ACRP Problem Statement: 15-10-06

*Alternative Anti-Icing Airfield Runway Systems*

Recommended Funding Amount: --

ACRP Staff Comments

There is potential overlap with ACRP Project 10-15, A Guidebook for Airport Winter Operations.

TRB Aviation Group Committee Comments

**AIRCRAFT/AIRPORT COMPATIBILITY:** This problem statement, while broadly covering the topic of alternative anti-icing methods, appears to concentrate on heated pavement panels. If the research product is an all-encompassing guidebook covering different methods of snow and ice control, then it will have benefit. The research should look at alternative methods of snow and ice control, including creative use of materials such as beet juice as environmentally friendly alternatives. Reference ACRP Report 45: Optimizing the Use of Aircraft Deicing and Anti-Icing Fluids, and its associated monitoring methods guidebook.

**ENVIRONMENTAL IMPACTS OF AVIATION:** Not supported. Although this is a valid topic of concern to airports, these questions could be addressed in a synthesis. The focus to date has been on physical (e.g., plowing, brooming) and chemical deicing, which are well understood. Alternate approaches may have the potential to greatly reduce chemical addition, which would have water quality compliance benefits. However, as proposed, this problem statement appears to be fundamental rather than applied research, which may not be consistent with ACRP's criteria. In addition, there are questions that should be addressed before further consideration, such as what alternatives have been successfully implemented at airports, and what FAA, the Department of Defense's environmental research programs, and others have done in this area of research.

Review Panel Comments

*Not recommended.* There is already abundant research in this area. The problem statement does not demonstrate that it is feasible and an appropriate project for ACRP.
I. PROBLEM TITLE
Alternative Anti-Icing Airfield Runway Systems

II. BACKGROUND
Snow and ice removal on the airfield property is an essential practice for the safe operation of many airports throughout a significant portion of the year. However, the most commonly deployed snow and ice removal practices, using snow plows, blowers, brooms and chemicals, are costly in terms of time, staff, and environmental resources. Alternative anti-icing runway systems or methods should be investigated to evaluate their cost effectiveness and environmental impact. Alternative techniques that are found to be efficient and effective will provide airports with cost savings, less time to return to normal runway operations, and lower environmental impacts.

Many US airfields are subjected to sub-freezing temperatures. Snow, ice, or slush runway conditions significantly impact aircraft landing and takeoff safety. Although airport managers do an excellent job in maintaining runway safety during winter conditions, snow removal is costly. Snow removal typically entails plowing and chemical treatment. Between 1958 and 1993, runway water, ice or snow contributed to more than 100 airplane accidents (NASA, 1999). In a recent ACRP study, between January 1978 and January 2009, there were 100 accidents / incidents that occurred at US runways with slush, ice or snow involving jet or turboprop aircraft weighing more than 5600 lbs and having a minimum of two engines (ACRP 4-08, 2010).

Airport authorities use plows, snow blowers, and/or sweepers to remove snow to ensure safe aircraft ground movements during winter storm conditions. Runway de-icing fluids (RDF’s) are used to break the bond between ice and pavement during icy conditions. Salt melts snow and ice; however, applying salt to a runway has the adverse effects of pavement and aircraft landing gear corrosion. Alternatively, more environmentally friendly freezing point depressant chemicals are used as anti-icing agents to reduce ice-pavement bond while complying with US EPA storm water regulations. Although, manually removing snow and applying de-icing solvents is one solution to ensure safe runways during winter conditions, it warrants adequate airport personnel and equipment, which is costly. However, alternative solutions are available and may be more advantageous.

III. OBJECTIVE
Summarize existing practices and develop new approaches for runway anti-icing.

IV. PROPOSED TASKS

• Review current airport runway anti-icing practices and categorize these practices based on ambient weather conditions. The survey should include domestic and foreign methods.

• Summarize currently used anti-icing practices as a function of their suitability and economy.

• Develop an experimental plan to select and judge optimal alternative practices for their suitability.

• Conduct preliminary experimental work using these optimal practices.

V. ESTIMATED FUNDING

Estimated problem funding: $450,000

VI. ESTIMATED RESEARCH DURATION

Research period: 2.5 years

VII. RELATED RESEARCH

A de-icing / anti-icing system incorporating conductive concrete may be a suitable alternative for airfield runways. Work has already been conducted using conductive concrete overlay panels at a Nebraska bridge site (Tuan 2008). However, energy supplied to the concrete overlay panels at the Nebraska bridge site used local energy grid. Converse to the Nebraska bridge site study, work was conducted by Heymsfield et al (2012) incorporating conductive concrete with renewable energy as the system’s energy source in a FAA study. Results showed that the conductive concrete approach is energy inefficient and therefore not cost effective. In another FAA study, a geothermal energy approach is being tried. This approach has also been found to be cost ineffective. In several joint NASA/FAA studies (Yager, et.al. 1990 and 1999), the adverse effects of snow/ice runway contaminants on aircraft stopping performance are discussed.

VIII. PROCESS USED TO DEVELOP THE PROBLEM STATEMENT

Extension of a RNS discussed in the AV070 Focus Group meeting with ACRP led by Daniel Findley to develop RNS (February 6, 2013). Collaborated effort between Thomas Yager and Ernie Heymsfield.

IX. PERSON DEVELOPING THE PROBLEM STATEMENT AND DATE

Ernie Heymsfield and Thomas J. Yager
REFERENCES
ACRP 4-08, “Accident Database for ACRP 4-08 – Improved Models for Risk Assessment of Runway Safety Areas (RSA)”, work in progress.


