

# Autonomous Snowplow Competition



**ION North Star Section  
Outreach Program**

**Autonomous Snowplow Committee**



**Competition Kickoff Meeting Presentation  
2012 Competitors**

**12 October 2011**

# Meeting Agenda

- Introductions
  - Autonomous Snowplow Competition Committee Members
  - 2012 Competitors
- Venue
  - Saint Paul Winter Carnival
  - Snowfield Surface
- Sponsors
- Preliminary Design Review Discussion
- Team Questions



# Contact List

## Committee Contacts

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# 2012 Competitors

- University of Minnesota
  - “Blizzard Buster”



- University of Michigan
  - “Yeti”
  - “Geili”



- Dunwoody College of Technology
  - “Snow Devil 2”



- Ohio University
  - “M.A.C.S”



- Miami University
  - “Redblade”



# Venue

- The Saint Paul Winter Carnival
  - Rice Park, Downtown Saint Paul
    - Gain lots of media attention
    - 350,000 visitors per year
  - 26-29 January 2012
    - 2012 is 126<sup>th</sup> year anniversary of Carnival
  - Beth Pinkney
    - CEO & President, St. Paul Festival and Heritage Foundation

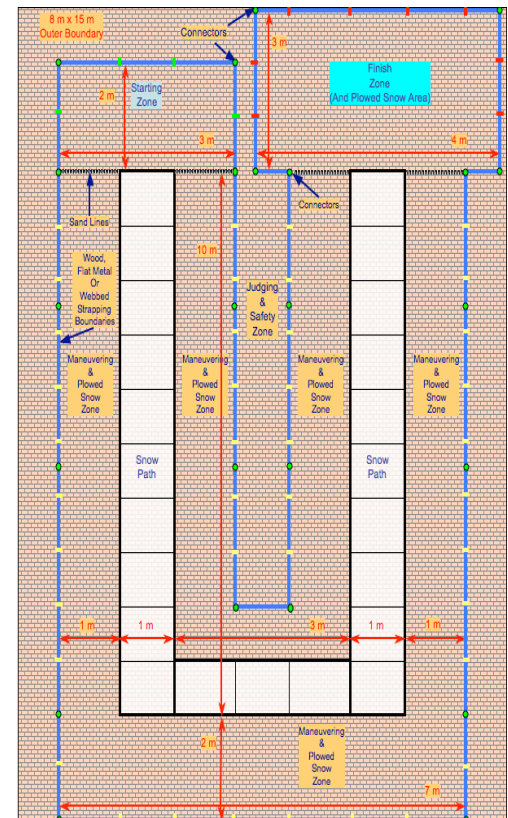
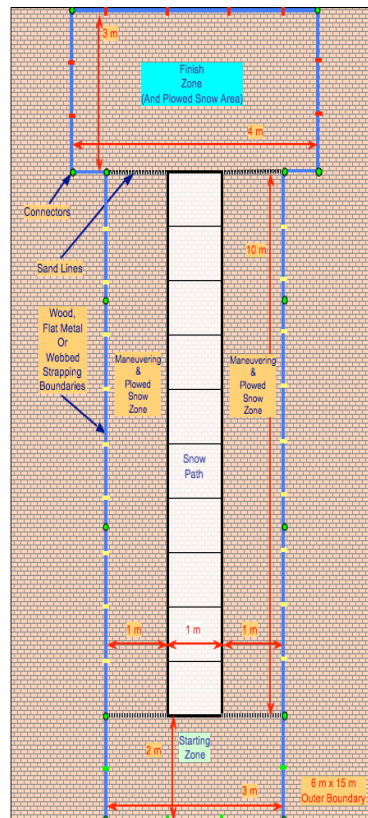


# Competition Time Line

- Jan 2011 – First Competition Event
- Sep 2011 – Application Forms Due  
(thanks for getting them in on time!)
- Oct 2011 – Competition Preliminary Design Review  
(Saturday, 29 October 2011)
- Nov 2011 – Review status with teams (trip planning, etc.)
- Jan 2012 – Second Year Competition  
Final Presentations, Vehicle Qualifications, &  
Snowplow Competitions

# Contest Rules

- Rulebook completed and available to teams
  - [www.autosnowplow.com](http://www.autosnowplow.com)
- Challenging, yet achievable contest
- Two snowfields to plow
  - Straight “I”
  - Squared “U”
  - 1 m width paths



# Competition Site

Downtown Saint Paul, MN

Landmark Center

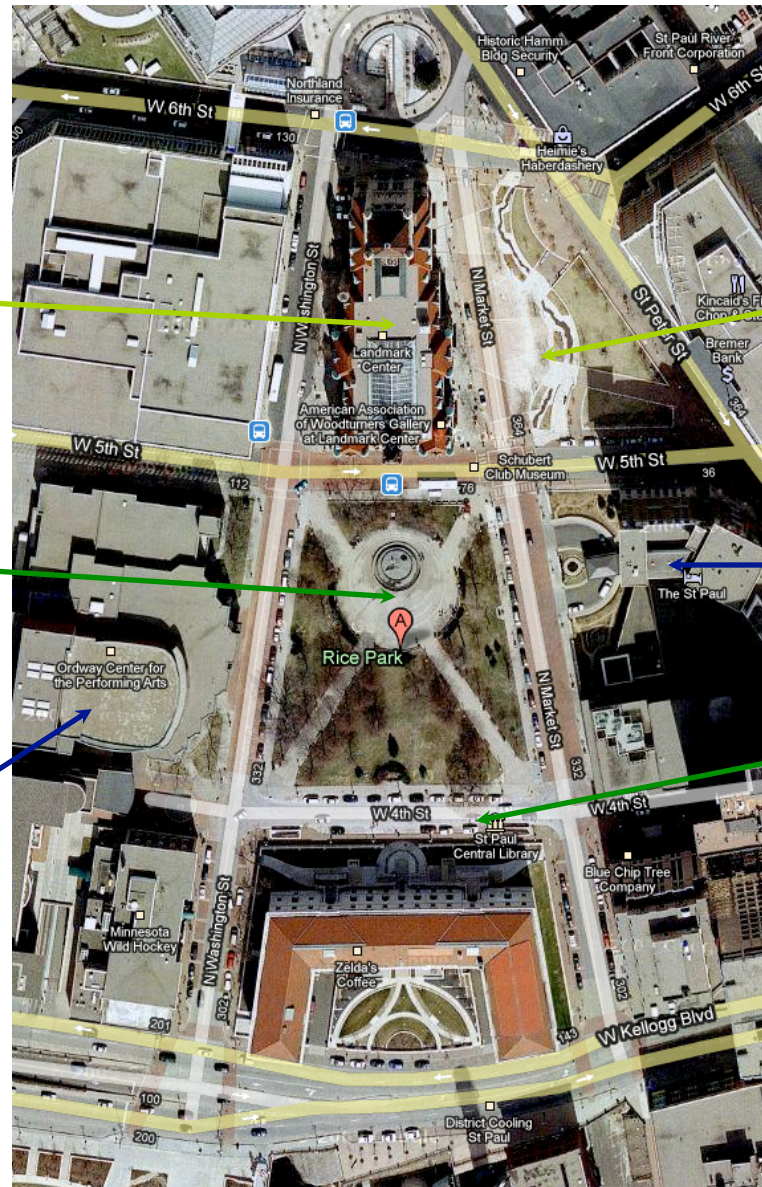
Ice Rink

Rice Park

The St Paul Hotel

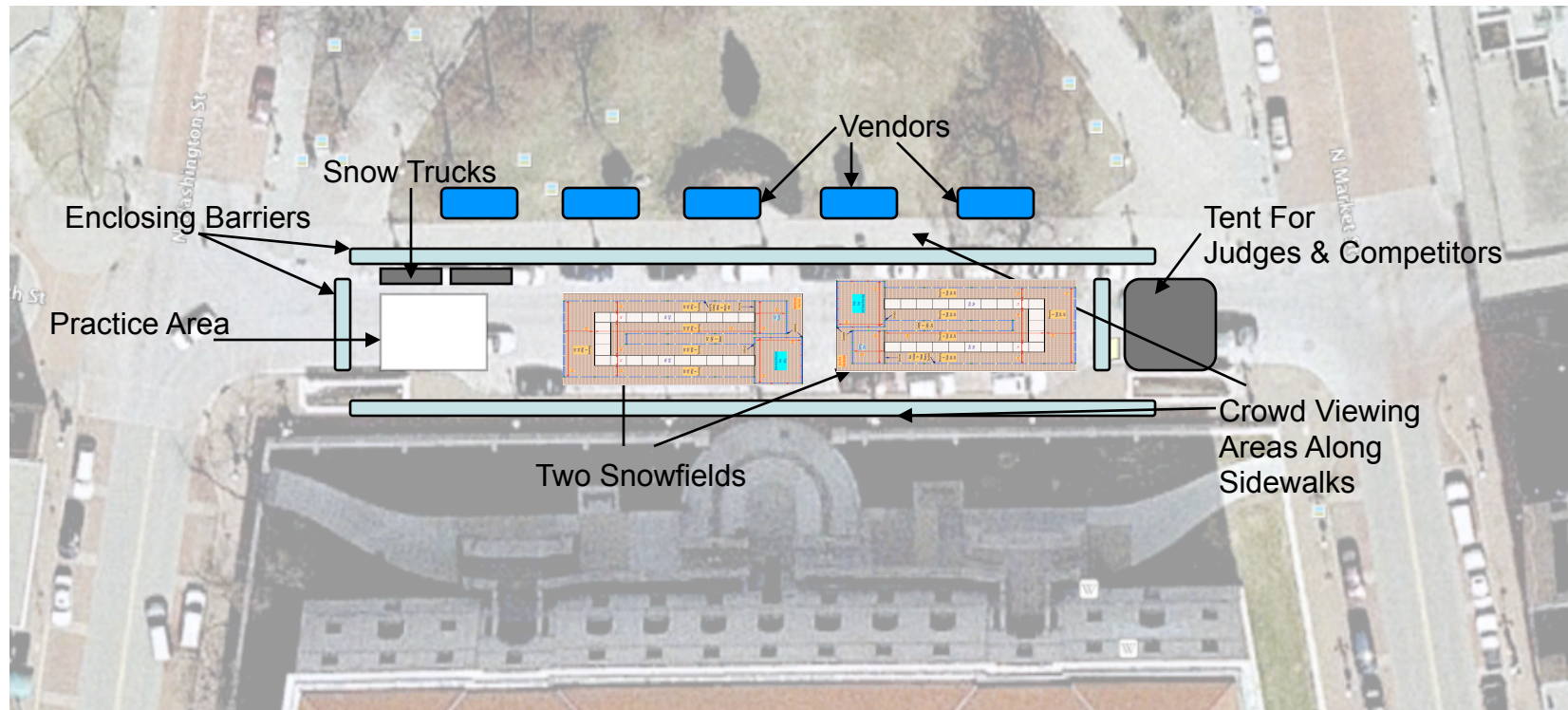
Ordway Center

W 4th Street





# Saint Paul Road Use



- Competition site: two snowfields set up on roadway of W 4th St, Saint Paul, MN
- Install barriers to stop crowds from entering competition areas
- Vendors close to draw in viewers
- Viewers can stand and watch all along barriers and steps of Central Library
- Practice area: available for teams
- Snow filled trucks: for fresh field set up

# Fake Snow

- Issue of how to test the vehicles in labs
  - Want to test year round and in warm climate
- Solution: Fake Movie Snow!!
  - Fairly inexpensive and does not melt!
  - Need to compare consistency to real snow
- Real snow used for competition



<http://www.stevespanglerscience.com/product/1262>



<http://www.discoverthis.com/super-snow.html>

The screenshot shows the product page for 'Super Snow 1lb' on the Discover This website. The page includes a navigation bar with 'Discover This' logo and 'Educational Science Kits & Toys'. A search bar is visible. The main content area features a product image of a bag of Super Snow, a price table showing a sale from \$19.99 to \$14.99, and a 'Add to cart' button. Below the price table is a 'DESCRIPTION' section with instructions on how to use the product. There are also sections for 'CUSTOMER PRODUCT REVIEWS', 'Additional items', and 'Other science kits you might be interested in'. The footer contains contact information and copyright details.

From the Spangler Science Labs  
www.SteveSpanglerScience.com  
<http://www.stevespanglerscience.com/product/1581>

**Insta Snow - Makes 4 Gallons**  
Just add water to Instant Snow and create an eruption of fluffy snow.

**Insta-Snow™ POWDER**  
Blue Slope Size - Insta-Snow  
Item #: WSNO-625 In Stock  
\$14.95

**LOWEST PRICE!** Just add water to Insta-Snow, the Instant Snow powder, to create an eruption of snow! This is what we call the Blue Slope or beginner size. Once you buy the 225 gram Blue Slope size, you'll be returning to buy more. Makes roughly 4 gallons of fluffy white snow. Includes mixing instructions, science explanation and measuring scoop that guarantees a perfect batch every time.

Mix contents with 5.5 quarts of water to make approximately 4 gallons of snow.  
Coverage area: 14' x 20' x 4"

Don't be fooled by imitations! Steve Spangler's Instant Snow was recently featured on the Tonight Show, Live with Regis and Kelly, The Today Show, ABC's Good Morning America, The CBS Morning Show.

See the video of Steve Spangler demonstrating Insta Snow, the original Instant Snow powder.

See All Insta-Snow Products

**What's included?**

225 grams of Instant Snow powder, measuring scoop and an activity guide.

[Insta-Snow Frequently Asked Questions](#)

[Cool Ideas for Using Insta-Snow](#)

**How does it work?**

Instant Snow is an amazing superabsorbent polymer that turns ordinary water into a white fluffy substance that looks like real snow! Add a little water and your Insta Snow expands to 100 times its original size. Go ahead, spread it around, it's fluffy and light like real snow! When the party's over, just store it and use it again.

**What does it teach?**

Explore the ever-changing science of polymers as students experiment with Instant Snow. Each Insta-Snow product comes with an activity guide with suggestions for science fair projects, classroom demonstrations, experiment ideas, and fun ways to explore the science of polymers. Insta-Snow, the original Instant Snow, is an amazing polymer that turns ordinary water into a white fluffy substance that looks

# Changes for 2012

- Run and Set up Time
  - Single 20-minute run for entire team
  - Set up as needed as part of the run
- Varied Snow Depth
  - Can vary between 5 and 10 cm in depth along the snowpath
- Simulated Post
  - Simulates a tree or parking meter near the snowpath
- No After-Hours Operations
  - Due to insurance and safety, as well as field protection

# Sponsorship

- Current Sponsors
  - ION Satellite Division
  - Lockheed Martin, Inc.
  - ASTER Labs, Inc.
  - Honeywell Inc.
  - Space Exploration Technologies Corp.
  - The Toro Company
  - The Hitching Post
  - Alliant Techsystems, Inc.
  - U.S. Bancorp
- Always looking for additional sponsors & funding!!



[www.toro.com](http://www.toro.com)



# PDR Rules

- PDR Presentation Day: October 29, 2011 (Saturday)
- Final Presentation Submission Deadline
  - October 27, 2011 (Thursday)
  - Time: 9:00 pm Central Time
    - Schedule detailed in Rulebook, page 5, table 1
  - Email submission: [vibhor.bageshwar@honeywell.com](mailto:vibhor.bageshwar@honeywell.com)
- Time: each Team is allotted 20 minutes
  - Presentation time: 15 minutes maximum
  - Q&A time: 5 minutes maximum
- PDR presentations held in confidence until end of competition
  - All Team materials eventually made public
- Team scoring and Reviews: November 7, 2011 (Monday)
  - Team reviews will be returned to Team contacts
  - Team standings will be updated on website

# PDR Presentation Schedule

Team	Presentation Time (Central Time)
Miami University "Redblade"	TBD: Teams select their top 3 choices; ASC Committee assigns times
University of Minnesota "Blizzard Buster"	
University of Michigan - Dearborn "Yeti"	
University of Michigan - Dearborn "Geili"	
Ohio University "M.A.C.S."	
Dunwoody Institute of Technology "Snow Devil 2"	



# PDR Scoring

- PDR Presentation Scoring: 5% of total Competition Score

Category	Scoring
Quality of Presentation Slides	40
Technical Presentation	40
Ability to Engage Audience	20
<b>Total Points</b>	<b>100</b>

# Team Questions

- Any Questions?
- General Discussion





# Backup Slides



# Introduction

- Goal: Design a *new* Engineering-based Outreach student competition
  - Specific to Guidance, Navigation & Control (GN&C) technology
- Modeled after ION Robotic Lawn Mower Competition
  - Complementary competitions
    - Similar vehicles, sensors, goals
    - Different seasons
- Take a *winter-approach* to the competition
  - Instead of lawn-mowing, choose snow-blowing/snow-plowing
  - Winter is a potentially a tougher scenario
    - Less fixed visual cues
      - Covered with snow (pure white)
      - Blowing snow (visibility poor)
    - Changing visual cues
      - Snow drifts change from day to day
    - Harsher environment
      - Cold effects sensors performance
      - Reduced lighting
    - Control challenges
      - Must redirect new snow away from old high snow drifts



# Motivation

- Public Outreach
  - Significant publicity and visibility of ION and its members to a new area
  - Promote ION's talents and capabilities to large public audience
- Technology Potential
  - MN Dept. Of Transportation: Snowplow safety systems
  - Minneapolis Airport Commission + FAA: Automated runway clearing
  - University of Minnesota: Driver-assisted bus and Alaskan highway snowplows
- Encourage growth within ION North Star Section
  - Competition provides a large, local project members can immediately contribute towards
- Large public venue available
  - St. Paul Winter Carnival (January in MN ... refreshing!)
- Encourage participation in all three ION competitions
  - Mini-Urban Challenge : High School-Level students
  - Robotic Lawn Mower : Spring Event, College-Level students
  - Autonomous Snowplow : Winter Event, College-Level students + public
- Encourage industry sponsorship
  - Mentorship and Judging competition opportunities
  - Meet competent, highly-motivated potential employees



# Plowing versus Blowing

- **Snow Plow**

- Move snow from one area to another along the ground



Hand Plow



Wheeled Plows



Yuki-Taro Autonomous Snow Plow Robot



RC Plow

- **Snow Blow**

- Eject snow from one area to another through air



Hand-Wheeled Blowers



Heavy Wheeled Blowers