

Weather Issues in Transportation

**Report on Research Focus Groups and
Recommendations for Future Action**

September 2004



Prepared by

**Iowa Department of
Transportation and**

**Center for Transportation
Research and Education**

Table of Contents

Executive Summary	iii
What’s at Stake? The Impact of Weather-related Transportation Hazards	1
Why Now? Foundational Studies	1
AMS Suggestions	2
BASC Suggestions	3
Midwest Regional Forum to Address Weather-related Transportation Issues	4
Identify and Involve Stakeholders	4
The Challenge to Focus Group Attendees	5
Focus Group Organization	5
Problem Statements	6
Funding Alternatives	7
Recommendations for Future Action	10
Appendix A: Focus Group Attendees	
Appendix B: Focus Group Scenarios	
Appendix C: Research Problem Statements from Focus Groups	

Weather Issues in Transportation

A Midwest Approach to Weather-Related Transportation Research

Executive Summary

Weather can have a profound, negative impact on mobility and traveler safety. Nationally, adverse weather is a factor in 1.5 million car and truck crashes and costs society nearly \$42 billion annually. Through ITS and better road weather information, winter maintenance managers, traffic managers, and travelers now have the opportunity to manage traffic and travel to more effectively ameliorate weather's safety and productivity challenges. In the past few years, weather-related transportation issues have become a priority for the national research agenda.

On June 14, 2004, the Iowa Department of Transportation hosted a regional, multi-disciplined forum. The purpose of the forum was to identify Midwest regional research and technology transfer priorities in weather-related transportation research and to discuss the possibility of establishing a regional research program to support the national road weather research agenda.

The June 14 *Weather Issues in Transportation* focus group forum provided an opportunity for transportation agency professionals, professionals representing transportation users, commercial weather data and forecast providers, and members of the meteorology community to express their priorities for weather-related transportation research and technology transfer. Focus groups were organized into the following eight initiatives:

- Weather Providers
- Weather Users
- Maintenance Equipment & Technologies
- Maintenance Management
- Maintenance Operations
- Traffic Operations & Safety
- Intermodal Traffic
- Design & Construction

The focus groups identified and ranked 25 research problem statements that would require over \$20 million for first-year funding if all projects were started in the same year. Since the U.S. Congress is well into the reauthorization process, special designation funding for the program within the reauthorization of the Transportation Equity Act is unlikely to be successful. However, immediate opportunity exists to submit one or two of the problem statements for consideration in the National Cooperative Highway Research Program for FY 2006 funding consideration. For longer range support and sustainability, a Midwest Center for Transportation Weather Research should be established using private and public funding options.

Weather Issues in Transportation

A Midwest Approach to Weather-Related Transportation Research

On June 14, 2004, the Iowa Department of Transportation (DOT) hosted a regional, multi-disciplined forum to identify regional research and technology transfer issues and priorities for weather-related transportation research. This meeting also served to provide direction for a formal Midwest-based transportation weather research program that supports the national road weather research agenda.

The vision for this program is to attract resources and research ideas from public and private sources to provide practical solutions to weather-related transportation issues through the most capable teams of individuals and agencies.

What's at Stake? The Impact of Weather-related Transportation Hazards

Weather has a profound impact on our daily life. It influences the way we dress, the activities we can or can't do. Rain will slow traffic, causing us to adjust our routine and leave earlier for a destination. Snow has a major impact on our mobility, and ice can bring us to a standstill. In fact, fog, snow, and ice contribute to over 500 million hours of delay annually on major roadways in the United States.¹

Weather also significantly affects the safety of regional highways and local streets. Nationally, adverse weather is a factor in 1.5 million car and truck crashes each year, resulting in 800,000 injuries and 7,000 fatalities. The estimated annual cost from these crashes amounts to nearly \$42 billion². Motorists traveling Iowa's roadways in 2003 were involved in 4,696 crashes in which weather conditions were recorded as an environmental contributing circumstance. These crashes resulted in 30 fatalities, 158 major injuries, 658 minor injuries, and 1,197 possible and unknown injuries.

Clearly, adverse weather results in huge, negative, societal, and economic impacts.

Why Now? Foundational Studies

While we cannot change the weather, we can take action to counter the adverse effects that weather can have on our lives. Through application of intelligent transportation systems (ITS) and better weather and road weather information (road weather is the micro-climate at the road's surface), winter maintenance managers, traffic managers, and travelers now have the opportunity to manage traffic and travel to more effectively ameliorate weather's safety and productivity challenges.

¹ Weather Information for Surface Transportation National Needs Assessment Report. Silver Springs, MD: U.S. Department of Commerce/National Oceanic and Atmospheric Administration. 2002.

² Lombardo, L. Overview of US Crashes and Environment. Presentation at the WIST II Forum, December 2000.

Weather-related transportation issues have recently become a priority for the national research agenda.

The Federal Highway Administration (FHWA) funded the Board on Atmospheric Sciences and Climate (BASC) of the National Research Council to determine research and technology transfer needs for improving the production and delivery of weather and road weather information for the nation's roadways. The BASC's conclusions were published in a report, *Where the Weather Meets the Road: A Research Agenda for Improving Road Weather Services*, released in early 2004. The report concluded that forecasting and dealing with road weather is a highly interdisciplinary problem, spanning micrometeorology, numerical weather prediction, vehicle technology, meteorological and pavement instrumentation, roadway construction and maintenance, human factors, and technology transfer.³

About the same time, in 2003, the American Meteorological Society (AMS) held a forum to address various issues connected with effective use of road weather information. The AMS Atmospheric Policy Program invited nearly 100 public and private transportation managers and users, representatives of weather information providers, academic researchers, and policy makers knowledgeable about the nation's highway system to participate in the two-day Weather and Highways Forum in Washington, D.C. Event discussions were summarized in a report, *Weather and Highways*, also published in 2004.⁴

Both the BASC and AMS reports suggest a suite of research activities and other efforts to foster the implementation of an improved road weather program:

AMS Suggestions

The AMS *Weather and Highways* report sets forth a concise six-point program as follows:

1. Congress should authorize and provide long-term funding for the appropriate federal agencies to develop a *national road weather research, development, and applications program*, to improve the application of weather information for highway safety and operations.
2. The federal and state departments of transportation should closely coordinate with public, private, and academic sector road weather stakeholders to improve the safety and efficiency of the nation's highway system during adverse weather.
3. DOT/FHWA and NOAA [National Oceanic and Atmospheric Administration], working with state DOTs, should establish a national road weather and road condition data collection, processing, and dissemination infrastructure to improve the safety and efficiency of the roadway system.

³ *Where the Weather Meets the Road: A Research Agenda for Improving Road Weather Services*. The National Academic Press, Washington, D.C. 2004.

⁴ *Weather and Highways*. American Meteorological Society, Washington, D.C. 2004.

4. NOAA/NWS [National Weather Service], commercial weather providers, and weather information users should work cooperatively to improve the observation system, develop and improve forecasts, and enhance the delivery of information and services on road weather.
5. Federal and state DOTs should train the road management community to more effectively integrate weather into the decision process. In addition, the atmospheric science community, particularly academia, should develop course curricula focusing on road weather science and engineering.
6. DOT/FHWA should provide incentives for vehicle manufacturers and highway engineers to raise public and private sector demand for in-vehicle road weather information.

BASC Suggestions

The BASC report suggests establishing a focused, coordinated national road weather research program as noted below:

“The committee finds that there are substantial research questions and opportunities in road weather that warrant a long-term national commitment and therefore recommends the establishment of a focused, coordinated national weather research program. Sufficient knowledge and experience exist today to initiate such a program; however, some aspects of the program exist only in concept and thus will require additional research and experience before they can be completely defined and implemented. A road weather research program is timely in that it can take advantage of investments being made in weather and in transportation research and infrastructure. An incremental investment in integrating these efforts will reap substantial benefits by producing a national road weather information system as part of the nation’s emerging infostructure”.

As recommended in the BASC report, the goals of this road weather research program should be to:

- Maximize the use of available road weather information and technologies;
- Expand road weather research and development to enhance roadway safety, capacity, and efficiency while minimizing environmental impacts; and
- Effectively implement new scientific and technological advances.

In addition, the committee believed that the goals of this road weather research program can best be met through a nationally led program that supports regional centers, national demonstration corridors, and a nationwide solicitation to support individual investigator-led research projects. Establishing and sustaining such a program long enough to achieve its goal will require dedicated funding sources over at least 15 years.

Regional Research Centers. The BASC report suggested that multiple regional centers were preferable to a single national center because each region of the country faces quite different weather conditions. Also the regional centers would have more interaction with stakeholders who ultimately would be the ones to use the research results. The regional centers need to be interdisciplinary, incorporating weather and transportation researchers and practitioners in both the private and public sectors.

National Demonstration Corridors. The BASC report recommended the establishment of national demonstration corridors along two interstate highways to demonstrate the effectiveness of road weather improvements and to facilitate nationwide implementation of research results. An emphasis should be for adjacent states to work together to provide a seamless stream of road weather information to users. This also provides enhanced opportunities for private-public-academic partnerships to develop naturally around these demonstration corridors.

Midwest Regional Forum to Address Weather-related Transportation Issues

Leading the effort to develop a Midwest regional plan, the Iowa DOT and Iowa State University's Center for Transportation Research and Education (CTRE) collaborated with the FHWA to launch a regional forum that would assist in identifying the Midwest's most pressing research and development initiatives for the next decade. The June 14, 2004, *Weather Issues in Transportation* focus group meeting provided an opportunity to identify and involve stakeholders, begin determining research and technology transfer priorities for the region, identify potential funding sources and partners, and plan a preliminary operational structure for a regional center.

Identify and Involve Stakeholders

Forum sponsors wanted to provide the wide community of potential stakeholders the opportunity to express their priorities for weather-related transportation research and technology transfer. Therefore, they invited several transportation agency professionals, professionals representing transportation users, commercial weather data and forecast providers, and members of the meteorology community.

More than 100 attendees participated in the forum, which consisted of several focus group meetings. This multi-discipline group brought experience from nine Midwest state DOTs, three municipalities, the FHWA, 18 representatives from universities, seven personnel from value-added meteorology services, two from the National Weather Service, eight equipment providers, three city and state enforcement officers, and two representatives from Iowa's Asphalt Paving Association and the Iowa Concrete Paving Association. The attendees are listed in Appendix A of this report.

The Challenge to Focus Group Attendees

Forum participants were asked to identify problems they were currently having with weather and road weather as applied to their area of operations and suggest an approach to solving those problems. They were also asked to think about transportation in the year 2020 in terms of driver expectations and road weather technology that will be necessary to meet the safety and mobility needs in the next 16 years. Three scenarios were sent to attendees in advance of the meeting to provide a context for idea generation and help them focus on weather issues in transportation. (These scenarios were taken from the BASC report, Chapter 2, “The Road Weather System of the Future,” and are included in Appendix B of this report.)

Attendees seemed to quickly grasp from the scenarios that reliable current and forecasted weather and road weather information, communicated in a timely and effective manner could assist drivers in making better, safer decisions about their travel plans and react properly when faced with weather that compromises driving conditions. They also knew that the present road weather sensing equipment was not sufficiently reliable to provide the quality data that will be needed to operate systems in the year 2020. They also readily sensed that the current level of awareness and attitude of the driving public had to be changed to get the desired results from the advanced road weather technology.

A current new-car advertisement was effective in demonstrating that cars of 2004 are being equipped with instrumentation to measure road and atmospheric conditions and have sophisticated global positioning and communication capabilities. These onboard systems can access state DOT web sites and environmental sensing stations and obtain raw data of doubtful quality from some stations for decision making.

Some of the field maintenance attendees had participated in the FHWA’s Maintenance Decision Support System field evaluations during the winters of 2002–2003 and 2003–2004. These attendees had a good grasp of how sophisticated modeling can now be used to support their field operations. These models integrate real-time road weather observations such as current weather, road conditions, and rules of practice to provide decision support for snow and ice treatments. It was apparent that similar models could be developed to serve other roadway maintenance operations, transportation managers, emergency managers, and personnel who build roads.

Focus Group Organization

Attendees were organized into eight initiatives as follows:

- Weather Providers
- Weather Users
- Maintenance Equipment and Technologies
- Maintenance Management
- Maintenance Operations
- Traffic Operations and Safety
- Intermodal Traffic
- Design and Construction

Problem Statements

Following is a listing of 25 research problem statements developed by participants of the eight focus groups. Details of each problem statement can be found in Appendix C of this report. Each attendee was given ten votes to indicate their preferences. The raw number of votes each problem received from all attendees is listed in parenthesis. No normalization techniques were used to account for audience imbalance.

- **Weather Providers (Facilitator: Steve Andrie, ISU/CTRE)**

- #1: Improving Fixed Platform Data Collection (42 votes)
- #2: Improving Forecasting Models, Data, and Dissemination (33 votes)
- #3: Developing Visibility Mitigations (12 votes)

- **Weather Users (Facilitator: Gerry Ambrosion, Iowa DOT)**

- #4: Researching, Developing, and Implementing a Public Communications and Education Plan (11 votes)
- #5: Researching and Developing a User-Based Decision-Making Model (8 votes)
- #6: Researching, Developing, and Implementing an Integrated Data Collection and Reporting System (22 votes)

- **Maintenance Equipment and Technologies (Facilitator: Duane Smith, ISU/CTRE)**

- #7: Developing an Automated Real-Time Data Collection System (59 votes)
- #8: Improving Snow Plow Design (47 votes)
- #9: Developing Public Warning Systems (16 votes)
- #10: Developing the Maintenance Decision Support System (32 votes)

- **Maintenance Management (Facilitator: Bob Hill, Iowa DOT)**

- #11: Educating Vehicle Operators and Users in Inclement Weather (15 votes)
- #12: Providing Real-Time Feedback from Users of Vehicle Sensors (24 votes)
- #13: Developing Operationally-Focused Weather and Road Weather Information and Decision Support Assistance (29 votes)
- #14: Developing Performance Measures and Levels of Service (21 votes)

- **Maintenance Operations (Facilitator: Tom Maze, ISU/Civil Engineering)**

- #15: Developing Mobile Weather Observing Platforms (31 votes)
- #16: Identifying Un-Forecasted Safety Critical Weather Events (29 votes)
- #17: Developing Better Radar Systems (22 votes)

- **Traffic Operations and Safety (Facilitator: Carol Culver, Iowa DOT)**

- #18: Implementing Multi-Disciplined Road Weather Training (29 votes)
- #19: Developing Real-Time Road Weather Messaging (56 votes)
- #20: Establishing Weather-Based Speed Limits (28 votes)

- **Intermodal Traffic (Facilitator: Neil Volmer, Iowa DOT)**

- | |
|---|
| #21: Establishing a Flood Monitoring and Prediction System (21 votes) |
| #22: Integrating Multimodal Data into Traveler Information (2 votes) |

- **Design and Construction (Facilitator: Tom Cackler, ISU/CTRE)**

- | |
|---|
| #23: Developing a 4D Design Model (34 votes) |
| #24: Developing Accurate Local Weather Forecasting and Construction Decision Support (42 votes) |
| #25: Improving Construction Techniques through Weather Sensitivity Analysis (18 votes) |

The intent and scopes of the resulting 25 research problem statements did overlap in many areas, reflecting several common issues and areas of need identified by multiple focus groups. Common research themes included the need for more reliable data through expansion and improvement of data collection techniques and technologies, the need for improved availability of data to potential users through more effective means of dissemination, and the need for a more informed and weather-savvy driving public through improvements in education and communications.

These common themes suggest that results of many eventual research efforts could be applied in several areas and ultimately be beneficial to multiple user groups and multiple locations.

Funding Alternatives

The 25 research problems developed from the focus groups would require more than \$20 million for first year funding if all of them were undertaken independently and started in the same year. Funding of this magnitude would, in all likelihood, require special designation within the reauthorization of the Transportation Equity Act and/or leveraging of state and national funding. Since the US Congress is well into the reauthorization process, it is unlikely that attempts to obtain direct funding from congress would be successful. Furthermore, the size and scope of these research problem statements are not well suited for the typical state research effort. Therefore, a regional research effort would seem to be the reasonable approach.

Several opportunities are available to submit these research problem statements for national funding in established national programs. A brief explanation of those funding resources follows:

National Cooperative Highway Research Program. A large potential source of funding is the National Cooperative Highway Research Program (NCHRP). For Fiscal Year 2005, projects totaling \$25,100,000 were selected and recommended for funding. The program is administered by the Transportation Research Board and sponsored by member departments of the American Association of State Highway and Transportation Officials AASHTO in cooperation with FHWA. Support is voluntary and funds are drawn from the states' Federal-Aid apportionment of State Planning and Research (SPR) funds. These funds can be spent only for the administration of problems approved on ballot by at least two-thirds of the states.

Each year in early July, the AASHTO Standing Committee on Research (SCOR) solicits problems from four authorized sources: (1) the chief administrative officers of the member highway and transportation departments, (2) the chairs of AASHTO's committees and subcommittees, (3) AASHTO's board of directors, and (4) the FHWA.

Problem statements are due September 15th. On receipt, FHWA and NCHRP evaluations are performed. These evaluations are sent to submitters around mid November, and submitters have until early December to comment on the evaluations or withdraw the problem statement. Late each December, these new problem statements along with any continuation projects from previous years go to the SCOR and the AASHTO Research Advisory Committee (RAC) with a ballot for rating the new problems according to priority. SCOR determines final priorities at a meeting in Washington, DC in late March. An Announcement of Research Projects is prepared each year in April. This Announcement details the preliminary scopes of work that will be considered in requests for proposals. Projects usually range from \$100,000 to over \$1,000,000. A list of these projects is available at <http://www4.nas.edu/trb/crp.nsf/upcoming/>.

Two continuing NCHRP projects are of particular interest to the Midwest initiative:

1. NCHRP Project 20-05, Continuing Project to Synthesize Information Related to Highway Problems. Sometimes much information, either documented or in terms of undocumented experience and practice, already exists that relates to the problem statement. Unfortunately, this information is often fragmented, scattered, and under-evaluated. In this 20-05 project, particular highway problems are designated as topics for information synthesis. For each topic the project objectives are as follows: (1) locate and assemble documented information; (2) learn what engineering practice has been used for solving or alleviating the problem; (3) identify all ongoing research; (4) learn what problems remain largely unsolved; (5) organize, evaluate, and document the useful information that is acquired; and (6) evaluate the effectiveness of the synthesis after it has been in the hands of its users for a period of time.

The NCHRP Project Committee SP20-5 meets each year to select topics for study. Current funding is \$1,200,000 which allows initiation of about 12 syntheses per year.

The following factors are considered in the selection process:

- The topic should address a problem that is widespread enough to generate broad interest in the synthesis.
- The topic should be timely and critical with respect to safety, economic, or social impact.
- The topic is appropriate if current practice is non-uniform or inconsistent from agency to agency, or if the validity of some practices appears to be questionable.
- The quality and quantity of useful available information should indicate a need to organize and compress that which has already been learned and written on the topic.
- The topic should not be one where ongoing research or other activities in progress might be expected to render the synthesis obsolete shortly after completion.

Candidate topics are suggested by members of the Project 20-5 Committee and by a variety of other sources, including state department of transportation personnel; FHWA, AASHTO, and TRB committees; and other practitioners and researchers. They can be submitted via the internet using the “Suggest an NCHRP or TCRP Topic” button provided on the Synthesis home page, <http://www4.trb.org/trb/synthesis.nsf>.

2. NCHRP Project 20-7, Continuing Research for AASHTO Standing Committee on Highways. The AASHTO Standing Committee on Highways (SCOH) is continually called on to rule on engineering and operations policies as a guide for state highway and transportation departments to follow. Requests for this research to aid in the development of guides, standards, policies and other AASHTO activities are usually initiated within the subcommittees of SCOH. Projects are usually in the \$50,000 to \$75,000 range. Total annual funding available is \$850,000. To view the variety of topics that have been funded, log on to <http://www4.trb.org/trb/crp.nsf/All+Projects/NCHRP+20-07>.

Transportation Pooled Fund Program. Another funding resource may be the FHWA Transportation Pooled Fund Program. When significant or widespread interest is shown in solving transportation-related problems, stakeholders can jointly fund research, planning, and technology transfer activities. To qualify as a pooled fund study, more than one organization – state transportation agency, federal agency, another agency such as a municipality or metropolitan planning organization, college or university, or a private company – must find the subject important enough to commit funds or other resources to conduct the research, planning, and technology transfer activity.

Federal and state transportation agencies may initiate pooled fund research projects as the sponsoring agency. However, regional and local transportation agencies, private industry, foundations, and colleges and universities may also make in-kind or financial commitments to proposed projects.

FHWA is the broker of funds obligated to pooled fund projects under the Transportation Pooled Fund Program. The normal match for SP&R funds is 80 percent and 20 percent non-federal funding, but the FHWA has the authority to approve the use of 100 percent federal SP&R funding for pooled fund projects at the request of a lead state if it is in the interest of the Federal-aid highway program. An FHWA technical liaison in the technical area of the study is assigned to each pooled fund study at the initiation of the project. Liaisons will give initial feedback on the project from the context of the national research and technology program and participate in the activities of the technical advisory committee.

The sponsoring agency staff may elect to serve in the “lead agency” role and complete the project initiation functions unilaterally. The sponsoring agency and project partners alternately may choose to have the Transportation Research Board or the FHWA manage the project. Definable and measurable implementation is crucial to overall program viability. Therefore, the pooled fund program includes an implementation plan that should be published and fulfilled as part of the pooled fund project.

Recommendations for Future Action

Considering the size and scope of the problem statements defined at the Midwest forum, an immediate opportunity exists to submit by September 15, 2004, one or two of the top priority statements for consideration in the NCHRP FY 2006 program. The lead state for these problem statements should be one with high interest and a strong leader to guide the process if selected for funding. To demonstrate multiple agency high interest in the problem, it will be necessary to obtain the endorsement of the appropriate AASHTO Highway Subcommittee on Maintenance Snow and Ice Task Force Leader, the Chairman of the AASHTO Winter Maintenance Technical Service Program, and the TRB Winter Maintenance Committee chairman and list these people on the submittal.

Looking beyond this immediate opportunity, the Iowa DOT has expressed an interest in providing leadership for the establishment of a Midwest Center for Transportation Weather Research. The center would provide an institutional platform to conduct the following activities:

- Initiate research and technology transfer leading to a significant reduction of the safety and mobility impacts of weather.
- Provide proactive leadership in the development of national and state-level research agendas.
- Support a forum for identifying the gaps in important, high priority, unmet national and state research programs.
- Raise financial resources from public and private sources to address high priority research and technology transfer research needs.
- Provide a mechanism to work with other weather research centers and universities that allows the focusing of the most qualified individuals, teams, and organizations on research and technology transfer activities.

Since the Iowa DOT already has an agreement with its three state universities that encourages and facilitates interaction and cooperation among them, the relevant parties can draw up a simple document describing the center and detailing some basic organizational issues as a low-energy starting point. Once this basic organization is established, a business plan can be written and financing options developed.

Appendix A
Focus Group Attendees

Participants in June 14, 2004 Weather Focus Groups

<u>Organization</u>	<u>Participant</u>	<u>Organization</u>	<u>Participant</u>
3M	Kover, Kyle	Iowa Department of Education	Christensen, Max
American Automobile Association (AAA)	Wedgewood, Phil	Iowa DOT	Adam, John
AASHTO	Smithson, Lee		Ambrosion, Gerry
Associated General Contractors (AGC)	Davis, Charlie		Anderson, Sheri
Ames Police Department	Huff, Geoff		Bane, Jim
City of Cedar Rapids	Parker, Greg		Banowetz, Dick
City of Clive	Weller, Bart		Black, Mark
City of West Des Moines	Hodne, Bret		Bramble, Tracey
Dallas County	Plymesser, John		Burkheimer, Dennis
Delaware County	Nahra, Mark		Crouch, Tim
Des Moines Airport (ret.)	Flannery, Bill		Culver, Carol
Federal Highway Administration (FHWA)	Brachtel, Jim Grogg, Max Murphy, Ray		Dowd, Jim
Goodrich Corporation	Smithberg, Jon Warner, Thad		Dunn, Mark
Grey Island Systems	Body, Chris		Frisch, Russ
Henderson Manufacturing	Holverson, Andy		Havick, Shawn
Illinois DOT	Dameron, Harold		Heinlen, Phil
Indiana DOT	Belter, Dennis		Hill, Bob
Iowa Asphalt Paving Association	Kvach, Michael	Iowa Department of Public Safety	Jerman, Troy
Iowa Concrete Paving Association	Smith, Gordon	Iowa Highway Patrol	Kennerly, Mike
Iowa Department of Agriculture	Hillaker, Harry	ISU/Agronomy	Krohn, Mike
			Larson, Sandra
			Mahoney, Kevin
			Marr, Mike
			McCauley, Diane
			Morrow, Kenneth
			Osborne, Brad
			Roethlisberger, Randy
			Rorholm, Dwight
			Sebben, Tony
			Shuler, Bill
			Sorenson, Willy
			Stein, Will
			Sunday, Wayne
			Vander Zwaag, Jeff
			Vigdal, Roger
			Volmer, Neil
			Whited, John
			Wilkinson, Lee
			Rushing, Bob
			Grant, Larry
			Misel, Todd
			Herzmann, Daryl

<u>Organization</u>	<u>Participant</u>	<u>Organization</u>	<u>Participant</u>
ISU/Civil Engineering	Maze, Tom	University of North Dakota (UND)	Cammack, Paul Tilley, Jeff
ISU/CTRE	Albrecht, Chris Andrle, Steve Kroeger, Dennis Smith, Duane	University of Northern Iowa (UNI)	Czarnetzki, Allen Somerville, John
ISU/Logistics	Crum, Mike	UNI and Iowa Academy of Science	Johnson, Craig
ISU/Meteorology	Gallus, Bill Greenfield, Tina Takle, Gene	UNI/NRVC	Smith, Daryl
ISU/PCC Center	Cackler, Tom Smith, Harold	UNI/Psychology	Wallace, Julia
Manatts, Inc.	Banes, Jeff	University of Iowa	Lee, Hosin Nixon, Wilf
Meridian	Block, Cory Hart, Bob	Wisconsin DOT	Adams, Mike Martinelli, Tom
Meteorlogix	Alviani, Jim Block, Jim Cornelsen, Doug	WOI Radio and ISU/Agronomy	Taylor, Elwyn
Minnesota DOT	Wikelius, Mark		
Missouri DOT	Jackson, Tim		
Monroe Truck Equipment	Davis, Kevin		
Nebraska DOR	Mattison, Mike Ronnau, Dalyce		
North Dakota DOT	Horner, Jerry		
NWS	Small, Brad		
Ohio DOT	Evans, Diane		
Persuade and Publish International	Piconi, Karen		
Salt Institute	Hanneman, Dick		
Surface Systems, Inc. (SSI)	Kinion, Kurt		

Appendix B

Focus Group Scenarios

The following narratives are taken from the National Academy of Sciences report

“Where the Weather Meets the Road”

.....
We have included these excerpts to help create a context for issues to be discussed on June 14th, at the Weather Issues in Transportation focus group meeting.

1. Amy is the senior traffic manager for the Dallas-Fort Worth Metroplex area, the “Golden Triangle” that includes Denton to the north, Dallas to the southeast, and Fort Worth to the southwest. It is November 25, 2030, the Wednesday before Thanksgiving, and the American Automobile Association is predicting that 37 million people will be traveling 50 miles or more by car; of those, 750,000 are expected in the Dallas-Fort Worth area, and many have already begun to hit the roads. In her operations center Amy watches a late-season line of strong thunderstorms move through the area accompanied by lightning, heavy rain on the order of an inch per hour, and winds gusting to 40 mph. Her radar display indicates the heaviest precipitation has moved into the metro area. Amy consults her traffic simulation model that monitors traffic and weather in real-time and predicts congestion out to three hours; she sees that there should be no major delays for the millions of people trying to get to their friend’s or relative’s home to eat turkey and give thanks. Her suite of traffic cameras confirm the model; upon onset of the heavy rain, all vehicles have automatically slowed and reconfigured for optimal traction on wet roads, and the automatic spacing between the cars has increased. Although the line of storms is narrow, Amy thinks back to earlier in this century when a line of storms similar to this would have jammed the already busy freeways and caused accidents, further compounding the holiday congestion and creating ripple effects that would have lasted throughout the day. Thankful for the research and technology that now facilitate smooth traffic flow in inclement weather, Amy sits back and relaxes, unworried by the steady rhythm of rain on the roof of the building.

2.

Lou is driving his semi-trailer tractor north on Interstate-35 across Iowa headed to Duluth, Minnesota. A major winter storm is heading east, with a foot of snow and strong winds forecast for much of northern Iowa and southern Minnesota. He consults his dispatcher using his “always-on” communication system to ask whether he should continue driving through the storm, stop and wait for the storm to pass, or head east and detour around the storm. The dispatcher must consider Lou’s safety and the possibility that he’ll be marooned for a few days if he continues, additional fuel and other vehicle costs, and any change in the time of delivery to the customer. Based on a continuously updated forecast that the storm is going to stay west of I-35, the dispatcher decides that Lou should continue on his original route. After a couple hours, however, the forecast now indicates the snow will spread farther east, causing patchy snow and ice accumulation on the road. Several vehicles about a mile ahead detect the icy conditions and report this through the highway’s intelligent network. The main communication computer on Lou’s truck picks up these reports, alerts Lou with a yellow light in the corner of his head-up display, and automatically reconfigures for better traction. Lou’s dispatcher also monitors and relays to Lou information about the status of plowing and chemical treatments, automated spray of chemicals to anti-ice bridges, and traffic and visibility conditions, as well as the progress of the storm.

3.

Curt, the winter weather maintenance official responsible for western Montana, is awakened at 1:00 a.m. by his beeper; the forecast service has sent out an alert that snow expected to arrive in his region of responsibility is still on track and will begin shortly. He uses his personal information management system to access a suite of decision support tools, including highly localized weather forecasts, a sophisticated road temperature model, and an application that helps him choose treatment options. Curt is most concerned about two mountain passes that typically ice up first due to their higher elevation. He finds that three pavement sensors in a mountain pass confirm the previous evening’s forecast that pavement temperatures would fall to below freezing just in that area. Curt quickly posts the weather radar display on his screen and the precipitation extrapolation shows that snow indeed is due at the mountain pass in a little over two hours. Based on this information, Curt quickly concludes that an anti-icing treatment would be necessary to ensure sufficient friction in the mountain pass in time for people to drive to work in the morning. A few verbal commands bring up his newly installed winter road maintenance decision aid system. It already has ingested all of the current weather and transportation information and confirms Curt’s preventative maintenance strategy. It also recommends the precise amount of brine to apply for the current and forecast pavement temperatures and snow amount as well as the length of the roadway, based on road elevation, to treat on either side of the pass. Based on this information, Curt decides that an anti-icing treatment is warranted. He contacts the several employees he had placed on call the night before based on the weather forecasts he received, and by 2:30 a.m. they begin to apply liquid brine at the recommended rates to the road segments identified. The trucks are equipped with sensors for road temperature, air temperature and humidity, precipitation, and surface chemistry and friction along with a computer system that determines how much additional chemical treatment is necessary to address the conditions.

Appendix C

Research Problem Statements from Focus Groups

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Weather Providers
Facilitator Name: Steve Andrle, ISU/CTRE
Date: June 14, 2004

Initiative Team Members: Steve Andrle (ISU/CTRE), John Whited (Iowa DOT), Shawn Havick (Iowa DOT), Harry Hillaker (Iowa Department of Agriculture), Elwyn Taylor (WOI Radio and ISU/Agronomy), Gene Takle (ISU/Meteorology), Bill Gallus (ISU/Meteorology), Tina Greenfield (ISU/Meteorology), Daryl Herzmann (ISU/Agronomy), Allen Czarnetzki (UNI), Craig Johnson (UNI and Iowa Academy of Science), Jeff Tilley (University of North Dakota), Brad Small (National Weather Service), Thad Warner (Goodrich Corporation), Kurt Kinion (SSI), Jim Block (Meteorlogix), Cory Block (Meridian)

Initiative #1 Title: Improving Fixed Platform Data Collection (42 votes)

1. Background and Problem Statement _____

Currently, there are significant issues concerning the quality of data produced by several types of fixed-location environmental sensors stations (ESS) or observing platforms. These issues include the low density of most fixed observation platform networks, the frequency of data collection at these sites, the accuracy of the sensors (especially concerning humidity), the necessary maintenance and calibration of sensors, the existence of multiple proprietary and public data formats and networks, and the need for better access to sensor data.

In addition, many of the existing observation stations were located with little thought of the location ultimately being representative of a larger roadway segment. In many cases, road weather information systems (RWIS) were located near specific locations of concern with unique characteristics, such as an ice-prone bridge or mountain pass. As a result, several of these locations would not be representative of conditions along the adjacent roadway miles.

2. Research Objectives _____

The objective of this research is to improve upon these data-related issues by investigating the impact of increasing the density of sensors and frequency of sampling, investigating new sensor technologies (radiation, accumulation rate, etc.) to help improve data accuracy, improving maintenance and preservation of observation platforms (RWIS, AWOS, etc.) once they are in place, improving access to historical and real-time data, and researching ways to standardize multiple ESS data formats and create interoperable networks.

3. Resource Needs and Time Frame _____

This research will involve a program of research. Therefore, this activity should become a multi-year program and be housed under a consortium such as the Aurora Program. In addition, significant resources are required to proceed with the above agenda of research activities. Therefore, it is recommended that \$500,000 per year be allocated to the Aurora Program to initiate activities of importance to improving the information available from fixed platform environmental sensors stations.

4. Intended Users _____

Ultimately all users of road weather information will benefit from better information provided by fixed platform sensors. These users include state departments of transportation, local governments, commercial and private road users, and several other users of surface weather information (railroads, contractors, etc.).

5. Implementation _____

Research could be implemented by member agencies of the Aurora Program and other state transportation agencies, NOAA, USDOT, sensor system integrators and vendors, value added meteorologists, and other weather service providers.

6. Other Outside Parties _____

Other potential parties have yet to be determined.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Weather Providers
Facilitator Name: Steve Andrle, ISU/CTRE
Date: June 14, 2004

Initiative Team Members: Steve Andrle (ISU/CTRE), John Whited (Iowa DOT), Shawn Havick (Iowa DOT), Harry Hillaker (Iowa Department of Agriculture), Elwyn Taylor (WOI Radio and ISU/Agronomy), Gene Takle (ISU/Meteorology), Bill Gallus (ISU/Meteorology), Tina Greenfield (ISU/Meteorology), Daryl Herzmann (ISU/Agronomy), Allen Czarnetzki (UNI), Craig Johnson (UNI and Iowa Academy of Science), Jeff Tilley (University of North Dakota), Brad Small (National Weather Service), Thad Warner (Goodrich Corporation), Kurt Kinion (SSI), Jim Block (Meteorlogix), Cory Block (Meridian)

Initiative #2 Title: Improving Forecasting Models, Data, and Dissemination (33 votes)

1. Background and Problem Statement _____

Those making travel or maintenance decisions based on weather data and/or information need accurate weather forecasting and significant lead time in order to make prudent decisions. The primary issues impacting forecasts include data ingestion, model accuracy, dissemination of model outputs, and forecast confidence (including level of probability). Important forecast components in these models include frost, humidity, radiation (pavement temperature), visibility, precipitation start and stop times, wind speed and direction. Of these elements, frost, humidity, and pavement radiation were identified as the most critical in Midwestern states.

The difficulty in using model outputs is due to the blending of two different scientific approaches to two different climatology phenomena, atmospheric weather and road weather. Each of these phenomena has unique micro-climate level features. Furthermore, in the early stages of each winter season, winter maintenance decision-makers often see less accuracy in their forecasts as models develop and adjust to the specific weather events. This problem also carries the risk of a secondary impact – the loss of confidence in forecasts that could last throughout a winter season.

2. Research Objectives _____

The objective of this research would be to ultimately improve forecasts by improving data ingestion, modeling practices, and forecast outputs.

3. Resource Needs and Time Frame _____

This is significant problem that cannot be addressed in one project. Instead, a program to improve forecasting models, data, and dissemination is recommended. It is also recommended that this program be funded at \$4,000,000 per year and is based at a university, or university-like organization, but funding should be available to the private and public sector through competitive grants focusing on key road weather forecasting modeling, data, and dissemination issues. As the program matures, it will focus on program of research which builds on past findings and funds high risk, high benefit projects.

4. Intended Users _____

The results of the research would focus on the entire community of road weather users – private and commercial drivers, weather professionals, and road maintenance programs of local and state governments.

5. Implementation _____

Research results could be implemented by state departments of transportation, the national weather service, RWIS system integrators, and other providers of weather information.

6. Other Outside Parties _____

Other parties have yet to be determined.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Weather Providers
Facilitator Name: Steve Andrlle, ISU/CTRE
Date: June 14, 2004

Initiative Team Members: Steve Andrlle (ISU/CTRE), John Whited (Iowa DOT), Shawn Havick (Iowa DOT), Harry Hillaker (Iowa Department of Agriculture), Elwyn Taylor (WOI Radio and ISU/Agronomy), Gene Takle (ISU/Meteorology), Bill Gallus (ISU/Meteorology), Tina Greenfield (ISU/Meteorology), Daryl Herzmann (ISU/Agronomy), Allen Czarnetzki (UNI), Craig Johnson (UNI and Iowa Academy of Science), Jeff Tilley (University of North Dakota), Brad Small (National Weather Service), Thad Warner (Goodrich Corporation), Kurt Kinion (SSI), Jim Block (Meteorlogix), Cory Block (Meridian)

Initiative #3 Title: Developing Visibility Mitigations (12 votes)

1. Background and Problem Statement _____

There are numerous potential causes of poor roadway visibility, both natural and man-made. Fog, smoke, dust, and precipitation can all significantly impact driver visibility. In addition, factors such as wind, roadway geometrics, and land cover can contribute to serious visibility issues, especially during snow events. Lastly, travelers and vehicles can also contribute to poor visibility with exhaust and road spray. All of these sources can be serious safety concerns on a given roadway. To complicate matters, many instances of poor visibility can be localized and difficult to predict.

2. Research Objectives _____

The objective of this research is to investigate possible solutions (roadway design, technologies, etc.) to improve driver visibility during certain weather events. Possible solutions include lane guidance technologies (markings or night vision), technology to disperse local fog conditions, and improvements in roadway and bridge design (living snow fences).

3. Resource Needs and Time Frame _____

This research is more likely possible as a program to improve roadway visibility through a variety of strategies. It is recommended that a program be funded at \$1,000,000 per year.

The program will seek proposals from the public and private sectors to develop and test technology, design solutions, and methodologies to improve driver visibility.

4. Intended Users _____

On-board vehicle technology developed will be used by vehicle manufactures, by after market equipment manufacturers, and by vehicle operators. Infrastructure-based improvements will be used by highway agencies at the state and local levels.

5. Implementation _____

Depending on the type of improvement, the developments will be implemented by either the public or private sectors.

6. Other Outside Parties _____

Other parties could include the American Automobile Association (AAA), vehicle manufacturer association, the United States Congress, USDOT, and others.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Weather Users
Facilitator Name: Gerry Ambroson, Iowa DOT
Date: June 14, 2004

Initiative Team Members: Gerry Ambroson (Iowa DOT), Karen Piconi (Persuade and Publish International), Willy Sorenson (Iowa DOT), Randy Roethlisberger (Iowa DOT), Mark Wikelius (Minnesota DOT), Mike Adams (Wisconsin DOT), Max Christensen (Iowa Department of Education), Mike Crum (ISU/Logistics), Jim Alviani (Meteorlogix), Julia Wallace (UNI/Psychology), Bob Hart (Meridian)

Initiative #4 Title: Researching, Developing, and Implementing a Public Communications and Education Plan (11 votes)

1. Background and Problem Statement _____

Much too often the motoring public drives unknowingly into weather situations and traffic conditions that they ultimately do not want to be in or should not be in. Therefore, there is a need to effectively communicate with, motivate, and educate the public about weather-related transportation issues so that they can or will choose to stay out of harms way or drive appropriately in less than ideal conditions. In addition, new research is needed to understand the human factors that motivate drivers to appropriately respond to road weather and road condition information and to determine how that information should be most effectively delivered.

2. Research Objectives _____

The objective of this research is to conduct user-based research to determine what information is needed and how, when, and where this information should be distributed to best ensure driver safety. Research should focus on understanding the human factors that motivate drivers to appropriately respond to road weather and road condition information (insurance discounts for continuing education and accident free driving) and determining how that information should be most effectively delivered (script on bottom of TV, warning message via radio, road and road weather web sites, variable message signs along the roadway, etc.). The possible outcomes of this effort include recommendations for public service announcements, student training materials, insurance discounts/policy requirements, brochures, and web site suggestions/tips.

3. Resource Needs and Time Frame _____

The research team should include human factors experts, adult learning specialists, a representative from the Iowa Association of Safety Educators, AAA representatives, winter maintenance specialists, driver training specialists, and representatives from the insurance and trucking industries. The project will take approximately two years to complete and cost about \$150,000. Funding sources to consider are NCHRP, FHWA, NHTSA, and regional or state DOT pooled funds.

4. Intended Users _____

Potential users would include state and local government agencies, transit and truck fleet managers, driver education programs, AARP, National Highway Traffic Safety Administration, media (television and radio), and insurance companies.

5. Implementation _____

All transportation agencies in the private and public sector, insurance companies, media, and educators could be potential implementers.

6. Other Outside Parties _____

Other potential parties have yet to be determined.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Weather Users
Facilitator Name: Gerry Ambroson, Iowa DOT
Date: June 14, 2004

Initiative Team Members: Gerry Ambroson (Iowa DOT), Karen Piconi (Persuade and Publish International), Willy Sorenson (Iowa DOT), Randy Roethlisberger (Iowa DOT), Mark Wikelius (Minnesota DOT), Mike Adams (Wisconsin DOT), Max Christensen (Iowa Department of Education), Mike Crum (ISU/Logistics), Jim Alviani (Meteorlogix), Julia Wallace (UNI/Psychology), Bob Hart (Meridian)

Initiative #5 Title: Researching and Developing a User-Based Decision-Making Model (8 votes)

1. Background and Problem Statement _____

The criterion an individual uses to make trip planning decisions is not well understood. Motorists do not always use good judgment in determining whether to begin, delay, or start earlier on a planned trip when provided current or forecasted weather or traffic conditions. The urge to continue a trip as originally planned and not disrupt those activities too often sends the motorist into harms way. This is often the case even when the trip purpose was not urgent and could have started earlier based on the forecasted event or delayed because of current conditions.

While the reasons individuals use to make trip planning decisions is not well documented, the same holds true in understanding the criteria an individual uses to make driving decisions. As long as traffic is flowing smoothly at high speed at capacity volumes, drivers seem to operate safely, but as soon as any interruption occurs (from a quick lane change, obstacle in the travel way, etc.) panic often sets in and unpredictable driving behavior occurs. Research is needed to determine what transportation policies and procedures are important to communicate that users must understand in order to make informed driving decisions based on their needs, profiles, and costs.

2. Research Objectives _____

Research should begin by developing individual user criteria for make driving decisions and understanding the how, when, where, and why of the decision process. The process then needs to be modeled into a decision support system which will ultimately develop solutions for the user. These solutions need to be interactive so the user gets an education on the outcomes of each alternative.

3. Resource Needs and Time Frame _____

A research team should consist of experts knowledgeable in the various sciences of behavior/logic/cognition/performance, adult learning specialists, multimedia specialists, representative from the insurance industry and Iowa Association of Safety Educators, a AAA representative, and an RWIS expert. The project will take about three years and \$2 million to fund. Funding sources include NHTSA, NHI, NCHRP, FHWA, state departments of transportation pooled fund sources, and the insurance industry.

4. Intended Users _____

Potential users include federal, state and local transportation agencies, AASHTO, AAA, enforcement personnel, the motoring public, educators, insurance companies, and road contractors.

5. Implementation _____

All transportation agencies operating highways, the motoring public, trucking agencies, schools and universities, and the insurance industry could be potential implementers.

6. Other Outside Parties _____

Other parties have not been determined to date.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Weather Users
Facilitator Name: Gerry Ambroson, Iowa DOT
Date: June 14, 2004

Initiative Team Members: Gerry Ambroson (Iowa DOT), Karen Piconi (Persuade and Publish International), Willy Sorenson (Iowa DOT), Randy Roethlisberger (Iowa DOT), Mark Wikelius (Minnesota DOT), Mike Adams (Wisconsin DOT), Max Christensen (Iowa Department of Education), Mike Crum (ISU/Logistics), Jim Alviani (Meteorlogix), Julia Wallace (UNI/Psychology), Bob Hart (Meridian)

Initiative #6 Title: Researching, Developing, and Implementing an Integrated Data Collection and Reporting System (22 votes)

1. Background and Problem Statement _____

There is great need to develop and implement a national integrated data collection and reporting system for weather, road weather, and road conditions. As part of this system, road weather and weather data need to include both present and forecasted conditions. In addition, universal standards are needed to convey road and weather conditions to end users. Data also needs to be time/date stamped and quality assured.

2. Research Objectives _____

The objective of this research is to develop, test, and implement an efficient, reliable, consistent, and inexpensive system that delivers accurate and timely data in a format that is easily understood and accessible to the motoring public.

3. Resource Needs and Time Frame _____

The research team should consist of experts from standard development organizations, communication specialists, RWIS experts, winter maintenance experts, multimedia specialists, automotive manufacturers, FHWA personnel, AASHTO members, AAA representatives, insurance industry representatives, state DOT personnel, and NCAR staff. The project will take about two years to accomplish and require approximately \$1 million in funding.

4. Intended Users _____

Potential users would include federal, state and local governments, FHWA, AASHTO, AAA, NOAA, enforcement personnel, traffic managers, motoring public, educators, insurance companies, and road contractors.

5. Implementation _____

All transportation agencies operating highways, enforcement personnel, emergency managers, trucking agencies, educators, automotive manufacturers, and insurance industry would be able to participate in the implementation.

6. Other Outside Parties _____

Other partners have yet to be determined.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Maintenance Equipment and Technologies

Facilitator Name: Duane Smith, ISU/CTRE

Date: June 14, 2004

Initiative Team Members: Duane Smith (ISU/CTRE), Dennis Kroeger (ISU/CTRE), Jim Dowd (Iowa DOT), Phil Heinlen (Iowa DOT), Jim Bane (Iowa DOT), Mike Krohn (Iowa DOT), Dick Hanneman (Salt Institute), John Somerville (UNI), Dalyce Ronnau (Nebraska DOR), Jerry Horner (North Dakota DOT), Jeff Vander Zwaag (Iowa DOT), Paul Cammack (University of North Dakota), Harold Dameron (Illinois DOT), Tony Sebben (Iowa DOT), Bill Shuler (Iowa DOT), Jon Smithberg (Goodrich Corporation), Brad Osborne (Iowa DOT), Kenneth Morrow (Iowa DOT), Mark Black (Iowa DOT), Andy Holverson (Henderson Manufacturing), Chris Body (Grey Island Systems), Kevin Davis (Monroe Truck Equipment)

Initiative #7 Title: Developing an Automated Real-Time Data Collection System (59 votes)

1. Background and Problem Statement _____

Snow plow operators and maintenance supervisors need to make quick and precise decisions when fighting winter storms. To make these decisions appropriately, they need accurate and reliable road condition and weather information and short-term (1-2 hour) forecasts. In addition, the information needs to be delivered to them in a simple format that can be readily understood even while in a plow truck delivering services.

2. Research Objectives _____

The objective of this research is to develop automated systems and methods that gather necessary data for winter maintenance operators and supervisors. The systems should:

- A. Identify required data on road weather conditions and short-term forecast conditions.
- B. Identify sources of those data and verify its timeliness, reliability and accuracy. Such sources might include appurtenances on snow plows, commercial trucks, or taxicabs that determine road surface conditions (for example, friction measuring device or Frensor freezing point detection devices).
- C. Identify technologies to integrate required data, receiving inputs in various formats and integrating it into a single format.
- D. Evaluate reporting systems and required technologies to convert the integrated data into useful format(s), including paper and electronic reports.
- E. Identify systems to validate and calibrate these systems and methods based on actual storm events.

3. Resource Needs and Time Frame _____

The research team should consist of RWIS experts, winter maintenance experts, FHWA personnel, AASHTO members, state DOT personnel, and NCAR staff. The project will take about two years to accomplish a study and require approximately \$100,000 in funding to cover a couple of winter seasons. A pooled-fund could be utilized to cover different areas of research.

4. Intended Users _____

Potential users would include state and local governments.

5. Implementation _____

State highway agencies, weather service providers, universities, and technology providers would be able to participate in the implementation.

6. Other Outside Parties _____

Other partners have not been determined yet.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Maintenance Equipment and Technologies

Facilitator Name: Duane Smith, ISU/CTRE

Date: June 14, 2004

Initiative Team Members: Duane Smith (ISU/CTRE), Dennis Kroeger (ISU/CTRE), Jim Dowd (Iowa DOT), Phil Heinlen (Iowa DOT), Jim Bane (Iowa DOT), Mike Krohn (Iowa DOT), Dick Hanneman (Salt Institute), John Somerville (UNI), Dalyce Ronnau (Nebraska DOR), Jerry Horner (North Dakota DOT), Jeff Vander Zwaag (Iowa DOT), Paul Cammack (University of North Dakota), Harold Dameron (Illinois DOT), Tony Sebben (Iowa DOT), Bill Shuler (Iowa DOT), Jon Smithberg (Goodrich Corporation), Brad Osborne (Iowa DOT), Kenneth Morrow (Iowa DOT), Mark Black (Iowa DOT), Andy Holverson (Henderson Manufacturing), Chris Body (Grey Island Systems), Kevin Davis (Monroe Truck Equipment)

Initiative #8 Title: Improving Snow Plow Design (47 votes)

1. Background and Problem Statement _____

Snow plow truck design improvements are needed to increase vehicle conspicuity to other vehicles and improve operators' visibility of the roadway situation. The speed differential between plows and the traveling public is a perceived problem. Plows operating at lower speeds during their operations often cause congestion. It may be advantageous for plows to operate at or near the speed of traffic on the roadways, which is termed "high speed plowing". High speed plowing may also have economic benefits since plow units can cover their routes more quickly, reducing the number of required vehicles, and thus reducing equipment and labor requirements.

2. Research Objectives _____

The objective of this research is to develop and evaluate systems and methods to enhance the operational efficiency and safety of winter maintenance vehicles. The research would:

- A. Investigate systems that enhance visibility of plow operators, including lighting systems.
- B. Investigate the safety and congestion impacts of speed differential between plows and traffic.
- C. Investigate the conspicuity of snow plows and methods to increase vehicle conspicuity.
- D. Investigate systems that enhance operator visibility of conditions around plows.
- E. Investigate appurtenances on snow plows that determine road surface conditions (for example, friction measuring device or Frensor freezing point detection device).
- F. Investigate feasibility of collision avoidance systems.
- G. Investigate feasibility of "heads up displays" (HUD) and lane departure warning systems.

3. Resource Needs and Time Frame _____

We recommend that this activity become a two-year program, possibly housed under a pooled-fund program of several states. Significant resources are required to proceed with the above agenda of research activities. Therefore, we recommend that \$500,000 is allocated to initiate activities of greatest importance.

4. Intended Users _____

Potential users would include state and local governments.

5. Implementation _____

State highway agencies and technology providers would be able to participate in the implementation.

6. Other Outside Parties _____

Other parties have not yet been determined.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Maintenance Equipment and Technologies

Facilitator Name: Duane Smith, ISU/CTRE

Date: June 14, 2004

Initiative Team Members: Duane Smith (ISU/CTRE), Dennis Kroeger (ISU/CTRE), Jim Dowd (Iowa DOT), Phil Heinlen (Iowa DOT), Jim Bane (Iowa DOT), Mike Krohn (Iowa DOT), Dick Hanneman (Salt Institute), John Somerville (UNI), Dalyce Ronnau (Nebraska DOR), Jerry Horner (North Dakota DOT), Jeff Vander Zwaag (Iowa DOT), Paul Cammack (University of North Dakota), Harold Dameron (Illinois DOT), Tony Sebben (Iowa DOT), Bill Shuler (Iowa DOT), Jon Smithberg (Goodrich Corporation), Brad Osborne (Iowa DOT), Kenneth Morrow (Iowa DOT), Mark Black (Iowa DOT), Andy Holverson (Henderson Manufacturing), Chris Body (Grey Island Systems), Kevin Davis (Monroe Truck Equipment)

Initiative #9 Title: Developing Public Warning Systems (16 votes)

1. Background and Problem Statement _____

Drivers, particularly older drivers, lack usable and understandable data to make informed driving decisions. This is true despite the fact that significant amounts of data about adverse weather and roadway conditions are readily available. In-vehicle systems are needed to provide the driving public with usable, understandable information in a uniform format alerting drivers in a timely manner to congestion-inducing work zones, road closures, slow-moving vehicles, and road surface conditions. This information should also identify to the driver the potential options to mitigate conditions (e.g. take a different route, slow down, etc.). Vehicles should then incorporate technologies that automate certain responses (e.g. loss of traction automatically overrides cruise control).

2. Research Objectives _____

The objective of this research is to identify, assess, and develop a system to integrate and format road weather and traffic condition data and to develop a method or methods of transmitting this information to drivers of private passenger and commercial vehicles. The research will:

- A. Assess what information drivers require for safe vehicle operation, including road surface conditions, traffic conditions and local weather conditions.
- B. Assess data sources for timeliness, reliability, and accuracy.
- C. Develop or identify technologies that can deliver this information to drivers.
- D. Develop or identify technologies to automate safety responses to adverse roadway, weather, and traffic conditions and provide drivers with advice on additional optional actions.

3. Resource Needs and Time Frame _____

It is recommended that this activity be addressed over a two-year time frame. It is also recommended that \$300,000 be allocated to this effort.

4. Intended Users _____

Potential users would include private and commercial drivers and their passengers as well as road maintainers and emergency medical personnel. The latter two groups who would have less liability and less demand respectively.

5. Implementation _____

State highway agencies and universities would be able to participate in the implementation.

6. Other Outside Parties _____

The National Highway Traffic Safety Administration may be another interested party.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Maintenance Equipment and Technologies

Facilitator Name: Duane Smith, ISU/CTRE

Date: June 14, 2004

Initiative Team Members: Duane Smith (ISU/CTRE), Dennis Kroeger (ISU/CTRE), Jim Dowd (Iowa DOT), Phil Heinlen (Iowa DOT), Jim Bane (Iowa DOT), Mike Krohn (Iowa DOT), Dick Hanneman (Salt Institute), John Somerville (UNI), Dalyce Ronnau (Nebraska DOR), Jerry Horner (North Dakota DOT), Jeff Vander Zwaag (Iowa DOT), Paul Cammack (University of North Dakota), Harold Dameron (Illinois DOT), Tony Sebben (Iowa DOT), Bill Shuler (Iowa DOT), Jon Smithberg (Goodrich Corporation), Brad Osborne (Iowa DOT), Kenneth Morrow (Iowa DOT), Mark Black (Iowa DOT), Andy Holverson (Henderson Manufacturing), Chris Body (Grey Island Systems), Kevin Davis (Monroe Truck Equipment)

Initiative #10 Title: Developing the Maintenance Decision Support System (32 votes)

1. Background and Problem Statement _____

The FHWA Maintenance Decision Support System (MDSS) program needs to be developed further, providing needed tools for snowfighters. There is a need for rapid, reliable identification of proper snowfighting tactics, based on weather and road conditions and agency policies and equipment. The MDSS should incorporate means to share information with neighboring agencies and among local organizations who would benefit from this information (e.g. emergency response providers, highway patrols, etc.).

2. Research Objectives _____

The objective of this research will be to:

- A. Evaluate data needs, building on the FHWA MDSS tool.
- B. Develop performance measures for roadway conditions, including traffic speed, congestion, road surface conditions, and crash incidence.
- C. Provide a means to incorporate into the model local agency policies and equipment availability.
- D. Develop an automated information processing capability to generate tactical options for snowfighting managers and operators in their vehicles.
- E. Develop winter severity index to enable post-season evaluation of the effectiveness of the available options and the options chosen.

3. Resource Needs and Time Frame _____

It is recommended that this activity be addressed over a two or three-year time frame. It is also recommended that \$300,000 per year be allocated to this effort. Potential funding sources include AASHTO, NASA, NAS, and private weather vendors.

4. Intended Users _____

Potential users would include snowfighting management and operators, emergency responders, highway patrol, elected policy-makers, and concerned citizens.

5. Implementation _____

Potential implementers include NOAA, state pooled funds, and a Midwestern university research center.

6. Other Outside Parties _____

Other potential parties include private weather vendors.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Maintenance Management

Facilitator Name: Bob Hill, Iowa DOT

Date: June 14, 2004

Initiative Team Members: Bob Hill (Iowa DOT), Mark Dunn (Iowa DOT), Wilf Nixon (University of Iowa), Dennis Belter (Indiana DOT), Mike Mattison (Nebraska DOR), Greg Parker (City of Cedar Rapids), Bart Weller (City of Clive), Bret Hodne (City of West Des Moines), Mark Nahra (Delaware County)

Initiative #11 Title: Educating Vehicle Operators and Users in Inclement Weather (15 votes)

1. Background and Problem Statement _____

Today, driver training programs do not include adequate training for operating a vehicle during inclement weather conditions. Equipment operators face a multitude of decisions in the cab for which they may be poorly prepared, thus endangering themselves as well as others. There is currently a lack of mechanisms to provide incentives for participation in training for new or inexperienced drivers.

2. Research Objectives _____

The objective of this research is to develop mechanisms such as simulators, videos, and public service announcements for training the public on how to drive during inclement weather conditions that are inherently not safe.

3. Resource Needs and Time Frame _____

The research team should include adult learning specialists, multimedia specialists, driver training/equipment operators, and training specialists/instructors. Scenario development will be an important part of the simulation process. Simulation equipment requires significant funding to build and maintain. Funding for this project is estimated to be \$2 million and take about 3 years to build, test, and evaluate.

4. Intended Users _____

Potential users would include state and local government agencies, transit fleet managers, contractors, driver education programs, insurance companies, and trucking companies.

5. Implementation _____

All transportation agencies in the private and public sector and educators could be potential implementers.

6. Other Outside Parties _____

Other parties have not been determined.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Maintenance Management

Facilitator Name: Bob Hill, Iowa DOT

Date: June 14, 2004

Initiative Team Members: Bob Hill (Iowa DOT), Mark Dunn (Iowa DOT), Wilf Nixon (University of Iowa), Dennis Belter (Indiana DOT), Mike Mattison (Nebraska DOR), Greg Parker (City of Cedar Rapids), Bart Weller (City of Clive), Bret Hodne (City of West Des Moines), Mark Nahra (Delaware County)

Initiative #12 Title: Providing Real-Time Feedback from Users of Vehicle Sensors (24 votes)

1. Background and Problem Statement _____

Currently, there is a need to supplement fixed RWIS locations with mobile road condition sensor information to improve the maintenance decision process. Technology exists to sense pavement and air temperatures and road surface conditions (dry, wet, freezing point of existing surface moisture, and surface friction) and correlate that information with GPS. That information can be down-linked for real time data feedback and used for the maintenance decision making process. Existing systems however, are costly to install and maintain.

2. Research Objectives _____

The objective of this research is to identify automatic vehicle location (AVL) systems currently deployed, determine costs and reliability of their data and equipment, and determine the strengths and weaknesses of the current systems. In addition, the effort will explore off the shelf components (build your own system) versus commercially available systems and determine which approach seems most feasible. The research will ultimately pilot a field test with multiple jurisdictions to determine the feasibility of widespread implementation.

3. Resource Needs and Time Frame _____

The research team should include instrument developers and systems integrators, an ITS architect, a motor vehicle designer, and a winter maintenance specialist. The project will cost about \$1,500,000 and take about three years to design, install, and evaluate.

4. Intended Users _____

Potential users would include state and local government agencies, traffic management centers, and public radio and television media (if posted on state or city web site).

5. Implementation _____

State transportation agencies, county and city agencies, contractors, equipment manufacturers and suppliers would all be potential implementers.

6. Other Outside Parties _____

Other parties have yet to be determined.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Maintenance Management

Facilitator Name: Bob Hill, Iowa DOT

Date: June 14, 2004

Initiative Team Members: Bob Hill (Iowa DOT), Mark Dunn (Iowa DOT), Wilf Nixon (University of Iowa), Dennis Belter (Indiana DOT), Mike Mattison (Nebraska DOR), Greg Parker (City of Cedar Rapids), Bart Weller (City of Clive), Bret Hodne (City of West Des Moines), Mark Nahra (Delaware County)

Initiative #13 Title: Developing Operationally-Focused Weather and Road Weather Information and Decision Support Assistance (29 votes)

1. Background and Problem Statement _____

Weather forecasts are not finely focused nor do they provide sufficient detail in a timely manner to facilitate operational decision making. Maintenance workers need accurate real-time data and forecast road weather information to include start and stop times of a storm, pavement temperature forecasts, air temperatures, wind speed, and precipitation type and intensity. Due to the complexity of considering all the storm variables, maintenance workers need assistance from a decision support system that could analyze the weather elements in a computer model and make operational recommendations.

2. Research Objectives _____

The objective of this research is to develop weather and road weather information collected from a variety of sources and localized to state, county, and municipal road segments. In addition, research would develop “what if” scenario-based decision support models to optimize operational strategies. In addition to winter maintenance operations, localized data are also needed for rainfall, flood forecasts, fog, and high winds in other seasons. Results should also be internet-based.

3. Resource Needs and Time Frame _____

This program should take about three years (one to refine existing systems and two to test, evaluate, and fine tune models) and involve a team of meteorologists, winter maintenance specialists, value added meteorology service providers, and maintenance supervisors.

The cost will be about \$2 million. Funding sources could be FHWA and state DOT pooled funds.

4. Intended Users _____

Potential users would include state and local government personnel and the general public through the state DOT web site or value added meteorologist services.

5. Implementation _____

All transportation agencies operating highways could be implementers.

6. Other Outside Parties _____

Other parties have not been identified.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Maintenance Management

Facilitator Name: Bob Hill, Iowa DOT

Date: June 14, 2004

Initiative Team Members: Bob Hill (Iowa DOT), Mark Dunn (Iowa DOT), Wilf Nixon (University of Iowa), Dennis Belter (Indiana DOT), Mike Mattison (Nebraska DOR), Greg Parker (City of Cedar Rapids), Bart Weller (City of Clive), Bret Hodne (City of West Des Moines), Mark Nahra (Delaware County)

Initiative #14 Title: Developing Performance Measures and Levels of Service (21 votes)

1. Background and Problem Statement _____

It is difficult to measure quality and performance of most maintenance operations. Levels of service are usually described in subjective terms, without the benefit of public input. Research is needed to develop a system to measure the quality and performance of contract maintenance operations and establish a performance-based incentive pay plan.

2. Research Objectives _____

The objective of this research is to establish quantifiable measures to improve performance, level of service, and cost effectiveness. In addition, this effort will identify a way to compare staff needed to achieve desired level of service and performance.

3. Resource Needs and Time Frame _____

Research team should include experts in maintenance management and maintenance contractors. Literature searches should include contract maintenance operations outside the United States who have had experience in performance based contracting. Research should be completed in one year at a cost of \$100,000.

4. Intended Users _____

Potential users would include state and local government agencies.

5. Implementation _____

All transportation agencies in the private and public sectors could be potential implementers.

6. Other Outside Parties

Other parties have yet to be determined.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Maintenance Operations
Facilitator Name: Tom Maze, ISU/Civil Engineering
Date: June 14, 2004

Initiative Team Members: Tom Maze (ISU/Civil Engineering), Troy Jerman (Iowa DOT), Diane Evans (Ohio DOT), Tom Martinelli (Wisconsin DOT), Tim Jackson (Missouri DOT), Roger Vigdal (Iowa DOT), Russ Frisch (Iowa DOT), Dick Banowetz (Iowa DOT), John Plymesser (Dallas County), Doug Cornelsen (Meteorlogix)

Initiative #15 Title: Developing Mobile Weather Observing Platforms (31 votes)

1. Background and Problem Statement _____

Currently fixed site platforms are the main type of weather observation devices. Mobile platforms may be mounted to maintenance and supervisory equipment to provide added information and observations. A mobile platform may even be able to obtain new types of information (e.g., pavement friction). The problem to be addressed is how to move forward with the implementation of new mobile systems and integrate them with fix location systems.

1. Research Objectives _____

The objective of this research is to develop the information necessary to facilitate the adoption and deployment of mobile weather observing platforms. This project will identify a prototype mobile platform for road weather that is affordable, can be implemented within the space and environment conditions that are typical of a winter maintenance vehicle, and has the flexibility to allow the implementation of devices to sense new or different weather parameters. In all, this project will involve:

- A. identification of the user requirements.
- B. development of a prototype device that meets as best it can the requirements
- C. field testing of the device
- D. defining an implementation plan for agencies and other private and public vehicle fleets throughout the snow belt

3. Resource Needs and Time Frame _____

This program should take roughly 3 years and will involve a research team of meteorologists, instrument developers and integrators, an ITS architect, a vehicle designer, and winter maintenance specialists. It would also be a good idea to include several private sector system integrators on a project advisory panel. This program many require as much as \$3 million. Funding may come from FHWA or a pooled fund of state transportation agencies.

4. Intended Users _____

Once the concept has been proven through a field test, it is expected that snow-belt agencies will start specifying mobile platforms. The private sector will supply the mobile platforms as options on vehicles. This equipment could also be used on other public or private sector fleets through a partnership.

5. Implementation _____

Deployment should be the responsibility of the private sector.

6. Other Outside Parties _____

Other partners have not yet been determined.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Maintenance Operations
Facilitator Name: Tom Maze, ISU/Civil Engineering
Date: June 14, 2004

Initiative Team Members: Tom Maze (ISU/Civil Engineering), Troy Jerman (Iowa DOT), Diane Evans (Ohio DOT), Tom Martinelli (Wisconsin DOT), Tim Jackson (Missouri DOT), Roger Vigdal (Iowa DOT), Russ Frisch (Iowa DOT), Dick Banowetz (Iowa DOT), John Plymesser (Dallas County), Doug Cornelsen (Meteorlogix)

Initiative #16 Title: Identifying Un-Forecasted Safety Critical Weather Events (29 votes)

1. Background and Problem Statement _____

Typically, several dangerous localized weather events go un-forecasted. For example, the resolution of forecasts is not fine enough to identify localized fog, black ice, or blowing snow. These localized weather events are not typically forecasted but can result in very hazardous driving conditions. There is a need to either predict or sense these dangerous conditions so that they can be mitigated.

2. Research Objectives _____

The research would investigate the technical and financial feasibility of forecasting or sensing localized dangerous conditions, conduct a field test and evaluation, develop a plan for implementing the prediction or detection system, and support the implementation of the plan by state and local transportation agencies. Since this may involve the development of roadside technology that does not currently exist today, this research is open-ended.

3. Resource Needs and Time Frame _____

This program should take roughly 5 years and will involve a research team to include meteorologists, instrumentation and equipment developers and integrators, an ITS architect, a transportation engineer, and winter maintenance specialists. This program may require as much as \$5 million. Funding should come from FHWA, NTHSA, and state transportation agencies.

4. Intended Users _____

This system could be used by all transportation agencies that maintain highways throughout the world. Localized events like fog are not limited to any geographical area. Therefore, the benefits and uses are limited to just snow-belt agencies.

5. Implementation _____

All transportation agencies operating highways could potentially be implementers.

6. Other Outside Parties _____

Other partners have not yet been determined.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Maintenance Operations
Facilitator Name: Tom Maze, ISU/Civil Engineering
Date: June 14, 2004

Initiative Team Members: Tom Maze (ISU/Civil Engineering), Troy Jerman (Iowa DOT), Diane Evans (Ohio DOT), Tom Martinelli (Wisconsin DOT), Tim Jackson (Missouri DOT), Roger Vigdal (Iowa DOT), Russ Frisch (Iowa DOT), Dick Banowetz (Iowa DOT), John Plymesser (Dallas County), Doug Cornelsen (Meteorlogix)

Initiative #17 Title: Developing Better Radar Systems (22 votes)

1. Background and Problem Statement _____

Current radar system sometimes miss approaching snow storms. In some cases, current radar systems are directed either above or below the cloud releasing snow or the current national weather service radar system doesn't provide ample coverage of rural areas to be able to detect snowfall. This project would examine new and emerging radar technology that would allow better radar coverage and better targeting of radar to identify snow clouds that are missed by current radar. This might involve an entirely new network of radar, and therefore, new institutional mechanisms for operating these radar as well as communications systems would have to be established.

2. Research Objectives _____

This research would involve:

- A. identifying the short comings of existing radar systems
- B. determining the requirements of winter maintenance for a better radar system
- C. identifying affordable technological options for providing better radar information
- D. identifying institutional and operational framework required to a new radar system
- E. identifying how new radar will be integrated with existing radar network
- F. defining a plan for deploying a better radar system.

3. Resource Needs and Time Frame _____

The research team should include meteorologists, an electronic engineer (radar and communications expert), a winter maintenance specialist, and an ITS architect. This project should also involve an advisory panel consisting of representatives from the National Weather Service, value added weather information providers, and state maintenance specialists. The project should be conducted over a period of 18 months and should have a budget of five hundred thousand dollars. This funding could come from FHWA, NWS, and pool of state departments of transportation.

4. Intended Users _____

This system could be used by National Weather Service and state and local transportation agencies.

5. Implementation _____

The results of the project will identify how the program is to be implemented.

6. Other Outside Parties _____

Other parties have not been identified to date.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Traffic Operations and Safety
Facilitator Name: Carol Culver, Iowa DOT
Date: June 14, 2004

Initiative Team Members: Carol Culver (Iowa DOT), Tim Crouch (Iowa DOT), Sheri Anderson (Iowa DOT), Ray Murphy (FHWA), Jim Brachtel (FHWA), Todd Misel (Iowa Highway Patrol), Larry Grant (Iowa Highway Patrol), Geoff Huff (Ames Police Department), Bob Rushing (Iowa DPS), Kyle Kover (3M), Phil Wedgewood (AAA)

Initiative #18 Title: Implementing Multi-Disciplined Road Weather Training (29 votes)

1. Background and Problem Statement _____

Too often, today's motoring public drive unknowingly into harms way. A change in mindset is needed to provide training on how to be proactive rather than reactive in response to road weather related incidents. Training is needed for the motorist on how to access and interpret the road weather information that is now available from many state DOT web sites. Careful and uniform packaging of accurate road weather information is also needed to obtain the necessary buy-in from the motorist in making data driven trip decisions.

2. Research Objectives _____

Research is necessary to understand the human factors that go into trip decision making and understanding the role that road weather information plays in the trip decision making process. This will lead to both improve road weather communications through a common understanding of safety messages about road weather and to better means of educating travelers in trip decision making during inclement weather.

3. Resource Needs and Time Frame _____

Research team should include meteorologists, value added meteorology service personnel, adult learning specialists, multimedia specialists, human factors specialists, a representative from the Iowa Association of Safety Educators, an RWIS expert, a traffic safety engineer, and a AAA representative. About \$500,000 would be required to fund this two-year project. Funding sources would include FHWA, NCHRP, State Transportation Agencies, trucking associations, and the insurance industry.

4. Intended Users _____

This system could be used by federal, State and local governments, AASHTO, AAA, enforcement personnel, motoring public, educators, insurance companies and road contractors.

5. Implementation _____

All transportation agencies operating highways, motoring public, trucking agencies and insurance industry could implement this research.

6. Other Outside Parties _____

Other parties have not been determined.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Traffic Operations and Safety
Facilitator Name: Carol Culver, Iowa DOT
Date: June 14, 2004

Initiative Team Members: Carol Culver (Iowa DOT), Tim Crouch (Iowa DOT), Sheri Anderson (Iowa DOT), Ray Murphy (FHWA), Jim Brachtel (FHWA), Todd Misel (Iowa Highway Patrol), Larry Grant (Iowa Highway Patrol), Geoff Huff (Ames Police Department), Bob Rushing (Iowa DPS), Kyle Kover (3M), Phil Wedgewood (AAA)

Initiative #19 Title: Developing Real-Time Road Weather Messaging (56 votes)

1. Background and Problem Statement _____

There is a lack of consistent, reliable, current and useable road weather and road condition information which is jeopardizing the safety and mobility of the traveling public. State transportation agencies have developed web sites containing information on road weather and road conditions with little consideration for communication and messaging standardization. Motorists can be confused by this lack of uniformity. Information is sometimes not date/time stamped making it difficult to determine its real time applicability.

2. Research Objectives _____

The objective of this research is to communicate road weather and road conditions to end users in a useable/understandable, timely, accurate, and regionally specific format. Communication standards need to be established for message uniformity for variable message signs, enunciation clarity, date/time stamps, data quality assurance, and regional specificity/understandability (ie, organize sequentially, macro to micro).

Currently the weather service announces storm warnings for counties in a state and visitors don't know county names. There is a need to identify the area of the state with reference to direction and distance from major cities, then minor cities and perhaps milepost on Interstates. The research will also identify a national architecture and standards for weather traveler information.

3. Resource Needs and Time Frame _____

The research team should consist of experts in the fields of traffic sign message development, communication standards, highway advisory radio (HAR), 511, dynamic sign message development and deployment, traffic engineering, enforcement, and web site development. About \$500,000 would be needed to fund the two-year project. Funding sources could be NCHRP, FHWA and state transportation agencies.

4. Intended Users _____

This system could be used by federal, state and local governments, AASHTO, AAA, enforcement personnel, the motoring public, educators, insurance companies and road contractors.

5. Implementation _____

All transportation agencies operating highways and industries that communicate with the motoring public could implement this research.

6. Other Outside Parties _____

Other parties have not yet been determined.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Traffic Operations and Safety
Facilitator Name: Carol Culver, Iowa DOT
Date: June 14, 2004

Initiative Team Members: Carol Culver (Iowa DOT), Tim Crouch (Iowa DOT), Sheri Anderson (Iowa DOT), Ray Murphy (FHWA), Jim Brachtel (FHWA), Todd Misel (Iowa Highway Patrol), Larry Grant (Iowa Highway Patrol), Geoff Huff (Ames Police Department), Bob Rushing (Iowa DPS), Kyle Kover (3M), Phil Wedgewood (AAA)

Initiative #20 Title: Establishing Weather-Based Speed Limits (28 votes)

1. Background and Problem Statement _____

Current speed limits are based on ideal road and road weather conditions. A system needs to be developed to set speed limits for less than ideal conditions. Drivers need to develop an awareness and be able to recognize less than ideal conditions and understand what the prudent speed limit should be. New legislation needs to be created to provide law enforcement and traffic managers the authority to set and enforce speed limits for driving in less than ideal conditions. Enforcement personnel need to have high visibility during these less than ideal conditions, but automatic enforcement should be authorized to avoid the disruption of on site apprehension and ticketing.

2. Research Objectives _____

The objective of this effort is to develop clearly defined, understandable, and enforceable standards for safe and prudent variable speed limits based on road and road weather conditions. The first step in this research will be to develop scientific evidence that defines the safety impacts and societal costs of driving at excessive speed or even making trips at all during inclement weather conditions. This information will be delivered into the hands of traffic safety advocates, law enforcement officials, and other public and private groups that can lobby for legislation to create education and enforcement for prudent driving when weather reduces the safety of the roadway. Education materials will be created to explain to the public the danger of driving during inclement conditions and help them to embrace more restrictive speed enforcement policies during poor driving conditions. The project will also develop model legislation to permit states to legislate variable speed limits for safety purposes. The second step of the research will be to develop strategies for traffic managers and enforcement to allow them to proactively manage traffic and promote safe driving. This may include variable speed limits, traveler advisories in terms that are more readably understood, and other strategies.

3. Resource Needs and Time Frame _____

The research team should include a traffic engineer, a traffic management specialist, law enforcement personnel, a legal specialist, a legislator, a human factors expert, educators, a representative from the Iowa Association of Safety Educators, National Weather Service representatives, and an RWIS expert.

The project should build on the successes other countries outside North America have had with variable speed limits based on weather and road surface conditions and the NHRP Project 6-14 “Feasibility of Using Friction Indicators to Improve Winter Maintenance Operations and Mobility”. The traffic engineering portions of the first and second steps the project should be completed within 2 to 4 years and require about \$1 million. The legislative and education portions of this project will proceed concurrently with engineering portion of the project and take 2 to 4 years a cost of approximately \$750,000.

4. Intended Users _____

This system could be used by federal, state, and local governments, AASHTO, AAA, enforcement personnel, motoring public, educators, insurance companies, and road contractors.

5. Implementation _____

All transportation agencies operating highways could potentially be implementers.

6. Other Outside Parties _____

Other parties have not been determined.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Intermodal Traffic
Facilitator Name: Neil Volmer, Iowa DOT
Date: June 14, 2004

Initiative Team Members: Neil Volmer (Iowa DOT), Chris Albrecht (ISU/CTRE), Diane McCauley (Iowa DOT), Mike Marr (Iowa DOT), Bill Flannery (Des Moines Airport - Retired)

Initiative #21 Title: Establishing a Flood Monitoring and Prediction System (21 votes)

1. Background and Problem Statement _____

Flash flooding is a serious safety concern in the upper Midwest, causing more fatalities each year in the United States than any other weather event associated with thunderstorms. Flooding impacts both rail and roadway traffic (automobiles, commercial vehicles, transit vehicles, and school buses transportation). Currently, there is no dependable system in place to convey flood risk to the transportation system users.

2. Research Objectives _____

The objective of this effort is to:

- A. Identify where key/critical transportation/waterway systems intersect.
- B. Prioritize these points based on overall risk (based on flood risk, VMT, etc.)
- C. Develop a flood monitoring/prediction system
- D. Implement the system and disseminate information on warnings and re-routings at critical times to the critical end users

3. Resource Needs and Time Frame _____

The research team should include traffic engineers, traffic management specialists, law enforcement personnel, USGS personnel, meteorologists, monitoring equipment manufacturers, software/system integrators, school transportation providers, local government representatives, rail companies, and university researchers. This project would last approximately 2 years and cost approximately \$500,000.

4. Intended Users _____

This system could be used by federal, state and local governments, transit operators, the general motoring public, AAA, and school transportation operators.

5. Implementation _____

All transportation agencies operating highways could potentially be implementers.

6. Other Outside Parties _____

Other potential parties have yet to be determined.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Intermodal Traffic
Facilitator Name: Neil Volmer, Iowa DOT
Date: June 14, 2004

Initiative Team Members: Neil Volmer (Iowa DOT), Chris Albrecht (ISU/CTRE), Diane McCauley (Iowa DOT), Mike Marr (Iowa DOT), Bill Flannery (Des Moines Airport - Retired)

Initiative #22 Title: Integrating Multimodal Data into Traveler Information (2 votes)

1. Background and Problem Statement _____

Currently, there is a lack of useable intermodal-specific traveler information for road users traveling to multimodal facilities (i.e. risking driving in a snowstorm to reach an airport where flights may be cancelled). In addition, it is difficult for travelers to locate good information on intermodal connections. As a result, travelers may take uninformed and unnecessary risks during inclement weather.

2. Research Objectives _____

The objective of this effort is to:

- A. Integrate readily available airline flight and passenger train data/information into mainstream traveler information systems to create an integrated information system to accommodate all modes.
- B. Increase monitoring on roads connecting intermodal facilities and integrate local road conditions into flight and train schedule information.

3. Resource Needs and Time Frame _____

The research team should include traffic engineers, traffic management specialists, meteorologists, monitoring equipment manufacturers, software/system integrators, intermodal transportation providers, local government representatives, and university researchers. This project would last approximately 2 years and cost approximately \$500,000.

4. Intended Users _____

This system could be used by transit operators, airlines, Amtrak, the general motoring public, FAA, and AAA.

5. Implementation _____

All transportation agencies operating highways, transit operators, airport and airlines, and Amtrak could potentially be implementers.

6. Other Outside Parties _____

Other partners have not been identified.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Design and Construction
Facilitator Name: Tom Cackler, ISU/PCC Center
Date: June 14, 2004

Initiative Team Members: Tom Cackler (ISU/PCC Center), Harold Smith (ISU/PCC Center), Wayne Sunday (Iowa DOT), Will Stein (Iowa DOT), John Adam (Iowa DOT), Jeff Banes (Manatts, Inc.), Mike Kennerly (Iowa DOT), Daryl Smith (UNI/NRVC), Gordon Smith (Iowa Concrete Paving Association), Michael Kvach (Iowa Asphalt Paving Association), Charlie Davis (AGC), Hosin Lee (University of Iowa)

Initiative #23 Title: Developing a 4D Design Model (34 votes)

1. Background and Problem Statement _____

More emphasis needs to be placed on designing and constructing roads that minimize the adverse impact of weather related problems. Digitized terrain models and high speed computers make further design analysis of snow and blowing snow problems, road shading, high winds, and other factors now possible.

2. Research Objectives _____

The objective of this effort is to evaluate existing technology for snow and blowing snow problem mitigation (include snow accumulation on roadway and visibility problems, surface texture, and road orientation for their relation to the formation of frost and black ice), incorporate historical weather data into road design, and optimize design for seasonal weather impacts.

3. Resource Needs and Time Frame _____

The research team should include experts in meteorology, snow and blowing snow research experts, winter maintenance specialists, and field maintenance specialists. Research will take about one year to complete and \$250,000.

4. Intended Users _____

State and local government agencies would be the principal users.

5. Implementation _____

All transportation agencies in the private and public sector could be potential implementers.

6. Other Outside Parties

Other parties have not been determined.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Design and Construction
Facilitator Name: Tom Cackler, ISU/PCC Center
Date: June 14, 2004

Initiative Team Members: Tom Cackler (ISU/PCC Center), Harold Smith (ISU/PCC Center), Wayne Sunday (Iowa DOT), Will Stein (Iowa DOT), John Adam (Iowa DOT), Jeff Banes (Manatts, Inc.), Mike Kennerly (Iowa DOT), Daryl Smith (UNI/NRVC), Gordon Smith (Iowa Concrete Paving Association), Michael Kvach (Iowa Asphalt Paving Association), Charlie Davis (AGC), Hosin Lee (University of Iowa)

Initiative #24 Title: Developing Accurate Local Weather Forecasting and Construction Decision Support (42 votes)

1. Background and Problem Statement _____

Weather has a major impact on construction operations. Pending storms can needlessly delay paving operations, while inaccurate forecasts can result in major damage to freshly laid paving. Most contractors obtain their weather information from radio, television, NWS, free web-based weather services, and in some cases, specialized forecasts produced by private sector companies. The information is too often not as timely or on as fine a scale as is needed for costly paving operations. Late fall paving is especially complicated due to pending weather changes, the urgency of meeting a construction deadline, and frost or thin top layer or soil freezing even though the sub-grade is still a source of heat.

2. Research Objectives _____

Research is needed to fully account for weather in construction operations. This research could be divided into two phases. The first phase would be to determine the accuracy, spatial resolution and elements needed for a construction forecast. Second would be to design a decision support system to meet the needs of the road construction community.

An example of one area of construction would be to enhance Hyperpave with real-time and forecasted weather data to optimize paving operations and quality control. This research could build on the basic research and design that has taken place in the winter maintenance operations community using RWIS and the MDSS models.

3. Resource Needs and Time Frame _____

The research team should include experts in meteorologists, PCC and ACC industry experts, PCC and ACC paving contractors, DOT construction and specification specialists, and NCAR personnel familiar with the MDSS project for winter operations. The first phase of the project could be accomplished in about 18 months at a cost of \$200,000. The second phase will take about three years to accomplish at a cost of \$1.5 million and can run concurrent with phase one.

4. Intended Users _____

State and local government agencies and contractors would be intended users.

5. Implementation _____

All transportation agencies and contractors could be potential implementers.

6. Other Outside Parties _____

Other partners have not yet been determined.

INITIATIVE PROSPECTUS (A-2)

Initiative Team Name: Design and Construction
Facilitator Name: Tom Cackler, ISU/PCC Center
Date: June 14, 2004

Initiative Team Members: Tom Cackler (ISU/PCC Center), Harold Smith (ISU/PCC Center), Wayne Sunday (Iowa DOT), Will Stein (Iowa DOT), John Adam (Iowa DOT), Jeff Banes (Manatts, Inc.), Mike Kennerly (Iowa DOT), Daryl Smith (UNI/NRVC), Gordon Smith (Iowa Concrete Paving Association), Michael Kvach (Iowa Asphalt Paving Association), Charlie Davis (AGC), Hosin Lee (University of Iowa)

Initiative #25 Title: Improving Construction Techniques through Weather Sensitivity Analysis
(18 votes)

1. Background and Problem Statement _____

Weather greatly impacts construction operations and product quality. It is sometimes necessary to let paving contracts in the summer with a late fall completion date. This often puts construction operations needing to be completed in marginal weather conditions. Rain, hail, and freezing temperatures significantly impact product quality.

2. Research Objectives _____

Research needs to be conducted on identifying the sensitivity of construction products to the various elements of weather. Results of the research need to be placed in guidelines to assist the designer in selecting materials which are less weather sensitive for use in early or late season construction.

3. Resource Needs and Time Frame _____

The research team should include experts in materials engineering, construction engineering and operations, and materials sciences. Funding for this project is estimated to be \$150,000 and take approximately one year to complete.

4. Intended Users _____

State and local government agencies would be intended users.

5. Implementation _____

All transportation agencies and road contractors would be possible implementers.

6. Other Outside Parties

Other parties have not been identified to date.