



AHEAD BY A CENTURY

The Future of Automotive Technology

The case for developing a world-class test facility for Intelligent Transportation Systems and autonomous vehicles in Southeast Michigan



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OPPORTUNITY

A World Class Test Facility Will Position Southeast Michigan’s Future in Connected Vehicle Technology

The auto industry is on the verge of revolutionary change with the potential to dramatically reshape the way we interact with vehicles and the future design of our roads and cities ([KPMG White Paper on Self Driving Cars](#)). The University of Michigan Transportation Research Institute (UMTRI) is leading the charge with breakthrough research that will transform the future of mobility. The Connected Vehicle Safety Pilot Program is a scientific research initiative that features real-world implementation of connected vehicle safety technologies, applications, and systems using everyday drivers.

The inclusion of the Ann Arbor region in this study, with real people driving real cars, will accelerate the learning cycles of drivers, thereby driving near term market acceptance and raising the stature of the State of Michigan in the Intelligent Transportation Systems (ITS) Automotive World. The proposed **Center for ITS and Autonomous Vehicles** will establish Southeast Michigan as the world leader in driving technology and standards through industry and regulatory collaboration.

The State of Michigan needs to leverage UMTRI’s dominant research and development success in this space and “control” industry collaboration, thereby attracting more private sector investment. Creating imminent value to the industry will leverage significant investment from OEMs and technology suppliers which should be captured in the Southeast Michigan region. As a leader in this field, the State of Michigan stands to gain from new private research dollars and a pipeline of federal funding geared towards the ITS industry. A need still remains for building the road testing and simulation infrastructure to spur an entrepreneurial environment around the ITS industry. Construction of a world class test facility at the RACER property, a significant asset straddling Washtenaw and Wayne County, will set Michigan apart from growing competition to capture ITS as an economic development catalyst.

Significant Economic Impact



Investment	Jobs	Wages
\$360,400,000	7,800	\$526,000,000

“ Numerous security threats will arise once personal mobility is dominated by self-driving vehicles. Network security applications could come in many forms to prevent threats, including vehicle authentication, encryption, tamper-proof hardware, real-time constraints, user-defined privacy policies, and defense-in-depth.”
- KPMG White Paper on Self Driving Cars



Implement precautionary testing before deploying new technology on public streets



Confirm that the automobiles work well with other vehicles on the road



Retain local talent and create jobs through private industry contracts

NEED FOR INFRASTRUCTURE

Off-road Testing is Required to Ensure Public Safety

There is an opportunity to create an industry asset so comprehensive and cutting edge that private industry will be obligated to bring jobs to the Southeast Michigan region to be in close proximity. Off-road test facilities are commonplace within the auto industry, including virtual simulation machines that can engage a driver with new technology before getting on a test circuit. A significant ITS test facility will undoubtedly receive support from the federal government because it will help alleviate fears that states are haphazardly passing laws that will flood the streets with untested vehicles.

The state of Michigan recently enacted legislation that will allow autonomous vehicle testing on Michigan roads - joining states like California, Nevada, and Florida with similar legislation. However, dynamic off-road testing is still required before ITS or autonomous vehicle can be deployed on public streets.

A field test facility of magnitude will create synergistic relationships among academia, government, and industry. The State of Michigan can be the leader in establishing this type of collaboration here in Michigan. With a test facility driving value, Michigan will be an attractive location for OEMs interested in hiring talent in software engineering, mobile application development, computer science, and cloud computing - retaining local talent and creating jobs through high-value private industry contracts.

“ Innovation really has two parts, and this is what some people miss; the first part of innovation is the development, invention, patent or some other form of intellectual property. The second piece of innovation is the commercialization of that into products and services. It's only when you commercialize that intellectual property, that know-how, that you transform an invention into an innovation; that's why it's important for us to be working with suppliers and partners, because the path to innovation for us has changed over time.

Carmakers will team up with digital partners like Google, Microsoft, Intel (maybe even Apple) to produce talking vehicles that don't crash and get you to work on time. Companies like Ford and Microsoft already collaborate on technology that lets you bring your music and social media apps into your vehicle. Now these non-traditional partners will be working together to solve the difficult challenges of urban mobility on an overcrowded planet.

- John Lauckner, GM CTO (Forbes)

“ Intel is looking to apply its expertise in consumer electronics and systems intelligence to the development of smarter vehicle technologies that seamlessly blend IT, CE, and the next generation ADAS while maintaining optimal safety.

- Mark Lydon, Director of Intel Capital

BUSINESS ATTRACTION & NEW OPPORTUNITIES FOR ENTREPRENEURSHIP

Expand the Technology Landscape of Southeast Michigan

In February 2012, Ford Executive Chairman Bill Ford called for new opportunities in a speech at a mobile electronic device conference in Barcelona, Spain. He said the mobile device industry should join with automakers and governments to develop connected car technology in order to solve looming congestion and safety problems around the world ([August 21st, 2012; CBS.com article "Can Cars Talk To Each Other?"](#)).

If cars are considered an operating platform for safety systems, then the infusion of technology into the vehicle has no limitations. Technology companies not previously perceived as auto suppliers could indeed possess the capability, platform, and entrepreneurialism to shape the industry. Gaining access to that community here in Southeast Michigan will not only significantly impact the auto industry, but will surely have a ripple effect across other industries as well.

If Google were to successfully enter the automotive market, its auto business would dwarf the current Google business model, and Silicon Valley technology companies are taking note. Both Intel and Cisco are undertaking efforts to gain a better understanding of the near term ITS opportunities, and other companies like Microsoft, Apple and Oracle would likely create a presence wherever this technology is being developed in vehicles.

“ A friend who works for a major car maker and who has access to its APIs has written an app that texts his wife and lets her know when he’s ten minutes from home. He’s considering writing an app that will tell him when his wife’s gas tank is down to one-quarter full, so he can fill it for her. He has also written an app that texts his teenaged daughter and lets her know when she is ten minutes away from having to leave wherever she is if she is to make it home before her curfew. ”
- “Google’s Trillion Dollar Driverless Car: The Ripple Effects”
(Forbes.com)



Willow Run’s acreage will accommodate the requirements of a world-class test facility



The existing infrastructure for utilities can be easily utilized



Two private entrances off US12 will allow for easy access via car, rail, and air

THE CASE FOR WILLOW RUN AS A PROPOSED DEVELOPMENT AREA

Selecting a Suitable Location for an ITS Testing Facility

HISTORY

The proposed site is the former Willow Run bomber plant where Ford Motor Company manufactured the B-24 Liberator bombers. The plant was eventually purchased by rival General Motors for its Ypsilanti Transmission Operation (YTO). In 2005, GM refurbished 1,000,000 s/f of the plant at the cost of \$200,000,000 to prepare for the manufacture of the new six-speed transmission. However, in 2009, GM announced the consolidation of the YTO into the Toledo, Ohio plant, and in December 2010, YTO closed its doors forever. After GM’s Chapter 11 bankruptcy in 2009, YTO became part of old GM surplus properties and is being disposed of by the RACER Trust. The site itself consists of a 5,000,000 s/f building (all under one roof) on 335 acres.

INFRASTRUCTURE

The site has two separate private entrances from US12, a Norfolk & Southern rail spur to the site, and adjacent Willow Run Airport runways.

DTE Energy serves the facility at 13.2 volts, and an on-site industrial substation built to serve the plant provides three transformers and 50 Mw of available capacity.

Public water and sewer serve the site with 6” water mains serving the engineering area, and 10” mains near the powerhouse on the south side of the facility. A 10” diameter sanitary sewer runs along the west side of the engineering area and a 15” diameter sanitary line runs to the south side of the building.



Racer Trust-Former GM Willow Run Powertrain Facility



Aerotropolis: Poised to conduct business and create partnerships on a global scale



Renaissance Zone: Located in a virtually tax-free area designated for NMDCs



Qualified for tax abatements and tax increment financing packages



Conveniently and centrally located to key facilities:

- 15 minutes to Detroit-Metro Airport
- 10 minutes to WCC and EMU
- 20 minutes to University of Michigan & UMTRI

LOCATION

The property is situated in a strategic location straddling Washtenaw and Wayne Counties. The proximity between Ann Arbor and Detroit will tie together research and development assets of the region with manufacturing know-how. The site is adjacent and contiguous to Willow Run airport, a cargo and personal aircraft hub in the region that also incidentally provides protected airspace. Detroit Metro Airport is within a 15 minute drive of this location. Academic and educational assets such as the University of Michigan, Eastern Michigan University, Washtenaw Community College, and Wayne State University are also close by. Interstate 94 is a four-lane divided highway that conveniently exits onto the main roadway, thereby connecting the site to a network of road systems such as I-275 and US 23. There are more than 1,000 acres around the site in Washtenaw and Wayne Counties that could support ancillary development. The Detroit to Ann Arbor dedicated commuter rail line is within one mile north of this site. The location is naturally secured and delineated from any adjacent commercial and residential neighborhoods.

INCENTIVES

The RACER Trust property is located in the Aerotropolis, a Next Michigan Authority. The Next Michigan Development Act (NMDA), enacted into law in December 2010, empowers “Next Michigan Development Corporations” (NMDCs or, in this case, the Aerotropolis Development Corporation ADC) to offer new tax incentive packages to qualified businesses who locate in a state-designated NMDC. The ADC offers streamlined “one stop shop” processing of eligible business applications by the ADC, instead of working with each local government. The ADC works directly with State economic development officials to approve and implement tax incentives, so that a business can be up and running quickly. Incentives

CASE STUDIES

ITS Test Facilities in the Private Sector



CITE City-Center For Innovation Testing and Evaluation

Pegasus Global Holdings, LLC, a private international technology development firm, is creating CITE to be the largest scale testing and evaluation center in the world, located near Albuquerque, New Mexico. CITE will represent a 20th century American city with a population of approximately 35,000 people and will be built on roughly 15 square miles. CITE's test city will be unpopulated. This unique feature will allow for a true laboratory without the complication and safety issues associated with residents. CITE will be a catalyst for the acceleration of research into applied, market-ready products by providing "end to end" testing and evaluation of emerging technologies and innovations from the world's public laboratories, universities and the private sector. Focus technology areas at CITE will be: ITS; Green Energy Systems; Smart Grid Technologies; Telecommunications; Resource Development; and Security. (Courtesy CITE website)



Toyota

Toyota has built an 8 acre facility near Mt. Fuji in Japan for its own private use. "The 3.5 hectare test site looks much like the artificial roads at driving schools, except bigger, and is in a corner of the Japanese automaker's technology center near Mount Fuji in Shizuoka Prefecture, central Japan. Toyota officials said the smart-car technology it is developing will be tested on some Japanese roads starting in 2014. Similar tests are planned for the U.S., although details were not decided. Such technology is expected to be effective because half of car accidents happen at intersections, according to Toyota. Managing Officer Moritaka Yoshida said Toyota sees preventing collisions, watching out for pedestrians and helping the driving of the elderly as key to ensuring safety in the cars of the future. he told reporters. All automakers are working on pre-crash safety technology to add value to their cars, especially for developed markets such as the U.S., Europe and Japan." (Yuri Kageyama, Associated Press)



APPENDIX

- **Components of a Comprehensive Off-Road Test Facility**
- **Conceptual Site Plan**
- **Economic impact**
- **Resources and Partner Organizations**



COMPONENTS OF A COMPREHENSIVE OFF-ROAD TEST FACILITY

The following should be included in a test track for ITS:

- Realistic Lane Markings, both new and worn for sensor recognition
- Simulated tunnels for GPS and wireless interference
- Buildings of varying scales that interfere with wireless communication and hinder the safe visibility of drivers (potential re-use of portions of GM facility to create dense downtown environment)
- Reflection areas that can bother the driver
- Unexpected maneuver opportunities around physically simulated obstacles
- Roundabouts
- Real vegetation, road side furniture, typical local and downtown signage (Sensors need to pick up everything)
- Roadways need to be built to the current standards: asphalt, pavement, dirt roads, gravel
- Rail crossings
- Weather conditions, specifically fog and rain or white out snow conditions
- Two mile straightaway to enable on/off ramps, road side signage and exit entrance ramp signage (land not available at RACER site)
- Realistic infrastructure that can be built to communicate with each other and with vehicles
- Center for virtually simulated tests, test track of the future
- Multi block neighborhood and downtown street grids
- Introduction of other moving vehicles or animals equipped with ITS such as: segways, bicycles, skateboards, scooters, roller blades

*Existing test facilities would still be very important as part of the overall ITS ecosystem. Tracks at MIS, Chelsea Providing Grounds, Milford, etc., still serve a highly functional purpose, but are also extremely limited in their capabilities.

** Source - The University of Michigan Transportation Institute

CONCEPTUAL SITE PLAN

SITE PLAN

- 1. Admin Building (90,000 SF 2/Story)
- 2. Labs/ Office (50,000 SF Single Story or 100,000 SF 2/Story)
- 3A. Warehouse (90,000 SF Single Story)
- 3B. Warehouse (15,000 SF Single Story)
- 4. Open Air Fuel Station W/Canopy
- 5. Tenant Garages (40,000 SF Each - Single Story)
- 6. Parking Lot for Trailers
- 7. Control Tower
- 8. Development Course
- 9. Development Course
- 10. UMTRI Test Course
- 11. Security Berm
- 12. Security Fence
- 13. Small Garages (8,000 SF)



Construction Investment: \$90 Million

The blended average cost of construction for this type of technology park is \$100 per square foot (\$150 for office/labs/admin and \$100 for warehouse/garage)

Direct Job Creation Potential: 1,950

Using a factor of 200 square feet per employee, an estimated 1,950 jobs can be directly created by this project

Indirect Job Creation Potential: 5,850 jobs

A multiplier of 3 was used to calculate additional job creation

Additional Investment Potential: \$270,300,000

A multiplier of 3 was used to calculate additional investment



ECONOMIC IMPACT OF PROPOSED SITE

A conceptual site plan for a proposed test facility identifies approximately 706,000 square feet of mixed industrial and research and development office space consisting of 12 buildings

Buildings	Qty	Total Sq Ft	* Construction Cost Per Sq Ft	* Total Construction Cost	# of Employees (1 per 200 sq ft)
Administrative	1	90,000	\$150	\$13,500,000	450
Labs/Office	2	100,000	\$150	\$15,000,000	500
Labs/Office	2	200,000	\$150	\$30,000,000	1,000
Warehouse	1	90,000	\$100	\$9,000,000	0
Warehouse	1	90,000	\$100	\$9,000,000	0
Tenant Garages	3	120,000	\$100	\$12,000,000	0
Small Garages	2	16,000	\$100	\$1,600,000	0
				\$90,100,000	1,950
Economic Impact Multiplier of 3:				\$270,300,000	5,850
Average Blended Salary				\$67,500	
Total Wages				\$526,500,000	
Total Impact			Investment	Jobs	Wages
			\$360,400,000	7,800	\$526,000,000

This model represents a one time investment and job creation snap shot. An economic modeling software was not applied.

* Approximations

RESOURCES AND PARTNER ORGANIZATIONS

Moving the Ann Arbor Region forward in larger scale to be the global epicenter requires significant partnerships and resources.

To be considered:

- UMTRI and Office of the Vice President of Research
- University of Michigan Business Engagement Center
- Ann Arbor SPARK
- Washtenaw County and County Municipalities
- RACER Trust
- Willow Run Airport
- Aerotropolis Development Corporation
- Michigan Department of Transportation
- United States Department of Transportation
- Michigan Economic Development Corporation
- Wayne County EDGE
- Federal Economic Development Administration and the Department of Commerce



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