by May 16, 2008
- **Award Ceremony and Presentations:** June 8 - 11, 2008

  Exact date(s) within this time frame to be determined
- **Competition web site:**
  http://www.faa.gov/runwaysafety/design_competition.htm

2006 – 2007 Competition Data

- 16 colleges and universities participated
- 18 faculty and 155 students involved
- 34 proposal submissions
- 4 individuals; 30 teams
- 16 graduate students; 139 undergraduate students
- Several design classes participated with multiple student teams



Airport Operations and Maintenance Challenge Winner 2006 - 2007

First Place – A team from the Department of Aviation and Technology at San Jose State University, San Jose, California under the guidance of Faculty Advisor,

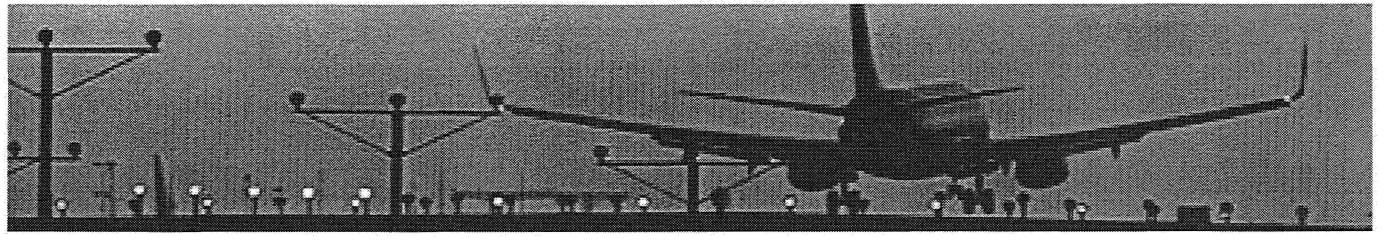
Dr. Triant Flouris, had the distinction of submitting the first place team proposal. Their proposal titled, "Airport Communicator Software," considered a software approach to integrating airport communications.

Runway Safety/Runway Incursions Challenge Winners 2006-2007

First Place – George Mason University Psychology Department in Fairfax, Va. Under the guidance of Dr. Raja Parasuraman submitted "Runway Incursion Monitoring and Direct Alert Systems (RIMDAS)."

Second Place – Georgia Institute of Technology Departments of Aerospace, Industrial and Systems Engineering in Atlanta, Ga. under the guidance of Dr. Amy Pritchett and Dr. Daniel Bruneau submitted "Controller Clearance Broadcast System."

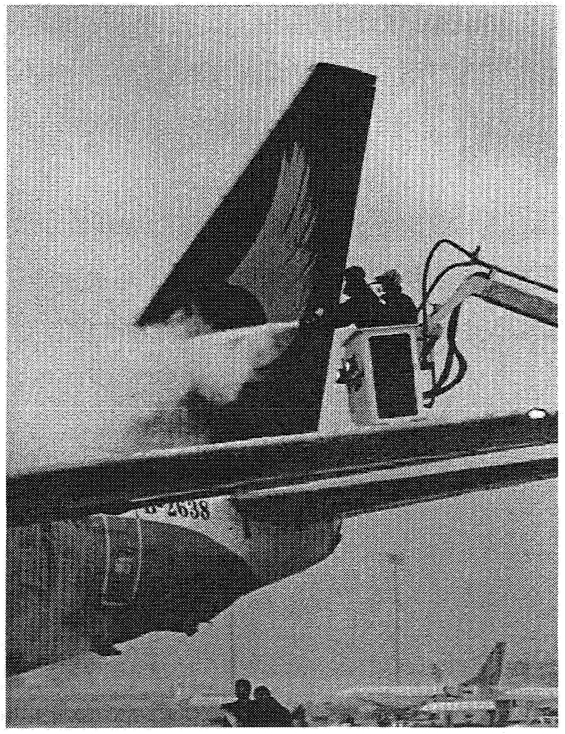
Third Place –University of Virginia Department of Systems and Information Engineering in Charlottesville, Va. under the guidance of Dr. Barry Horowitz submitted "A Systems Approach to Runway Incursion Prevention."



Airport Environmental Interactions Challenge Winners 2006 - 2007

First Place – San Jose State University's Department of Aviation and Technology under the guidance of Faculty Advisor, Dr. Triant Flouris submitted, "Feasibility of Replacing Conventional Airport Lighting with Light Emitting Diodes."

Second Place – University of Alabama's Department of Civil, Construction and Environmental Engineering, under the guidance of Dr. Robert Peters and Dr. Nasim Uddin submitted a proposal addressing environmentally friendly snow and ice removal.



Third Place – Rose-Hulman Institute of Technology's Department of Civil Engineering in Terre Haute, In., under the guidance of Dr. Michael Robinson submitted the third place proposal addressing environmentally friendly snow and ice removal.

Participant Comment

"For the majority of students, this was their first experience of working on a collaborative team design project in which different academic disciplines were represented and, as such, it was exciting to witness the student development in such a challenging, yet rewarding environment."

-Faculty Advisor

Participant Comment

"...this hands-on experience with industry experts and front line managers has been priceless. It has really helped to open my eyes up to the variety of issues that an aerospace professional has to look at on a daily basis...it has also opened my eyes up to a broader spectrum of opportunities in the aviation business world."

- Student participant