



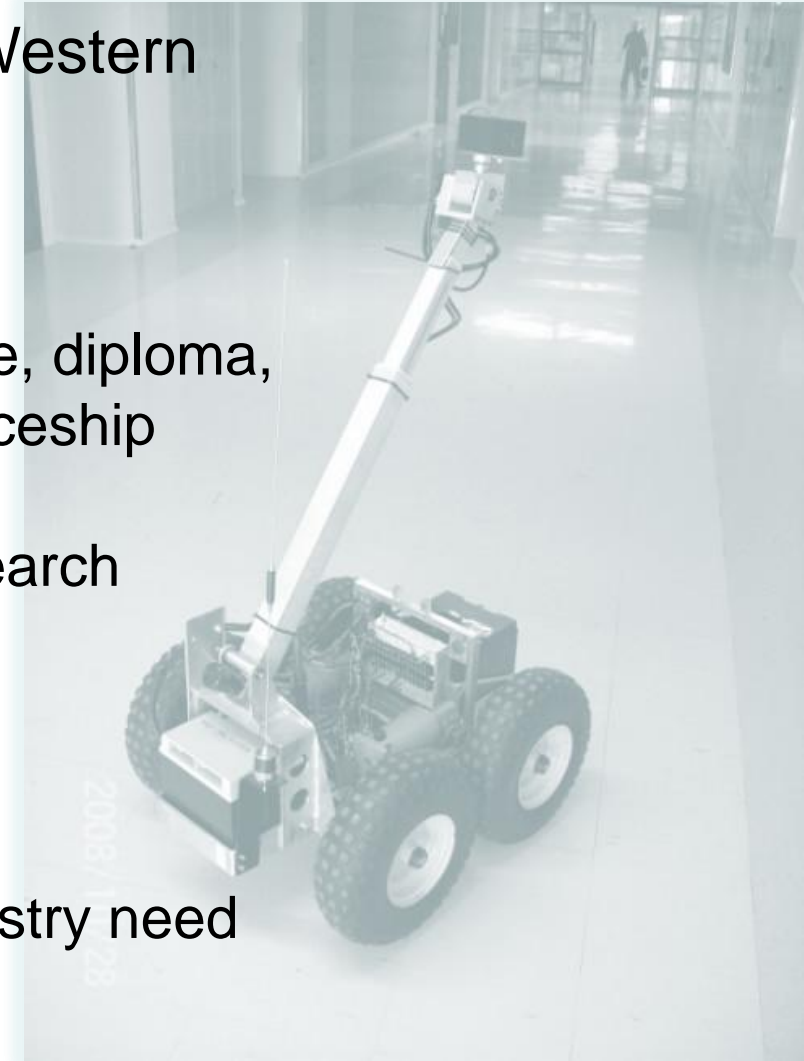
## Robotics Projects at NAIT

David Carpenter PhD.

# Introduction and background

## NAIT- Largest Polytechnic in Western Canada

- As a Polytechnic:
  - Programs include degree, diploma, certificates and apprenticeship
  - Second most active research Polytechnic after SAIT
  - Research is applied
  - Research driven by industry need



# Research Activity

NAIT has five schools:

- Research activity is carried out within the Schools.
- Activities are based on Program disciplines
- School of ICET has activities that include:

Prototyping (typically electronic and mechanical)

Sensor integration (we build systems)

Control Systems

Unmanned Ground Vehicles



# Facilities – Most are shared between research staff and teaching/students

**Some of the diploma programs and research centers share facilities – relating to robotics:**

- **Mechanical Engineering Technology Diploma/NSMC (NAIT Shell Manufacturing Centre)**
- **Nanotechnology Systems Diploma/nanoCARTS (NAIT's Technology Access Centre for nanotechnology)**
- **Electronics Engineering Technology Diploma/Electronic Prototyping Centre**
- **Electrical Engineering Technology Diploma/Machines and Drives Research Group**

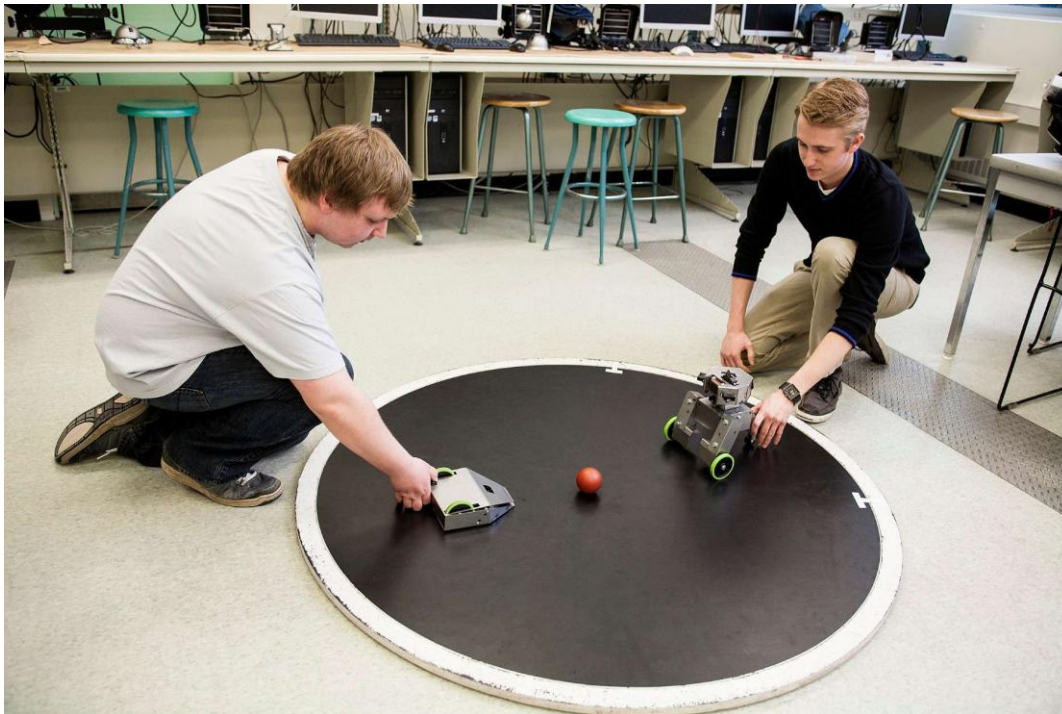


# Staff/Students

## – Involvement in Robotics

For in-depth research activities:

- Longer term research projects carried out by faculty and research staff



Student involvement:

- As part of the above team
- Shorter projects with industry (Capstone Projects)
- Final year projects (may have industry input)
- Other project based courses
- Competitions



# Prospective Students

## – Involvement in Robotics

Prospective students:

- NAIT hosts a number of high-school competitions in robotics



- ❖ VEX
- ❖ First Lego League
- ❖ Skills Canada



# Prospective Students

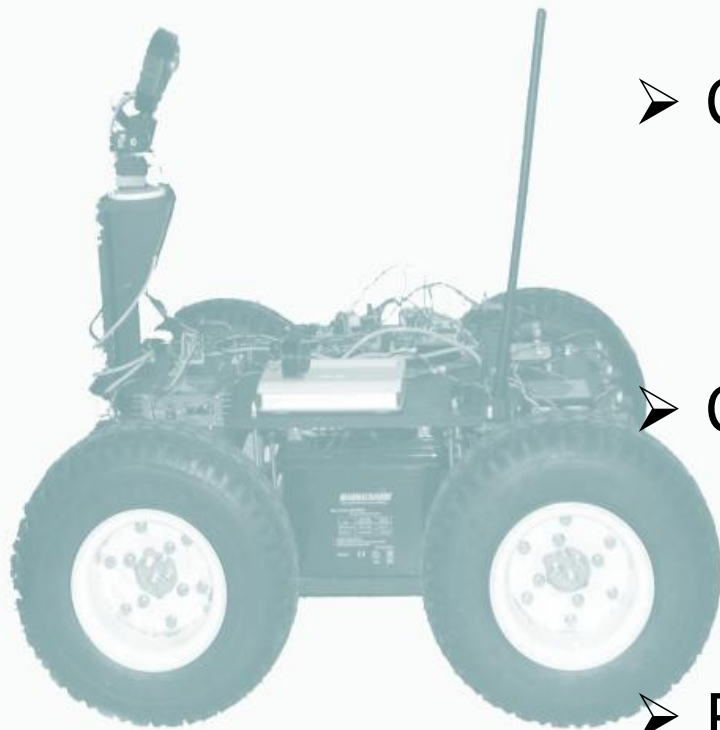
## – Involvement in Robotics

Get Set summer campus on robotics :

- ❖ 5 days
- ❖ Some female only (supporting WITT)



# Robotics research activities



Combining activities such as:

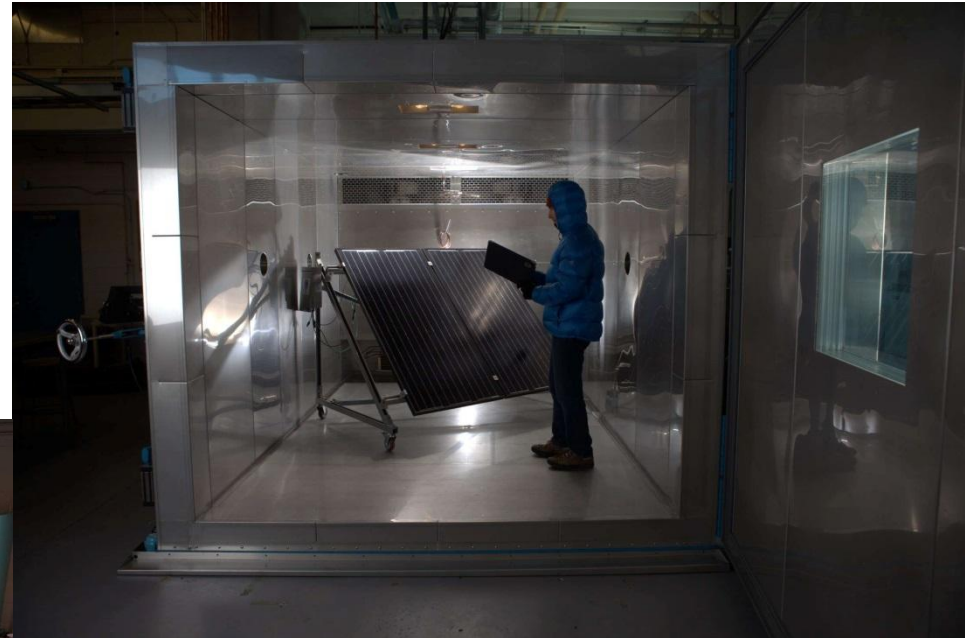
- Sensor integration and testing
  - Remote sensing
- Communications, e.g.
  - Wi-Fi
  - Cell phone networks
  - RF
- Control systems
  - PID
  - Variable frequency drives
  - Vector Control
- Permanent Magnet Motors
- Robotic Welding



# Facilities – environmental testing

A number of environmental chambers available.

Available through NSMC or nanoCARTS



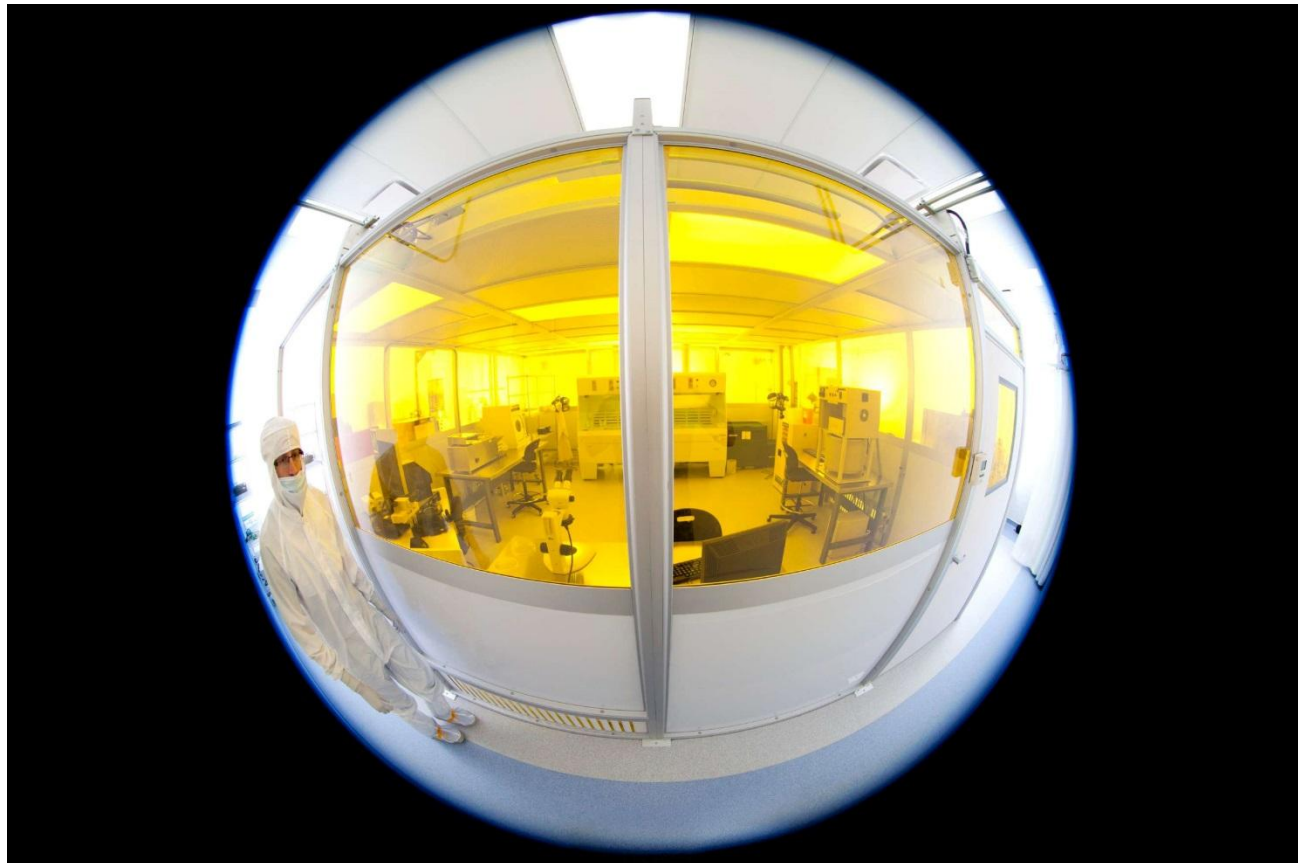
Most are cabinet sized.  
We do have:  
“Big Blue”



# Facilities – clean room facilities for testing

nanoCARTS has a class 1000:

Sensor development and integration into systems

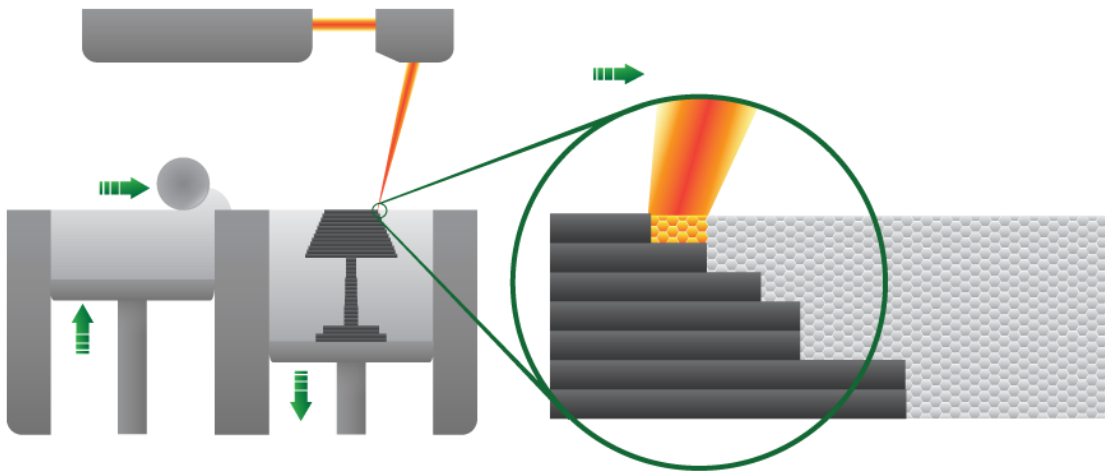


# Facilities – a number of 3D additive manufacturing options

A number of additive manufacturing systems are available:

3D printing of polymers to allow rapid prototyping of non-metallic parts and assemblies.

3D direct to metal printing using sintering techniques.



Some 3D scanning capabilities are also available.

# Facilities – electronic rapid prototyping

Electronic prototyping focused on systems integration (usually of sensors).

Usually includes mechanical design also.



# Facilities – electronic rapid prototyping

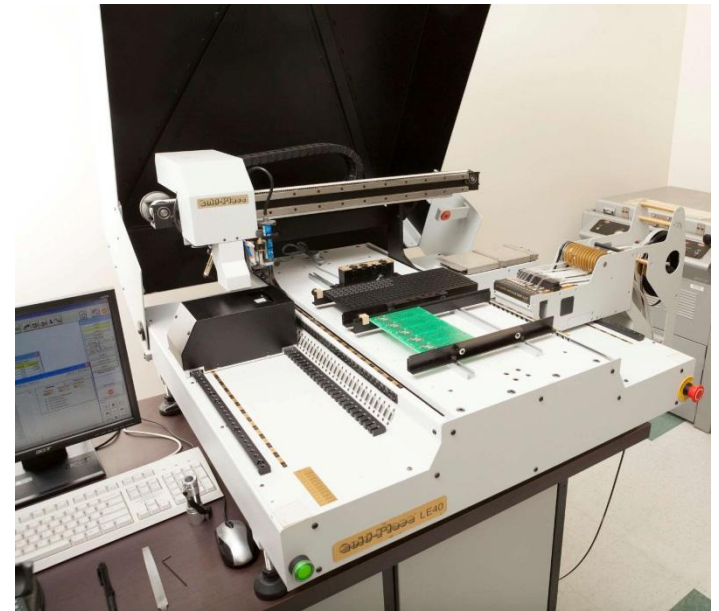
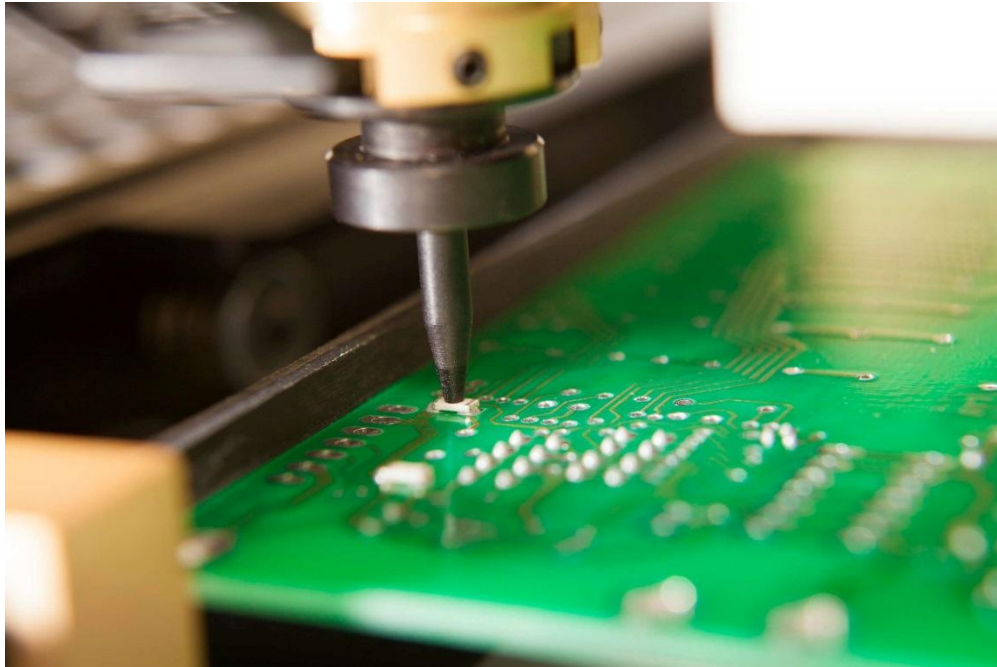
Variety of systems available to achieve this:

Prototyping pick and place machine

Traditional pcb design and manufacturing

Reflow oven system

pcb routing machine



# Facilities – electronic rapid prototyping

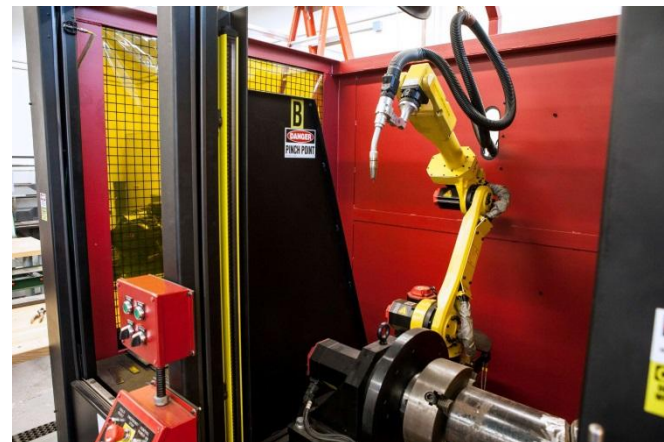


Variety of systems available to achieve this:

- laser cutting systems
- extensive range of cnc systems
- robotic welding



Technical staff with expertise to use these systems efficiently.

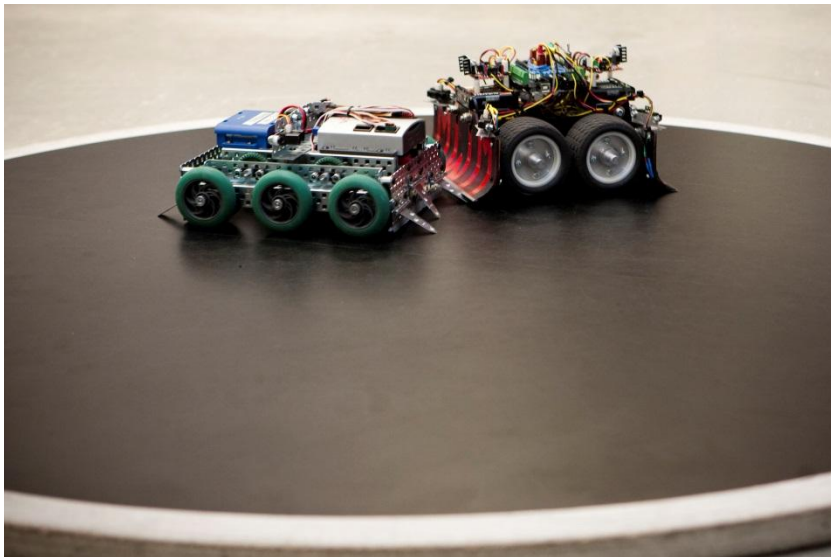


# Electronics and Mechanical rapid prototyping

Electronic and Mechanical prototyping provides students an opportunity to become involved in robotics.

Robotics has been a long time interest of faculty and staff.

Always a hit with students.



# Developing a Tactical Semi-Autonomous Robot for First Responders

Initially developed for the EPS and RCMP

Robotics system with some autonomy:

Vision system

IR sensors

Zipper mast (3 m extension mast)





# Field trials

- EPS field trial.
- Urban office building scenario.
- To locate a body.
- Comparison testing with Vanguard vehicle.
- Some commendable features
- Some feedback for improvement



- RCMP field trial with CBRN team at CFB Suffield
- Mission: to test NAIT vehicle in chemical hazard scenario.
- Vehicle performed well during the near 3-hour test.



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## Questions

