



The Federal Highway *Research & Technology Program*

Destination: Enhanced Mobility for America

January 2004

The Presentation

- ***The Critical Role of Our Roads and Highways
Providing Answers Through Research and the
Deployment of Innovative Technologies
Destination: Enhanced Mobility for America,
IF...***

America's Transportation System

AIR



America's Transportation System



TRANSIT

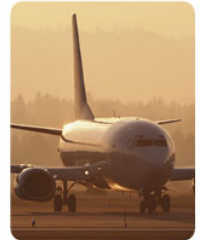


America's Transportation System

RAIL

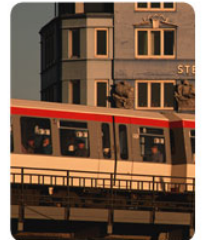


PIPELINES

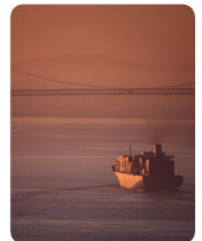
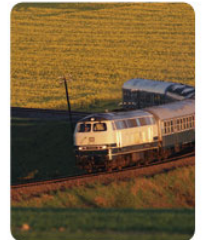


America's Transportation System

WATER

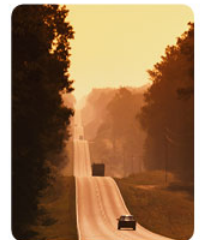
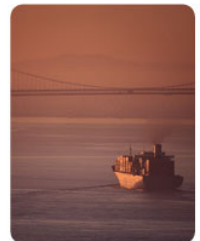
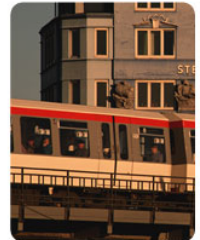


America's Transportation System ***HIGHWAYS***



America's Transportation System

- Recognized as one of the best in the world
- Air, transit, rail, water and highways provide:
 - Unprecedented mobility for Americans
 - Reliable, just-in-time access to goods/services
 - Key to continued economic growth



One Aspect of U.S. Transportation: National Highway System

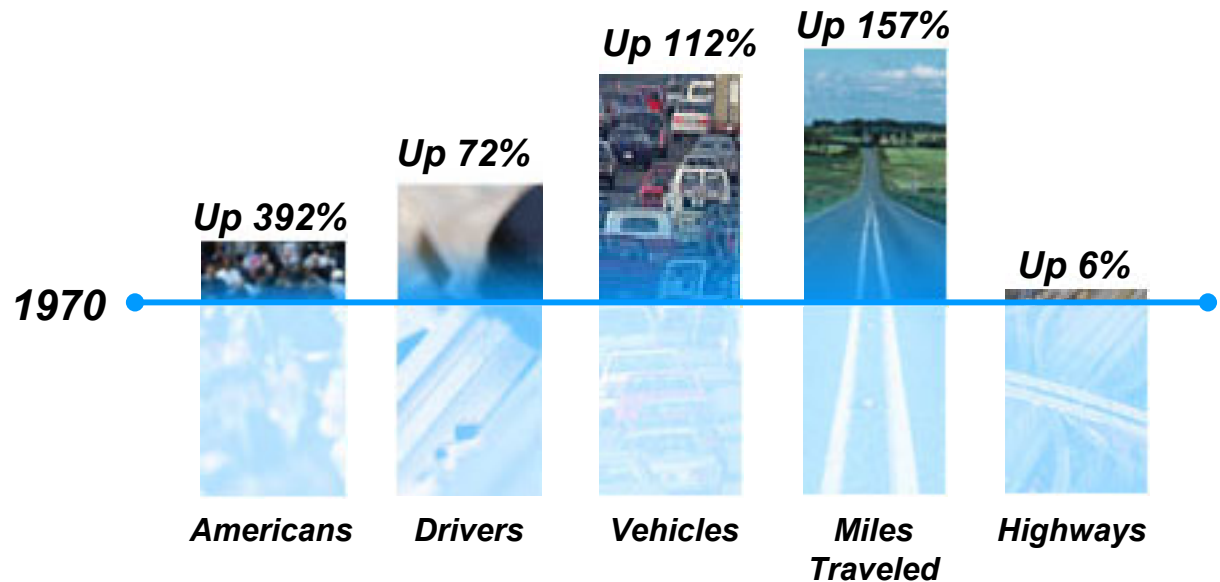
- A \$1 trillion investment/priceless national asset
- A defining American system
- The way nearly all products move
- Intermodal sea/air/rail/manufacturing link
- Permits our high quality of life/\$\$ growth
- And mobility – our fundamental freedom
- Key to national defense
- Maintained/upgraded by States and local jurisdictions

HIGHWAY CHALLENGES

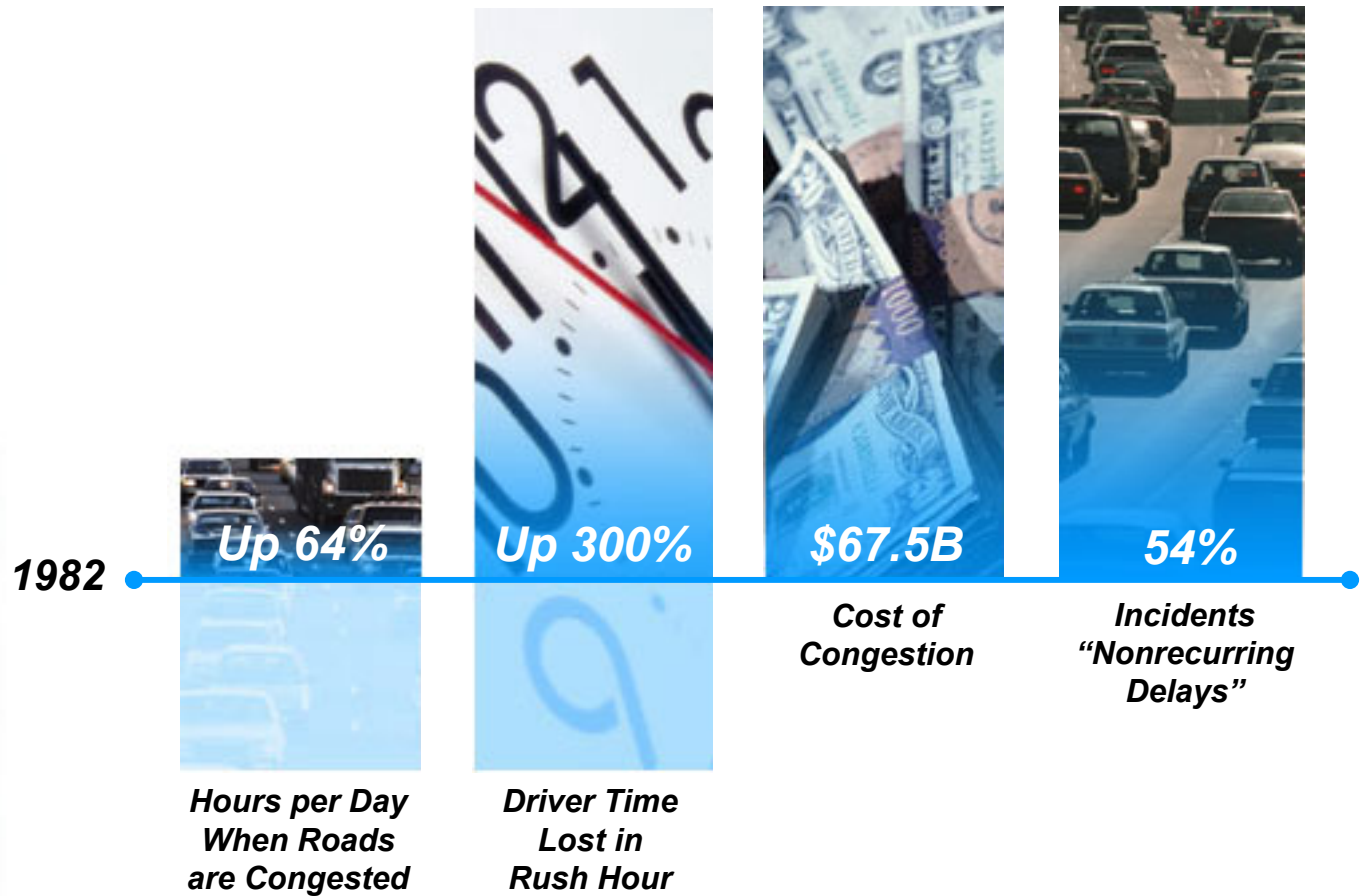


AHEAD!

Traffic congestion on the rise! Compared with 1970:



2002 TTI Report shows mobility hampered by growing congestion:



CHALLENGE

Traffic congestion

- Hurts business operations
- Impacts reliable movement of goods and people
- Can compromise national security
- Increases commuter costs
- Leads to higher fuel usage
- Impacts air quality
- Increases risk of crashes



CHALLENGE

Following current congestion trends:

More than 8 hours per day!



*Hours per Day
When Roads
are Congested*

About 80 hours per year!



*Driver Time
Lost in Rush
Hour*

More than \$250 per year per American!



*Cost of
Congestion*

Between 1970 and 1990 ...

- Vehicle travel **↑** 76%
- Highway fatalities **↓** 2%



However ...

Safety on our roads a national issue

- 6.4 million motor vehicle traffic crashes (2002)
 - 42,000+ fatalities
 - 3.0 million injuries
 - Cost of \$230B

11%
*Pedestrian &
Pedalcyclist
fatalities*



21%
*Intersection
fatalities*



32%
*Speed-related
fatalities*



40%
*Run-off-the-road
fatalities*



Our aging highways and bridges

- Demand now often exceeds capacity
- Serving travelers for more than 40 years
- More than 11,000 miles of the highway system considered to be in “poor” condition
- 5,000 U.S. bridges become volume- or condition-deficient every year



A Delicate Balance

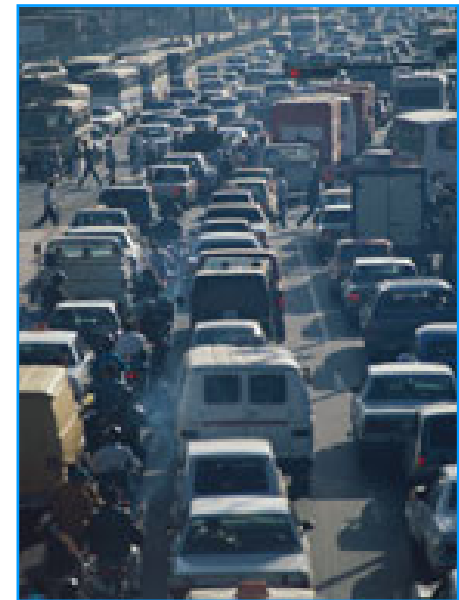
Americans want *both* mobility
AND a clean environment:

- Air & water quality
- Communities
- Ecology and natural resources
- Native American lands
- Federal lands
- Wetlands & other fragile ecosystems
- Historically significant areas
- Scenic byways



Our system of roads and highways is reaching its limits

- Increased congestion & travel delays
- Fatality rates are declining only a little
- Environmental issues regarding new capacity
- Deterioration with age,
- More traffic and trucks with heavy freight loads
- Weather extremes



At stake for America

Protect or Enhance

- Productivity for the nation
- Unprecedented mobility & quality of life
- Positive economic impact
- Environmental stewardship/streamlining

While Minimizing

- Tremendous human toll
- Economic cost of crashes = \$230B
- Lost time/fuel delays (75 areas) = \$68B
- Environmental impacts

How America Responded in the Past

National transportation challenges led to great accomplishments and innovation:

- Canals (early-mid 19th century)
- Railroads (mid-late 19th century)
- Highways (mid-late 20th century)
- Highway System Operation & Management (late 20th century)



Photo: NPS

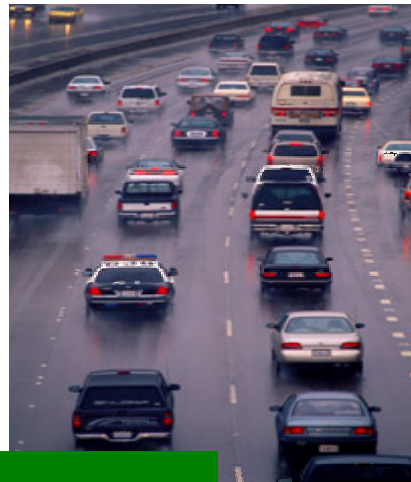


Photo: Fred Hultstrand History in Pictures Collection, NDIRS-NDSU, Fargo.



How Will America Respond Today & In the Future?

- Improvements in efficiency, safety, and productivity
- Extend life, preserve performance



©Mark Heayn

21st Century Challenge/Opportunity

- Selectively build new roads
- Maximize capacity and reliability of current roads with **innovative technologies** and techniques
 - Management
 - Operational



***New Solutions Through Partnerships,
Research, and the
Deployment of Innovative Technology***

The INNOVATION Process



Range of Research & Technology

**From simple process improvements
to the latest software and hardware**

The Appropriate Federal Role


- Find solutions to near-term problems
- Conduct long-term, high-risk research
- Support research conducted by State DOTs/
industry/academia
- Stimulate innovative technology development
- Provide leadership for technology implementation
and deployment
- Educate the transportation professional
of the future
- Facilitate research partnerships

Highway R&T is a partnership

- US DOT modal administrations
- Other Federal agencies
- State DOT research programs
- Transportation Research Board
- Academic institutions
- AASHTO
- Industry
- User community

Examples of Partnerships

- National Highway R&T Partnership
Highway R&T: the Need for Greater Investment (2002)
- Transportation Research Board
National Cooperative Highway Research Program
- Transportation Pooled-Fund Program
(Federal agencies, States, local organizations, universities, foundations, private industry)

A stylized, colorful illustration of a landscape. On the left, a road curves through green hills. A large, white, spiral-shaped cloud or smoke plume rises from the road. The background is a bright blue sky. The overall style is artistic and vibrant.

**Working together, these partners
find solutions for today's critical
roadway challenges ...**

Research can lead to solutions for...

- **Safety**

*Improving
pedestrian
& bicyclist
safety*



*Reducing
intersection
collisions*



*Reducing
excessive
highway
speeds*



*Preventing
run-off-the-road
crashes*



SOLUTION

Improved Roadway Design and Driver Aids

- Safety assessment of road geometric designs
- Visible signs & pavement markers
- Shoulder & centerline rumble strips
- Roadway departure warning technologies
- Crashworthy hardware
- Variable speed management systems



SOLUTION

Research can lead to solutions for ...

- **Safety**
- **Mobility & Infrastructure**
 - Enhancing construction techniques/processes
 - Reducing the need for maintenance long term
 - Developing long-life pavements to last 50 years or more
 - Developing a new generation of bridge systems capable of 100 years of performance
 - Improved levels of service, safety, and quality
 - Maintaining a holistic approach to asset management for mission optimization

SOLUTION

Tools to keep traffic moving

- Traffic management
- Incident management
- Electronic toll collection
- National 511
Traveler Information



SOLUTION

SOLUTION

Superpave®

- SHRP product
- NYDOT was one of 6 States taking the lead-State role
- Superpave may save NY \$1B in 30 years



SOLUTION

SOLUTION

Designs and materials to make bridges last longer

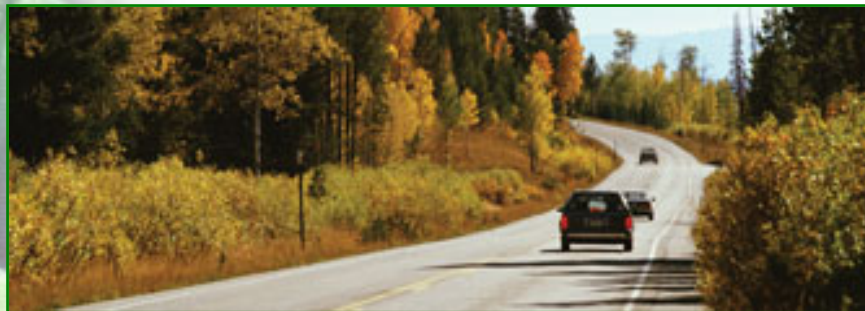
- Load and Resistance Factor Design (LRFD)
- High performance steel and concrete
- Fiber reinforced polymer (FRP) composite materials
- Prefabricated bridge elements and systems
- Corrosion-resistant coatings



SOLUTION

Research can lead to solutions for ...

- **Safety**
- **Mobility & Infrastructure**
- **Our Communities & Natural Environment**
 - Advancing socially and environmentally responsible transportation improvements
 - Managing land use and transportation choices
 - Streamlining the environmental process
 - Increased reuse and recycling



SOLUTION

Environmental Breakthroughs

- Geofoam
- Highway Traffic Noise Model
- Environmental streamlining & stewardship
- Fine particulate emissions research



Geofoam blocks

SOLUTION



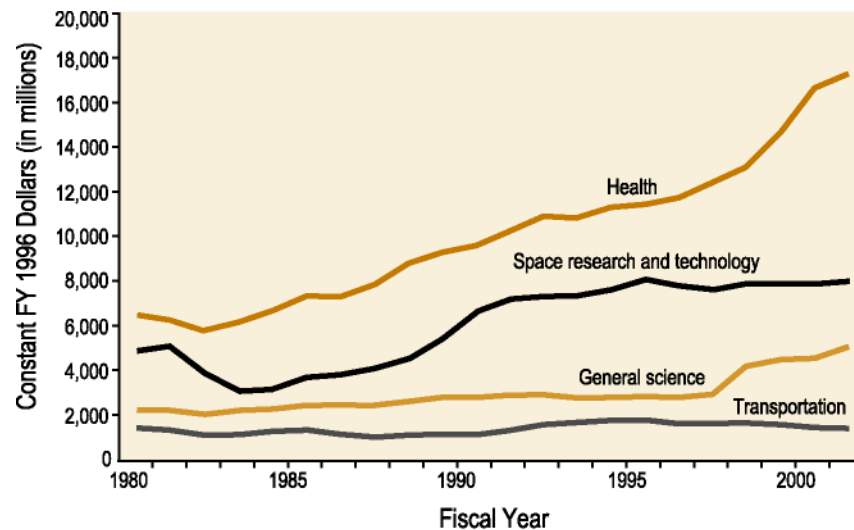
***What's Next for the
Highway R&T Program?***

Are we investing enough?

- Research on new solutions for roads accounts for only **1/2 of 1%** of National highway expenditures
- Flexibility of funding has decreased as earmarks and designations increase

Federal Research Priorities

- Our economy and quality of life depend on an efficient transportation system. *However...*
- Federal R&D efforts in health, space, and science far exceed funding in transportation



Total federal R&D by selected budget function, fiscal years 1980-2001.
(Sources: *Federal R&D Funding by Budget Function, Fiscal Years 1999-2001*; *Historical Tables, National Science Foundation, 2000.*)

Research is recognized as key

A 2001 TRB study recommended that the current highway R&T program be greatly strengthened, calling for:

“... a strong federal highway R&T program designed to maximize the investment of public funds in a research effort that is vital to the nation’s economy and the quality of life of all its citizens.”

Transportation Research Board
Special Report 261

An Investment Out of Balance

TRB stated recently:

“At the national level, the investment in transportation research—a primary source of innovation in the sector—is entirely out of balance with the importance of transportation to society.”

Critical Issues in Transportation 2002
Transportation Research Board

Next Steps for Highway R&T

- Develop a Highway R&T agenda
- “Raise the bar” in response to SR 261
- Improve environmental analysis/planning practices at all government levels
- Maximize the return on R&T investments
- Integrate surface transportation info to provide a “seamless travel experience”
- Improve system reliability/monitor performance
- Identify national/international best practices
- Develop tomorrow’s transportation workforce

Highway research provides innovative solutions related to:

- New operations & safety technologies
- More effective approaches for allocating resources
- New design, materials, & construction methods
- New ways to align travel/environmental needs
- Breakthroughs *we haven't even imagined yet*

The roads in tomorrow's America can be

- Less congested, with increased capacity
- Smoother and more durable
- Geared toward the economy and national defense
- Friendly to communities & the environment
- **Safer**



If...