CONNECTED AUTOMATION:
DISRUPTIVE TRANSFORMATION

Jim Barbaresso
HNTB Fellow and Senior Vice President
Intelligent Transportation Systems
1,000,000 will die in traffic crashes
We’re on the cusp of a transformation in transportation, driven by advances in vehicle connectivity, automation, and electrification. The changes will be disruptive.
DISRUPTION POSES CHALLENGES
TECHNICAL CHALLENGES

- Interoperability and standards
- Implementation and support of specific applications & technologies
- Data management
- Data privacy
- Communications and network management
- Security management
- Local network security
- Technical obsolescence
1. **Funding.** Shortfalls impact the ability to deploy.
2. **Education & workforce considerations.** Lack of staff with necessary technical skills.
3. **Business case.** Lack of benefit and cost information to support investment decisions.
4. **Data ownership.** How to access it, who owns it, how do they support it?
5. **Liability.** What’s the risk and how does it get allocated?
6. **Forces outside their control.** Changing technologies and political climate leave public agencies feeling uncertain.
Education & workforce considerations. New skills needed in data analytics, IT, application support, software and new algorithms – a new generation of operations staff needed

Data management. Big data from connected vehicles will challenge operational staff – a blessing in disguise

Keeping up with advances. The transportation operations environment will continue to evolve at a rapid pace – don’t just chase the shiny objects

New partnerships and business models. Public and private – evaluate current operations and ask if you need to keep doing them

Giving up control. Greater automation of traffic management functions, greater empowerment of travelers, and impacts of connected automation
Disruption creates opportunity.
AUTOMATED VEHICLES

- USDOT Policy released Sept. 20, 2016
- USDOT AV Proving Grounds designations
- Industry introducing automated features on vehicles
  - Lane tracking
  - Adaptive cruise control
  - Automated braking
  - Park assist & automated valet
  - Platooning technology
- Dynamic mobility ecosystem

Source: General Motors
CONNECTED VEHICLES

- Notice of Proposed Rulemaking on December 12, 2016
- Final rule on V2V – currently in the 90 day comment period
  - Change in administration
  - Spectrum challenge
  - Privacy and security challenges
  - Progress on 5G M2M solutions
- GM moving forward
- Government stimulus for V2I
  - Connected vehicle pilot deployment program
  - Smart City Challenge
  - FAST Act funding

Source: Florida DOT
CONNECTED VEHICLES

Vehicles have 360 degree awareness of surroundings

Communicate with other vehicles 10 times per second

“Basic Safety Message” (J2735 standard)

- Location, heading, speed (Part 1)
- Air temperature, lighting, ABS, traction control, wiper status (Part 2)
ELECTRIC VEHICLES

- Renewed emphasis on zero-emission driving
- Infrastructure – a constraining factor
  - Range anxiety and charging stations
  - Wireless induction
  - Dynamic charging – potential tolling environment for electric vehicles
OPPORTUNITY REQUIRES VISION
VISION OF A SMART CITY

A **Smart City** utilizes **innovative and emerging technologies and concepts** to collect, analyze, and utilize data from many sources to enhance the city’s livability.

<table>
<thead>
<tr>
<th>Mobility</th>
<th>Transportation Infrastructure</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automated / connected vehicles</td>
<td>Sensors</td>
<td>Health &amp; human services</td>
</tr>
<tr>
<td>Public transit</td>
<td>Parking &amp; charging station monitoring</td>
<td>Public safety</td>
</tr>
<tr>
<td>Mobility as a service</td>
<td>ITS &amp; incident management</td>
<td>Energy, waste, water</td>
</tr>
<tr>
<td>Payment systems</td>
<td>Arterial operations</td>
<td></td>
</tr>
</tbody>
</table>
VISION OF A SMART CITY

Empowerment of the User
COLUMBUS SMART CITY CHALLENGE

- Columbus was the single winner out of 78 applicants for the Smart City Challenge

- Framework for connecting people with opportunities
  - 4 systems
  - 4 districts
  - 4 outcomes
MOBILITY AS A SERVICE

- Phenomenal growth in TNCs, sharing economy, app development
- Auto companies getting into the game
  - GM/Lyft partnering
  - Ford Smart Mobility
  - Maven
- Buy rides, not cars
- Mobility bundles
- Integrated information and payment solutions
BUSINESS CASES FOR AUTOMATION

- Urban applications – shared use vehicles
- Intermodal facilities – first and last mile opportunities
- Residential and campus applications
- Highway maintenance operations
- Truck platooning
TRANSITIONING ON OUR HIGHWAYS

- Managed lanes in a new context
- Should we separate automated vehicles from others to generate the most benefits?
- At what penetration rate should we dedicate a lane?
- Incrementally increase the number of special lanes as the fleet turns over?
EMPOWERING THE MACHINE

- Traffic signalization impacts
- Signage
- Seamless travel between roads and modes

Source: University of Texas
if CARS don’t CRASH
WHAT’S NEXT?

Flying cars and riding in tubes at the speed of sound
EMERGING MOBILITY SOLUTIONS

- Integration of connected, automated, and electric vehicle technologies into the existing operations environment will be challenging and disruptive to current paradigms
- Engineering and operational concepts, performance measures, algorithms, the transportation workforce, design standards, traffic control systems, and policies will be transformed
- Opportunities will be abundant

We can rewrite the book (or have it read to us).
CONNECTED AUTOMATION:
DISRUPTIVE TRANSFORMATION

Jim Barbaresso
HNTB Senior Vice President
Intelligent Transportation Systems

jbarbaresso@hntb.com
248-561-3552