Future City Competition
North Texas Region

Tomorrow's Transit

Transportation Background
and Visions Forward

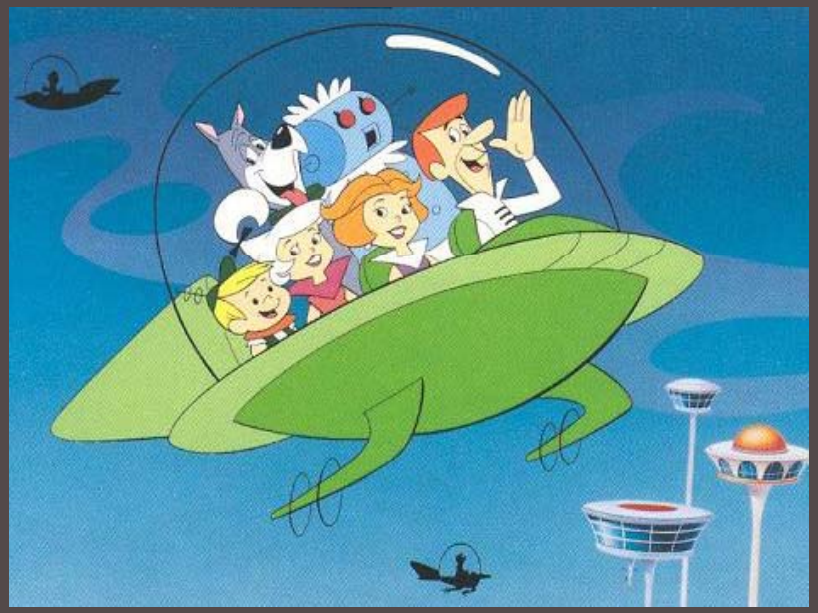
Today's Presenter

- **Chris Hoff, P.E.**
  Senior Project Manager, Transportation Planning & Design
  Jacobs Engineering – Dallas & Fort Worth
- Education
  - BS Civil Engineering (Transportation) – Texas A&M University
  - ME Civil Engineering (Traffic) – University of Texas at Arlington
- Professional
  - Licensed Professional Engineer (TX, 1997)
  - Past President, Greater Fort Worth Section
    Institute of Transportation Engineers (ITE)
- Experience (22 years):

Highway Planning	Complex Interchange Design
Agency Coordination	Public Involvement
Environmental Assessments	Bicycle/Pedestrian Facilities
Traffic Engineering	Subsurface Utility Engineering

What Transportation Planning (and Today's Presentation) is NOT:

A Bunch of Pictures of Futuristic Cool Vehicles

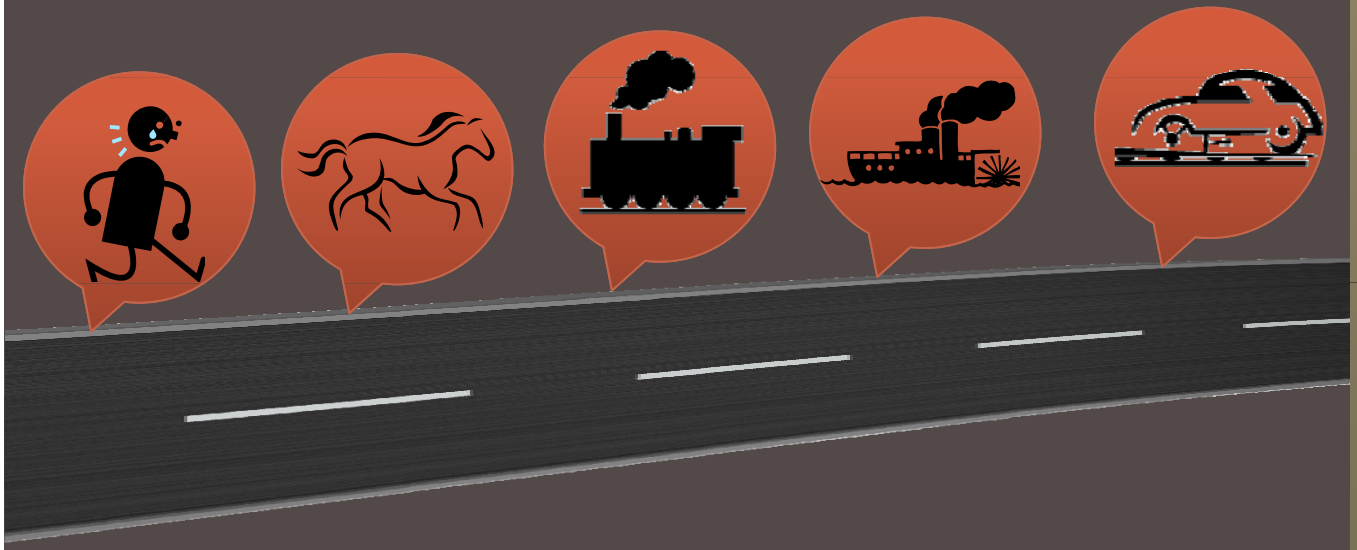


Sources of Information for Today's Presentation

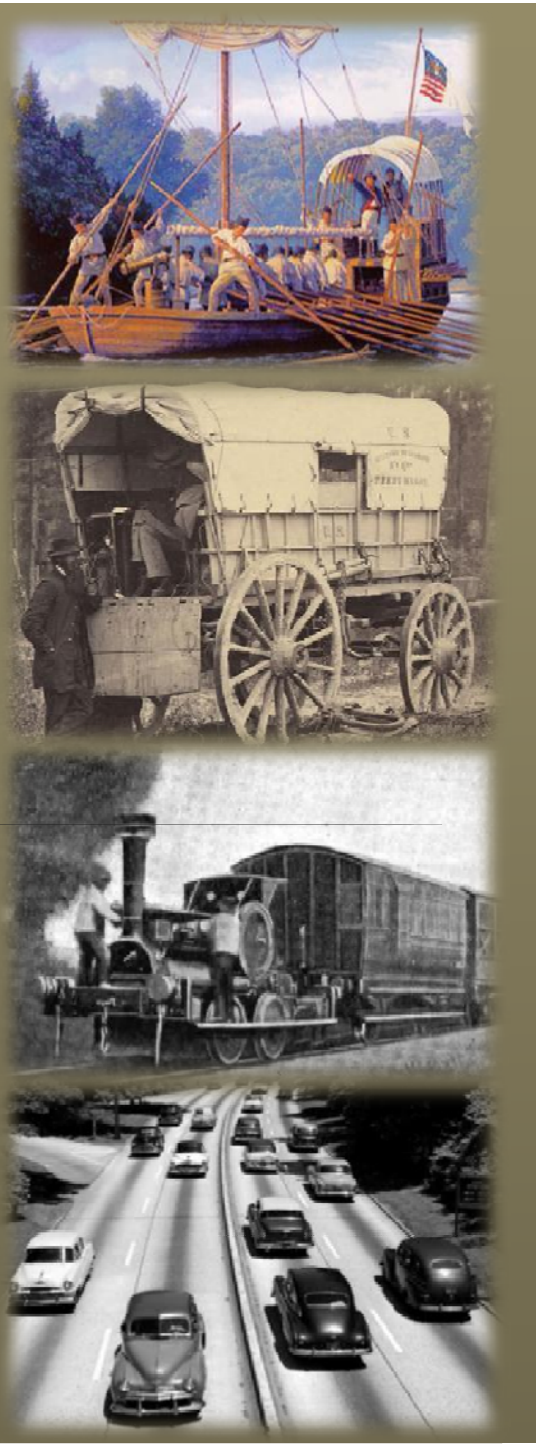
- This presentation Sources a Considerable Amount of Information from the Future City National Webinar "Tomorrow's Transit"
  - October 2, 2013
  - Accessible on National Future City Website
  - Viewable on YouTube (Approx. 65 minutes)
  - Four Presenters with Distinct Areas of Considerable Expertise
  - Please Reference that Presentation for Sources and Credits for Context, Verbiage & Graphics
- Some Aspects of this Presentation are my own Opinion and Do Not Necessarily Reflect Those of Future City, Jacobs Engineering, or any other Entity.

History of Transportation

Transportation has gone through an incredible amount of progress in the past 100+ years !



Imagine how much further this field can progress in the next 100 years.



History of Public Transportation

This is NOT a Planning Solution, Folks

A Wealth of Local Planning Information

- A Metropolitan Planning Organization (MPO) is a Central Authority in Regional Planning
- Typically Represents Collection of Public Agencies
- In North Texas, the MPO is the North Central Texas Council of Governments (NCTCOG)
- Their Website (and Staff) is a Fantastic Source of Regional Planning and Transportation Information. www.nctcog.org

Transportation Demand Management

- **"We Can't Continue to Build Our Way Out Of Congestion"**
- Optimize Transportation System Performance
  - Utilize Existing Facilities/Systems as Efficiently as Possible While Maintaining Adequate Safety
- Improve Transportation Choices
  - Reduce Dependency on Single-Occupancy Vehicles
  - Manage Travel Demand
  - Assist in Reducing Air Quality Impacts
- Increased Transportation Efficiency
  - Manage Existing Infrastructure
  - Make Strategic Investments for the Future

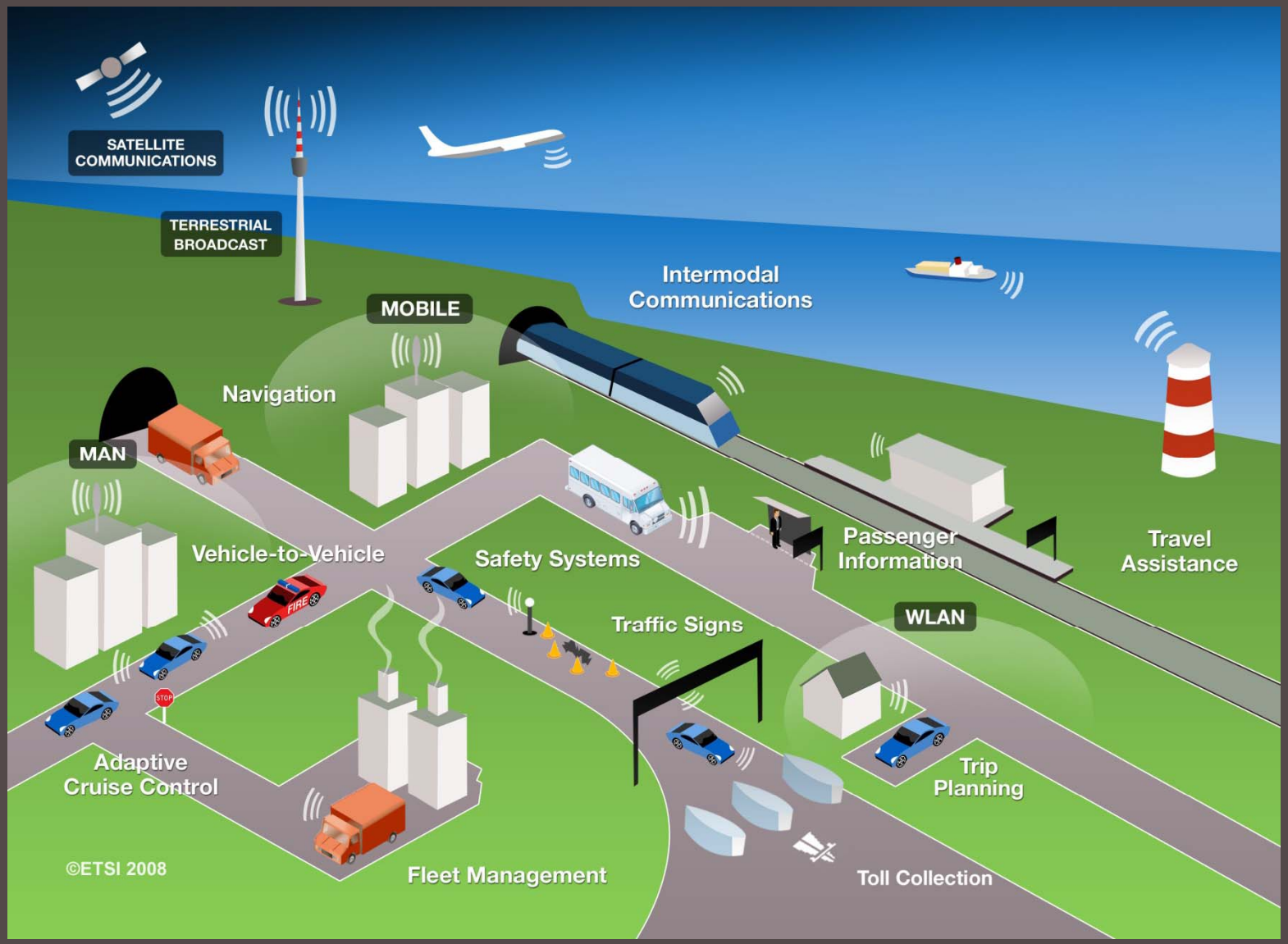
Intelligent Transportation Systems (ITS)

- Definition
  - Application of Information, Technology, and Systems Engineering to the Management and Operation of Surface Transportation Systems
- Objectives
  - Improve Safety
  - Provide Environmental Benefits
  - Maximize Efficiency

Examples of ITS - How Many Have You Seen Already?

- Collision Avoidance
- Traffic Signal Control
- Variable Message Signs
- Automated Tolls
- Parking Guidance
- Connected Vehicles
- Autonomous Vehicles

ITS Has Many Applications



ITS & Improved Mobility

- Travelers have access to up-to-date and accurate information
- System operators have opportunity to make real time updates to maximize efficiency of transportation system
- On-board data collection to help manage the transportation system
- Potential Performance Improvements:
  - Traditional Highway Capacity: 2,000 -2,400 vplph*
  - w/Automation: 4,000 – 8,000 vplph*

(*vplph = vehicles per lane per hour)

Benefits of Autonomous Vehicles

- *"In some ways, computers make ideal drivers: They don't drink and then climb behind the wheel. They don't do drugs, get distracted, fall asleep, run red lights or tailgate. And their reaction times are quicker."*

- *"A new study says self-driving cars and trucks hold the potential to transform driving by eliminating the majority of traffic deaths, significantly reducing congestion and providing tens of billions of dollars in economic benefits."*
- *Source: ABC News "Leaving the Driving to a Computer Has Big Benefits"*

Challenges Facing ITS

- Automating/Minimizing/Removing Human Control/Decisions Can Potentially Create New Unique Issues
- Technical Challenges
- Funding / Capital
- Privacy, Trackability
- Public Acceptance
- Perception/Suspicion of “Big Brother”
- Liability
- Security / Cyber-Vulnerabilities

Reliance on Single Occupancy Vehicles

- Why Not Drive?
  - Often the fastest mode of travel
  - Relatively inexpensive to drive (cents per mile in operating expenses)
  - Tends to be more comfortable
  - Can be more prestigious & individualized
  - Allows flexibility in origin, destination, & schedule

Travelers Need/Prefer Alternative Modes

- Many people cannot drive (disability, age constraints, vehicle failures, etc)
- Some people should not drive (disability, impaired by alcohol, economic constraints)
- Many prefer alternative modes (walking and cycling provides exercise, transit commuting imposes less stress & allows rest, etc)
- Society could benefit from more efficient use of road space that favors higher value trips
  - Trips that reduce congestion, parking costs, accidents, emissions, and stress.

Multimodal Transportation

- Combines more than one means of transportation into a single trip
- A Keystone to the Success of a Planned Transportation System
- End users can prioritize their preferred modes based on their needs
  - Fastest, most flexible, most predictable, least costly, most pleasant experience, etc

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Local Example of Multimodal Connection:
Fort Worth Intermodal Transportation Center

Local Example of Multimodal Connection: DFW Airport / DART Rail Station

(Currently Under Construction: Opening 2014)

Transit Oriented Development (TOD)

- Mixed-use residential and commercial area designed to maximize access to public transport
- Often incorporates features to encourage transit ridership.
- Typically has a center with a transit station or stop surrounded by relatively high-density development with progressively lower-density development spreading outward from the center.
- Generally located within a radius of one-half mile from a transit stop, as this is considered to be an appropriate scale for pedestrians, thus solving the “last mile problem”.

Transit Oriented Development (TOD)

Arlington County, Virginia

High-Speed Rail

Rome Tokyo London Paris

France Germany Japan

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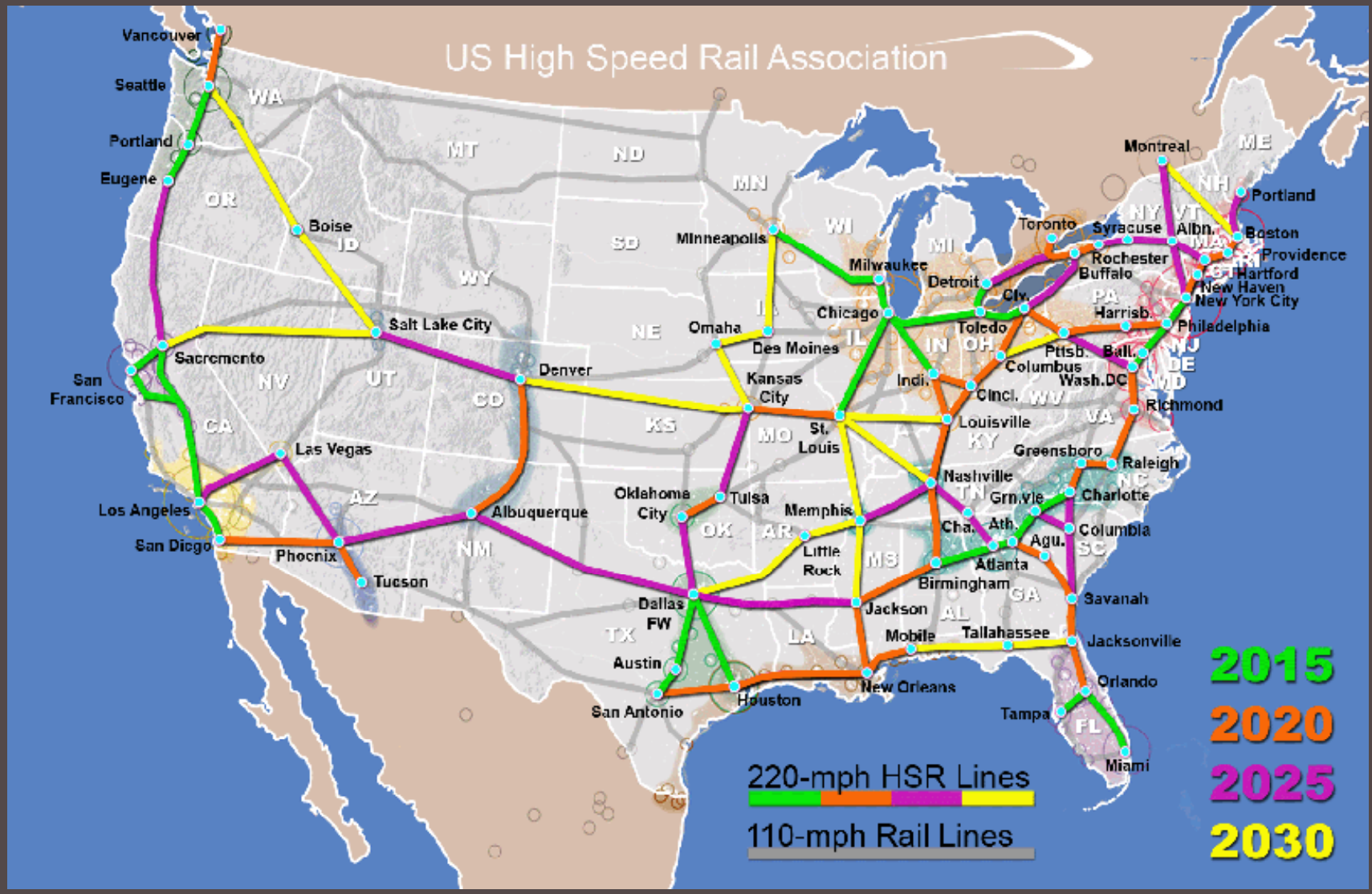
Potential High Speed Rail System

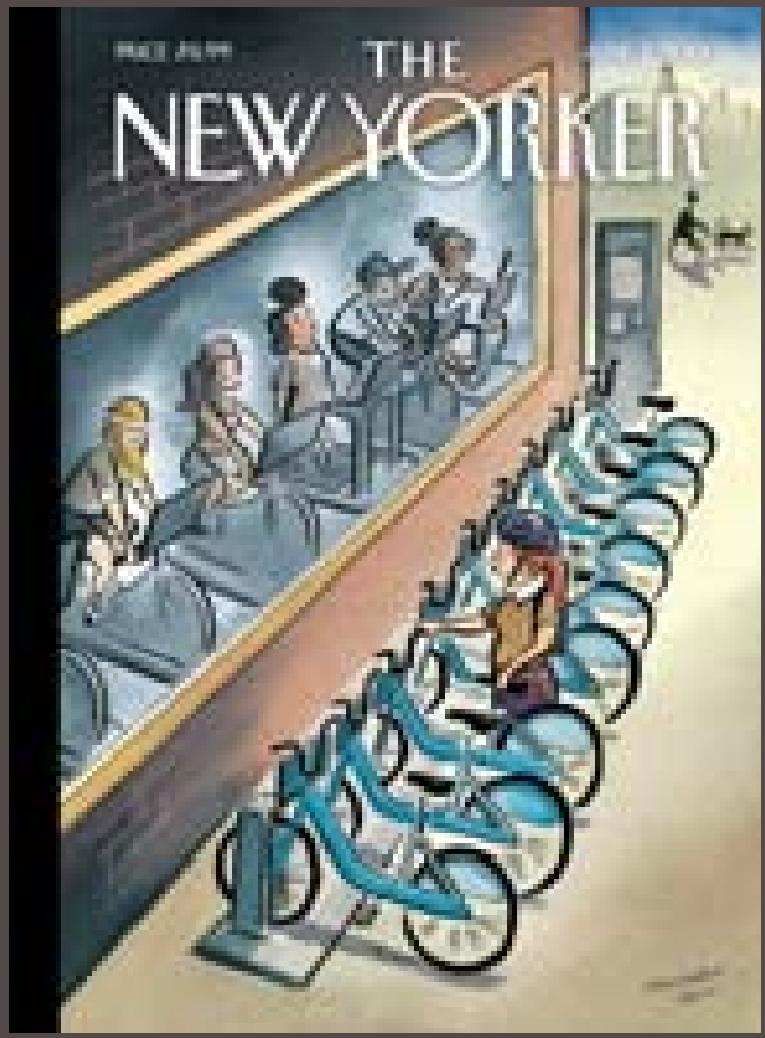


Green Mobility

- Walking, Bicycling, Trails
- How Will Children and Seniors Get Around if They Can't Drive?
- How Will People Get To/From Transit Stations?
- How Will Transport Help to Make People Healthy, Safe, and Happy?
- How Can Transport Minimize Carbon Footprint?
- Helps Solve The "Last Mile Problem"

There is Considerable Room for Society's Views to Migrate/Shift

- Treadmills and Spin Class likely are drawing far more participants than those modes used as actual transportation
- Most users DRIVE to the gym to walk/run/cycle IN PLACE at an indoor facility, sometimes viewing a screen with simulated moving scenery. (Eye Roll)



Bikesharing: In Place Today

- Fort Worth Bikeshare
- Operational Since May 2013
- www.fortworthbikesharing.org

Technology is Vitally Important and It Can Make Things “Easier”, but Let’s All Agree Not to End Up This Way

Sustainable Transport

- Includes vehicles, energy, infrastructure, roads, railways, airways, waterways, canals, pipelines, and terminals
- Short-term activity often promotes incremental improvement in fuel efficiency and vehicle emissions controls
- Long-term goals include migrating transportation from fossil-based energy to other alternatives such as renewable energy and use of other renewable resources

Hybrid/Electric Vehicles Becoming Increasingly Accessible & Affordable

- Most Major Automakers have from One to Several Hybrid Models Readily Available
- More and More Choices Exist for All-Electric Vehicles
- As Battery Technology Improves, so does Range, which is a Major Consideration for a Potential Buyer.

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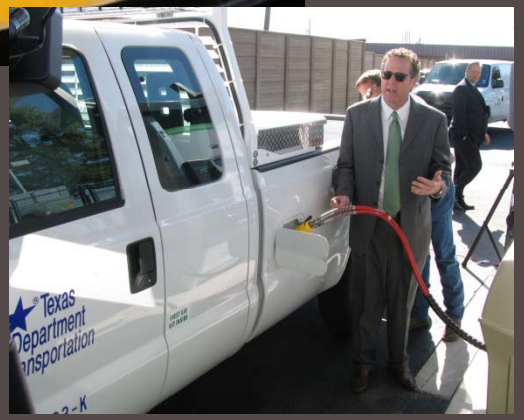
Fleet Fuel Conversions

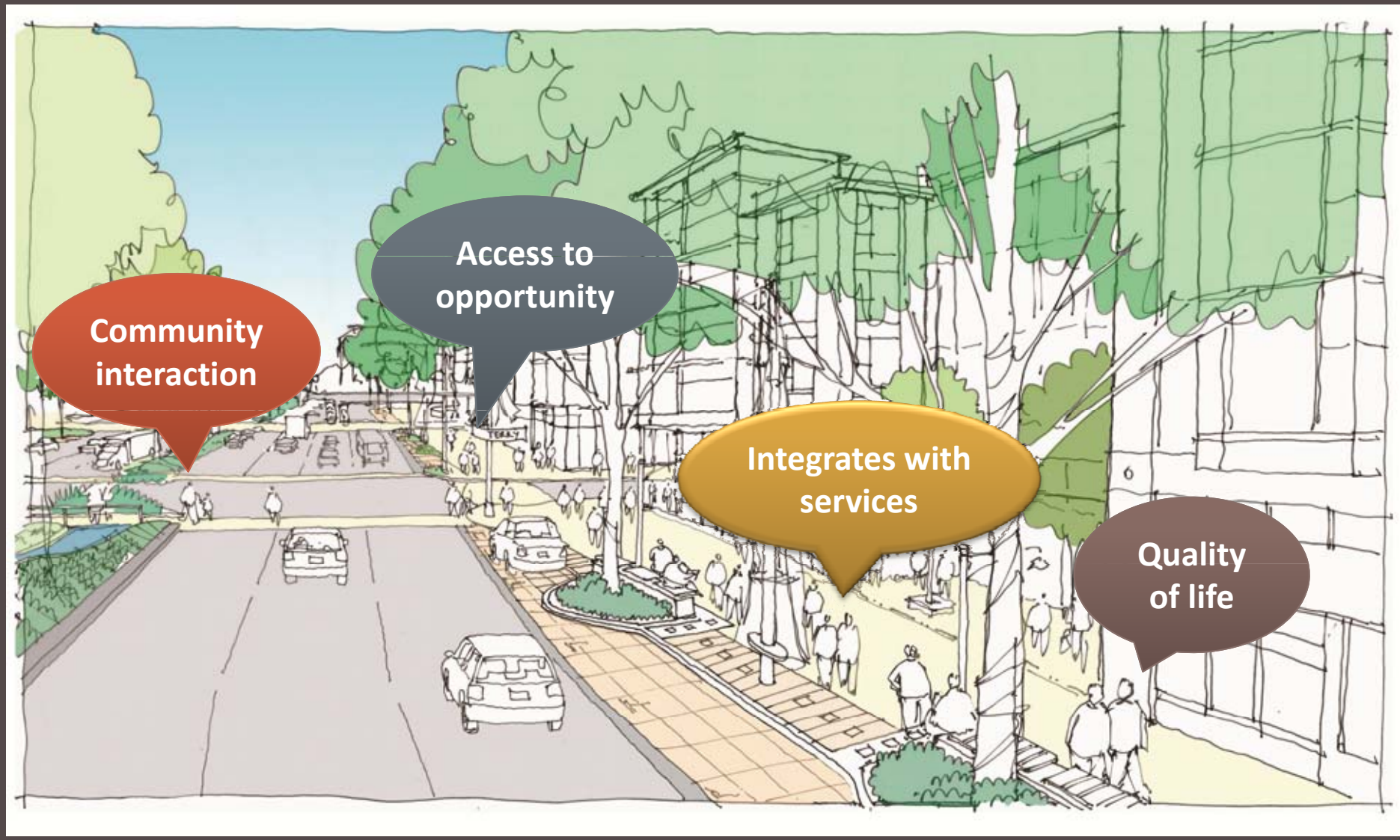
- Many large public transportation agencies have programs to convert at least portions of their fleet to alternative fuel sources
- DOT's, Transit Agencies, School Districts, etc



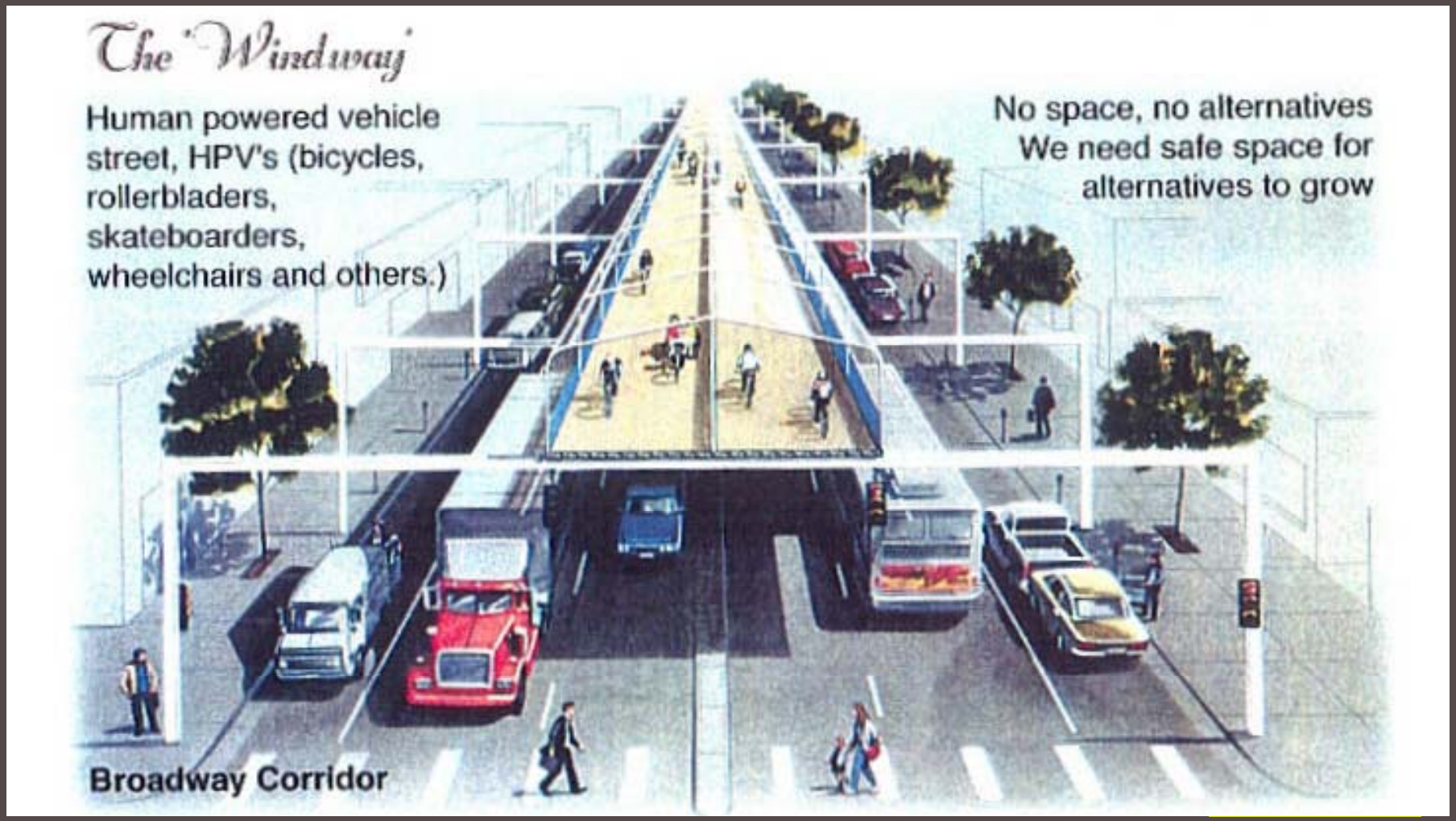
Sustainable Transport

- Traditional transportation planning aims to improve mobility, especially for vehicles, and may fail to adequately consider wider impacts.
- The real purpose of transportation is access - to work, education, goods and services, friends and family, and entertainment.
- There are proven techniques to improve access while simultaneously reducing environmental and social impacts, and managing congestion.

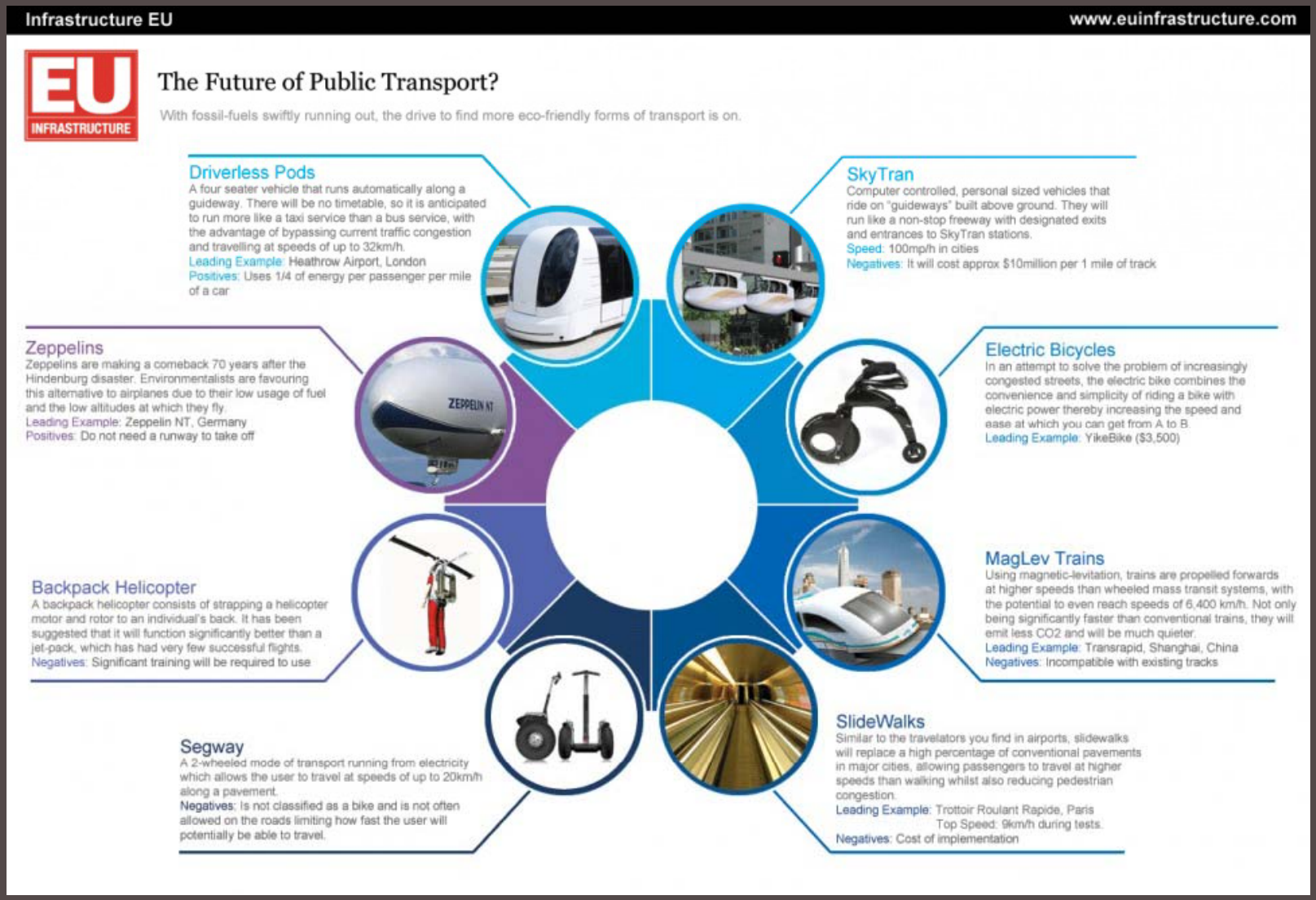
Sustainability- Considerations



Example of Brainstorming for Innovative Green Mobility



Brainstorming Future Transportation

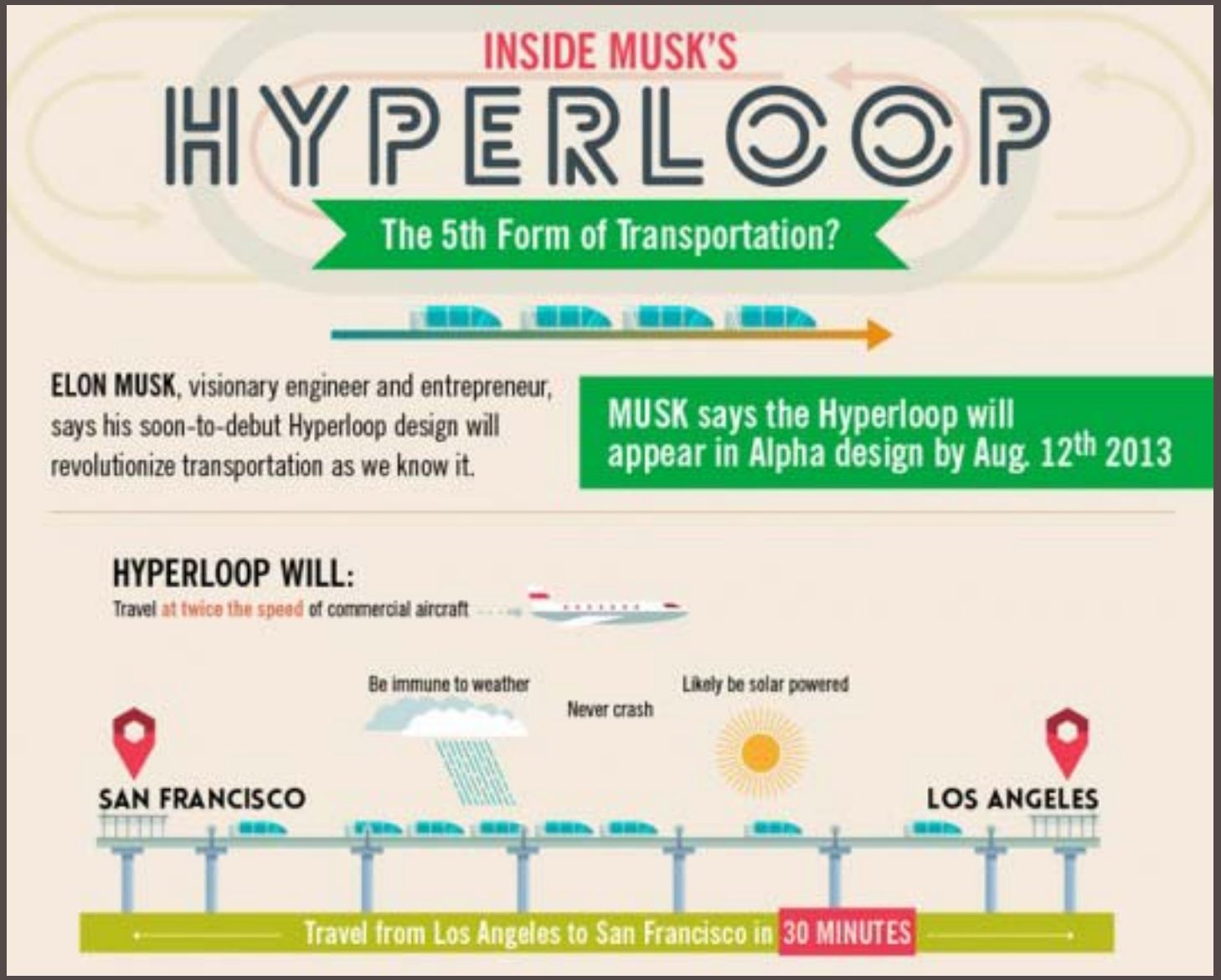


Many considerations for a Future City Transportation System

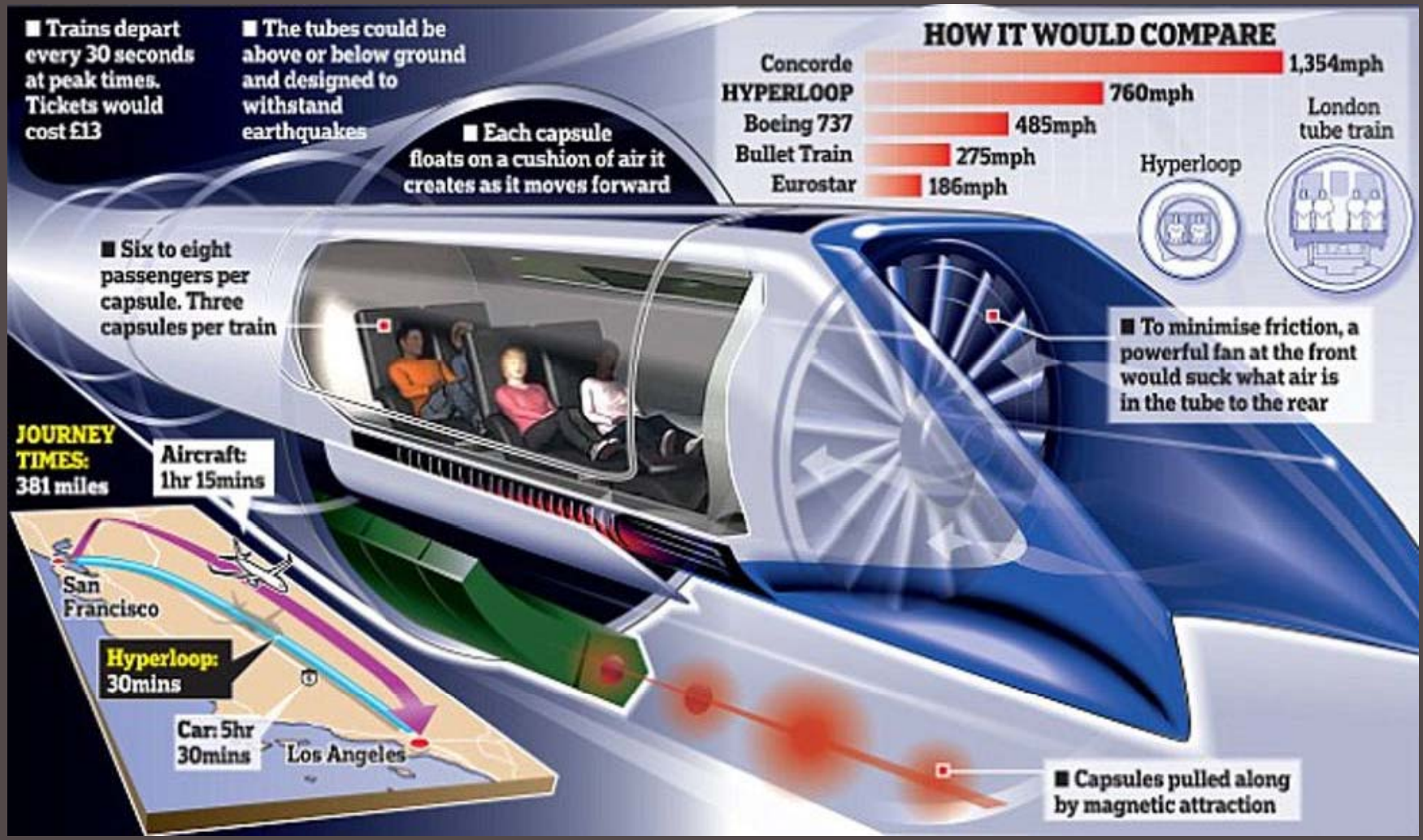
Transportation Visionary: Elon Musk

- Began with **PayPal**, which was Purchased by Ebay
- He's Interested in Forwarding Transportation, and His $ Enables Him to Work Towards His Visions
- **SpaceX** is essentially taking over for NASA's Shuttle Program, and the Falcon Spacecraft has already become the first privately-owned vehicle to dock with the ISS.
- **SolarCity** is the largest provider of solar power systems in the U.S.
- **Tesla Motors**' Model S Recently Earned the Title "Safest Car Ever Reviewed" by Consumer Reports
- **HyperLoop** Alpha (see Next Slides)

Looking Into The Future

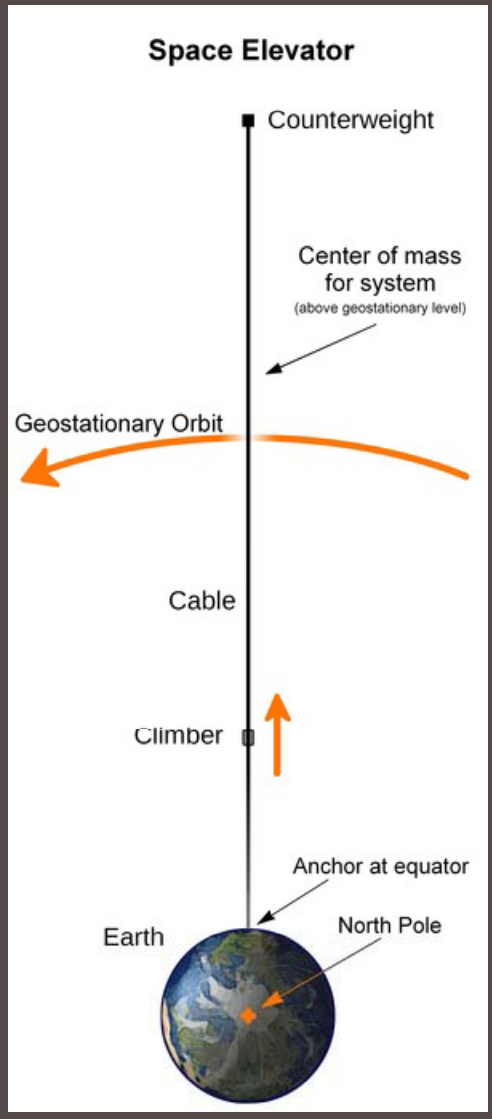


HyperLoop Alpha Infographic



Looking **WAY** Into The Future

- Space Elevator
  - Think Tetherball
  - from Earth to Geostationary/Geosynchronous Orbit
  - Guideway Stays Taut Via:
    - Anchor to Earth
    - Gravity Pulls Towards Earth
    - Centrifugal Force Pulls into Space



DISCOVER

GOING UP

Way, way up. By 2050, people may actually be able to take a space elevator to a station 36,000 km above Earth if all goes according to plan for one Japanese company.

The project: Space elevator

A trendy vacation spot could be a spaceport offering a stellar view of Earth's surface 36,000 km below.

The company:

OBAYASHI

Obayashi Corp. is based in Japan, 120 years old, and is one of the world's leading construction contractors

Travel time:
Approx. one week

Travel speed:
200 km/h

30 passengers:
could travel in an enclosed elevator car.

Why an elevator?

With an elevator, tourists wouldn't require any training beforehand, allowing the space station to work as a true destination. The reusable vehicle would be powered upward by solar panels on the orbital base, making it a low-cost way to get people and payloads into space.

RISKS

- Passengers need to be protected from the expected radiation exposure during the trip.
- The elevator and spaceport would be at risk of collision with orbiting satellites.

COUNTERWEIGHT
The cable would be anchored by a counterweight attached to the space end to help keep the line taut.

GEOSYNCHRONOUS ORBIT

But isn't the Earth always rotating?
It is. That's why the floating station would be placed where it could have a "geosynchronous" orbit, circling in sync with the spinning of the Earth and always remaining in the same spot relative to its base on the ground.

SPACEPORT
36,000 KM ABOVE THE EARTH

SOLAR POWER GENERATION FACILITIES
The use of a solar power generation facility would transmit power both to the spaceport and to the ground terminal.

CABLE

A cable would be stretched up to 96,000 km, or ***about one-fourth of the distance between the Earth and the moon.***

One issue that has plagued space elevator designs is finding the right material to build such a long cable. Engineers believe carbon nanotubes, super-light and super-strong sheets of carbon rolled into tubes, might be the answer if they can be mass produced cheap enough.

Carbon nanotubes are 20 times stronger than steel.

96,000 KM

ELEVATOR CAR
The elevator car would be propelled up the cable using magnetic linear motors.

The International Space Station is about 350 km above the Earth.

GROUND TERMINAL

SUSAN BATSFORD, GRAPHICS EDITOR, TWITTER @SBATS1; INFOGRAPHIC BY TARA CORRAN/QMI AGENCY

Today's Issues are Tomorrow's Transportation Challenges

- Urban Populations are Increasing
- Existing U.S. Infrastructure Quality is in a State of Disrepair (Ref: ASCE Report Card)
- Less Public Money is Available to Invest in Major Infrastructure Projects
  - Public / Private Partnerships
  - Entrepreneurs (Ref: Elon Musk & Tesla)
- Government "Red Tape"
- The World Needs More Forward Thinkers like Future City Contestants

Sources of Information

- www.nctcog.org/trans
- www.ite.org
- www.fhwa.dot.gov/planning/processes/
- www.its.dot.gov/faqs.htm
- en.wikipedia.org/wiki/Google_driverless_car
- www.nctcog.org/trans/sustdev/
- www.nctcog.org/trans/sustdev/TOD/TOD_Brochure.pdf
- www.newurbanism.org
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- www.thsrtc.com/info/ www.texascentral.com/
- www.spacex.com www.teslamotors.com/blog/hyperloop
- www.dfwairport.com/

Hope This Has Been Helpful !

- Never underestimate the power of Google and Google Images, as well as Wikipedia and YouTube for Quickly Researching and Learning.

- Questions?

- Thank you for your time and effort with the Future City Competition.

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