

Autonomous Snowplow Competition



**ION North Star Section
Outreach Program**

Autonomous Snowplow Committee

**Preliminary Design Review
Presentation Information & Outline
2021-22 Competitors**

January 2022

PDR Presentation Rules

- PDR Objectives
 - Demonstrate to ASC Judge single vehicle design and/or two-vehicle collaborative vehicle designs
 - PDR presentation slides must follow the provided outline
 - Standardize judging for all Teams
- PDR presentation slides held in confidence throughout Competition
 - PDR slides will not be made public
 - Squad Teams should work together on Two Vehicle PDR sections. But each team must present their own Single Vehicle presentation.
- PDR presentation slides submission deadline: **24 hours after PDR**
 - To help judges follow presentation, it is advantageous (but not required) to submit PDR slides in advance of your presentation.
 - Email submission to Vibhor and Suneel:
vibhor.bageshwar@honeywell.com & sheikh@asterlabs.com
 - *Please submit a PDF version of the presentation to minimize file size. Videos not necessary.*

PDR Presentation Rules

- PDR presentation days: December 2022
 - Final dates based upon Teams and Judges availability
 - Planning for Weeks of 6 – 10 Dec. and 13 – 17 Dec.
 - Presentation medium: Zoom Meeting (Video Conference)
 - ASC Committee will set up a Zoom Meeting for each Squad
 - **ASC Committee request all participants turn their cameras on!**
 - ASC Committee will call in to Zoom Meeting 2 minutes before the PDR presentation time
 - **Teams will be provided with a Zoom Meeting 2+ days before the scheduled presentation day**
- PDR presentation time: each Squad is allotted 55 minutes

PDR Presentation Rules

- 55 minute presentation time breakdown
 - 1st Team Single Vehicle presentation: 15 minutes maximum
 - 2nd Team Single Vehicle presentation: 15 minutes maximum
 - Squad presentation: 15 minutes maximum
 - Q&A with Judges: 5 minutes maximum

5 minutes allotted for transitions

- Team scoring and reviews
 - Team scoring will be returned to Team in late December 2021
 - The Single Vehicle Presentation are scored independently for each Team
 - The Squad presentation score will be scored for the Squad

**Feedback to Teams will be provided by the Judges
during the 55 minute PDR**



PDR Presentation Rules

- PDR Presentation Outline: *ASC Committee Hints*
 - Judge's scoring form follows the outline exactly
 - Slide titles should match outline titles
 - Follow the slide outline order
 - Address each section of the outline using at least one separate slide
 - Teams will not score points if sections of the given outline are not addressed
 - The Two Vehicle presentation should be presented collaboratively by the Squad
 - Use Figures and Tables to convey information to ASC Judges
 - Minimize the use of text where possible!!

PDR Summary: Actions

Date	Actions
November 30, 2021	Form to sign up for a PDR time slot will be emailed to all squads
December 3, 2021	PDR sign up will close
December 6, 2021	PDR schedule is finalized
December 6-22, 2021	PDR!
January 6, 2022	PDR scores sent to Team contacts

PDR Presentation Scoring

- PDR presentation scoring
 - Single Vehicle**
 - 5% of the total Competition score for 2022
 - Two-Vehicle Squad**
 - 5% of the total Competition score for 2022

Category	Scoring
Quality of Presentation Slides / Technical Presentation	80
Ability to Engage Audience	20
Total Points	100

Single Vehicle Outline

PDR Presentation Outline: 1/2

Slide Title	Suggested Format	Minimum # of Slides
Team Slide*		1
Objectives	Only slide with a lot of text	1
Team Composition & Collaborative Team Composition		1

()*: Title slide;



PDR Presentation Outline: 2/2

Slide Title	Suggested Format**	Minimum # of Slides
Own Team Snowplow		
Top-Level Requirements	Table	1
Plowing Strategy: Single "I" Snowfield	Figure	1
Snowplow Vehicle Design	Figure	1
Navigation System Design	Figure	1
Guidance System Design	Figure	1
Processor & Software Design	Figure	1
Safety Systems	Figure	1
Test Plans	Table	1
Failure Modes & Recovery Actions	Table	1
Overall Risk Assessment Summary	Table	1
Vehicle Design Challenges	Table	1

(**): Include additional text outside figure/table as necessary

PDR Presentation Details 1/4

- Title Slide (1 slide)
 - Team university/name/logo
- Objectives (1 slide)
 - Team objectives
 - Single “I” snowfield
 - Collaboration and the Triple “I” snowfield
- Team Composition (1 slide)
 - Own Team composition
 - Collaborative (Joint) Team composition

PDR Presentation Details 2/4

Own Team Snowplow (Single “I” snowfield)

- Top-Level Requirements (1 slide)
 - Hint: a requirement is a number that indicates when a design satisfies an objective
 - Hint: during the presentation, the Team doesn't need to go through every requirement; instead highlight the important requirements for the Judges
- Snowplow vehicle plowing strategy (minimum 1 slide)
 - Single “I” snowfield
 - Hint: address vehicle strategy to plow snow, minimize plowing time, maximize snow removal, avoid obstacles, and return to garage
- Snowplow Vehicle Design (minimum 1 slide)
 - Snowplow vehicle and blade designs
 - Hint: include physical dimensions (size and weight)
 - Hint: consider the amount of snow that needs to be plowed at any time and consider the vehicle design required to plow (at least) that amount of snow
 - Sensor + processor component housing
 - Hint: address temperature control

PDR Presentation Details 3/4

Own Team Snowplow (Single “I” snowfield)

- Navigation System Design (minimum 1 slide)
 - Concept and sensors
 - Navigation augmentation system
 - Location of navigation aids in competition field
- Guidance System Design (minimum 1 slide)
 - Way-point selection concept
 - Hint: describe how snowplow vehicle will generate its plowing path, avoid obstacles, and perform its functions
- Processor & Software design (minimum 1 slide)
 - Processor selection and operating system
 - Timing and action sequence flowchart
- Safety System (1 slide)
 - System description; Emergency shut-off options (physical and remote)
 - Stopping distance from maximum speed (identify surface)
 - Figure: show how power is interrupted by emergency shut-off options
- Test Plans (1 slide)
 - Select system; identify test for that system; identify inputs; identify expected outputs (Hint: 4 columns)
 - Hint: describe test that would show a system to be operational

PDR Presentation Details 4/4

Own Team Snowplow (Single “I” snowfield)

- Failure Modes and Recovery Actions (1 slide)
 - Identify failure modes and recovery actions
 - Hint: consider operational problems and how the snowplow vehicle would recover
- Overall Risk Assessment Summary (1 slide)
 - Evaluate major subsystems – identify the risk of subsystem issues on snowplow vehicle performance
- Vehicle Design Challenges (1 slide)
 - Highlight vehicle or system design changes from the existing designs
 - Indicate whether the vehicle or its systems are pre-existing or newly designed
 - Highlight the design challenges the Team will face adapting the vehicle and its systems to this year’s Competition and weather conditions
 - Hint: first year Teams should identify major design decisions
 - Hint: returning Teams should highlight the design challenges the Team faced adapting the vehicle and its systems to this year’s competition

Two-Vehicle Outline



PDR Presentation Outline: 1/1

Slide Title	Suggested Format**	Minimum # of Slides
Collaborative (2 Team) Snowplows		
Top-Level Requirements	Table	1
Plowing Strategy: Triple "I" Snowfield	Figure	1
Joint Communication System Design	Figure	1
Joint Safety Systems	Figure	1

()**: Include additional text outside figure/table as necessary



PDR Presentation Details 1/1

Collaborative (2 Team) Snowplow

- Top-Level Requirements (1 slide)
 - Hint: identify requirements that both vehicles would have to each satisfy to plow the triple “I”
- Snowplow Vehicle Plowing Strategy (minimum 1 slide)
 - Triple “I” Snowfield
 - Hint: address joint vehicle strategy to plow snow, minimize plowing time, maximize snow removal, avoid obstacles, and return to garage
- Joint Communication System Design (minimum 1 slide)
 - Outline methodology of inter-vehicle communication and equipment
 - Equipment mounting position on own vehicle
- Joint Safety System Design (minimum 1 slide)
 - Identify scenarios
 - Inter-vehicle safety scheme
 - One vehicle failure effect on other vehicle: actions taken