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TRANSPORTATION RESEARCH BOARD

Planning an Effective Airport Deicing Runoff Management Program

December 8, 2020

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#TRBWebinar

Learning Objectives

- Identify the primary environmental characteristics of deicing products used at airports
- Explain an adaptive management approach to planning deicing runoff management systems
- Identify examples in each of the five categories of deicing practices
- Apply the Deicing Decision Support Tool to identify potentially applicable deicing practices for an airport

American Association of Airport Executives (AAAE)

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ACRP Report 14 2nd Edition

Deicing Planning Guidelines and Practices for Stormwater Management Systems

Dean Mericas, Ph.D.

Chuck Pace, PE

Tim Arendt, PE

Dean Mericas, Ph.D.
Principal Investigator

- Senior Aviation Consultant, Mead & Hunt, Inc.
- 28 years experience with deicing issues at commercial & military airfields
- Lead author on original Report 14 and other ACRP deicing reports/ guidebooks

Chuck Pace, PE
Senior Engineer

- 22 years experience on deicing and water quality issues
- Technical advisor to the major air carriers and carrier groups at over 15 airports from Dulles to Anchorage
- Lead author on ACRP Report 134, Applying Whole Effluent Toxicity Testing to Aircraft Deicing Runoff

Tim Arendt, PE
Treatment Specialist

- Senior Vice President, Gresham Smith
- 26 years experience with deicing issues at commercial and cargo facilities
- Lead author on ACRP deicer treatment and monitoring guidebooks

ACRP Report 14 Oversight Panel

Kevin Gurchak, Allegheny County Airport Authority–Pittsburgh International Airport, Pittsburgh, PA (Chair)

Michael Parletta, The Port Authority of New York & New Jersey—LaGuardia Airport, Flushing, NY

Asciatu Whiteside, Dallas Fort Worth International Airport, DFW Airport, TX

Phil Argiroff, Michigan Department of Environmental Quality, Lansing, MI

Kimberly Engle, Cryotech Deicing Technology, Fort Madison, IA

Devon Cancilla, University of Missouri–Kansas City, Kansas City, MO

Michael Lamprecht, FAA Liaison

Melinda Pagliarello, Airports Council International–North America Liaison

Tim Pohle, Airlines for America Liaison

Christine Gerencher, TRB Liaison

ACRP 02-71 Research Objectives

1. **Update ACRP Report 14**
   - Current state of practice and emerging issues
     - Deicer characteristics
     - 2012 USEPA Deicing Effluent Limitations Guidelines
     - North American and global trends
     - Performance of techniques and technologies
   - Update technology (BMP) fact sheets.
   - Integrate with other ACRP reports
2. **Decision Support Tool**
   - Identify solutions most likely to be the best choice
   - Establish basis for subsequent engineering analyses and design

3. Advanced Deicing Training Course

Report 14 – Volume 1

1 Introduction

2 Developing Integrated Deicing-Runoff Management Systems

- Aircraft and Airfield Requirements for Deicing
- Regulatory Drivers
- Framework for Planning Deicing Runoff Control Programs
- Role and Application of Modeling Tools

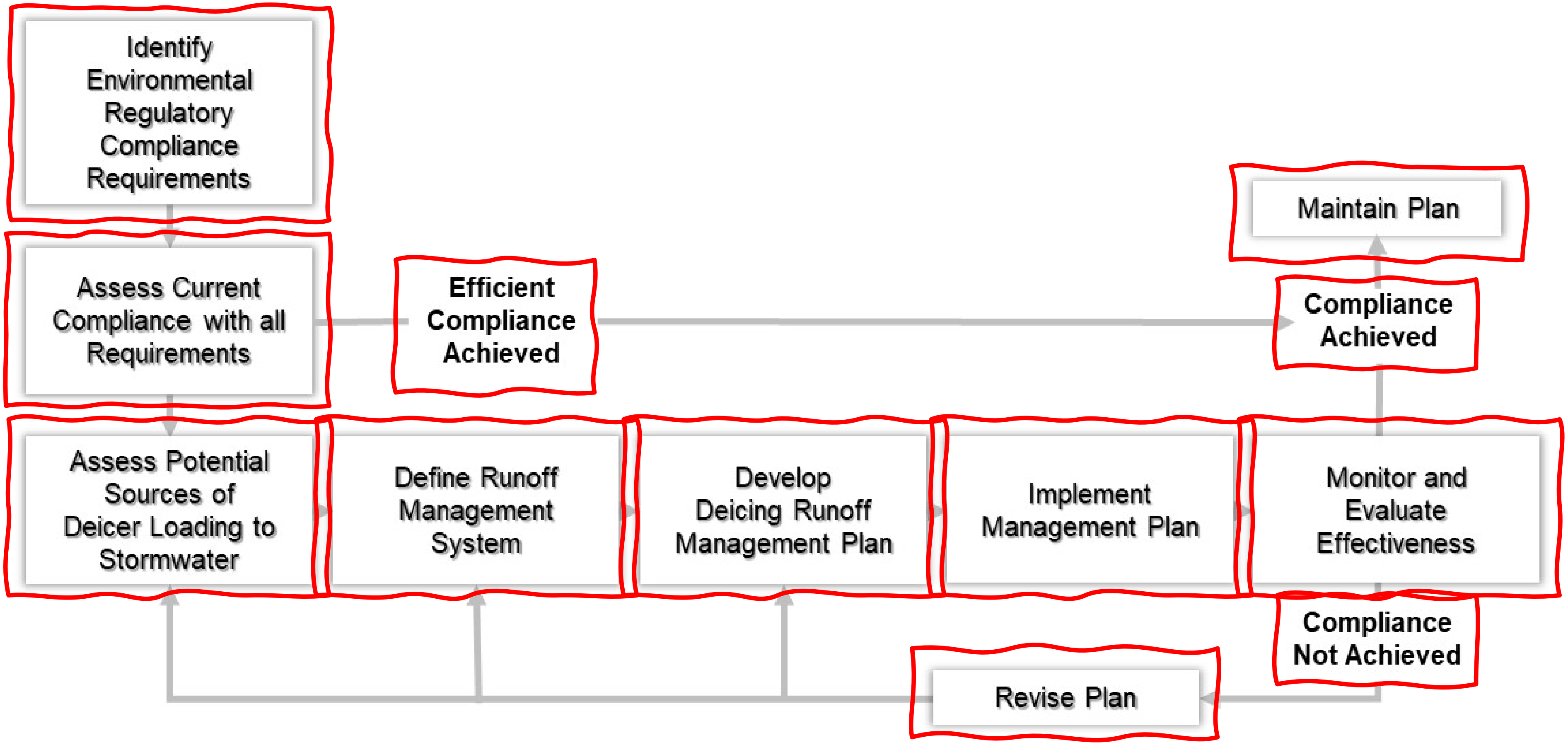
Characteristics of Deicing Products

COD | BOD_5 | BOD_{28} | Aquatic Toxicity

Table 2-1. Summary of Available Information R… Environment… …tics of Airc… …nd Anti-icing Fluids (circa 2018)

												Acute Toxicity to Fish				Acute Toxicity to Aquatic Inverts			Toxicity to Aquatic Plants					
Brand Name	FPD	Manufacturer/ Distributor	Product No.	Specific Gravity	COD (mg/L)	TOD	Biodegradation or kg O_2 /kg fluid 20°C	kg/L 20°C	2°C	20°C	2°C	Sheepshead Minnow	Fathead Minnow	Salmon	Rainbow Trout	*Daphnia magna*	*Ceriodaphnia dubia*	Saltwater Mysid	Freshwater Algae	Marine Algae	Toxicity to Microorg.	Chronic Toxicity to Fish	Chronic Toxicity to Aquatic Inverts	Notes
Type I																								
Polar Plus ADF Concentrate	PG	Cyrotech	—	1.043	1.57 g O_2/g deicer		65% bioxidiation	—	—	—	—	—	LC_{50} 6,350 mg/l	—	—	LC_{50} 6,825 mg/l	—	—	—	—	—	—	—	(a)
Polar Plus 63/37 Dilute ADF	PG	Cyrotech	—	1.041	0.90 g O_2/g deicer	—	40% biooxidation	—	—	—	—	—	LC_{50} 6,350 mg/l	—	—	LC_{50} 6,825 mg/l	—	—	—	—	—	—	—	(a), (b)
Polar Plus 55/45 Dilute ADF	PG	Cyrotech	—	1.039	0.86 g O_2/g deicer	—	36% biooxidation	—	—	—	—	—	LC_{50} 6,350 mg/l	—	—	LC_{50} 6,825 mg/l	—	—	—	—	—	—	—	(a), (b)
Polar Plus LT ADF Concentrate	PG	Cyrotech	—	1.043	1.61 g O_2/g deicer	—	57% biooxidation	—	—	—	—	—	LC_{50} 45,400 mg/l	—	—	LC_{50} 28,000 mg/l	LC_{50} 21,800 mg/l	—	—	—	—	—	—	
Polar Plus LT ADF 63/37 Dilute	PG	Cyrotech	—	1.041	1.01 g O_2/g deicer	—	36% biooxidation	—	—	—	—	—	LC_{50} 45,400 mg/l	—	—	LC_{50} 28,000 mg/l	LC_{50} 21,800 mg/l	—	—	—	—	—	—	(a), (b)
Polar Plus LT ADF 55/45 Dilute	PG	Cyrotech	—	1.039	0.89 g O_2/g deicer	—	31% biooxidation	—	—	—	—	—	LC_{50} 45,400 mg/l	—	—	LC_{50} 28,000 mg/l	LC_{50} 21,800 mg/l	—	—	—	—	—	—	(a), (b)
Octoflow EF	PG	Clariant	243150	1.044	—	—	—	—	—	—	—	—	—	—	LC_{50}/96 HR 40,613 mg/l	—	—	—	EC_{50}/96 HR 19,000 mg/l	—	—	30 DAY 2,500 mg/l	NOEC/ 7 DAY 13,020 mg/l	(c)
Octoflow EF 55/45 Dilute	PG	Clariant	243151	1.038	—	1.26 kg O_2/kg of fluid	44% biooxidation	—	—	—	—	—	—	—	LC_{50}/96 HR 40,613 mg/l	—	—	—	EC_{50}/96 HR 19,000 mg/l	—	—	30 DAY 2,500 mg/l	NOEC/ 7 DAY 13,020 mg/l	(c)
Safewing MP I ECO Dilute 55/45	PG	Clariant	197564	1.039	—	—	—	—	—	—	—	—	—	—	LC_{50}/96 HR 40,613 mg/l	—	—	—	EC_{50}/96 HR 19,000 mg/l	—	—	30 DAY 2,500 mg/l	NOEC/ 7 DAY 13,020 mg/l	(c)
Safewing MP I Eco	PG	Clariant	190933	1.0452	—	—	—	—	—	—	—	—	—	—	LC_{50}/96 HR 40,613 mg/l (c)	EC_{50}/48 HR 10,000 mg/l	—	—	EC_{50}/72 HR >10,000 mg/l	—	—	30 DAY 2,500 mg/l (f)	—	
E188	EG	LNT Solutions	—	1.13 – 1.15 g/cm 25°C	1.18 kgO2/kg	—	59% biooxidation	—	—	—	—	—	LC_{50}/96 HR 10,225 mg/l	—	—	LC_{50}/48 HR 3,650 mg/l	—	—	—	—	—	—	—	
P180	PG	LNT Solutions	—	1.045	1.34 kg)2/kg	—	31% biooxidation	—	—	—	—	—	LC_{50}/96 HR 12,500 mg/l	—	—	LC_{50}/48 HR 10,500 mg/;	—	—	—	—	—	—	—	—
UCAR Concentrate	EG	DOW Chemical Company	—	1.1	—	1.29 mg/mg	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	

Planning Framework for a Deicing Runoff Management Strategy



ACRP Training Course Provides Instruction on Applying the Framework

https://crp.trb.org/acrp0261/w6-1/

Report 14 – Volume 1 (Con't)

3 Selecting Individual BMPs

- Screening Process
- Use and Interpretation of Fact Sheets

4 Overview of the Fact Sheets

Characteristics of Deicing Management Practices

Proven & Demonstrated Application

Implementation & Operational Requirements

Advantages, Constraints & Requisite Factors for Success

Costs & Savings

TABLE 3-1. Summary of … best management practices f… …nd airfield deicing and anti-icing operations.

BMP (Fact Sheet #)			…esponsibili… for Implementation			…ments	Training Requirements	Adva…		…eys to Success		
Source Reduction												
Aircraft Deicing												
Product selection (#1)	N	5	Carriers/FBOs	Carriers/FBOs	4	5	3	No special equipment requirements May offer opportunity to reduce toxicity	Must conform with FAA-approved deicing plan Limited choice of products	Gaining aircraft operator acceptance	—	—
Storage and handling (#2)	N	5	Carriers/FBOs	Carriers/FBOs	4	5	3	Addresses sources outside of containment areas Saves money on wasted product	Depends on adoption of practice by carrier and FBO staff	Incorporation of practices into Standard Operating Procedures Education of employees who handle deicers	4	2
Proactive anti-icing (#3)	N	4	Carriers/FBOs	Carriers/FBOs	4	5	2–3	Reduces delays Reduces Type I use under certain weather conditions	May require extra deicing crew shift Must be incorporated into FAA-approved deicing plan	Suitable climate Accurate weather forecasting Suitable flight schedule	4	3
Blending to temperature (#4)	N	3	Carriers/FBOs	Carriers/FBOs	3	4	2	Optimizes use of aircraft deicers Reduces overall Type I use with certain weather conditions	Logistically complicated for FBOs serving multiple carriers with different FAA-approved deicing plans May require specialized equipment May undermine recycling efforts	Predominance of milder temperatures where lower glycol ratios can be used Ready source of water for blending Deicing equipment designed to facilitate blending Effective training and quality assurance	2–4	3–4
Forced air/hybrid deicing (#5)	N	2	Carriers/FBOs	Carriers/FBOs	3	5	1	Potentially significant reductions in ADF use	Reduced effectiveness with ice and heavy wet snow Specialized and extensive training required Equipment is more complex than conventional trucks May reduce amounts of recyclable glycol Significantly higher capital cost than conventional trucks	Extensive operator training and skill development Operator understanding of effectiveness under different conditions Climate that is suited to the technology's strengths Procurement as part of regular deicing truck replacement schedule	2–3	3–5

Key:

Emerging Technology
- N Proven technology at airports
- D Demonstrated outside of the airports industry
- R In research & development phase

Industry Application
- 5 Standard practice
- 4 Widespread
- 3 Common
- 2 Limited
- 1 Rare
- — Unknown

Ease of Implementation
- 5 Immediate
- 4 Administrative requirements
- 3 Capital equipment required
- 2 Infrastructure required
- 1 Major infrastructure required
- — Unknown

Labor Requirements (During Deicing Periods)
- 5 No additional labor
- 4 <1 day per week
- 3 2–3 days per week
- 2 1 FTE
- 1 >2 FTEs
- — Unknown

Training Requirements
- 5 No additional training
- 4 Basic orientation
- 3 Short training session
- 2 Multiple training sessions
- 1 Extensive training
- — Unknown

Relative Capital Costs
- 5 Negligible
- 4 < $100,000
- 3 $100,000–$1,000,000
- 2 $1,000,000–$10,000,000
- 1 >$10,000,000
- — Unknown

Potential Savings
- 5 Significant savings
- 3 Modest savings
- 1 No savings
- — Unknown

Reported Performance: Source Controls

Practice (Fact Sheet #)	Performance[a]	Comments
Source Controls	**% Load Reduction**	
Aircraft Deicing		
Product selection[b] (#1)	~15	Based on product literature on the BOD_5 of Type I ADFs currently used in the U.S.
Blending to temperature (#4)	18–50	Very dependent on local climate
Forced air/hybrid deicing (#5)	10–85	High end only attainable under ideal conditions
Hangared parking (#8)	≤90	Based on estimated Type IV requirements
Hot water deicing (#9)	≤90	Based on estimated Type IV requirements
Holdover time determination systems (#12)	80 (Type IV only)	Applies only to Type IV use; based on limited testing in Montreal
Deicer use tracking (#13)	80 (Type IV only)	Based on limited testing in Montreal
Airfield Pavement Deicing		
Product selection[b] (#16)	60–84 (fluids) 60–90 (solids)	Based on product literature on COD expressed as g O_2/g product. Consideration of possibly reduced application rates is not included.
PDM application technology (#18)	≤20	Based on reports from Munich Airport

[a] Values shown represent extremes of reported or estimated performance from available information from a limited number of airports. No assumption should be made regarding the distribution of performance metrics between these extremes.

Reported Performance: Containment/Collection

Practice (Fact Sheet #)	Performance[a]	Comments
Containment/Collection	**% Capture**	
Centralized deicing facilities (#21)	44–86	High end attainable only under ideal conditions
Apron collection systems (#22)	10–65	Very dependent on local climate and apron drainage infrastructure
Glycol collection vehicles (#23)	23–48	Very dependent on local climate
Block-and-pump systems (#24)	20–35	Very dependent on local climate and apron drainage infrastructure
Airfield drainage planning/ design/retrofit (#25)	—	No data
Deicer-laden snow management (#26)	0–11	Based on USGS report from one airport (Corsi et al., 2006). Very dependent on local conditions and operations.

[a] Values shown represent extremes of reported or estimated performance from available information from a limited number of airports. No assumption should be made regarding the distribution of performance metrics between these extremes.

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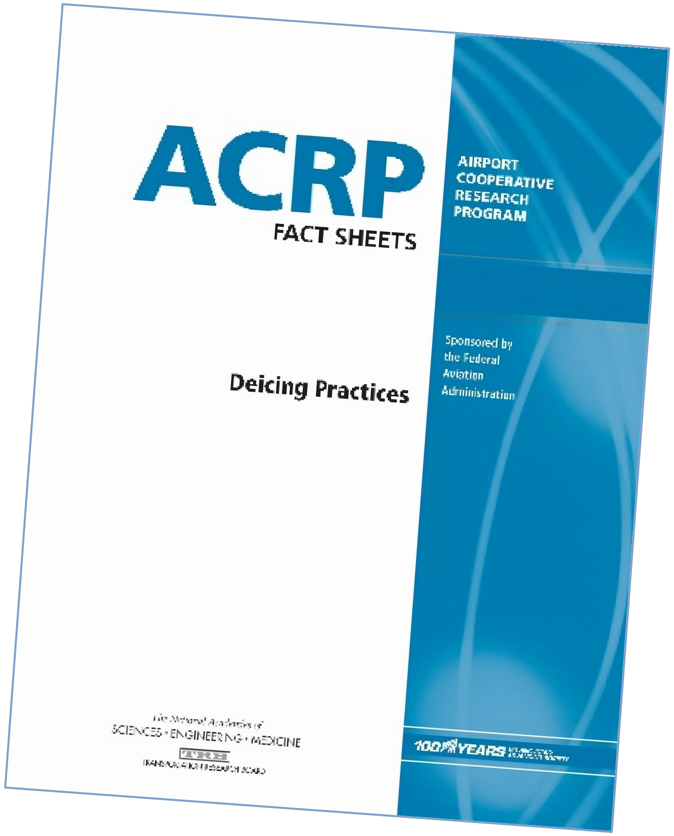
Report 14 – Volume 2

Deicing Fact Sheets

- Aircraft Deicing Source Reduction
- Airfield Pavement Deicing Source Reduction
- Containment/Collection
- Treatment/Recycling
- System Components



Fact Sheet Format

1. Description

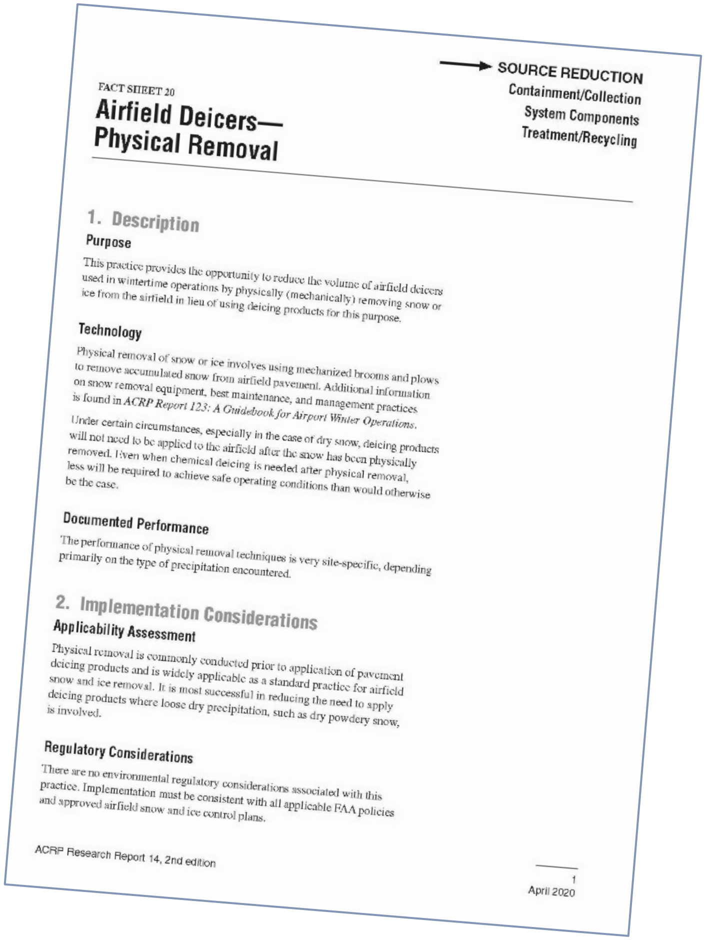
- Purpose
- Technology
- Documented Performance

2. Implementation Considerations

- Applicability Assessment
- Regulatory Considerations
- Planning & Design Considerations
- Integration with Other Practices
- Operation & Maintenance Considerations

3. Costs

- Capital Costs
- Operation and Maintenance Costs



SOURCE REDUCTION
Containment/Collection
System Components
Treatment/Recycling

FACT SHEET 20

Airfield Deicers—Physical Removal

1. Description

Purpose

This practice provides the opportunity to reduce the volume of airfield deicers used in wintertime operations by physically (mechanically) removing snow or ice from the airfield in lieu of using deicing products for this purpose.

Technology

Physical removal of snow or ice involves using mechanized brooms and plows to remove accumulated snow from airfield pavement. Additional information on snow removal equipment, best maintenance, and management practices is found in *ACRP Report 123: A Guidebook for Airport Winter Operations*.

Under certain circumstances, especially in the case of dry snow, deicing products will not need to be applied to the airfield after the snow has been physically removed. Even when chemical deicing is needed after physical removal, less will be required to achieve safe operating conditions than would otherwise be the case.

Documented Performance

The performance of physical removal techniques is very site-specific, depending primarily on the type of precipitation encountered.

2. Implementation Considerations

Applicability Assessment

Physical removal is commonly conducted prior to application of pavement deicing products and is widely applicable as a standard practice for airfield snow and ice removal. It is most successful in reducing the need to apply deicing products where loose dry precipitation, such as dry powdery snow, is involved.

Regulatory Considerations

There are no environmental regulatory considerations associated with this practice. Implementation must be consistent with all applicable FAA policies and approved airfield snow and ice control plans.

ACRP Research Report 14, 2nd edition

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Source Reduction

Definition

- Source Reduction: Any practice that reduces the amount of a contaminant entering a waste stream or otherwise released to the environment.
- **Practice** can consist of a BMP or a technology

Aircraft Deicing Source Reduction

Industry Status

- Aircraft Deicing Effluent Limitation Guideline encouraged the use of source reduction / pollution prevention (P2) technologies to reduce ADF usage.

- A pollution prevention credit was incorporated into the final regulations:
  - 40 CFR 449.20(a)(2)(ii)
  - Permittee must demonstrate use of a P2 technique that reduces the volume of, or quantity of, pollutants in available ADF

Aircraft Deicing Source Reduction

Common Technologies

- FS1 – Aircraft-Deicing Production Selection
- FS4 – Blend to Temperature
- FS6 – Forced Air / Hybrid Deicing
- FS12 – Holdover Time Determination Systems

Typical Considerations

- Environmental characteristics
- Climatic conditions
- Operator experience
- Logistics and Cost

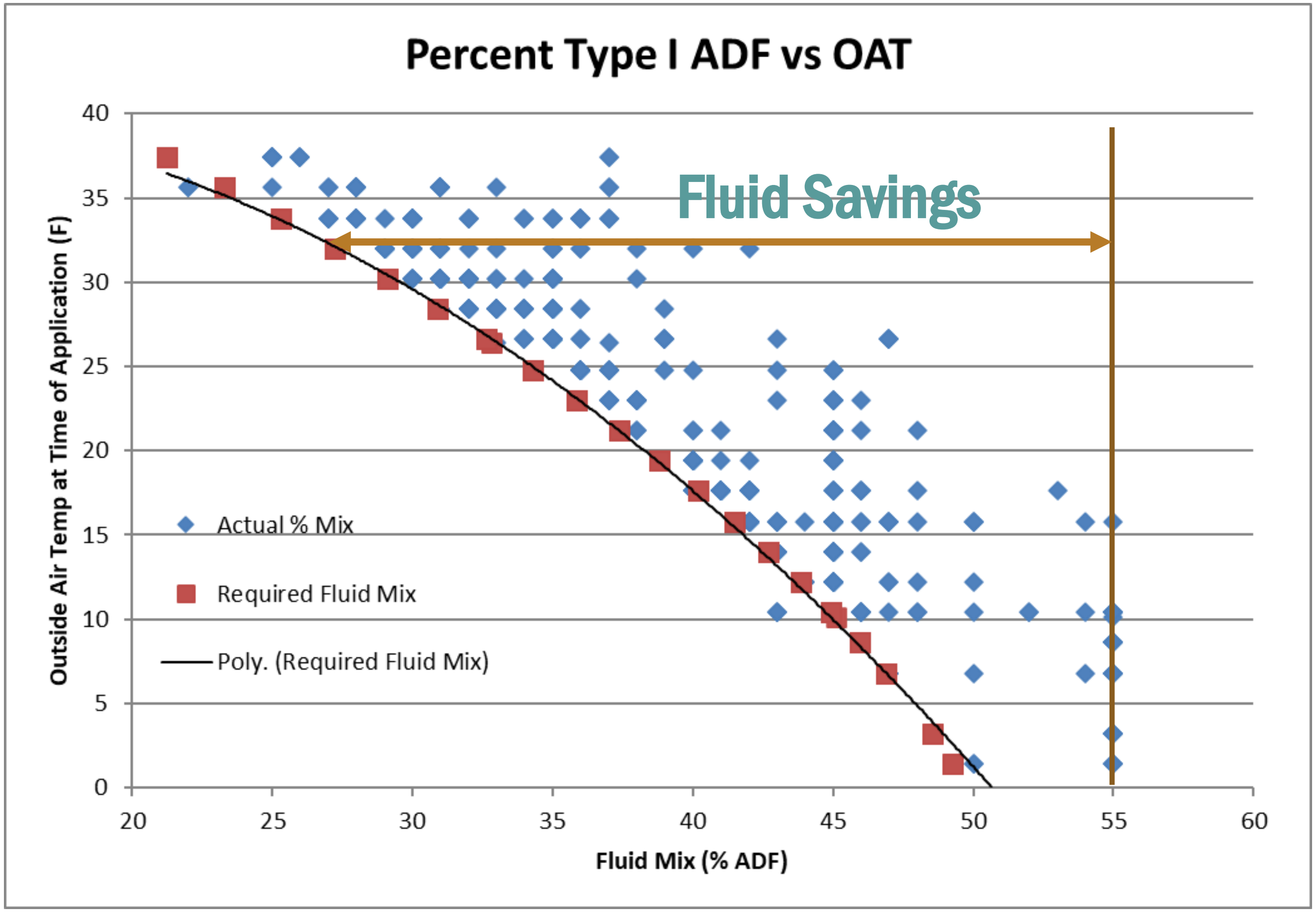
Aircraft Deicing Source Reduction

Highlight: Blend to Temperature

- Reduces the volume of glycol applied in Type I ADF by optimizing the dilution of Type I concentrate relative to the outside air temperature (OAT).

Current Fluid Mix (Type I concentrate:water)	Typical Deicing Temperatures				
	10–15°F	15–20°F	20–25°F	25–30°F	30–35°F
55:45	22%	27%	35%	41%	45%
50:50	14%	20%	28%	35%	40%
45:55	4%	11%	20%	28%	33%
40:60		0%	10%	19%	25%
35:65				7%	14%
30:70					0%

Blend to Temperature Effectiveness



Airfield Pavement Deicing Source Reduction

Industry Status

- Product selection and handling is the primary strategy
  - Deicing ELG strongly discourages use of urea deicers
  - EPA did not identify any available economically achievable technologies for the collection of pavement deicing stormwater

Typical Considerations

- Environmental Characteristics
- Liquid versus Solid Material
- Logistics
- When to Apply

Airfield Pavement Deicing Source Reduction

Common Technologies

- FS16 – Product Selection
- FS17 – Storage and Handling of Deicing Materials
- FS18 – PDM Application Technology
  - Couple with enhanced weather forecasting system
  - Integrate with GPS technologies
  - Couple runway and air temperatures with application rates
- FS19 – Heated Pavement
- FS20 – Physical Removal

Deicing Runoff Containment/Collection

Definition

- Practices and technologies for isolating, collecting, and containing storm water runoff from deicing activities before it reaches receiving waters.

- In most instances, these practices are implemented to address aircraft deicing runoff.

Deicing Runoff Containment/Collection

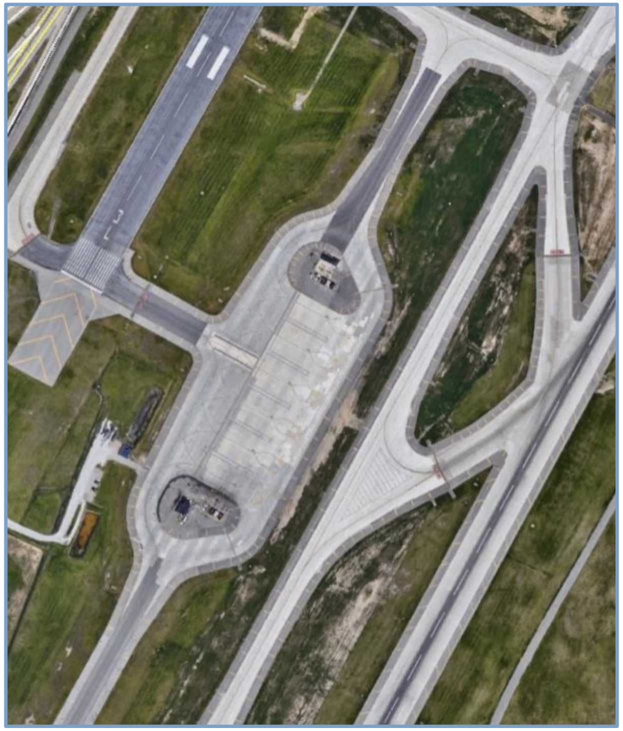
Industry Status

- Technologies are relatively mature
- USEPA's Aircraft Deicing Effluent Limitation Guideline set performance expectations among regulatory staff
- Airports often use combinations of technologies
  - Accommodate different types of operations
  - Target different ranges of glycol concentrations
- Scale of deicing operations, regulatory requirements and available disposal options tend to drive selection

Deicing Runoff Containment/Collection

Common Technologies

- FS21 - Centralized Deicing Facilities
- FS22 - Apron Collection Systems
- FS23 - Glycol Collection Vehicles
- FS26 - Deicer-Laden Snow Management



Deicing Runoff Containment/Collection

Typical Considerations

- Collection performance needed to meet regulatory compliance
- Treatment/recycling options
- Air carrier operational practices and preferences
- Gate demand
- Throughput during peak deicing periods
- Spatial constraints/opportunities
- Existing drainage infrastructure
- Opportunities in planned airfield projects
- O&M costs

Deicing Runoff Treatment/Recycling

Definition

- Process systems used to remove or recover deicing chemicals from collected deicing stormwater.

Deicing Runoff Treatment/Recycling

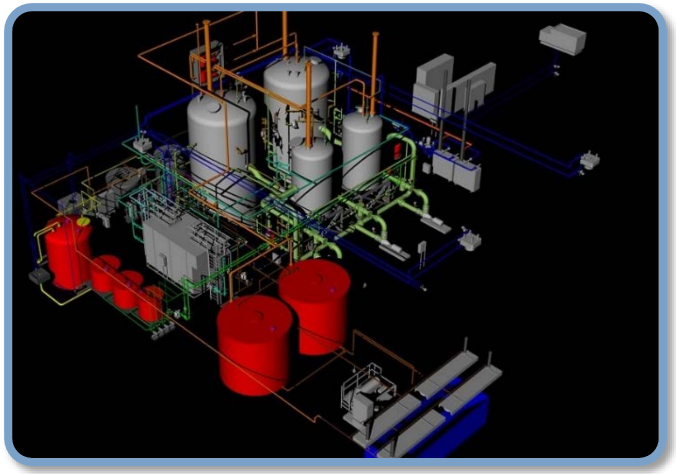
Industry Status

- Treatment technologies relatively mature
- Many airports use more than one technology to manage low and high concentration streams
- Site characteristics and conditions dictate best fit
- Appropriate sizing and operation as important as technology selection

Deicing Runoff Treatment/Recycling

Common Technologies

- FS34- POTW Discharge
- FS41 - Glycol Recovery
  - Membrane Filtration
  - Mechanical Vapor Recompression
  - Distillation
- Biological Treatment
  - FS35 - Anaerobic Fluidized Bed Reactor
  - FS36 - Aerated Gravel Beds
  - FS38 - Activated Sludge



Deicing Runoff Treatment/Recycling

Typical Considerations

- Most typical critical factors in treatment selection
  - Deicing stormwater characteristics (flows, load, concentration)
  - Availability of discharge to sanitary
  - Spatial constraints

- Success factors
  - Appropriate storage-treatment balance
  - Control of variability
  - Operating within design ranges

Deicing Runoff System Components

Definition

- Components of systems that may be implemented in various locations, and serving different purposes, in any given system.

Deicing Runoff System Components

Industry Status

- Technologies for managing runoff with spent deicer
- Often used to reduce stormwater volume to manage
- Provide opportunities for creativity

Deicing Runoff System Components

Common Technologies

- FS33 - Catch Basin Inserts/Valves
- FS32 - Online Monitoring
- FS31 - Manual and Automated Diversion Valves
- Storage Structures
  - FS27 - Portable Tanks
  - FS28 - Modular Tanks
  - FS29 - Basins
  - FS30 - Permanent Tanks
- FS114 - Pumping Systems

Deicing Runoff System Components

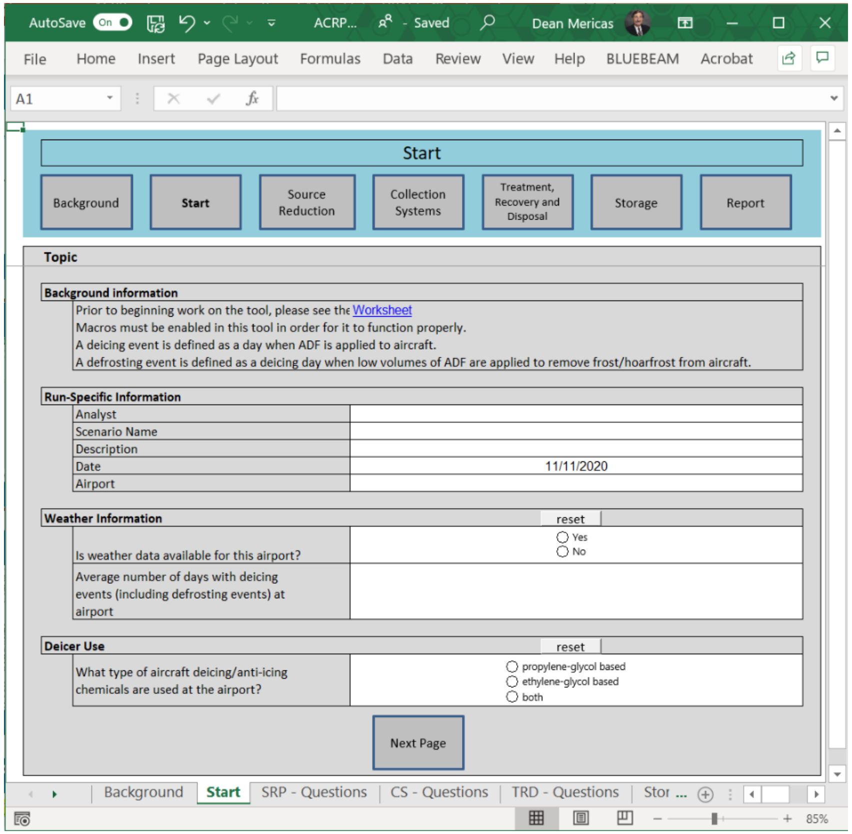
Typical Considerations

- Putting the puzzle pieces together
- Effective selection requires characterizing runoff
- Properly applied can reduce water handling and treatment costs
- Selection and placement highly site specific

Decision Support Tool

Functional Objectives:

- Accessible and applicable to a wide range of airports
- Identify candidate practices and technologies that are potentially feasible at an airport
- Recommendations lay the groundwork for subsequent engineering feasibility analysis and design
- Documentation of analyses to support decisions



Decision Support Tool - Documentation

User Guide:

- Overview and purpose
- Capabilities and limitations
- Step-by-Step instructions
- Report generation and interpretation
- Input worksheet
- Explanation of scoring method

Instructional Video

- 20 minutes
- Step-by-step through data entry and report generation

APPENDIX A: Decision Support Tool Worksheet

This worksheet is intended to be used in conjunction with the Decision Support Tool to facilitate gathering and organizing information about your airport for input to the tool. This information will be used in the tool to identify deicing best management practice (BMPs) and technologies that have potential applicability at your airport. The sections are organized by topic and directions are provided.

A. Glycol Use

A.1 Please fill out the following information regarding the type and amount of glycol use at your airport.

1) What type of aircraft deicing fluid (ADF) is in use at your airport?

☐ Propylene glycol ☐ Ethylene Glycol

2) How many annual gallons, on average, are used for each type of fluid as either applied (mixed) or as undiluted (neat)?

Type I _________ ☐ Undiluted (neat) ☐ As applied (mixed)

Average mixture applied for Type I? _________ *(e.g. 55:45 mixture is 55% ADF concentrate and 45% water)*

Type II _________ ☐ Undiluted (neat) ☐ As applied (mixed)

Type IV _________ ☐ Undiluted (neat) ☐ As applied (mixed)

B. Weather

B.1 Please fill out the following weather information as it pertains to your airport.

On average, how many deicing days (including defrosting days) occur per deicing season?	
On average, how many frost deicing days occur per deicing season?	
On average, how many days per deicing season include less than 1 inch of snow (or liquid equivalent of less than 0.1 inch)?	
What is the average deicing season temperature (in Fahrenheit)?	

C. Operations

C.1 The level of activity in an area during deicing conditions may impact the type of best management practices that are potentially applicable. Please provide the following information on congestion and apron areas at your airport during deicing conditions.

What are the relative congestion levels in the following areas?
(lower congestion levels would indicate additional traffic could be accommodated)

Area	Low	Medium	High
Ramps around terminal area	☐	☐	☐
External gates and jetways	☐	☐	☐

C.2 Please provide the following information on aircraft operations during deicing conditions.

What is the peak hourly departure rate during deicing conditions? (air carrier and other commercial aviation)	
Is an area available to install a stationary blend to temperature system which would be convenient to air carrier operations?	Yes / No
Does most aircraft deicing occur in an area where stormwater drainage could be isolated to a dedicated drainage system under deicing conditions?	Yes / No

Capabilities of the Decision Support Tool

- Simulates an expert practitioner's analysis when approaching a deicing project at an unfamiliar airport
- Screens out inapplicable deicer management BMPs
- BMPs that pass the screening analysis are linked with other compatible BMPs that pass the screening analysis
- Applied to a single drainage area
- Scenarios can be saved for future reference or documentation

Limitations of the Decision Support Tool

- Assumptions may not be applicable to unique local situations
- Site-specific and fine-scale evaluations not supported
- Generalized inclusion and exclusion criteria
- Generalized performance estimates
- Costs are not estimated
- Not intended to provide the final word

Uses for the Decision Support Tool: New Systems

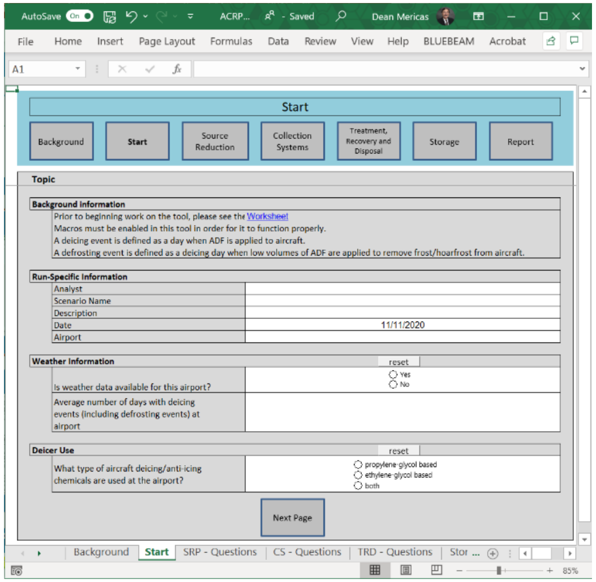
- Identify and understand regulatory requirements
- Explore potentially suitable solutions to managing deicing runoff.
- Gain better understanding of the factors that affect the feasibility of different deicing runoff management BMPs.
- Facilitate discussions with airport management, airlines, regulators or interested third parties.
- Explore different combinations of BMPs
- Reduce time spent researching potential options

Uses for the Decision Support Tool: Existing Systems

- Assess the suitability and performance of a current deicing runoff management system.
- Identify potentially applicable BMPs not currently implemented.
- Support preparation of RFPs for deicer management services.
- Facilitate use of other ACRP guidance documents.
- Understand the limiting factors preventing use of other BMPs.
- Assess possible future deicing runoff management systems.
- Evaluate broad impacts of changing airport conditions.
- Identify potentially applicable BMPs under future conditions.

All Research Products are Downloadable

http://www.trb.org/ACRP/Blurbs/180557.aspx



https://crp.trb.org/acrp0261/w6-1/

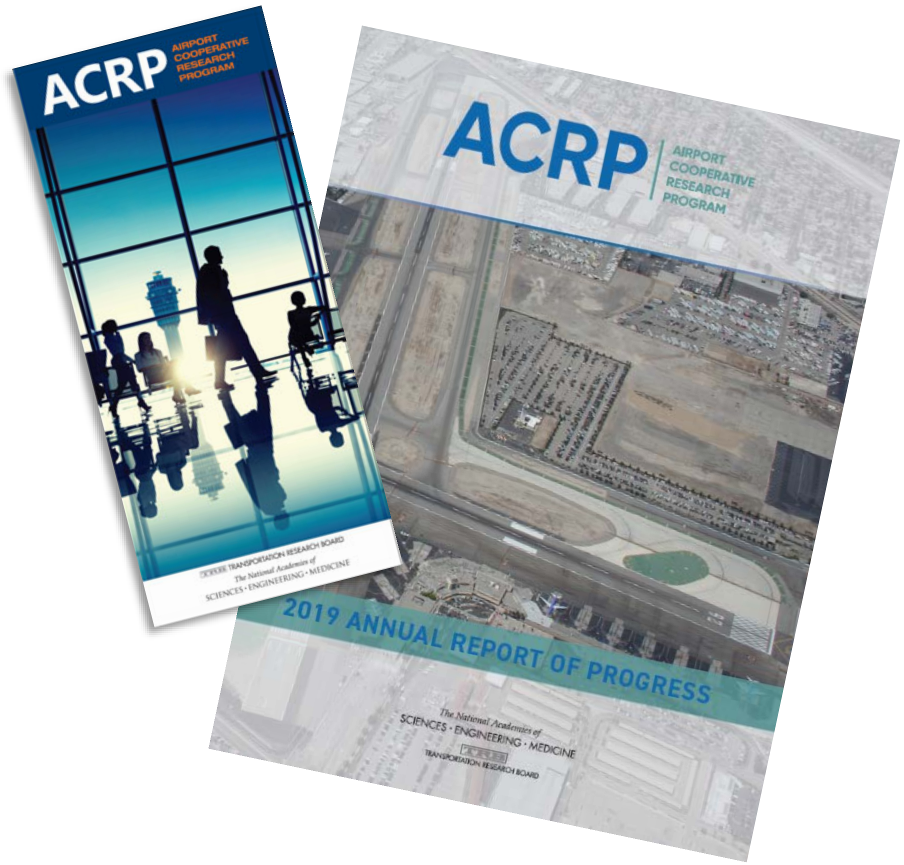
FOR ADDITIONAL INFORMATION

Dean Mericas

Dean.Mericas@MeadHunt.com

ACRP is an Industry–Driven Program

- Managed by TRB and sponsored by the Federal Aviation Administration (FAA).
- Seeks out the latest issues facing the airport industry.
- Conducts research to find solutions.
- Publishes and disseminates research results through free publications and webinars.



Other Ways to Participate

Become an Ambassador. Ambassadors represent ACRP at events and conferences across the country!

Sponsor or become an ACRP Champion. The champion program is designed to help early- to mid-career, young professionals grow and excel within the airport industry.

Visit ACRP's Impacts on Practice webpage to submit leads on how ACRP's research is being applied at any airport.

Visit us online:
www.trb.org/ACRP

Other ACRP Research on Today's Topic

WebResource 3: *Airport Stormwater Resource Library and Training Materials*

Report 45: *Optimizing the Use of Aircraft Deicing and Anti-Icing Fluids*

Report 72: *Guidebook for Selecting Methods to Monitor Airport and Aircraft Deicing Materials*

Report 115: *Understanding Microbial Biofilms in Receiving Waters Impacted by Airport Deicing Activities*

Report 123: *A Guidebook for Airport Winter Operations*

Report 134: *Applying Whole Effluent Toxicity Testing to Aircraft Deicing Runoff*

Report 166: *Interpreting the Results of Airport Water Monitoring: A Guidebook*

Report 169: *Clean Water Act Requirements for Airports*

Report 174: *Green Stormwater Infrastructure – Volume 2: Guidebook*

Visit us online:
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Today's Panelists

#TRBWebinar

Moderator: Kevin Gurchak, *Pittsburgh International Airport*

Dean Mericas

Mead & Hunt

Chuck Pace

EA Engineering, Science, and Technology, Inc., PBC

Tim Arendt

Gresham Smith

WOOLPERT

Design2Train

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Transportation Research Board

Getting involved is free!

Be a Friend of a Committee bit.ly/TRBcommittees

– Networking opportunities
– May provide a path to Standing Committee membership

Join a Standing Committee bit.ly/TRBstandingcommittee

Work with CRP https://bit.ly/TRB-crp

Update your information www.mytrb.org

#TRBAM is going virtual!

- 100th TRB Annual Meeting is fully virtual in January 2021
- Continue to promote with hashtag #TRBAM
- Check our website for more information

TRB turns 100 on November 11, 2020

100 YEARS 2020 TRB

Help TRB:

· Promote the value of transportation research;

· Recognize, honor, and celebrate the TRB community; and

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#TRB100

MOVING IDEAS: ADVANCING SOCIETY—100 YEARS OF TRANSPORTATION RESEARCH