

Winners Selected for 2012-2013 National FAA Design Competition for Universities

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The Federal Aviation Administration (FAA) recently selected winners for its seventh annual Design Competition for Universities. Top honors went to student teams from the University of Virginia, Georgia Institute of Technology, Embry Riddle Aeronautical University, Binghamton University – State University of New York and George Mason University.

The competition seeks to engage students at U.S. colleges and universities in addressing issues facing airports while providing quality educational experiences and exposure to aviation and airport-related careers. Students were invited to propose in six technical challenge areas: airport operations and maintenance; runway safety; airport environmental interactions; airport management and planning; innovative application of FAA data and electric/hybrid-electric aircraft technology. The competition requires that students work with a faculty advisor and that they reach out to airport operators and to industry experts to obtain advice and to assess the practicality of their proposed designs/solutions.

This competition is managed for the FAA by the Virginia Space Grant Consortium based in Hampton, VA. Partnering organizations are: American Association of Airport Executives; the Airport Consultants Council; Airports Council International – North America; National Association of State Aviation Officials; and the University Aviation Association. Partners assist in developing competition guidelines, provide expert advisors for teams, disseminate competition information to organizational members, and participate in design reviews.

Panels of FAA, industry and academic experts selected the winning proposals. Students from winning teams equally divide cash prizes. First place teams receive their awards and present their work at FAA Headquarters on July 17th from 1:00 p.m. to 3:00 p.m. In addition, they will present their designs as the lunch Keynote at the Airport Consultants Council (ACC) Transportation Security Administration (TSA) Summer Series Workshop in Arlington, Va., July 18th. They also present at one other professional meeting during the academic year. Promising designs may also receive FAA funding to take their concepts to the next stage of development.

First, second, third place, and honorable mention awards for each challenge area are announced below. Copies of designs receiving first, second or third place awards will be available by June 30th at the Competition website: <http://FAADesignCompetition.odu.edu>

First Place Awardees:

Airport Operations and Maintenance: *A Solar-Thermal Approach to Runway Ice Management*, submitted by Binghamton University - State University of New York. Advisor: Professor William Ziegler. The team proposal is a two-step process to improve ice management at airports by harnessing solar thermal energy to prevent ice from forming. The design uses an inexpensive

solution of photochromic glass beads and concrete stain to help manage the problems of runway icing allowing airports to efficiently prevent ice from forming on runways.

Runway Safety, Runway Incursions, Runway Excursions: *INSPIRE: Keeping You on Track* submitted by Embry-Riddle Aeronautical University. Advisors: Professors Kelly Neville and Martin Lauth. The team designed an Intuitive Navigation System for the Prevention of Incursions in the Runway Environment (INSPIRE) to serve as a situational awareness aid that supports heads-up, eyes-out taxi operations.

Airport Environmental Interactions: *Noise Reduction in Close Proximity to Airports: An Active Sound Wave Canceling Solution* submitted by Binghamton University - State University of New York. Advisor: Professor William Ziegler. The team proposed an active noise reduction solution for residents impacted by loud aircraft noise. The system will analyze frequencies of incoming sound waves, generate a wave 180 degrees out of phase, and send the opposing wave through speakers in individual rooms in order to effectively reduce or entirely cancel specific frequencies.

Airport Management and Planning: *eAPT: The Electronic Airport Planning Tool* submitted by Embry-Riddle Aeronautical University. Advisors: Professors Kelly Neville and Martin Lauth. *eAPT* is a map-based planning tool that combines airport pavement information with aircraft specifications to support the efficient creation of airport event plans. *eAPT* is designed around SMART board technology to provide a collaborative planning environment for event planners.

Electric/Hybrid-Electric Aircraft Technology: *Two Teams Tied for First Place:* *GT Aircraft, Inc: NXG-50* submitted by Georgia Institute of Technology. Advisors: Professors Dimitri N. Mavris, Jimmy Tai and Chris Perullo. The NXG-50 offers a feasible and viable solution in closing the gap between current aviation operations and NextGen 2025 goals.

Sustinere: A Turboelectric Distributed Propulsion Regional Jet for 2025 submitted by the University of Virginia. Advisor: Professor James McDaniel. The design proposal features a potential hybrid electric regional aircraft consisting of turboelectric generators and liquid hydrogen that regenerate cooling system to improve sustainability and reduce emissions. The design accounts for liquid hydrogen storage and transport at the airport, a shorter take-off distance, engine-out conditions, and NextGen flight pattern. The overall concept offers a means to improve the noise, emissions, and performance of regional aircraft for commercial service by 2025.

Innovative Application of FAA Data: *Fleet: A Mobile Information Application for Reducing Travel Anxiety* submitted by George Mason University. Advisor: Professor Robert J. Youmans. The design team formulated a mobile application around ways of providing travelers with more travel information as a means to reduce travel anxiety. *Fleet* augments existing FAA data with crowd-sourced data to provide travelers with reliable information about airport congestion, flight delays, boarding times, baggage handling, and many other uncertain aspects of air travel that can create anxiety.

Second Place Awardees:

Airport Operations and Maintenance: *Glyscreen* submitted by the University of Rhode Island. Advisors: Professors Bahram Nassersharif, Carl-Ernst Rousseau and Valerie Maier-Speredelozzi. The team created a dynamic design process utilizing sound systems engineering principles producing an enclosure using aluminum T-slot framing with scratch and ultraviolet resistant polycarbonate windscreens. The design will provide airlines with a low-cost, after-market operator enclosure compatible with existing deicing trucks designed to improve visibility conditions for more accurate application of deicing fluid.

Runway Safety, Runway Incursions, Runway Excursions: *AIRIP: Advanced Integrated Runway Incursion Prevention* submitted by Embry-Riddle Aeronautical University. Advisors: Professors Kelly Neville and Martin Lauth. AIRIP increases runway safety by inexpensively augmenting the current Airport Surface Detection Equipment, Model X (ASDE-X) system. AIRIP has been designed to fill a dangerous gap in the current ASDE-X set-up. AIRIP would instead immediately broadcast an ASDE-X warning via radio transmission to pilots in the runway environment. AIRIP would automatically alert pilots instantly to ASDE-X outputs allowing quicker initiation of the appropriate evasive action.

Airport Environmental Interactions: *Two Teams from the University of Colorado Boulder Tied for Second Place:*

Fuel Spill Containment at Bozeman submitted by the University of Colorado at Boulder. Advisor: Professor Angela Bielefeldt. The team designed an alternative for fuel spill clean-up at Bozeman International Airport (BZN). A BuffVac response vehicle was designed to safely and quickly recover up to 100 gallons of spilled fuel.

LED Runway and Taxiway Lighting Powered with On-Site Solar Panels submitted by the University of Colorado at Boulder. Advisors: Professors Karl Linden and Angela Bielefeldt. The student team proposal would install Light Emitting Diode (LED) runway lights with solar panels to improve energy needs for Grand Junction Regional Airport. Included in the design was a solar photovoltaic array that will annually generate 49 MWh of electricity, which is just enough to power the lights.

Airport Management and Planning: *Dynamic Collaborative Gate Allocation* submitted by the University of California at Berkeley. Advisor: Professor Jasenka Rakas. The team developed a stochastic optimization model that helps airlines and airports collaboratively determine gate usage in real-time. The proposed model enables airports to increase capacity without additional infrastructure, and helps airlines to decrease flight delays, gate delay variance, and fuel usage.

Innovative Application of FAA Data: *Bulita Travel* submitted by Tufts University. Advisor: Professor Daniel Hannon. The student designed an informational mobile application, *Bulita Travel*, that allows a user to view FAA statistical information on aircraft delays and cancellations, which in turn helps the user make educated decisions whether to fly or resort to another transportation mode.

Third Place Awardees:

Airport Operations and Maintenance: *Illuminating the Night Sky* submitted by Embry-Riddle Aeronautical University. Advisors: Professors Kelly Neville and Martin Lauth. The team proposes to make all LED obstruction lighting in the national airspace system (NAS) compatible with night vision goggles (NVGs) allowing pilots to use aided vision for takeoffs, landings and navigation.

Runway Safety, Runway Incursions, Runway Excursions: *The Guairdian System* submitted by Stevens Institute of Technology. Advisor: Professor Eirik Hole. The team proposes a cost effective, GPS based system concept for ground vehicles that operate within the perimeter of an airport. The Guairdian System would continuously inform drivers of their position relative to their cleared area of movement and proactively warn them if they are about to cause an incursion on runways, taxiways, or other areas of the airfield they are not cleared for.

Airport Environmental Interactions:

Providing Secondary Containment for Mobile Refuelers submitted by the University of Missouri. Advisor: Professor Carlos Sun. The team designed a method of secondary containment at small to moderate size airports using a dike/berm perimeter featuring a gate valve.

Electric/Hybrid-Electric Aircraft Technology: *MHD and Hybrid Design* submitted by Arizona State University Polytechnic. Advisor: Professor Pavlos Mikellides. The team proposes to replace the turbine section of a turbofan with magnetohydrodynamic (MHD) power generators. The propulsor, because of its higher efficiency, would burn less fuel and thus decrease emissions. The hybrid propulsion system would be environmentally friendly and quieter.

Honorable Mention:

Runway Safety, Runway Incursions, Runway Excursions: *Application of Highway Video Detection Software to Assist in Runway Incursion Mitigation:* Advisor: Professor Carlos Sun. The team proposed a software application to mitigate incursions by adding video detection software to air traffic control cameras. The software would identify mobile objects on an airfield including aircraft and ground vehicles.

Airport Environmental Interactions: *The Power of Urine* submitted by the San Jose State University. Advisor: Professor Glynn Falcon. The team proposes to use human urine as an alternative to on-site electrical power production.

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