

BRT Vehicle Development: Where Do We Go from Here?

Cliff Henke, Parsons Brinckerhoff

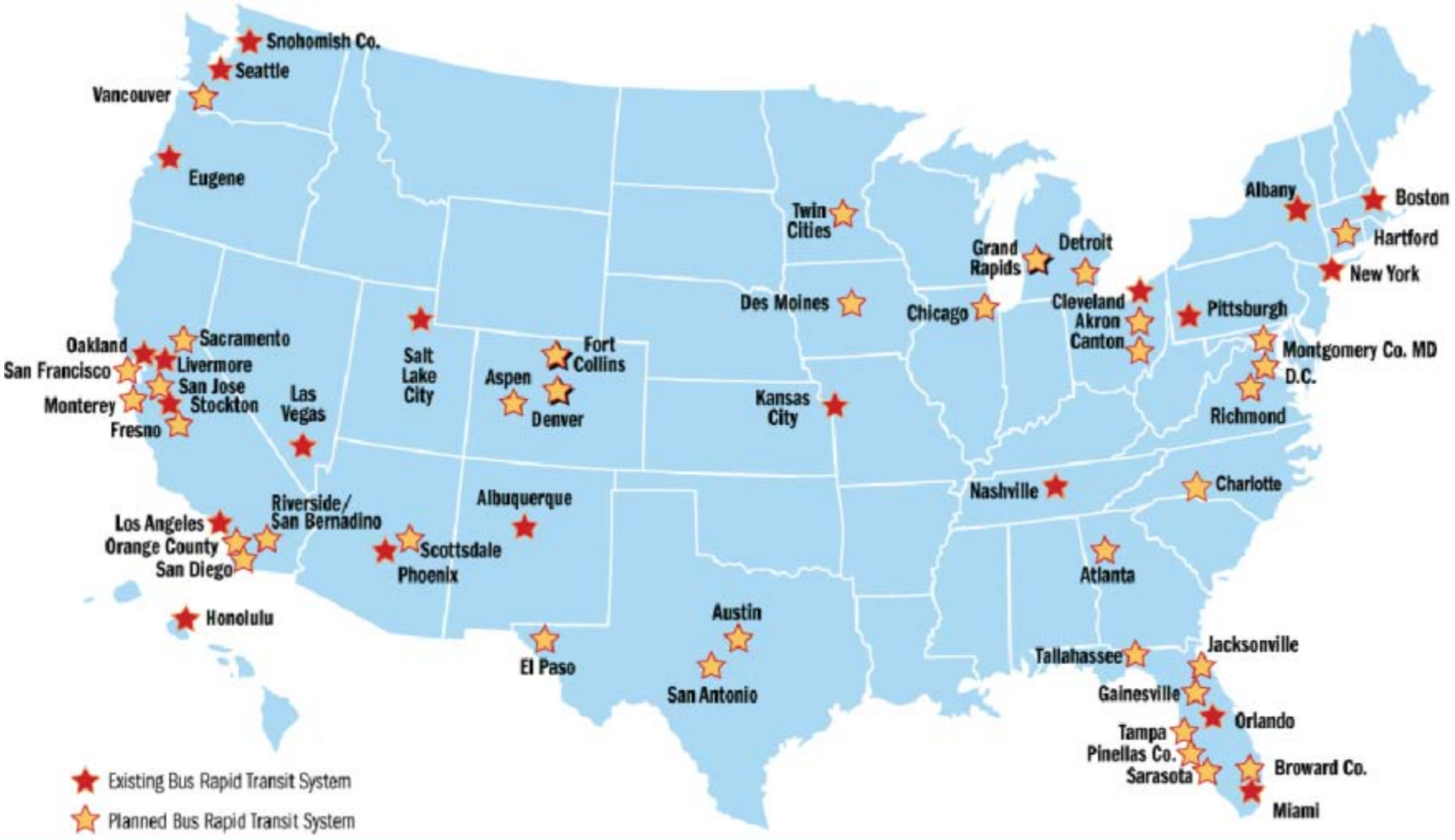
TRB National BRT Conference, August 2012

PARSONS BRINCKERHOFF

Agenda

- BRT Working Group Goals and Results
- Current BRT Vehicles and Trends
- Current and Future Research Needs
- Discussion

Explosive Growth In BRT



PARSONS BRINCKERHOFF

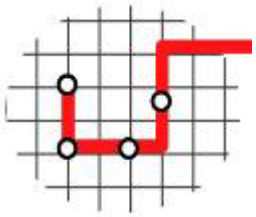
Vehicles Only One System Component

Vehicles

- Unique vehicle design
- Capacity
- Quiet, Clean, Modern

Running Ways

- Transitways



Service Plan

- Wider stop spacing
- High-frequency service
- Simple and direct routing

Stations & Stops

- Level boarding

ITS & Fare Payment

- Transit signal priority
- Off-board fare collection
- Real-time passenger information

Bogotá, Columbia

PARSONS BRINCKERHOFF

Quito, Ecuador

PARSONS BRINCKERHOFF

Cambridgeshire, England

Leeds, England

Las Vegas

PARSONS BRINCKERHOFF

PARSONS BRINCKERHOFF

PARSONS BRINCKERHOFF

PARSONS BRINCKERHOFF

Station Access

BRT “Lite”: *Swift*, Everett WA

RapidRide, Seattle

BRT Spectrum

BRT – "Lite"	*"Hybrid" BRT*	*Full BRT*
Swift BRT - Everett	**Eugene EmX**	**Orange Line - LA**
		
$1–3 million per mile	$3–10 million per mile	$10–27 million per mile

Vehicles are greater share of project cost when cost is lower

PARSONS BRINCKERHOFF

The European bus design challenge

PARSONS BRINCKERHOFF

Las Vegas Has Led Challenge to U.S. Builders

- Driven by image and BRT needs

Seeding the BRT Concept

Weststart/Calstart

- Advanced transportation technologies consortium
  - Dedicated to technology development, analysis and implementation
- Sponsored the first international design competition for BRT vehicles
  - Attracted academic and private entries from around the world
- Designated "program manager" to the FTA for its BRT Vehicle Action Plan (2004-2007)

Seeding the BRT Concept

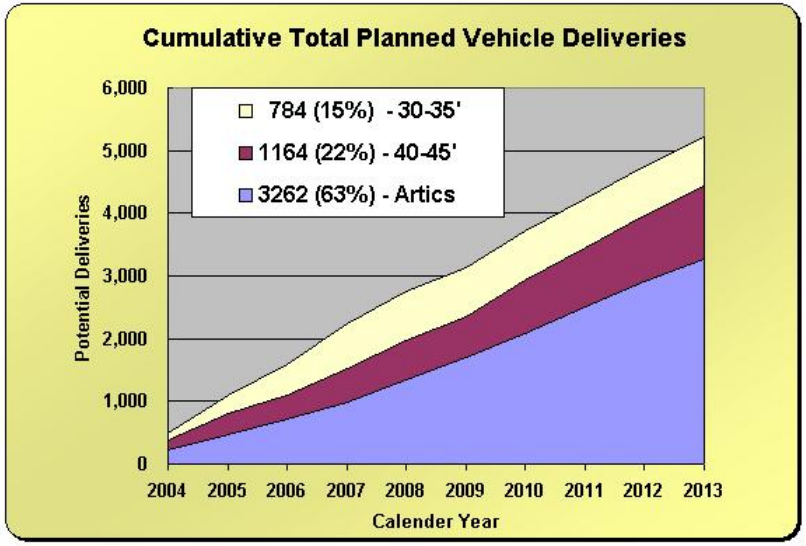
Weststart/Calstart

- Developed vehicle portion of the FTA's "Characteristics of Bus Rapid Transit" (CBRT) document
- BRT Vehicles Working Group
  - Connected U.S. vehicle manufacturers, transit agencies, component suppliers and regulators
  - Goal to speed up commercialization of BRT vehicle technology
- Developed/disseminated clean transportation technologies information for BRT industry conferences
- Launched/facilitated "Hybrid Bus Working Group" to help lower the cost and speed deployment
  - Most popular propulsion option for BRT vehicles

Seeding the BRT Concept

Industry BRT Vehicle Working Group

- Launched in September 2004 by FTA officials, grantees & manufacturers
- Focused initially on BRT Vehicle design & availability issues



- Created BRT Vehicle Action Plan outlining 16 strategies for development and commercialization
- Group reviewed work in progress and declared victory for several strategies at July 2006 meeting
- Recommended that a new BRT visionary group was necessary to handle next stage of the BRT industry

Common BRTV Myths

- Vehicles – “smoke-belching toaster on wheels”
  - Sleek, inviting, “Jetsons”
- Vehicles too expensive
  - BRT $900K; Streetcar $2.8M; LRV $3.8M
- Must choose LRT or BRT
  - Convertibility/shared use in Seattle, in development in Ottawa, York
- Not zero emissions like LRT
  - Hybrid electric, or 100-percent electric “e-BRT” ultrafast recharge at stations with super-capacitor
  - If this is so important why not the trolleybus option…?
- Only applicable for medium-sized cities
  - Spokane, Eugene …… Los Angeles, Chicago Boston….

U.S. Manufacturers Have Responded

- Driven by environmental and BRT needs

North American Vehicles Now with Doors on Both Sides

NABI 60-BRT hybrid demo

New Flyer 60DELFBRT hybrid for Cleveland Health Line

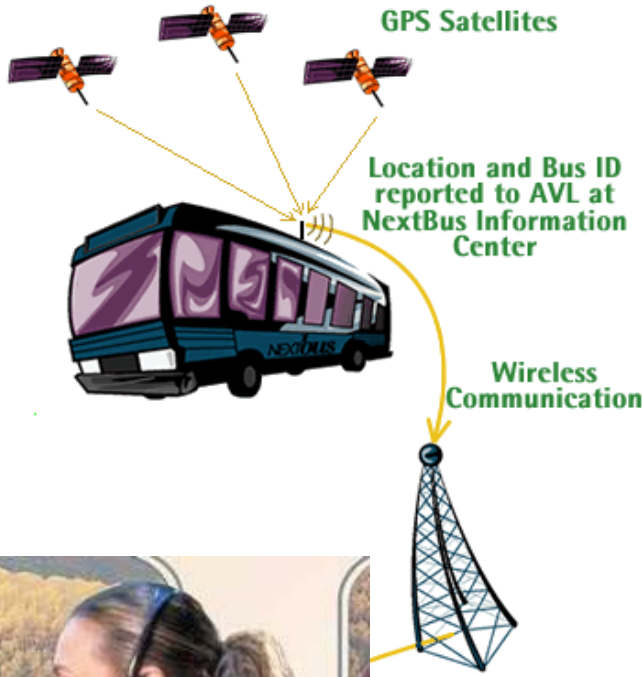
Passenger Information

At Stations
LA: Metro Rapid Bus

On Board
Paris: Val de Marne Busway

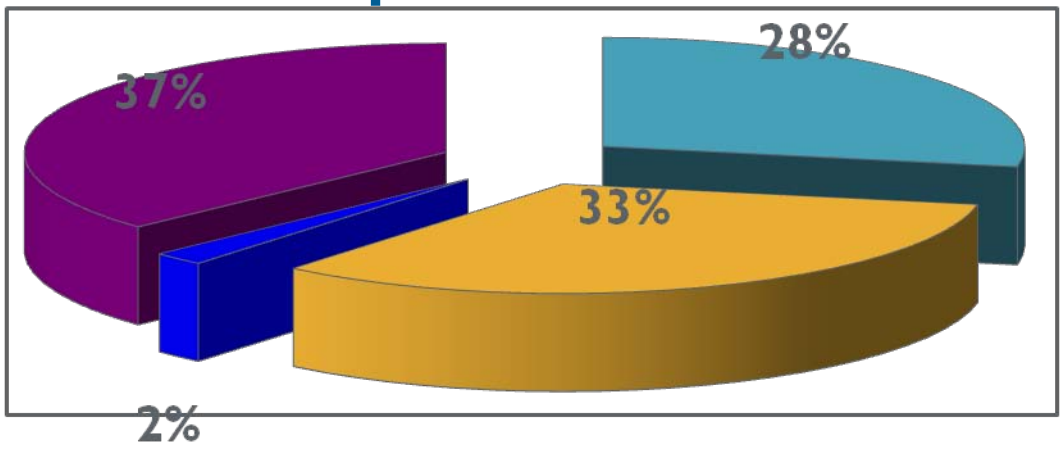
Other Info Technologies Also Have Income Streams

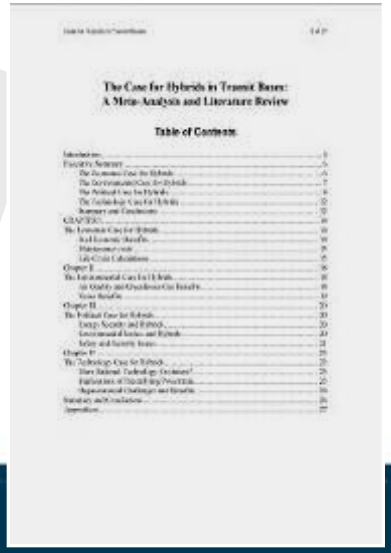
- On-Board Wi-Fi (L.A., Miami, various European cities)
- On-Board and Station Advertising with Next-Bus Info
- “Transit TV”



Hybrid will surpass CNG for most BRT Propulsion

- 28% of total will be hybrids
- One-third to be CNG (traditional drivetrain)





PARSONS BRINCKERHOFF

Docking/Narrow Lane Guidance Systems

Mechanical

Rail/Groove

Kassel Curb

Guide Wheel

Docking/Narrow Lane Guidance Systems

Magnetic

FROG **PATH**

Optical

Siemens

California and Oregon Demonstrations

USDOT Vehicle Assist & Automation

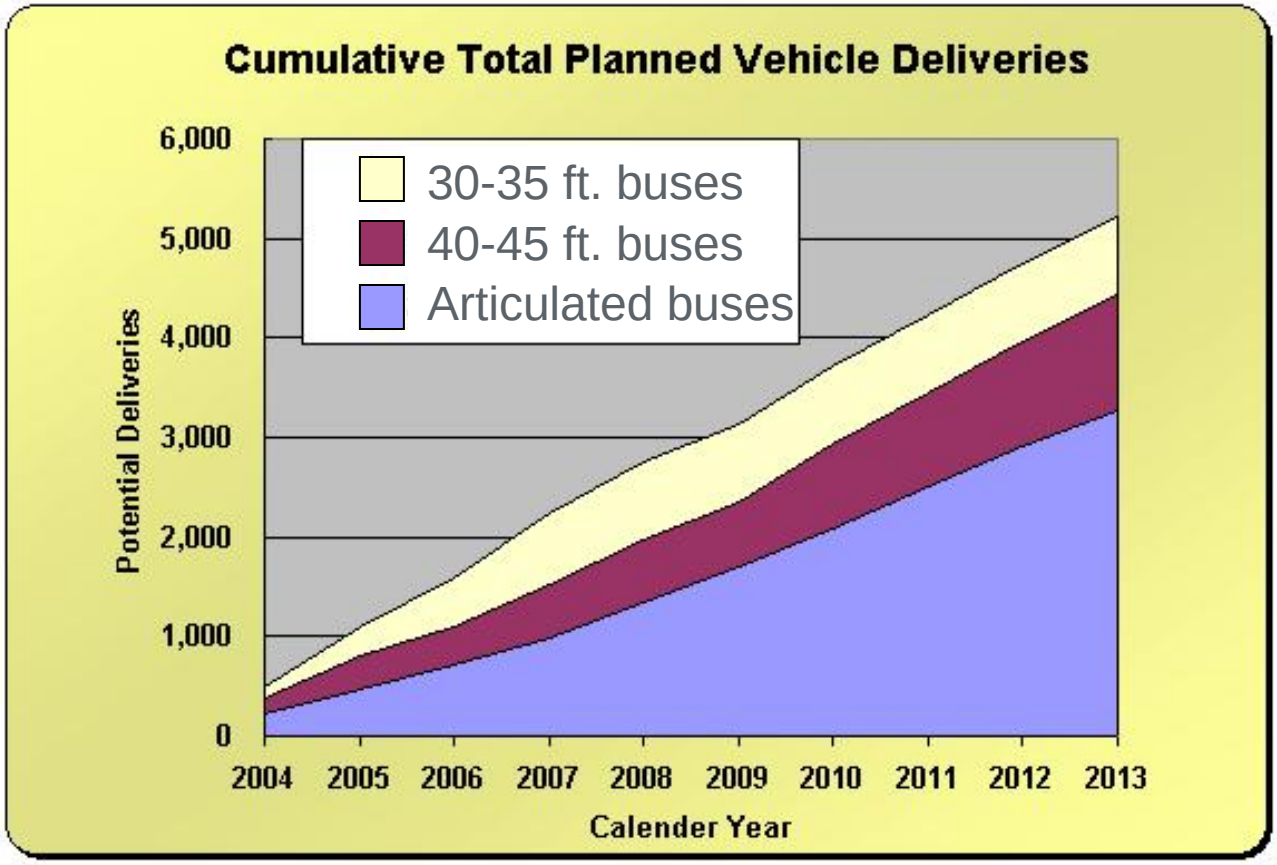
- Local Partners: Caltrans, PATH, AC Transit, Lane Transit District (LTD)

- Applications:
  - Lateral guidance on a three-mile section of HOV lane and through a toll booth on SR 92 – AC Transit
  - Lateral guidance and precision docking on Franklin EmX BRT route – LTD
- Technologies (individually and in combination):
  - –Magnetic Marker Sensing
  - –Differential Global Positing System (DGPS) / Inertial Navigation System (INS)
- Revenue Service Operations: Spring 2012 (Scheduled)

Level Boarding

BRT Vehicle Demand Growth

Projected U.S. Market for BRT Vehicles



Source: FTA 2004 Vehicle Demand Survey of 48 cities' expected BRT bus deliveries over the next 10 years (CALSTART, 2004)

- 20% to be 40-45 footers
- 450 per year, 66% for new services

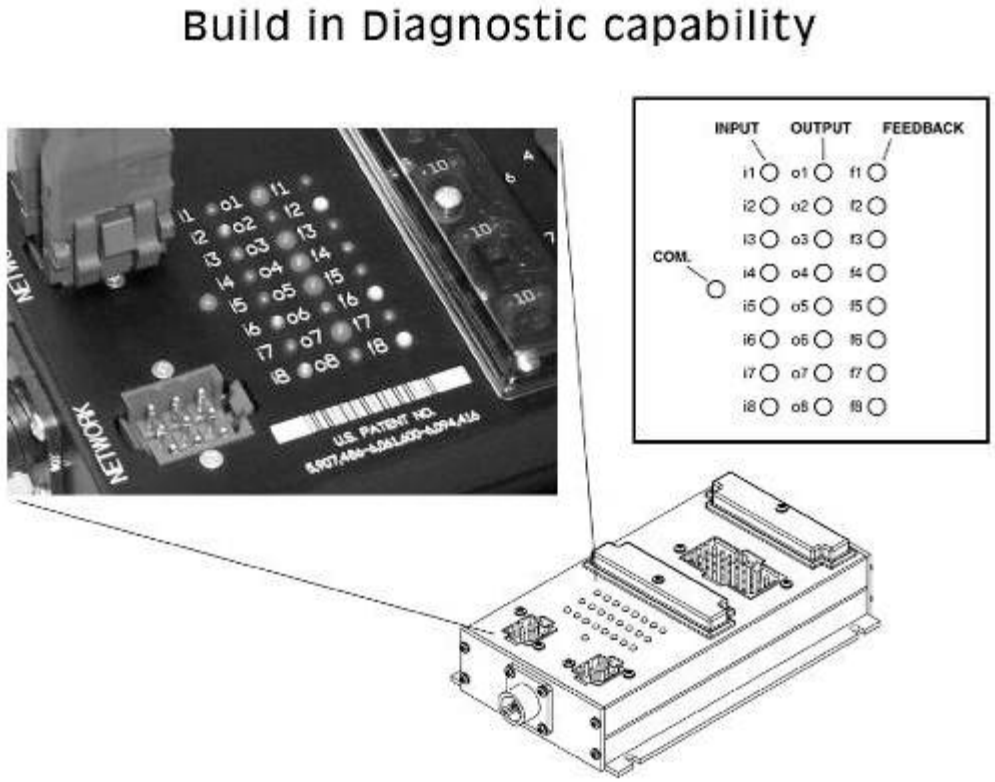
Pace of Technology's Change

The 1990s:

- Multiple floor heights, lengths
- Several fuels (and aftertreatments)
- Multiple structures
- Advanced electronics (multiplexing, AVL, voice annunciators, AVM, etc.)

The 2000s:

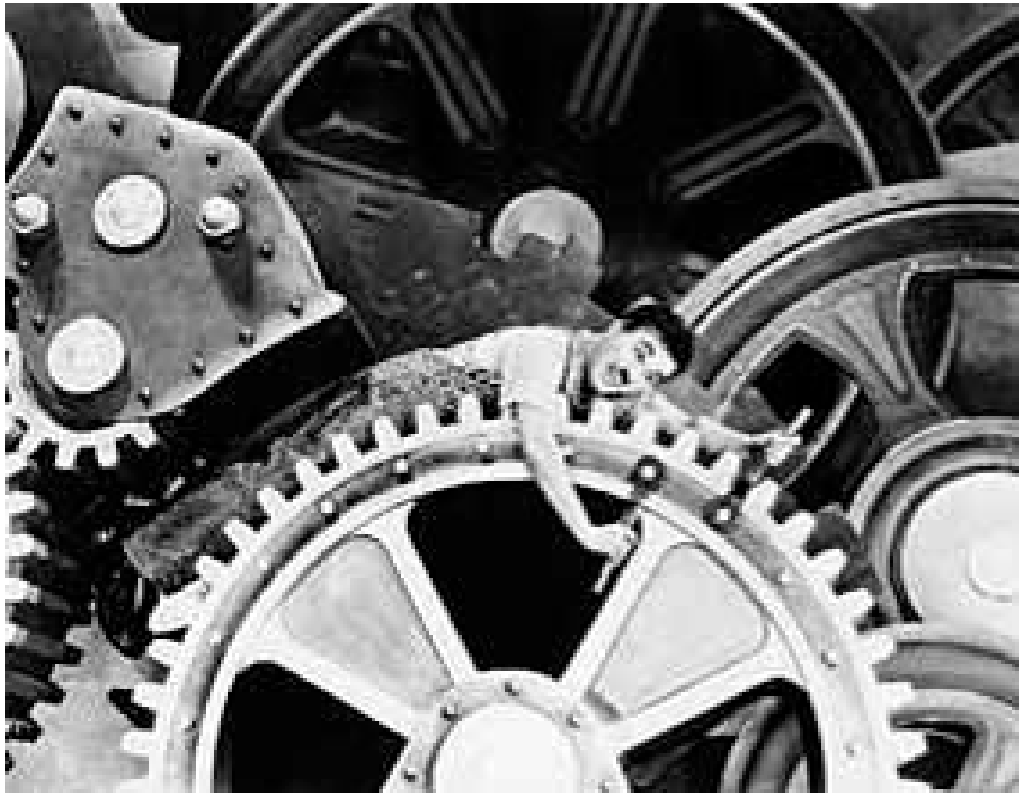
- Growing use of hybrids
- Real-time video surveillance
- Data logging and advanced diagnostics
- Wi-Fi
- BRT features



I/O Controls' multiplexing system

Result: A “Build to Order” Market

- Each order custom
  - Pilot bus
  - Wiring scheme different
  - Major components different (even allowed by SBPGs)
- Time to market now 18 months—or less
- Big reason why OEMs are financially fragile



- “And now you want what?”

Important Vehicle Research Issues

Resurrect Working Group?

- Buy America enforcement
- Altoona testing: new tests, waivers etc.
- Local Preferences (e.g., State Dealer Reqs.)
- Vehicle weight: axle loading, cost
- Standards incentives/mandates
  - Styling? Ride Quality? Advance Propulsion? Guidance?

Conclusions

- Remember: BRT Is A System of Elements
- Most Important Vehicle-Related System Performance Impacts:
  - Capacity
  - Doors/Seat Layout
  - Route Speed (Vehicle and TSP)
  - Route Structure/Convenience
  - Fleet Size = Frequency
  - Vehicle Reliability
- Largest System Design Impacts
  - Branding-Related Livery and Interiors
  - Vehicle and Station Styling
  - Information/Ease of Use
- What areas need further federal investment or policy changes?



Thanks

PARSONS BRINCKERHOFF