Enabling the Safe Deployment of V2x Smart Mobility Innovations

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Accelerating Time to Market

• Area X.O is a technology-rich, secure R&D complex for all weather experimentation

• Helping to bring next-gen smart mobility, autonomy and connectivity tech to market faster
  • Develop, test, validate, demonstrate and apply
  • Onsite engineering team
  • Regulator collaboration to accelerate adoption
  • $33+ million in tech investment

• Addressing R&D challenges and opportunities in many sectors:
  • CAVs, unmanned systems and drones, public safety, defense, cyber security, mobility, smart cities, agtech
Multiple Real-world Test Environments

Test First at our Private Track
- Real-world urban and rural mobility infrastructure including at Grade Rail Crossing and 3 way and four-way traffic intersections
- 16KM track
- 1750 hectare/1850-acre private gated site
- Air and pavement temperature sensors
- DSRC, GPS, LoRA, LTE/4G, WiFi and 5G
- HD Map of entire site
- Localized control of traffic operations and situational awareness systems

Opportunity to move to Public Track
- Established process with City of Ottawa for SMEs to do real world deployments
- Demo Areas: Smart Intersection, Smart Rail Crossing
- Multi-lane use cases, nine traffic intersections (DSRC) with speeds from 40km – 100km
- DSRC, High precision GPS, 4G-LTE and 5G for V2I, V2V, V2p and V2N
- Data, cloud and analytics platform services
Ottawa was the first municipality to provide real time traffic information to a CAV using DSRC and V2X communication.
Transport Canada – Developed Framework for LSAS Testing and Trials

- Executed first LSAS trial on public roads in Ontario
- 1,500m loop around a federal campus (shown in yellow)
- Four stops with access to LRT station and key buildings
- Travelling at 15km/h; 20 seconds per stop; 9 campus loops per hour
- Connection to public transit and several highly frequented destinations
- Possibilities for many low-speed interactions with other road users
- Proximity to secure overnight storage with electric charging
Transport Canada: Smart Safe Intersections that Protect Vulnerable Road Users

- Executing complex test scenarios in a four-season climate - adoption of the WEF Safe DI testing framework
- Assessing the design, testing and integration of emerging CAV, V2X and smart mobility tech in intersections and safety for vulnerable road users
- Move to real world intersection “Kanata Smart Intersection”
- Accelerating tech development, time to market, and future adoption (policy)
Transport Canada: Safe Smart Rail Crossings - *Project under consideration with TC*

- City of Ottawa is home to 67 at-grade rail crossings, many of which are located on high-speed (60 km or greater) roads.

- Connected infrastructure, sensors, communications, and vehicle technology have the potential to prevent or significantly reduce the impact of vehicular and rail accidents.

- Deploy a suite of machine visions sensors at Public at Grade Crossings to collect real time data

- Technology and solutions to improve safety at high-speed rail crossing will be tested at AreaX.O and City may choose to deploy at public crossing.

- enabling SCMS certified safety messages be sent over multiple communication modes 5G/ LTE/ DSRC to connected vehicles, including a connected snowplow.
Enhancing safety and unified situational awareness at rail crossings

Using cooperative perception and trusted V2X communication
Mission: To promote sustainability and profitability in agriculture through innovation and knowledge transfer

- Support testing and demonstration (virtual workshops)
- Match-making with industry, government and post secondaries
- Enables SME commercialization and R&D around BMP’s and technology
- Supports sharing data, learnings and insights
- Aims to increase ROI for producers
Areas of Focus

• Field Baseline Data, Analytics, Modeling
• Innovative Crop Planting
• Environmental Sustainability N2O emissions
• Soil Health and Crop Productivity
• CA Vehicles in Agriculture
• Aerial Imaging: Satellite and Drones
• Sensor Monitoring and Effectiveness across different regions in Canada
• Data: Common Infrastructure Platforms
• Communication Infrastructure and Rural Connectivity
2021 4R Field Scale Trials

1. Conventional Full Tillage With Broadcast Fertilizer Applied
2. Two Types Of Strip Tillage Practices:
   a) Fertile-Stripping With Fertilizer blended in the Strips (coulter strip till)
   b) Conventional Strip-till Fertilizer Applied at bottom of strip (shank strip till)
3. Vertical Tillage With Broadcast Fertilizer Applied
4. No Tillage With Broadcast Fertilizer Applied

Equipment
- The coulter strip till was done with a down plurbis.
- The shank strip till was done with a Krouse gladiator.
  - The fertilizer on the strip till units was using a Flexi-coil air cart with two tanks that can independently meter fertilizer.
  - The conventional tillage was performed using a roto tiller.
N2O EMISSION FLUX SAMPLE MEASUREMENTS expressed in Kilograms per Hectare

Figure Shows the total Kg of N2O-N Ha-1 measured over 93 days during the growing season. Measurements were taken using Licor Sensors every half an hour. The measurements were

Figure Shows the average amount of Kg N₂O-N ha⁻¹ day⁻¹ starting on the 160 day of the year and ending on the 260 day of the year.
Innovative Fertile Stripping
Fertilizer applied 150kg/ha
Mass: 345g
Yield: 9194 kg/ha

Conventional Fertile Stripping
Fertilizer applied 225kg/ha
Mass: 235g
Yield: 7315 kg/ha

Conventional Broadcast Cropping
Fertilizer applied 225 kg/ha
Mass: 190g
Yield: 6923 kg/ha

Corn yield using Different Farming Techniques
Creating an Algorithm to predict N2O emissions

DOY 163
(June 13, 2021)

DOY 256
(September 13, 2021)

Model after just one year of data – minimal inputs required (soil makeup, rainfall, ambient temperature, type of planting and dates and rates of inputs ie. Fertilizer)

*more data from across Canada and automate input of variables