

Paul Menig Presentation

SAE ComVec 2013

Designing Tomorrow's On/Off Road Vehicle

Slide 1 Title .25 minutes

[CLICK] Good morning, everyone. Is this what we can expect the new tractor-trailer rig in 2025 to look like? I hope to answer that with my last slide.

Slide 2 Forces Driving Business Forward 1 minute

[CLICK] Twenty-five years ago, I was first introduced to a strategic business model called the Five Forces. Later the model was changed to include the sixth force of Government. We've just heard from our government, as a representative of all the people, tell us what is needed for the greater good of the nation and the world.

For my purposes, I have further expanded the model to include the seventh force of technology, overarching everything else. Business would love to optimize and run efficiently without change, while technology is ever in motion and pushing us to accept change as inevitable. Here in the middle of the diagram is a vehicle OEM. Often times, the focus is on the dealers, the service providers and their preferred suppliers.

Slide 3 Forces act on all businesses .5 minutes

[CLICK] We've also heard from an end user customer, a fleet, who lives at the center of his own universe with its own challenges of suppliers, competitors and customers. Some customers may feel like they are disconnected and part of their own universe that the vehicle OEM does not understand. That is partially true. The vehicle OEM is all about the truck. The fleet is all about truck--ING.

Slide 4 Fleet Customers Want It All 1.25 minutes

[CLICK] Let me summarize what I believe I have heard today, and recently, that our customers want from vehicle OEM's.

- [CLICK]** It must meet government regulations (of course)
- [CLICK]** Low upfront cost (because it takes capital at some interest rate and effort to install and train)
- [CLICK]** Reliability (it needs to do what you said it would do)
- [CLICK]** Durability (it needs to last a long time in my application)
- [CLICK]** Availability (I can't have it in the shop going through multiple updates and recalls and regular service)
- [CLICK]** It has to be fit for the job (Don't give me a vehicle that goes 100 miles when I need one that goes 500)
- [CLICK]** It has to be fit for the driver (Some others in the panel will talk about driverless vehicles)
- [CLICK]** It has to be safe (for the driver, other vehicles and the environment)
- [CLICK]** It has to be easy to use (Try training an artistic person to use your vehicle and all its gadgets)
- [CLICK]** It should not need to be repaired (but if it must, it should be easy and economical to service)
- [CLICK]** Don't talk to me about Total Cost of Operation unless you can meet the other criteria

Slide 5 Mission Critical .5 minutes

[CLICK] One thought to keep in mind as we continue to talk is the critical mission of a commercial vehicle:

1. Move fast to get something from point A to point B safely as in most on-highway medium- and heavy-duty trucks and busses.
2. Slowly move and do some useful work, such as cutting grass, plowing, planting and harvesting;
3. Stay in one place and do some useful work such as a vehicle for an electric utility, a sewer sucker or a drilling derrick;

Slide 6 Routing and clipping must improve 1 minute

[CLICK] This is a current show truck. We won't delight our customer if we don't work hard on the basics. Nothing in a commercial vehicle works without the electrical system. Yet, we still have serious problems with routing and clipping, heat, abrasion and corrosion. We don't get signals where they need to be when they need to be there. Three weeks ago at the Technology and Maintenance Council meeting, it was shown that inoperative lights on the vehicle is the biggest category of violation with the new CSA (Compliance, Safety, Accountability) requirements of the government. Some were beginning to suggest that LED lamps will solve that problem. Some others, rightfully in my opinion, pointed out that the problem is more with the wires and connectors than it is with the lamp. Get the basics right. I have two rules for electricity in a commercial vehicle:

1. Make a good mechanical connection;
2. Keep liquids away.

Sounds simple, but it's a lot harder to achieve than we would all like.

Slide 7 Batteries will be better 1 minute

[CLICK] Today's batteries are not good enough, therefore they will improve. Many of you may be skeptics, but two weeks ago I attended the Battery Show where new ideas in academia, the national labs and research centers were presented. I'm convinced that light duty vehicles are driven to use more hybrids and electric vehicles to meet government requirements around the world. Graphene and nano-tubes are two technologies among many that look to improve the chemical process of creating electricity. Can you remember when you put water (preferably distilled water) into your batteries? Batteries are better today than 20 years ago, and they will continue to improve.

Slide 8 Solar powered truck stop charging .5 minutes

[CLICK] How do you keep those batteries charged? Currently, there are more than 62 truck stops around the country with equipment to provide electricity to parked trucks. In 2025 I expect it will be at truck stops with solar powered outlets. There are already plans for these solar powered units to provide advertising revenue with digital screens along the edges and large screen monitors. Think of it as a personal drive-in theatre for a driver.

Slide 9 Super capacitors will be mainstream .5 minutes

[CLICK] Super capacitors have been talked about and worked on for more than a decade for trucks. As we sit here, there are hundreds of trucks with them installed aftermarket and OEM's are working on getting them installed in production in the thousands. By 2025, I expect them to be mainstream and in volume production.

Slide 10 Too many computers and too many communications links 2.25 minutes

[CLICK] Unbelievable. Unacceptable. I've said it before and Volvo said it recently. **[CLICK]** We've been adding a computer device to our trucks every year for 20 years. **[CLICK]** Where-as we started with one communications network 25 years ago, we now have vehicles with upwards of 12 high speed networks and even more low speed networks. If we have trouble with the basics, this level of complexity is beyond what we can expect people to maintain and repair. That gives us a couple of options:

- Make it so that it never, **Never, NEVER** fails
- Find a new solution that is simpler

[CLICK] One opportunity for simpler is suggested by the work that Peterbilt is doing on the SuperTruck program. They are investigating having larger "routers" that are connected to each other via the internet protocol and having dedicated networks behind those.

The second opportunity comes from machine to machine (M2M) efforts. The Zigbee protocol is already recognized in some transportation circles and in industrial applications. **[CLICK]** Intel, just two weeks ago, announced Quark chips for such applications. I hold out hope for someone to successfully deploy powerline carrier based networks because that would resolve the problem of getting power to the device. Since it's possible to get high speed internet protocol over power lines in the home, it should be possible to do it in a vehicle.

Unfortunately, I don't see the steady march toward more networks and more computers ending in the time frame we are talking about.

But, there is one positive I see. For several years now, we have had automatic updates of software for our computers and portable devices. Some of this is over the air. Fleet management aftermarket systems on the trucks have this over the air programming feature. It won't be easy to make sure it all works correctly and safely, but I believe some of the new computers on a truck will be able to be programmed over the air, which will improve the availability of a vehicle to a fleet.

Slide 11 Commercial instrumentation more basic than passenger cars

1.75 minutes

[CLICK] 1**[CLICK]** This year Mercedes-Benz announced the new S class. To a great extent, we can consider this to be the state-of-the-art production. 2**[CLICK]** But most cars are a bit simpler, with a center stack with a display and lots of controls on the steering column. 3**[CLICK]** Pick up trucks for personal use are similar. 4**[CLICK]** Take a step up to a commercial van or a class 3-5 COE and instrumentation gets significantly simpler. 5**[CLICK]** A class 8, heavy-duty, on-road truck is still being sold with dashes that have a dozen or more chromed gauges. I'll admit, this is not the majority of trucks sold. More often they look like these dashes. 6**[CLICK]** There is no good reason that a commercial vehicle in 2025 will not look a bit more 7**[CLICK]** like this 2012 concept vehicle from Peterbilt or 8**[CLICK]** this Revolution picture from Daimler or 9**[CLICK]** this new FH from Volvo. 10**[CLICK]** However, I hope to see a small number of vehicles starting production with flexible displays that curve with the physical dash, are molded into the door or the seat arm rest. These displays are expected to be sunlight readable. I say that, because unlike the first picture with the extended eyebrow over the instrumentation, I look forward to the day when no eyebrow is needed. This will open significant new opportunities in the cab. 11**[CLICK]** And, if passenger cars next year will have iOS in the Car, we should see it in a tractor by 2025.

I must admit, that displays on off-road tractors are more advanced than those for on-road.

Slide 12 Wearable Computers 1.5 minutes

[CLICK] Since the first portable and aftermarket devices were introduced to the trucking industry, there have been challenges in getting them installed into the vehicle. Getting these devices to avoid compromising the driver's visibility of the road and keeping them from distracting her has been all but impossible. Upcoming rules for tracking driver hours of service will pose more challenges in this respect. But, it will also open up tremendous possibilities. I don't have a good solution to the challenge that fleets want to specify the fleet management system across all makes of vehicles, while vehicle OEM's want to limit their development efforts and partner with one or two suppliers. The real challenge and opportunity, to me, **[CLICK]** is the advent of wearable computers. We already have pilots and emergency vehicle personnel wearing a significant amount of gear. Motorcycle riders have gear in their helmets. Recent introductions of watches and bands and glasses open up the possibility of a vehicle OEM installing a wireless hub in the vehicle that can connect to these different wearable computers. We will be able to see where the driver is looking, listen to his voice, feel his pulse, measure his blood glucose level and monitor her stress levels in real time. The vehicle OEM's need to be working now to incorporate this new portable device into their plans.

Slide 13 The Future? 1 minute

Unfortunately, time is limited so I could not talk about alternative fuels, engines, transmissions, safety and all the other parts of the tractor/trailer that are going to change. **[CLICK]** To answer the question from the first slide, the future tractor-trailer rig of 2025 is going to look a lot like today's rig on the outside. It will be sleeker, have more aerodynamic features, eliminate the exhaust stacks to save weight and cost, eliminate the external antennas to improve aerodynamics and save fleets the cost of repair. Hopefully, the government will allow us to downsize the mirror and make better use of cameras and monitors. On the inside, though, the future rig is going to be as different from today, as today's rig is from the ones produced in 2000. If we do it right, it will be more than different, it will be better and meet the needs of all the customers of a vehicle OEM.

Extra words

2025 seems like a long way off. I don't want to be accused of making too much of a blue sky forecast. I don't want to over-promise and under-deliver. It takes years to go from sketches in the design studio of a passenger car to everyday use in a commercial vehicle.

Think back to 2000, just 13 years ago. Get a picture in your mind of what a commercial vehicle and trucking looked like then. Now compare it to today. Think about those changes. 2025 is only 12 years away, about the same amount of time as that look backward. Now, let's make that leap.

Supercapacitors have been around a long time. I started working with them in the early 2000's. I believe they will be in regular production on our vehicles in 2025.

Slide 12 Safety On-Board

The rate of accidents for commercial vehicles has seen a good decline over the last decade. Yet, there are still too many and there are cost effective, technology capable solutions available. Commercial vehicles already have cameras for lane departure warning, radar for collision avoidance, and other cameras for helping drivers learn to stay focused on the task at hand by keeping their eyes on the road, hands on the wheel and in control of the flow of information bombarding them. These systems will see increasing penetration and government regulations requiring their use. I expect that we will have multiple cameras in the future, that regulations will change and we will have cameras replacing some mirrors on the vehicle. The camera on a smart phone today is capable of facial recognition and gesture recognition. These technologies are certainly headed for passenger cars in the next few years and will find application in a commercial vehicle by 2025.

Slide 13 Wireless XX minutes

25 years ago, the first wireless, fleet management systems found their way into trucking. An aftermarket product, allowed low speed communications and vehicle tracking before the advent of the GPS system and cell telephones. I'm excited about the advances we will see in the next two decades. It's not so much that anything will be revolutionary. Much of the advancement will be in the penetration of the devices and the features that

already exist. But, just as the advent of cell telephones and GPS and digital cameras has created new things that we cannot imagine, so too, the next couple of decades will have some surprises for us. So, let me blue sky for a moment at the risk of over-promising for the future.

Trucks that park themselves at a truckstop, cutting significant time from the drivers hours of service

Replacement of the CB by cell phone based, audio twitter like feeds so you can listen anywhere, not just in the vehicle, and follow your favorite people. Imagine a reality show where you are listening to the real time conversation of your favorite waitress at a truckstop.

Traffic signals that tell you what speed to go to avoid having to stop--unless you are driving a hybrid and need to stop to recharge the batteries.

Or, how about a camera mounted to the dock that sends a wireless video signal to the tractor for the driver to view, eliminating many of the backing accidents into a dock.