

**Invitation: Off-road Autonomy Demonstration at
International Society of Terrain Vehicle Systems ISTVS 2025 Conference,
Lebanon, NH: Oct 6 - 10, 2025**

Executive Summary:

An Off-Road Autonomy Demonstration and Workshop will be held as part of the 2025 ISTVS Conference. The event will include a full day of live demonstrations on various autonomous navigation approaches (Wed), followed by keynote and technical presentations (Thurs) and an “after action review” style workshop (Friday morning). Technical teams working to advance autonomy in an off-road environment are invited to present and demonstrate their capabilities. Results will be compiled into a journal publication reporting on autonomy techniques; suitability, issues and level of effort for operating in off-road environments; and concepts for future developments. This is an opportunity to demonstrate your capabilities and engage with engineers and scientists with wide-ranging expertise in off-road mobility aiming at advancing the state-of-the-art.

Conference Information

The 55th Conference of the International Society for Terrain-Vehicle Systems (ISTVS) will be held October 6-10 2025 in Lebanon, New Hampshire, USA. This conference may include papers and presentations from technical experts around the world in the fields of vehicle terrain interaction, robotics, and autonomy. Research is presented from multiple disciplines including mechanical engineering, vehicles and machines, robotics and automation, soil science, civil engineering, agricultural engineering, environmental engineering, and this work includes professionals from academia, industry, and government agencies. October is a great time to be in New England with the fall foliage (Figure 1,) and the venue is in close proximity to the US Army Engineer Research and Development Center Cold Regions Research and Engineering Laboratory (CRREL) that conducts research in many of these same areas (Figure 2.)



Figure 1: Fall Foliage in New England



Figure 2: CRREL winter sensor testing

Conference Schedule of Events:

Preconference / Monday, October 6, 2025

ISTVS Board of Directors Meeting (may be on Sunday)
Off-Road Simulation workshop by Algoryx
Optional Local Meetings and Tours
Ice Breaker Reception

Day 1 / Tuesday, October 7, 2025

Opening Ceremony
Keynote Speeches
Technical Sessions

Day 2 / Wednesday, October 8, 2025

Team O'Neil Tarmac Technical Tour
Autonomy Demonstrations

Day 3 / Thursday, October 9, 2025

Keynote Speeches
Technical Sessions (Robotics and Autonomy talks concentrated on this day; including a panel discussion on virtual autonomy simulation by Clemson University)
Banquet and Closing Ceremony

Day 4 / Friday, October 10, 2025

Half day autonomy workshop (***free of charge but registration is required***)
Optional Post-conference Team O'Neil Rally School Tour in Dalton, NH (***free of charge but registration is required***)

Technical Tour

The technical tour will include two separate events about 1.5 miles apart. The group will be split in two with the first group attending Team O'Neil (TON) Rally School Tarmac events and the second group attending the autonomy demonstrations at nearby Ridge Runner Promotions. The teams will meet back at TON for lunch before switching areas for the afternoon session. The day will start with pickup at the hotel at 0700 for an 0800 start of the demonstrations and will return to the hotel around 1730 that evening. This combination of events will: 1) Demonstrate possibilities and the limits of highspeed vehicle control on asphalt with instruction/discussions on how this applies to high-speed driving on gravel, snow-covered, and sometimes rough terrain condition, and 2) showcase the current state of "high-speed" autonomous navigation in complex off-road conditions. The pairing of these events will allow both fields to see where improvements and techniques can be shared between the manned and unmanned worlds of extreme driving.

Team O'Neil Demonstrations:

Vehicle Dynamics and Soft Soil Mobility by multi-time Rally Champions Tim O'Neil and North American Rally champion Travis Hansen.

Static display and introduction to Rally cars and their modifications for high-speed, paved and unpaved-road performance.

Ride-along asphalt rally experience (1 to 3 per vehicle, depending on number of participants and schedule.)

There will be power, water, and restroom facilities onsite.

Autonomy Demonstrations:

Off-road vehicle autonomy presents unique challenges beyond those facing on-road autonomy due to the unpredictable and varied nature of off-road environments. The exploration and extension of novel modeling, estimation, and control methodologies and frameworks spanning from the subsystems to system, and system-of-systems are crucial for unlocking the full potential of autonomous off-road vehicles. In particular, developing robust and reliable technologies for off-road autonomy will incorporate applications across diverse sectors, including agriculture, mining, construction, planetary applications, military and defense. This operational demonstration and workshop aims to bring together the autonomous vehicle community to jointly explore the technical challenges, showcase promising technical directions, and outline opportunities for future exploration. Specifically, the objectives of the demo will focus on theoretical and machine learning comparisons and promote a technical exchange between government, industry, and academic participants. The goal is to have four (4) or five (5) teams showcasing their approach to off-road autonomous vehicle navigation. Approaches may include: Birds eye view (BEV) transformers, hybrid approaches that could include elements of machine learning and physics of mobility, maneuver, terrain, a classical algorithm approach (Flow), a visual language model approach (VLM). Teams should come prepared to discuss the rationale for their technical/algorithmic solutions at the Friday workshop. These discussions should include the

effort of implementing their specific technical solution (discussed in more detail in the workshop description).

The autonomy teams will be demonstrating their hardware and navigation software on unpaved and vegetated trails at Ridge Runner Promotions ATV site. This site consists of open grassy and gravel road areas, wooded trails, an unmaintained motorcross track, steep hill climb track and potentially some small water features. The image below shows the outline of the property in google earth. Demo teams will have access to this site for a few days prior to the event to gather information as required for their autonomy demonstrations. The site will have power, water, restrooms and tents for each vendor.

Autonomy Workshop on Friday morning:

The Autonomy workshop will be held on Friday to discuss the demonstrations and define the key needs and questions related to autonomy. The results of the workshop will be presented in a publication in the Journal of Terramechanics. The Autonomy workshop on Friday is co-organized by GVSC and will be held at the CRREL auditorium so it is ***free of charge but registration is required***. Sponsorships are welcome to help cover conference and demonstrations/tour costs.

The workshop aims to integrate the knowledge from the conference demonstrations, technical talks and assembled off-road mobility experts. It will start with a panel discussion on Autonomy Methods for Off-Road Navigation motivated using specific questions of interest to the off-road community; next will be a short description and impressions from the live demonstration teams; and followed by an open but guided discussion loosely adhering to an after action review (AAR) or lesson's learned format to recap a) what was planned, b) what was accomplished, c) the different approaches and what worked well or not-so-well, and d) the overall level of effort of implementing specific technical solutions (overall effort meaning – the development/testing/training time to implement their specific algorithmic solution on a new platform, the fiscal and/or time cost related to hardware requirements or software development and testing time, the types of technical backgrounds of the engineers and students required to implement their solution confidently, etc.), and e) what could be improved for the future.

Results will be compiled into a journal publication reporting on off-road autonomy techniques, suitability, issues and level of effort for operating in off-road environments; and concepts for future developments.



Figure 3: Autonomy Demonstration Site

Action Request

The ISTVS 2025 technical tour is sponsored by Team O’Neil Rally School and the Nevada Automotive Test Center. All participants will have the opportunity to experience both the Team O’Neil and autonomy demonstrations over the course of the day.

The Autonomy demonstration and workshop is being planned by GVSC, CRREL and NATC.

Please contact Mike Parker and Sally Shoop if you are interested in demonstrating your capabilities during the Autonomy Demonstration: michael.w.parker@erdc.dren.mil and sally.a.shoop@erdc.dren.mil.