Mobility Paradigm for the 21st Century

by Francis J. Dance, *Massachusetts Zeta '76*

INTRODUCTION: On September 14, 1999, I was stuck in Frankfurt, Germany, traffic trying to get to the exhibition hall for the bi-annual international automobile exposition. That evening, I spent an additional two hours parked on the autobahn as I waited for rush-hour traffic to clear. The dichotomy of my dilemma finally hit home. As an automotive engineer with 25 years of experience, I was trying to participate in the global dream: a newer, faster, sleeker automobile — a cocoon and escape from the world. My road experience revealed a much different reality. We will not be able to drive our new dream-mobiles for much longer if we don't create a significant paradigm shift within our transportation model. If the public and private sectors do not join forces to change our world, the world will change itself abruptly and in a fashion unanticipated.

Mr. Paul Newman, actor, entrepreneur, and racing car driver/owner, in August 1970 reflected on EPA mandates and human nature in *Motor Trend* magazine. "The laws . . . made in pollution control are basically designed much more to protect the oil and automobile industries than they are designed to our real concern about ecology. It's very funny, you know. The human animal is an escalating beast; he's always been that: a greedy little thing. It has to do, I suppose with love, affluence, and power; and I don't think he's going to change. I think that the cars are going to get bigger (*Ford Excursion?*), and they'll continue to put controls on them. Horsepower, I believe, is just a release from boredom, an emotion of sorts . . . . If I felt that I was part of a mass movement, I'd be willing to make almost any sacrifice. The point is that there is no mass movement, there is no leadership, and until we get that, you're going to be driving your car, and I'm going to be driving mine."

Thirty years later, it is now the time for leadership, the time for vision, the time to think of our children and our children's children. What kind of world are we creating for them; what kind of legacy are we leaving them? Will they own lovely cars, unmovable, as the last drop of gasoline has long ago been consumed? Will they be stranded in cities unable to move except by their own two feet?

Is our current infrastructure sustainable beyond the current oil crisis or beyond the next 20 years? The future is coming, like it or not. We will eventually run out of fossil fuels. We may cook, drown, or starve ourselves through global warming. We may pollute our air, water, and soil to the point of disease and decay. We may ultimately repeat the cycle of the dinosaurs whose remains we dine on daily.

We still have the chance to change our ways. We must define and pursue viable alternatives while we still have time.

BACKGROUND

Fossil fuels are not renewable, yet we are on an escalating global consumption curve, like a drug addict who can just not get enough. We extend our addiction to emerging countries as they join North America, Europe, and Japan in our mad rush for personal mobility, a sure sign of affluence and therefore a positive self-image. Global warming, although not yet conclusively accepted by all technologists, can surely not be abated by our increasing generation of carbon dioxide and pollutants. While developed countries enforce stricter emission laws, emerging economic powers such as China allow relaxed standards to accelerate infrastructure development as a way to "catch up." When combined with our ever increasing population and declining ride-sharing, plus increasing time spent with the engine idling in traffic jams, our environment suffers further. Engines idling in traffic are especially wasteful of fossil fuels and further increase pollution — the catalytic converters drop in temperature and efficiency, and the low amounts of fuel and air flow are insufficient to activate their precious metal elements.

Our remaining fossil fuels should be conserved for future generations, used sparingly and efficiently. We do not yet know where and when we may find better use for this precious resource. But consumers will not give up fossil fuels without a fight. Even European fuel taxes, resulting in $4+/gallon pricing, do not significantly diminish usage. The recent rise in domestic prices due to the OPEC cartel's successful output-reduction program has not yet affected Americans' driving or vehicle-purchasing patterns. Our legislators are encouraged to reduce taxes to make our fuel addiction affordable. This is the wrong way to go!

New governmental fuel-use taxes can be levied and applied to fund our necessary paradigm shift! To change our habits, a consumer-friendly, restructured transportation model must be developed, funded, and endorsed by the global community, in cooperation with private-sector initiatives. Such a model is proposed below.

RE-INVENTING OUR URBAN MOBILITY

The large cities of our world are unfriendly to people; they are noisy, dirty, smelly, and crowded. Cities seem to get worse everyday as more people migrate to our urban centers to live and to work. Cities throughout the world should agree to alleviate congestion by mandating that personal automobiles not enter the city during the working week, instead, substituting the following infrastructure.

Urban leaders of metropolitan areas such as New York, Atlanta, Miami, Houston, Dallas, Los Angeles, San Francisco, London, Tokyo, Frankfurt, and Paris must be convinced to establish the following mobility infrastructure:

• Rail, bus, ferry, and air travel to and from the city borders is enhanced to provide on-time, low-cost, and increased capacity services to an expanding user base.

• City commuters leave their personal cars (which continue to satisfy and reinforce their deepest self-perceptions) at expanded park-and-ride facilities near their homes. They take the enhanced trains, subways, and buses to the city. Their personal vehicles are saved for weekend getaways, configured with highly efficient hybrid power trains, consisting of a regenerative electric motor, a buffered reserve battery supply, and a constant speed and load direct injection diesel engine-driven generator or fuel cell to provide localized source energy for long trips. The battery supply alone is adequate for 20 miles of silent urban travel without recharging, as well as for quicker acceleration in combination with the generator. The Toyota "Prius" and Honda "Insight," coming to America this summer, are indicators of the future generation of personal-mobility vehicles that are environmentally friendly and exceptionally fuel efficient — yet still exciting to the consumer, since they possess great mobility and performance.

• Hybrid (electric with direct-injection diesel generator or fuel cell) commercial vehicles are at the city's central air and rail terminals for arriving and departing visitors. These taxis and buses have amenities such as a snack bar and toilet. Each seat has a personal display for television and internet access while telephone hardware accepts our personal identity/charge card. In these vehicles the battery packs are larger, allowing predominate use of stored electrical power. The generator is used only to assist acceleration or allow the completion of the day's journey. Overnight, these vehicles recharge at a central base station.

• Rental electric vehicles are available for personal use, sized like the "Smart" and Ford "Think City" cars sold in Europe. These are also equipped with advanced telematics features such as navigation systems and telephones with voice recognition, text-to-speech conversion, and linkage to the internet. The driver's personal identification card (like a GSM SIM card or Visa card) allows full access to all the features, as well as the car itself, which is "tied" (like the horses of old) to the central recharging station. These vehicles, built by GM, Ford, DaimlerChrysler, etc., are rented from Hertz, Avis, Budget, etc., thus preserving the current private-sector infrastructure.

• Car sharing, a member-driven rental organization, is extended from its pioneering introduction in Portland, OR, to other major urban centers, mitigating the need for a second car, and perhaps even a primary personal vehicle.

• By annual permit, city occupants still may take their vehicles in and out of the city, especially for holidays and

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vacations. Electronic toll-collection transponders are set at pricing levels which make this option financially unattractive for daily travel, further subsidizing the new mass transportation model.

• Delivery vehicles are also hybrid-powered and only allowed access to the city in allocated time envelopes spread over the 24-hour period. Charges for city access are variable, with prices highest during the 8 a.m.-to-6 p.m. period and lowest from 10 p.m. to 5 a.m. and on weekends. In-vehicle, GPS location-based data recorders are automatically downloaded to terminals located throughout the city for monthly billing purposes.

CHANGING OUR THINKING

But this is not all that must be done as we wean ourselves from our current personal mobility model. We must ask: "Why do we travel so much; why this urge for going?" The answers include: "To go to work, to shop, to see family and friends, to go on vacation, for entertainment," and many more reasons. Are there other ways to satisfy these needs? Can technology and incentives work together to provide them within a private/public partnership? Here are some ideas:

• Encourage telecommuting for knowledge workers through tax incentives to both businesses and individuals. Society's infrastructure benefits through enhanced use of existing resources (your own home, already being heated and cooled, instead of a new office), through reduced fuel consumption, through reduced road congestion and wear/tear, through reduced accidents with its accompanying lower social cost, and through no wasted commuting time.

• Encourage video conferencing via networked PC cameras. Hold fewer face-to-face meetings and more frequent communication using this technique. Visionphone finally becomes a belated reality via low-cost voice over internet protocol (VoIP).

• Stagger the factory- and office-work hours over the full seven-day, 24-hour time period to balance the transportation load so that the current infrastructure can support more people. Even 30-minute shifts, offset throughout the work day, would create a significant improvement during the typical rush-hour periods. Families and communities must be allowed to influence and decide upon the optimal arrangements to preserve and enhance the nuclear family. Businesses must be encouraged to accommodate such worker flexibility, possibly through tax incentives.

• Provide a virtual vacation or exhibition experience through remote-controlled, multiple-channel, cable TV broadcasts, sold as pay-per-view, such as Bernie Eccklestone has deployed for Formula One race viewers in Europe. For a fee, the subscriber can choose from approximately 30 different viewing or in-vehicle car cameras, effectively becoming the director. Perhaps robotic cameras/monitors can be "rented" as virtual show attendees to view specific interests or interview sales agents at conferences.

• Enhance virtual experience through smell and touch (pressure) sensors/transmitters at both ends of video conferencing capabilities. This allows loved ones to more fully share the sensual experience.

• Encourage internet shopping for all essentials with route-optimized fleet delivery of purchased items. Food is now available via the worldwide web in many large cities, with the individual's shopping list saved in memory for weekly updating. E-commerce will probably displace the retail experience, without significant public sector encouragement.

• Increase video bandwidth to allow multi-camera coverage of virtually all entertainment events on demand. Already, television coverage typically offers a superior experience to in-person football, baseball, and NASCAR racing. Video-on-demand needs to become a true home offering, with any movie or television program available at any time at reasonable cost.

STAYING FIT

All this technology may sound grand, but will we all become couch potatoes? Not necessarily!

• Cities become the property of pedestrians once again, with special lanes for bicyclists and other human-powered vehicles, such as roller blades and skateboards for the aging GenXers.

• Hiking and biking in our suburban communities become a social event as our air becomes clean again and our smog evaporates. With fuel taxes high, "going for a drive" becomes an historic event.

• Our home-entertainment centers are equipped with exercise equipment that is coupled to our television to allow virtual participation in marathons, football, etc.

ENERGY FOR THE FUTURE

How will the electrical energy be generated to support this model?

• Nuclear, as we know it today, disappears with deep-salt storage of the spent uranium. Fusion research continues, carefully. Once it works, the power stations may be placed in orbit with a microwave energy link to earth receptacles.

• Superconducting distribution networks allow remote power generation with a renewed emphasis on hydro-electric sources, such as tapping the tremendous tidal changes at the Bay of Fundy.

• Fuel cells provide rural and developing areas clean and efficient energy generation with hydrogen, reformed from methanol or natural gas.

• Solar energy is revitalized with power webs in the desert regions of the world using high-efficiency eight-inch silicon wafers. Battery storage satisfies buffer requirements with DC/AC conversion.

• Wind turbines are located on mountains and ridges with high average wind-velocity profiles, distant from residences, mitigating blade noise complaints.

• Conservation receives a renewed emphasis with energy efficient homes oriented to southern exposures, with heat pump cooling/heating in more temperate regions.

• Home heating from wood and coal stoves with catalytic converters warm homes, but with a carbon dioxide environmental penalty.

CONCLUSION

Without bold and dramatic initiatives from both the public and private sectors, humanity in the 21st Century may be painted into an unsustainable corner. When fossil fuels finally run out, will our infrastructure alternatives be ready? The time to start is now, without delay!