Cross-Border Collaboration: Driving Regional Competitiveness in Advanced Mobility

Toyota Motor North America, R&D
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February 8, 2017
Toyota Motor North America

25 million
vehicles built in North America

40,000
team members

11
manufacturing plants

16
different models

https://www.toyota.ca/toyota/en/about/north-america
Toyota in North America

1957  60th  Toyota Motor Sales
1972  Manufacturing Operation
1973  Calty Design Research
1977  40th  Toyota Tech Center
1986  Kentucky Production
1987  Toyota USA Foundation
1988  1st Canada Production

1993  Arizona Proving Ground
1995  Engine Production
1996  US Manufacturing HQ
1997  5 million NA Production
1999  1 million Production
2000  1st Hybrid in US
2002  10 million NA Production

2003  1st Lexus Production
2006  Hybrid Production in US
2010  NA Center for Quality
2011  Collaborative Safety Research Center
2012  15 million NA
2015  Plano HQ Construction
2016  7 million Production

http://www.toyota.com/usa/operations/map.html
Toyota in Michigan & Ontario

TMNA R&D

Vehicle Design
Vehicle Evaluation
Powertrain
Research
Adv. Development
Purchasing
Supplier Engineering
Etc.

Toyota Canada Cold Research Centre
Timmins, ONT

Miller Technology
North Bay, ONT

Toyota Canada, Inc.
Toronto, ONT

Toyota Motor Manufacturing Canada
Cambridge, ONT
Woodstock, ONT

Calty
Ann Arbor, MI

Toyota Motor North America
Ann Arbor, Saline, Detroit,
Plymouth, Livonia

Toyota Research Institute
Ann Arbor, MI

http://www.toyota.com/usa/operations/map.html#!/Operations-By-State
http://www.toyota.com/usa/operations/map.html#!/ttc_ann_arbor_and_saline
http://corporatenews.pressroom.toyota.com/releases/toyota+advanced+automated+vehicle+technology+us+roads+sept4.htm
Developed & Manufactured in US & Canada

- **Mississippi**
  - Corolla
    - Toyota Motor Manufacturing, Mississippi, Inc. (TMMMS)
  - R&D

- **Kentucky**
  - Camry
    - Toyota Motor Manufacturing, Kentucky, Inc. (TMMK)
  - Kentucky
    - Toyota Motor Manufacturing, Kentucky, Inc. (TMMK)
  - Kentucky
    - R&D
  - Kentucky
    - R&D

- **Indiana**
  - Sienna
    - Toyota Motor Manufacturing, Indiana, Inc. (TMMI)
  - Sequoia
    - Toyota Motor Manufacturing, Indiana, Inc. (TMMI)
  - R&D
  - R&D

- **Texas**
  - Tacoma
    - Toyota Motor Manufacturing, Texas, Inc. (TMMTX)
  - Tundra
    - Toyota Motor Manufacturing, Texas, Inc. (TMMTX)
  - R&D
  - R&D

- **Cambridge**
  - R&D
  - Woodstock
    - RX
      - STARTING AT $43,120
      - 295 HP 3.5L V6
      - 30 MPG COMBINED RATING
  - R&D

- **Canada**
  -http://www.toyota.com/usa/operations/map.html
  -http://www.tmmca/en
Toyota: Innovation

http://www.toyota-global.com/innovation/vision/
Innovation & Collaboration: Powertrain

Improve automotive powertrain efficiency: development process and energy

Math-based modeling for virtual development of complex systems

Using information technology for reduced energy consumption and greenhouse gas emissions

Matching Fund Partners
- Natural Sciences and Engineering Research Council of Canada (NSERC)
- Automotive Partnerships Canada
- Canada Foundation for Innovation
- Ontario Centres of Excellence
- Ontario Research Fund

GAIA
Green and Intelligent Automotive Facility
Innovation & Collaboration: Safety

By collaborating on research with the best and brightest from universities, hospitals and researcher institutions across North America and by sharing the results with academics, government and the rest of the automotive industry – we’re working to advance transportation safety and help reduce the number of traffic injuries and fatalities.

CSRC Collaboration Partners

Active Safety

Passive Safety

Human Factors

Data Analytics & Tools

Designing feedback to help induce safer driving behaviors

http://www.toyota.com/csrc/#
http://hfast.mie.utoronto.ca/
Innovation & Collaboration: Safety

Designing feedback to help induce safer driving behaviors

Providing feedback to drivers
• to enhance their performance
• to change their long term behaviours
• without imposing distractions detrimental to safety

Specific objectives:
• feedback characteristics to inhibit risky behaviors.
• when feedback can become a potential distractor and what type of individuals are more prone to it.
• the learning curve, how drivers adapt to feedback over time, and if benefits sustain when feedback is not available.

Voluntary distraction: Some drivers are more willing to engage in a secondary task, e.g., sending a text message

Involuntary distraction: Some drivers are more likely to be distracted by irrelevant stimuli, e.g., phone ringing

http://hfast.mie.utoronto.ca/research/driver-feedback/
Innovation & Collaboration: ITS & ADAS

Leadership Circle

Developing an entire system of connected and automated transportation on the streets of southeastern Michigan through 2021.

→ Deployment of Vehicle to Vehicle (V2V) & Vehicle to Infrastructure (V2I)

Pillar 1
Connected Ann Arbor

- Expand DSRC fleet and infrastructure in Ann Arbor
- Start DSRC installation to up to 1000 TTC lease cars

Pillar 2
Connected SE Michigan

- Expand DSRC infrastructure in Southeast Michigan

Pillar 3
Connected-Automated

- M-City Test Course
- Connected & Automated Test Vehicle

Government – Industry – Academia Partnership to Accelerate Research & Deployment of Connected & Automated Vehicle (CAV) Technologies
Innovations: V2X Technology

Toyota’s Vehicle to Infrastructure (V2I) and Vehicle to Vehicle (V2V) Products (since 2015)

- Right-Turn Collision Caution
- Red Light Caution
- Signal Change Advisory
- Communicating Radar Cruise Control
- Emergency Vehicle Notification
- Roadside Unit

http://toyota.jp/technology/safety/itsconnect/
http://lexus.jp/brand/technology/itsconnect/
http://newsroom.toyota.co.jp/en/detail/9676551
Innovations: ADAS Technology

Almost all Toyota & Lexus models will have Toyota’s ADAS Package as standard by the end of 2017.

Pre-Collision System (PCS)
Pre-Collision System With Pedestrian Detection Function (PCS w/PD)
Lane Departure Alert (LDA)
Automatic High Beams (AHB)
Dynamic Radar Cruise Control (DRCC)

TSS Toyota Safety Sense
LSS+ Lexus Safety System +

Package of key ADAS features using sensor fusion

http://www.toyota.com/safety-sense/
http://newsroom.toyota.co.jp/en/detail/4228443
Innovations: Opportunity (even easier)

Driving Automation
Automated driving Technologies

ITS & Mobility Eco-System

Ultra-Compact Mobility Sharing Network

Two Major Events in 2017 Connecting Michigan & Canada and Cars & Roads

Vehicle SAFETY
6/5-8, 2017
Cobo Center, Detroit
https://www-esv.nhtsa.dot.gov/

Intelligent Transportation
10/29 – 11/2, 2017
Palais des congrès de Montréal
https://www.itscanada.ca/events/wc_2017.html

http://www.toyota-global.com/innovation/intelligent_transport_systems/lowcarbon/
Summary

• Mobility improvement is a **global** issue with **regional** uniqueness.
• **Regional** talent can contribute to **improvement** of global issues.