Despite surging oil prices, volatile credit markets, and a lagging economy, the Federal Aviation Administration predicts 3% annual growth in air travel. Travelers are faced with increasing delays and inadequate conditions as a result of the long overdue need to modernize the outdated air traffic control system and the failure to enact a federal aviation program.

TRANSPORTATION

FACTS ABOUT AVIATION

TRANSPORTATION

AVIATION

2009 GRADE **D**

RAISING THE GRADES
SOLUTIONS
THAT WILL WORK **NOW**

A = Exceptional
B = Good
C = Mediocre
D = Poor
F = Failing

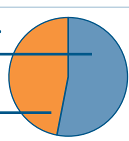
AMERICA'S INFRASTRUCTURE G.P.A. **D**

ESTIMATED 5-YEAR FUNDING REQUIREMENTS FOR **AVIATION**

Total investment needs
$87 BILLION

Estimated spending
$46.3 BILLION

Projected shortfall
$40.7 BILLION



★ **MODERNIZE** the air traffic control system by implementing the Federal Aviation Administration's (FAA) Next Generation Air Transportation System (NextGen) program;

★ **INCREASE** the aviation user fee to meet the needs of the National Plan of Integrated Airport Systems (NPIAS);

★ **INCREASE** the Passenger Facilities Charge (PFCs) cap;

★ **USE** Airport and Airway Trust Fund balances for air traffic and airport infrastructure and improvement projects only, not security costs;

★ **PREVENT** trust fund revenues from being diverted from aviation transportation system investment by preserving current firewalls;

★ **CLOSE** the gap on annual funding shortfalls by increasing funding guarantees in the reauthorization;

★ **STREAMLINE** the regulatory environmental permitting process to reduce delays in constructing new or upgrading existing airport facilities.

CONDITIONS

Air travel in the U.S. rebounded from its post-September 11, 2001, downturn and reached new highs in both domestic and international travel. Enplanements on U.S. carriers for both domestic and international flights totaled 669.2 million in 2000. By 2006, that number had risen to 744.7 million; in 2007 alone, the number increased an additional 25 million to 769.6 million. A sharp increase in the cost of aviation fuel, followed by the recent economic downturn, however, has slowed the demand for air travel. The number of domestic and international passengers on U.S. airlines in October 2008 was 7.1% lower than in October 2007. From January to October of 2008 there were 630.1 million enplanements, a decrease of 2.6% from the same 10-month period in 2007.[4] It is estimated that air travel will increase in 2009 though, the latest forecast (March 2008) projecting an annual increase of 2.9% in domestic U.S. commercial enplanements and 4.8% in international enplanements—a system increase total of 3%.[2]

The Federal Aviation Administration (FAA) has a goal of ensuring that no less than 93% of the runways at National Plan of Integrated Airport Systems (NPIAS) airports are maintained in good or fair condition. That goal was exceeded in 2007: 79% were rated good, 18% were rated fair, and only 3% were rated poor. However, there were 370 runway incursions in 2007—up from 330 in 2006.[1] Due to the FAA's 2008 change in definition for a runway incursion, this number is likely to increase further. A runway incursion is defined as an incident involving the incorrect presence of an aircraft, vehicle, person, or object on the ground that creates a collision hazard for an aircraft taking off, intending to take off, landing, or intending to land.

Every year the industry incurs avoidable air traffic control delays that, while beyond the immediate control of air traffic control personnel, waste hundreds of millions of dollars. In 2007, airlines reported

RAISING THE GRADES CASE STUDIES

WASHINGTON, D.C. ★ Washington-Dulles International Airport

Washington-Dulles International Airport is the nation's 16th busiest airport, with more than 419,127 takeoffs and landings per year and more than 12 million passengers. The new runway, which opened in 2008, is equipped with a high-speed exit taxiway and can handle larger planes, such as the Airbus A380, will see more than 100,000 takeoffs and landings per year. This marks Dulles's first new runway since 1962, when the airport opened for business.

TABLE 7.1 ★ Top 10 U.S. Passenger Airports, 2006–2007

RANK	LOCATION	AIRPORT
1	**Atlanta, GA**	Hartsfield–Jackson Atlanta International
2	**Chicago, IL**	Chicago O'Hare International
3	**Los Angeles, CA**	Los Angeles International
4	**Fort Worth, TX**	Dallas/Fort Worth International
5	**Denver, CO**	Denver International
6	**New York, NY**	John F. Kennedy International
7	**Las Vegas, NV**	McCarran International
8	**Phoenix, AZ**	Phoenix Sky Harbor International
9	**Houston, TX**	George Bush Intercontinental/Houston
10	**Newark, NJ**	Newark Liberty International

SOURCE U.S. Department of Transportation, Bureau of Transportation Statistics, 2008

an on-time arrival record of 73.3%, the second worst in history; the worst record—72.6%—was recorded in 2000.[1] The air traffic control system remains outdated and inefficient, and modernization efforts continue to meet with delay. The FAA is seeking to implement its NextGen system; however, drawn-out congressional reauthorization of the FAA funding mechanism is causing delay and confusion among airport sponsors across the nation.

The old airline business model is being replaced by a newer low-fare, low-cost model. Between 2000 and 2006, U.S. airlines' domestic operations reported combined operating and net losses of $27.9 and $36.2 billion, respectively. However, in 2007—for the first time since 2000—the airline industry posted a $5.8-billion net profit. And, cargo carriers continue to report strong results with net profits of $1.4 billion.[1] While the new airline operating model along with more fuel and operationally efficient aircraft are being introduced into the National Airspace System (NAS), commercial and corporate aircraft operators cannot take advantage until the FAA and other sponsoring agencies implement policies that reduce delays and invest in emerging technologies and infrastructure that increase capacity and safety. In order to meet these challenges, the NAS must find ways to become more flexible and ensure that the capital required to meet these infrastructure needs is available. There is general

RAISING THE GRADES CASE STUDIES

SEATTLE / TACOMA, WA ★ Sea-Tac International Airport

Sea-Tac Airport, in the top 10% of the nation's busiest airports, experiences delays due to low visibility conditions approximately 44% of the year. However, its two existing runways were too close to allow for two streams of traffic to land in such conditions. The new, $1.1-billion runway, which does allow for two streams of traffic, was designed to reduce arrival delays by as much as 80%, save millions of dollars in wasted fuel, and prevent the release of thousands of tons of greenhouse gases. *Photo courtesy of Sea-Tac Airport.*

CHICAGO, IL ★ Chicago-O'Hare International Airport

In 2004, the FAA imposed flight caps on Chicago O'Hare International Airport due to extreme delays that were affecting the airport's operations. The new runway—the airport's seventh and its first since 1971—is part of a larger, $15-billion expansion project. Designed to handle planes as large as the Boeing 747, the runway will primarily be used for arrivals in inclement weather. The new runway, which has prompted the flight cap to be lifted, will reduce delays by as much as 40% and allow for an additional 52,000 flights per year, according to the FAA. *Photo courtesy of the City of Chicago.*

TABLE 7.2 ★ Top 10 U.S. Cargo Airports, 2006–2007

RANK	LOCATION	AIRPORT
1	**Anchorage, AK**	Ted Stevens Anchorage International
2	**Memphis, TN**	Memphis International
3	**Louisville, KY**	Louisville International
4	**Miami, FL**	Miami International
5	**Los Angeles, CA**	Los Angeles International
6	**Indianapolis, IN**	Indianapolis International
7	**New York, NY**	John F. Kennedy International
8	**Chicago, IL**	Chicago O'Hare International
9	**Newark, NJ**	Newark Liberty International
10	**Oakland, CA**	Metropolitan Oakland International

SOURCE U.S. Department of Transportation, Bureau of Transportation Statistics, 2008

consensus that maintaining the integrity of the NAS requires continuous updates and a steady and predictable flow of capital. The FAA estimates a five-year need of $49.7 billion for the years 2009–2013.[1] The most recent estimates from the Airports Council International's *Airport Capital Development Costs 2007–2011* noted total U.S. airport capital development costs as $87.4 billion over five years, or $17.5 billion per year (adjusted for inflation of 4%).[7]

Generally, there are four sources of funding used to finance airport infrastructure and development: airport cash flow; revenue and general obligation bonds; federal/state/local grants, including the Airport Improvement Program (AIP) grants; and passenger facility charges (PFCs). Access to these funding sources varies widely among airports. Since fiscal year 2001, AIP grants have exceeded $3 billion annually, and for the past five years, PFC collections have exceeded $2 billion annually. Together, AIP grants and PFC collections account for 40% of annual U.S. airport capital spending. Since 1990, annual funding for airport capital needs has been in the range of $5.5 to $7.3 billion.[1] Since congressional authorization for the AIP expired in September of 2007, the program has operated under a series of continuing resolutions, making long-term planning difficult.

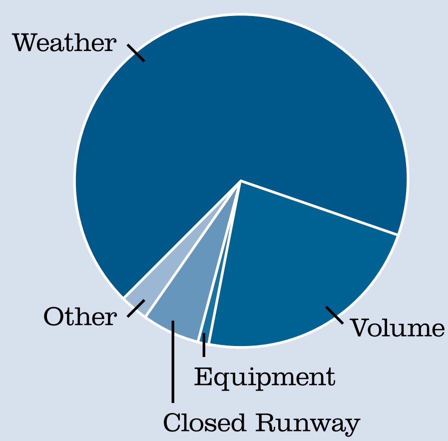
An additional challenge to airport capacity-building is the fragmented nature of airport ownership. Local governments and the private sector represent the majority of owners and investors in air transportation infrastructure, and they tend to focus primarily on their own needs, and only secondarily on national, systemwide concerns. According to the NPIAS, there are 3,356 existing publicly owned, public-use airports in the United States, with an additional 55 proposed. There are also 522 commercial service airports, and of these, 383 have more than 10,000 annual enplanements and are classified as primary airports.[1]

RESILIENCE

Aviation's rapid movement of goods and services, as well as its support of tourism, is critical to the economic vitality of the nation, and air travel is often chosen over other modes of transportation on the basis of convenience, time, and cost. Thus, the consequence of failure is severe. Additionally, shifts in demand corresponding to threats, delays, and fuel pricing contribute to the volatility of the industry. In a highly complex system like aviation, resilience is not simply a matter of technical or facility upgrades. Future investments must consider dynamic system changes, security, capacity, life-cycle facility maintenance, technology innovations, and redundancy.

FIGURE 7.1 ★ Cause of National Aviation System Delays

	% OF DELAYS
Weather	67.98
Volume	22.74
Equipment	0.95
Closed Runway	5.81
Other	2.52



SOURCE U.S. Department of Transportation, Bureau of Transportation Statistics, 2008

RAISING THE GRADES CASE STUDIES

LOS ANGELES, CA ★ Center Taxiway, Los Angeles International Airport

In 1991, Los Angeles International Airport (LAX) experienced one of the worst runway accidents in the nation's history—between a US Airways 737 and a SkyWest Metroliner. Since then, LAX has consistently held some of the nation's highest annual runway incursion rates, several of which have been classified by the FAA as having had serious potential to cause an accident. Completed on budget and four days ahead of schedule, the new center taxiway was designed to improve safety and reduce the number of runway incursions by acting as a buffer between the two southern runways. After landing, pilots will hold planes on the taxiway for clearance to cross the inner runway. *Photo courtesy of LAWA-LAX (Los Angeles World Airports/Los Angeles International Airport).*

RAISING THE GRADES CASE STUDIES

NEWARK, NJ ★ Next Generation Ground Based Augmentation System, Newark Liberty International Airport

In December 2008, Newark Liberty International Airport, in collaboration with the Port Authority of New York and New Jersey, the FAA, Continental Airlines, and Honeywell International, announced that it would be the nation's first major hub to test a new satellite navigation technology designed to reduce flight delays. Replacing existing radar technology, the Ground Based Augmentation System (GBAS) uses data from ground-based antennas and satellites, which prevents the signal from being blocked by mountains, buildings, and other obstacles. This eliminates the need for planes to take a straight-line approach to landing, thus increasing efficiency and navigational precision. The new GBAS system will be installed at the airport and Continental will outfit 15 of its planes with the new equipment and train pilots in using the new system. The program is expected to be operational by the end of 2009. *Photo courtesy of the Port Authority of New York and New Jersey.*

CONCLUSION

Just as the industry was recovering from the events of September 11, 2001, it was dealt another blow from the impact of surging oil prices, volatile credit markets, and a lagging economy. In the face of recent FAA estimates that predict an annual 3% growth in air travel, the continuing delays in reauthorization of federal programs and updating of the outdated air traffic control system threaten the system's ability to meet the needs of the American people and economy. To remain successful, the nation's aviation systems need robust and flexible federal leadership, a strong commitment to airport infrastructure, and the rapid deployment of NexGen. ★

SOURCES

1 Federal Aviation Administration, U.S. Department of Transportation, *Report to Congress National Plan of Integrated Airport Systems (NPIAS) 2009–2013*, September 30, 2008

2 Federal Aviation Administration, U.S. Department of Transportation, *FAA Aerospace Forecast, Fiscal Years 2008–2025*, March, 2008

3 Federal Aviation Administration, U.S. Department of Transportation, *Capacity Needs in the National Airspace System 2007–2025: An Analysis of Airports and Metropolitan Area Demand and Operational Capacity in the Future*, May, 2007

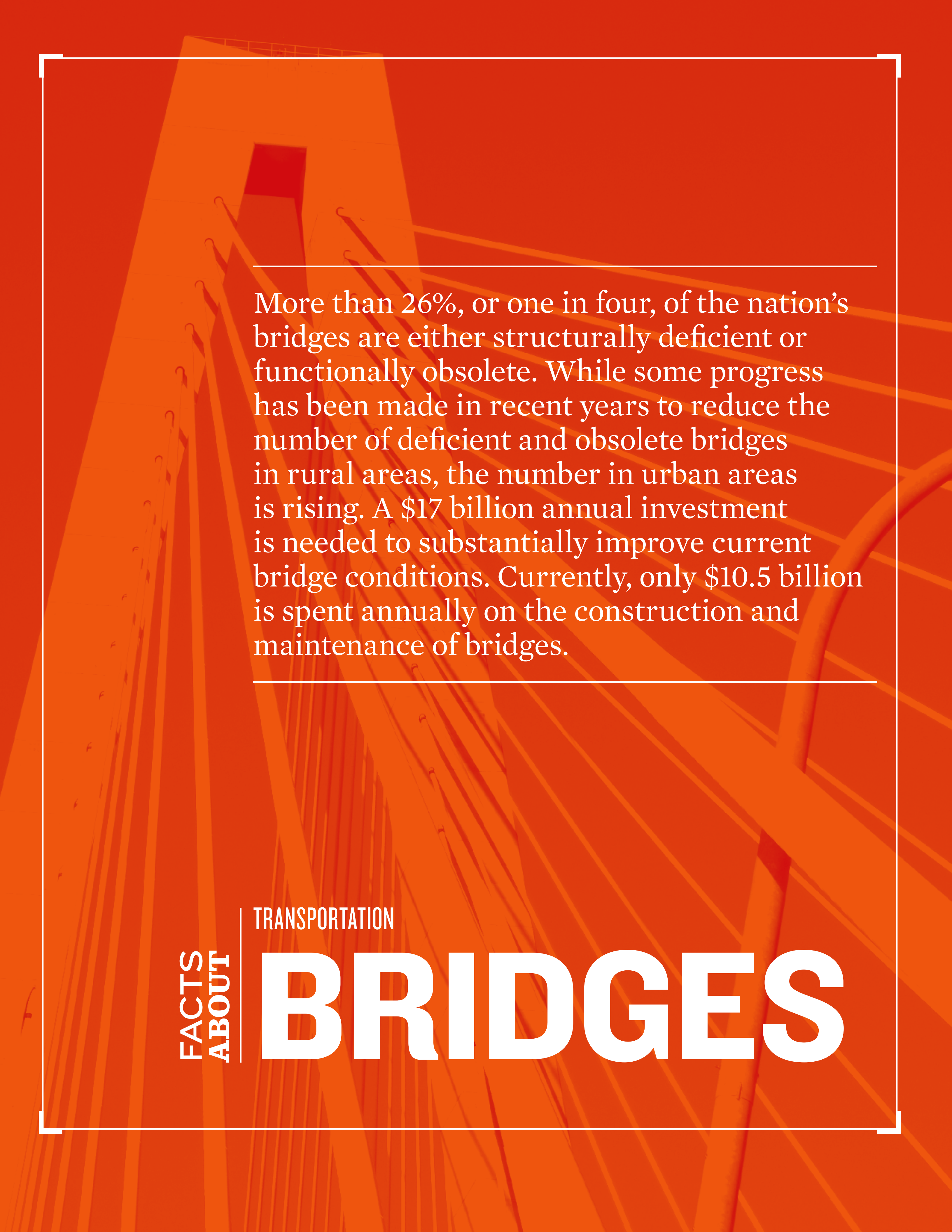
4 Research and Innovative Technology Administration, Bureau of Transportation Statistics, U.S. Department of Transportation, *October, 2008 Airline Traffic Data*, December 11, 2008.

5 U.S. Government Accountability Office, *Next Generation Air Transportation System: Status of Systems Acquisition and the Transition to the Next Generation Air Transportation System*, GAO-08-1078, September, 2008.

6 Statement of Gerald L. Dillingham, Ph.D., Director of Physical Infrastructure Issues, U.S. Government Accountability Office, Before the Committee on Science and Technology, U.S. House of Representatives, *Next General Air Transportation System: Status of Key Issues with the Transition to NextGen*, GAO-08-1154T, September 11, 2008

7 Airports Council International, *Airport Capital Development Costs 2007–2011*, May, 2007.

ABOVE: Airport congestion at Philadelphia International Airport. *Photo courtesy of Matthew Johnson, skyscrapersunset.com*



More than 26%, or one in four, of the nation's bridges are either structurally deficient or functionally obsolete. While some progress has been made in recent years to reduce the number of deficient and obsolete bridges in rural areas, the number in urban areas is rising. A $17 billion annual investment is needed to substantially improve current bridge conditions. Currently, only $10.5 billion is spent annually on the construction and maintenance of bridges.

FACTS ABOUT

TRANSPORTATION

BRIDGES

TRANSPORTATION

BRIDGES

2009 GRADE **C**

RAISING THE GRADES

SOLUTIONS

THAT WILL WORK **NOW**

★ **SET** a national goal that less than 15% of the nation's bridges be classified as structurally deficient or functionally obsolete by 2013;

★ **INCREASE** transportation investment significantly at all levels of government to fund the needed repair, renovation, or reconstruction of the nation's deficient bridges;

★ **IMPLEMENT** an asset-management approach to maintaining bridges to achieve an appropriate balance between correcting immediate problems, conducting preventive maintenance, rehabilitating deficient bridges, and periodically replacing older bridges;

★ **UPDATE** bridge-inspection standards and implement risk-based prioritization for the repair or reconstruction of the nation's bridges;

★ **INCREASE** funding for long-term transportation research at the national level to ensure better performing and more resilient bridges.

A = Exceptional
B = Good
C = Mediocre
D = Poor
F = Failing

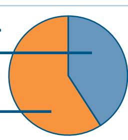
AMERICA'S INFRASTRUCTURE G.P.A. **D**

ESTIMATED 5-YEAR FUNDING REQUIREMENTS FOR **BRIDGES AND ROADS**

Total investment needs
$930 BILLION

Estimated spending
$380.5 BILLION

Projected shortfall
$549.5 BILLION



CONDITION

Usually built to last 50 years, the average bridge in our country is now 43 years old.[1] According to the U.S. Department of Transportation, of the 600,905 bridges across the country as of December 2008, 72,868 (12.1%) were categorized as structurally deficient and 89,024 (14.8%) were categorized as functionally obsolete. From 2005–2008, the number of deficient (structurally deficient plus functionally obsolete) bridges in rural areas declined by 8,596. However, in urban areas during the same time frame, there was an increase of 2,817 deficient bridges.[2] Put another way, in 2008 approximately one in four rural bridges were deficient, while one in three urban bridges were deficient. The urban impact is quite significant given the higher level of passenger and freight traffic.

A structurally deficient bridge may be closed or restrict traffic in accordance with weight limits because of limited structural capacity. These bridges are not unsafe, but must post limits for speed and weight. A functionally obsolete bridge has older design features and geometrics, and though not unsafe, cannot accommodate current traffic volumes, vehicle sizes, and weights. These restrictions not only contribute to traffic congestion, they also cause such major inconveniences as forcing emergency vehicles to take lengthy detours and lengthening the routes of school buses.

With truck miles nearly doubling over the past 20 years and many trucks carrying heavier loads, the spike in traffic is a significant factor in the deterioration of America's bridges. Of the more than 3 trillion vehicle miles of travel over bridges each year, 223 billion miles come from trucks.[1]

To address bridge needs, states use federal as well as state and local funds. According to the American Association of State Highway and Transportation Officials (AASHTO), a total of $10.5 billion was spent on bridge improvements by all levels of government in 2004. Nearly half, or $5.1 billion, was funded by the Federal Highway Bridge Program—$3.9 billion from state and local budgets and an additional $1.5 billion in other federal highway aid.[1] AASHTO estimated in 2008 that it would cost roughly $140 billion to repair every deficient bridge in the country—about $48 billion to repair structurally deficient bridges and $91 billion to improve functionally obsolete bridges.[1]

Simply maintaining the current overall level of bridge conditions—that is, not allowing the backlog of deficient bridges to grow—would require a combined investment from the public and private sectors of $650 billion over 50 years, according to

In 2008, approximately one in four rural bridges were deficient, while one in three urban bridges were deficient. The urban impact is quite significant given the higher level of passenger and freight traffic.

TABLE 8.1 ★ U.S. Bridge Statistics

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
All Bridges	**582,976**	**585,542**	**589,674**	**589,685**	**590,887**	**591,940**	**593,813**	**595,363**	**597,340**	**599,766**
Urban	128,312	130,339	133,384	133,401	135,339	135,415	137,598	142,408	146,041	151,171
Rural	454,664	455,203	456,290	456,284	455,548	456,525	456,215	452,955	451,299	448,595
Structurally Deficient Bridges, Total	**93,072**	**88,150**	**86,692**	**83,595**	**81,261**	**79,775**	**77,752**	**75,923**	**73,784**	**72,520**
Urban	14,073	12,967	NA	12,705	12,503	12,316	12,175	12,600	12,585	12,951
Rural	78,999	75,183	NA	70,890	68,758	67,459	65,577	63,323	61,199	59,569
Functionally Obsolete Bridges, Total	**79,500**	**81,900**	**81,510**	**81,439**	**81,537**	**80,990**	**80,567**	**80,412**	**80,317**	**79,804**
Urban	27,588	26,095	29,398	29,383	29,675	29,886	30,298	31,391	32,292	33,139
Rural	51,912	52,835	52,112	52,056	51,862	51,104	50,269	49,021	48,025	46,665

NA = Not Available

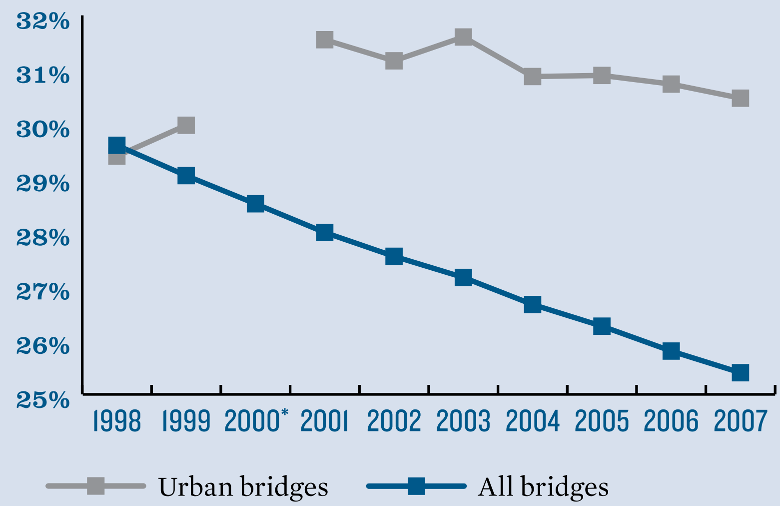
SOURCE *Transportation Statistics Annual Report*, U.S. Department of Transportation, Bureau of Transportation Statistics, 2008

AASHTO, for an average annual investment level of $13 billion. The cost of eliminating all existing bridge deficiencies as they arise over the next 50 years is estimated at $850 billion in 2006 dollars, equating to an average annual investment of $17 billion.[3]

RESILIENCY

The reliable and efficient flow of people, commodities, and emergency services within our roadway system relies on the nation's bridge system, which overall is highly resilient. The keys involve three components: system redundancy and workarounds; recovery measures, including rapid restoration ability, security, and robustness against hazards—both natural and man-made; and individual bridges' structural redundancy. Interstate bridges are usually built in pairs so that if one is taken out of service, the companion bridge can carry traffic in both directions temporarily. Also, in most urban areas, there are a number of bridges that can provide suitable alternate routes for traffic. Those key bridges that lack redundancy make it extremely difficult to establish convenient workarounds should the bridge be closed. Increasing congestion means that any

FIGURE 8.1 ★ Percent of Deficient Bridges in the United States



* 2000 data not available

SOURCE *State Transportation Statistics: 2007*, U.S. Department of Transportation, Bureau of Transportation Statistics, 2008

rerouting caused by a significant bridge closure could result in major traffic delays.

Bridges are designed to account for the likely loads and forces that the span could expect to encounter during its service life. Structurally, today's bridges are highly redundant, and incorporate multiple girder systems that can compensate for the failure of a single member. There are exceptions for example, fracture-critical bridges, which require more frequent monitoring to ensure that they remain capable of handling their designed traffic loads. Resiliency should be part of the evaluation criteria in a risk-analysis to justify and prioritize bridge investment. That investment includes activities that range from nonstructural measures to the structural and from the design of new bridges to the rehabilitation and replacement of old bridges.

CONCLUSION

While some progress has been made recently in improving the condition of the nation's rural bridges, there has been an increase in the number of deficient urban bridges. At the same time, truck traffic over the nation's bridges is on the rise—a matter of great concern as trucks carry significantly heavier loads than automobiles and exact more wear and tear on bridges. The investment gap is accelerating and the failure to invest adequately in the nation's bridges will

RAISING THE GRADES CASE STUDIES

UTAH ★ Accelerated Bridge Construction

The Utah Department of Transportation (UDOT) has used some form of the accelerated bridge construction (ABC) method on 19 projects that have included 77 bridges. The majority of these projects entailed the use of precast decks cast off-site and lifted into place over a short period of time—often overnight. The benefits of the ABC method include not only reduced road closure time and a compressed schedule, but enhanced quality and increased safety for drivers and construction workers as well. The concept of fabricating entire bridge spans off-site and moving them into place with self-propelled modular transports (SPMTs) was used in four projects that replaced a total of 13 bridges. The use of off-site fabrication and SPMTs usually allows for the replacement of bridge spans over a weekend. In one case—the 4500 South crossing of I-215 in Salt Lake City—construction time was reduced by 120 days, saving drivers an estimated $4.2 million in terms of construction delays. *Photos courtesy of Utah Department of Transportation.*

RAISING THE GRADES
CASE STUDIES

I-495 / 95, NORTHERN VA / MD ★ Woodrow Wilson Bridge

Solving one of the worst bottlenecks on the East Coast, the $2.4 billion Woodrow Wilson Bridge Project in northern Virginia and Maryland replaced nearly 12% of the Capital Beltway (Interstate 495/95) and created four new interchanges. Opened in 1961, the original bridge was designed for 75,000 trips per day, but over the years traffic swelled to nearly 200,000 trips daily—11% of them by large trucks. With eight highway lanes squeezing into the original bridge's six lanes, the lack of shoulders and merge lanes resulted in accident rates twice those of other segments of the Beltway, and emergency crews were delayed in reaching those in need. Peak period stop-and-go conditions also contributed to decreased air quality. As one of nine bridges within the interstate highway system with a movable span, the 260 bridge openings per year created additional delays and congestion. These issues rendered the old bridge functionally obsolete.

The new drawbridges are 20 feet higher than the original, and the number of openings is expected to be reduced to about 65 per year, down about 75%. Shoulders on the new bridge will reduce the rate of accidents and improve accident management, and new merge lanes will increase safety. The new bridge has 12 lanes, including two express-type through lanes on each span to accommodate High Occupancy Vehicle (HOV) traffic. The new bridge was named the 2008 Outstanding Civil Engineering Achievement by ASCE. *Photo courtesy of the Wilson Bridge Project.*

RAISING THE GRADES CASE STUDIES

OAKLAND, CA ★ The MacArthur Maze Repairs

When a gasoline tanker rig flipped over on an elevated interstate highway connector ramp on April 29, 2007, the massive explosion and burning fuel warped and collapsed a critical section of the San Francisco Bay Area's MacArthur Maze. To allow traffic and commerce to flow through this vital artery quickly, the state undertook extreme measures to complete repairs in record-breaking time. The twisted steel and crumbled concrete that was the I-580 overpass also damaged the I-880 elevated ramp below. Such extensive damage could have been expected to take months to repair, but with the connectors so vital to commuters, the California Department of Transportation went to work around the clock under an emergency declaration. Only one week after the accident, the lower I-880 connector had been repaired and was reopened. The I-580 overpass was completed in just 26 days, due in part to a bonus of $200,000 paid for each day the work was completed sooner than two months after the accident. *Photo courtesy of California Department of Transportation, photographed by John Huseby.*

lead to increased congestion and delays for motorists, wasted fuel, the further deterioration of bridge conditions, and increased safety concerns. Once Congress works to address these problems in the 2009 authorization of the Surface Transportation Program, it should establish a goal that less than 15% of the nation's bridges be classified as structurally deficient or functionally obsolete by 2013 and should provide the funding needed to accomplish that. ★

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1 American Association of State Highway and Transportation Officials (AASHTO). Bridging the Gap. July 2008

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3 Report of the National Surface Transportation Policy and Revenue Study Commission, Transportation for Tomorrow, December 2007 final report. Volume II, Chapter 4, p. 6

The average tow barge can carry the equivalent of 870 tractor trailer loads. Of the 257 locks still in use on the nation's inland waterways, 30 were built in the 1800s and another 92 are more than 60 years old. The average age of all federally owned or operated locks is nearly 60 years, well past their planned design life of 50 years. The cost to replace the present system of locks is estimated at more than $125 billion.

TRANSPORTATION

FACTS ABOUT INLAND WATERWAYS

TRANSPORTATION

INLAND WATERWAYS

2009 GRADE **D-**

RAISING THE GRADES

SOLUTIONS

THAT WILL WORK **NOW**

A = Exceptional
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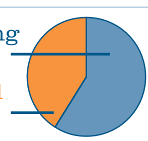
AMERICA'S INFRASTRUCTURE G.P.A. **D**

ESTIMATED 5-YEAR FUNDING REQUIREMENTS FOR **INLAND WATERWAYS**

Total investment needs
$50 BILLION

Estimated spending
$29.475 BILLION

Projected shortfall
$20.5 BILLION



★ **ESTABLISH** a program to improve and maintain ports, harbors, and waterways;

★ **CREATE** a predictable and reliable source of maintenance funding with a dedicated source of revenue, such as a portion of U.S. Customs receipts;

★ **DEEPEN** and widen ship channels to accommodate the world fleet's new, larger ships;

★ **CONTINUE** maintenance dredging of ship channels for the efficient handling of maritime commerce;

★ **LIMIT** erosion and sedimentation in ports, harbors, and waterways;

★ **CONTINUE** the development of the navigation engineering specialty within the engineering profession.

CONDITIONS

Because of their ability to move large amounts of cargo, the nation's inland waterways are a strategic economic and military resource. A recent analysis by the U.S. Army War College concluded that "the strategic contributions of these inland waterways are not well understood. The lack of adequate understanding impacts decisions contributing to efficient management, adequate funding, and effective integration with other modes of transportation at the national level. Recommendations demonstrate that leveraging the strategic value of U.S. inland waterways will contribute to building an effective and reliable national transportation network for the 21st century."[1]

Forty-one states, including all states east of the Mississippi River and 16 state capitals, are served by commercially navigable waterways. The U.S. inland waterway system consists of 12,000 miles of navigable waterways in four systems—the Mississippi River, the Ohio River Basin, the Gulf Intercoastal Waterway, and the Pacific Coast systems—that connect with most states in the U.S. The system comprises 257 locks, which raise and lower river traffic between stretches of water of different levels.

Three-quarters of the nation's inland waterways, or approximately 9,000 miles, are within the Mississippi River system. The next largest segment is the Ohio River system with 2,800 miles. The Gulf Coast Intercoastal Waterway system comprises 1,109 miles and the Columbia River system, the shortest of the four major systems, is only 596 miles long.

The nationwide network includes nearly 11,000 miles of waterways funded by federal user fees through an excise tax on fuel. Commercial waterway operators on these designated waterways pay a fuel tax of 20 cents per gallon, which is deposited in the Inland Waterways Trust Fund (IWTF). The IWTF, which was created in 1978, funds half the cost of new construction and major rehabilitation of the inland waterway infrastructure.

Forty-seven percent of all locks maintained by the U.S. Army Corps of Engineers were classified as functionally obsolete in 2006. Assuming that no new locks are built within the next 20 years, by 2020, another 93 existing locks will be obsolete—rendering more than 8 out of every 10 locks now in service outdated.[2]

Currently, the Corps has $180 million per year available for lock repairs—half comes from the IWTF revenues and half comes from congressional appropriations. With an average rehabilitation cost of $50 million per lock, the current level allows the Corps to fully fund only two or three lock projects each year.

There is no recognized engineering specialty to comprehensively address the

The U.S. inland waterway system consists of 12,000 miles of navigable waterways in four systems—the Mississippi River, the Ohio River Basin, the Gulf Intercoastal Waterway, and the Pacific Coast systems.

TABLE 9.1 ★ The Nation's Busiest Inland Ports

INLAND PORT	DOMESTIC TONS*	DOMESTIC % INCREASE**	FOREIGN TONS*	FOREIGN % INCREASE**	TOTAL TONS*	TOTAL % INCREASE**
Huntington-Tristate, WV	76.5	-0.9	0	0	76.5	-0.9
Duluth-Superior, MN & WI	31.4	-3.5	15.1	4.7	46.5	-1.0
Pittsburgh, PA	38.1	-9.3	0	0	38.1	-9.3
St. Louis, MO & IL	32.1	2.6	0	0	32.1	2.6
Chicago, IL	21.1	-6.3	3.4	6	24.5	-4.8
Memphis, TN	18.8	-1.4	0	0	18.8	-1.4
Indiana Harbor, IN	14.5	-7.5	0.5	6	15	-7.0
Detroit, MI	11.4	-12	3.5	-19.4	14.9	-13.9
Two Harbors, MN	13.1	-2.2	0.6	942.7	13.7	1.9
Cincinnati, OH	13.2	-0.9	0	0	13.2	-0.9
Cleveland, OH	10.4	-9.5	2.4	-35	12.8	-15.8
Toledo, OH	4.5	95.3	8	-9.9	12.5	11.7
Presque Isle, MI	7	0.8	1.8	-15.7	8.8	-3.1
Gary, IN	7.9	-6.4	0.2	-73.6	8.1	-11.5
Louisville, KY	7.8	6.4	0	0	7.8	6.4

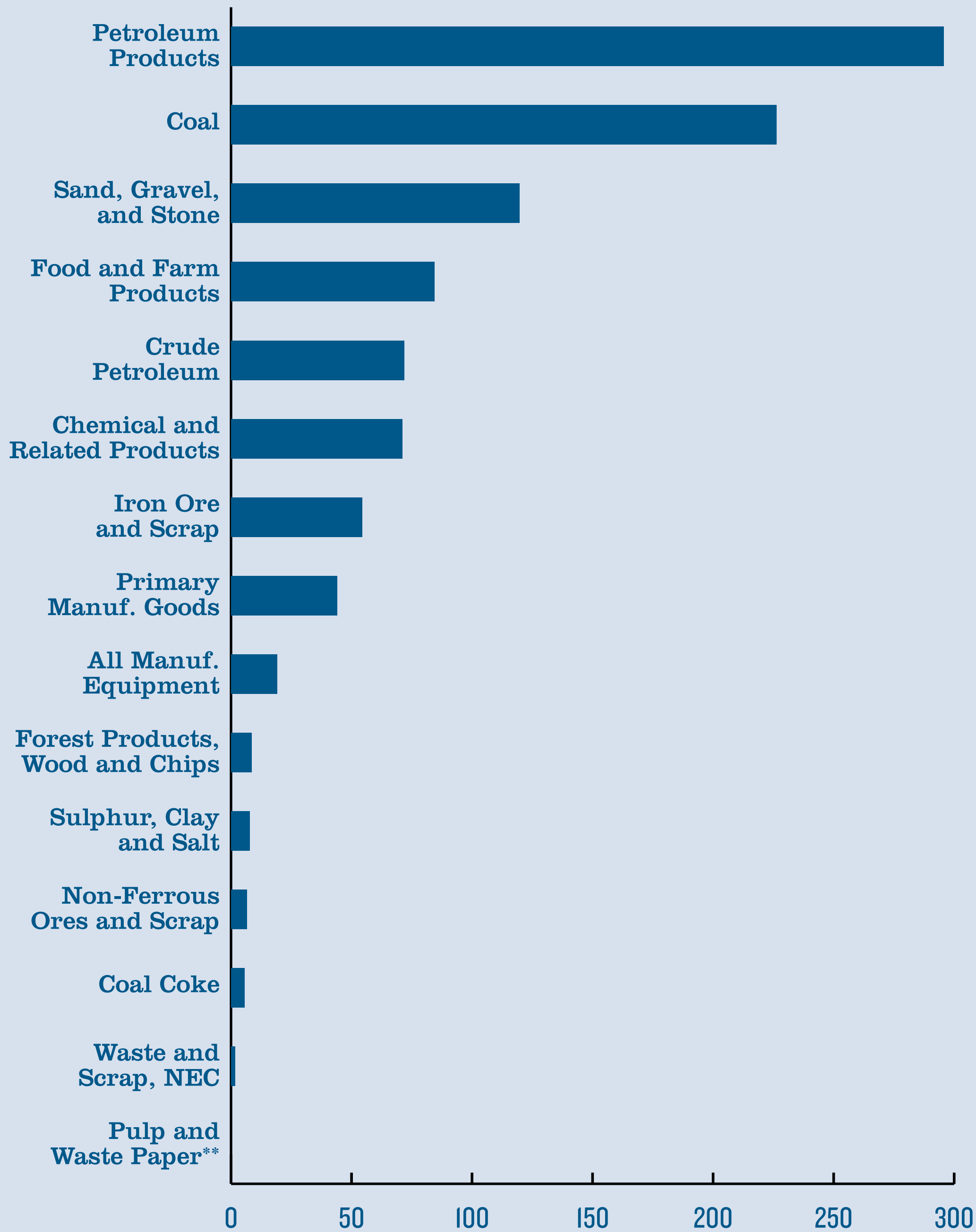
* Short Tons in Millions
** Percent Increase 2006–2007

SOURCE Leading U.S. Ports—Inland Waterways (Including Great Lakes), USACE, 2007

current and future waterways systems challenges. In the past, systems were basically designed and maintained by the Corps and therefore most of the engineering knowledge and experience has been self-contained. Now much of that mission is contracted and other related functions are privatized. These factors and the loss of experienced engineers in and outside the Corps result in the urgent need to formally educate a new audience in the developing specialty of navigation engineering.

Due to a lack of adequate data, ASCE was unable to assess the condition of, or assign a grade to, the infrastructure of the nation's more than 300 ports and harbors. Ports, which are owned and operated largely by state, local, and private entities,

FIGURE 9.1 ★ Commodities Shipped Via Inland Waterway (by tons*)



* Short Tons in Millions
** Tonnage less than 50,000 tons or extreme percent change

SOURCE U.S. Waterborne Traffic by Commodity, 2007, USACE

RAISING THE GRADES
CASE STUDIES

UNITED STATES ★ Real-Time Current Velocity System

The Corps is bringing new technology online to make waterways navigation safer. The latest innovation is called the real-time current velocity system. This system alerts waterways users to the real-time speed of wind and currents on inland waterways. The additional current information, which will be transmitted automatically to tows on approach, will allow tow pilots to improve safety and prevent collisions when tows are approaching locks. A total of six systems are expected to be implemented by the end of 2009.

LOUISVILLE, KY ★ McAlpine Lock, Ohio River

In March 2009, the Corps will open a new 1,200-foot lock on the Ohio River to replace a single, shorter lock built in 1921. The new lock chamber at Louisville, Ky.—originally built to transport commodities over the Falls of Ohio—will enable the facility to meet projected increases in commercial barge traffic during the next 30 years.[8] According to the Corps' Louisville District, in calendar year 2006, 55 million tons of freight passed through McAlpine, 39% of which was coal. *Photo courtesy of the U.S. Army Corps of Engineers, Louisville District.*

are not required to report on the condition of their infrastructure to the federal government. Nevertheless, U.S. ports connect to 1,000 federally maintained harbor channels and 12,000 miles of taxpayer-funded inland waterways, and their landside port infrastructure facilities include terminals, wharves, rail yards, and roadways within the harbor districts.[6] In 2007, the American Association of Port Authorities (AAPA), which represents ports in the U.S., Canada and Mexico, reported that public ports in the U.S. must invest $1.7 billion annually to update and modernize their facilities. The AAPA report contained no assessment of the physical condition of individual ports or of port infrastructure generally.[4]

RESILIENCE

The current system of inland waterways lacks resilience. Waterway usage is increasing, but facilities are aging and many are well past their design life of 50 years. Recovery from any event of significance would be negatively impacted by the age and deteriorating condition of the system, posing a direct threat to the American economy.

CONCLUSION

Inland and intracoastal waterways directly serve 38 states including the states on the Atlantic seaboard, the Gulf Coast, and the Pacific Northwest. Shippers and consumers in these states depend on the inland waterways to move approximately 630 million tons of cargo valued at more than $73 billion annually. States on the Gulf Coast and throughout the Midwest and Ohio Valley especially depend on the inland and intracoastal waterways. Texas and Louisiana each ship more than $10 billion worth of cargo annually, while Illinois, Pennsylvania, West Virginia, Kentucky, Mississippi, Alabama, and Washington State each ship between $2 billion and $10 billion annually. Another 8 states ship at least $1 billion annually.

This system provides an average transportation savings of $10.67 per ton over the cost of shipping by alternative modes. This translates into more than $7 billion annually in transportation savings to the U.S. economy. Future investment must focus on life-cycle maintenance, system interdependencies, redundancy, security, and recovery from natural and man-made hazards. ★

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RAISING THE GRADES CASE STUDIES

PHILADELPHIA, PA ★ Delaware River Channel Deepening Project

In June 2008, an agreement was signed between the U.S. Army Corps of Engineers and the Philadelphia Regional Port Authority to begin a five-year, $379-million project to deepen the Delaware River's shipping channel. The deeper channel, which is being increased from 40 to 45 feet, will allow ports on the Delaware River to compete more effectively for cargo, provide safe passage for vessels and increase jobs in the region. Approximately 26 million cubic yards of dredging material will be removed, 7.4 million cubic yards of which will be used for wetland creation and beach nourishment. *Photos courtesy of the U.S. Army Corps of Engineers, Philadelphia District.*

SAVERTON, MO ★ Lock 22, Upper Mississippi River System

The U.S. Army Corps of Engineers' new 1,200-foot Lock 22 will allow a tow with a full accompany of barges to move through the lock without having to break the tow's load into two pieces. Keeping a tow's load in one piece minimizes environmental impact, increases worker safety and reduces transit times. The lock's design is largely transferable to four other lock sites, saving both time and money. The existing 600-foot lock will remain in place and will become an auxiliary lock serving primarily recreational traffic. *Photo courtesy of the U.S. Army Corps of Engineers, Rock Island District.*

A freight train is three times as fuel efficient as a truck, and traveling by passenger rail uses 20% less energy per mile than traveling by car. However, growth and changes in demand create bottlenecks that constrain traffic in critical areas. Freight and passenger rail generally share the same network, and a significant potential increase in passenger rail demand will add to the freight railroad capacity challenges. More than $200 billion is needed through 2035 to accommodate anticipated growth.

FACTS ABOUT

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RAISING THE GRADES SOLUTIONS THAT WILL WORK NOW

★ **INTEGRATE** rail into a national multimodal transportation policy that recognizes and takes advantage of efficiencies;

★ **IMPROVE** passenger rail as an alternative to air and automobile travel;

★ **INCREASE** and expand Amtrak's corridor services linking major cities less than 500 miles apart.

A = Exceptional
B = Good
C = Mediocre
D = Poor
F = Failing

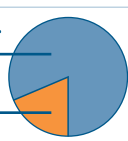
AMERICA'S INFRASTRUCTURE G.P.A. **D**

ESTIMATED 5-YEAR FUNDING REQUIREMENTS FOR **RAIL**

Total investment needs
$63 BILLION

Estimated spending
$51.3 BILLION

Projected shortfall
$11.7 BILLION



CONDITION

Freight Rail

The U.S. freight rail system is comprised of three classes of railroad companies based on annual operating revenues: 8 Class I freight railroad systems; 30 Class II regional or short-line railroads; and 320 Class III or local line-haul carriers.[1]

Approximately 42% of all intercity freight in the United States travels via rail, including 70% of domestically manufactured automobiles and 70% of coal delivered to power plants.[2] As of 2006, Class I railroads owned and operated 140,249 miles of track.[3] However, most traffic travels on approximately one-third of the total network, which totals 52,340 miles.

After years of shedding excess capacity, railroads have been increasing infrastructure investment and spending in recent years. In 2006, overall spending on rail infrastructure was $8 billion, a 21% increase from 2005.[2] More specifically, spending on construction of new roadway and structures increased from $1.5 billion in 2005 to $1.9 billion in 2007.[4] Increased spending on maintenance of railroad networks and systems has become necessary as investments are made in more costly signaling technology, heavier rail, and the improved substructure necessary to accommodate heavier trains.[3]

Demand for freight transportation is projected to nearly double by 2035—from 19.3 billion tons in 2007 to 37.2 billion tons in 2035.[4] If current market shares are maintained, railroads will be expected to handle an 88% increase in tonnage by 2035.[4] However, as many look to rail as a more efficient and environmentally friendly freight shipper, rail's market share could increase and lead to additional increases in freight rail tonnage.

An estimated $148 billion in improvements will be needed to accommodate the projected rail freight demand in 2035.[4] Class I freight railroads' share of this cost is estimated at $135 billion.[4] Through productivity and efficiency gains, railroads hope to reduce the required investment from $148 billion to $121 billion over the period 2007 through 2035.[4]

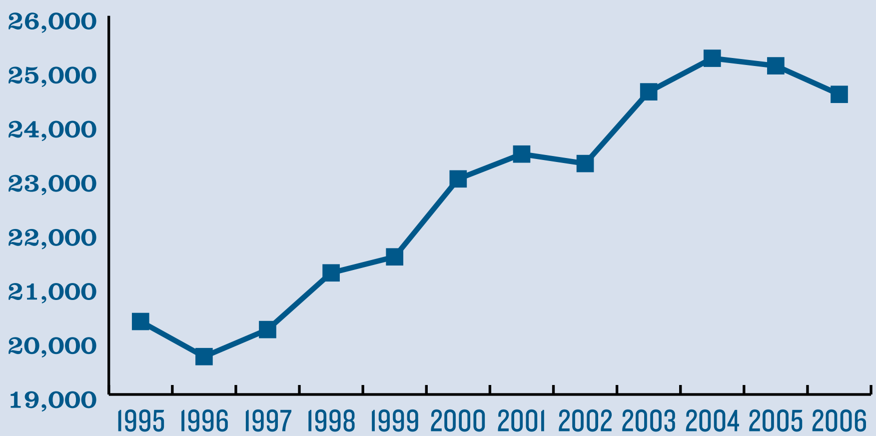
Passenger Rail

Amtrak, the nation's only intercity passenger rail provider, carried 28.7 million riders in fiscal year 2008, an 11.1% increase from fiscal year 2007.[5] Further, the 2007 ridership represented a 20% increase from the previous five years.[5] Corridor services linking major cities less than 500 miles apart, such as Milwaukee-Chicago, Sacramento-San Francisco-San Jose and the Northeast Corridor, are experiencing the fastest growth.[5]

Increased ridership has led to increased revenue, and Amtrak received $1.355 billion in federal investment in fiscal year 2008. However, an additional $410 million in immediate capital needs have been identified, including acquiring new cars to add capacity. In addition, upgrades to comply with the Americans with Disabilities Act (ADA) and improve overall conditions of the 481 stations in its network are estimated at $1.5 billion.[6]

While electrical power in the Northeast Corridor cushioned some of the blow of

FIGURE 10.1 ★ Number of Amtrak Passengers (in thousands): 1995–2006



SOURCE *Transportation Statistics Annual Report: 2007*, U.S. Department of Transportation, Bureau of Transportation Statistics, 2008

increased fuel prices in 2008, it also represents a major infrastructure challenge for Amtrak. Upgrading the electrical system in the Northeast Corridor, parts of which were installed in the 1930s, is among the immediate needs identified. Failure of these critical systems could bring the entire line to a halt, which would impact not only Amtrak, but also the 8 commuter railroads that share the Northeast Corridor.[6]

Amtrak anticipates reaching and exceeding capacity in the near future on some routes. For example, approximately half of trains traveling on one northeast regional line were 85% full and 62% were at least 75% full during one week in July 2008. Even though the current economic downturn has dampened growth, trains will soon reach capacity as the economy

Corridor services linking major cities less than 500 miles apart, such as Milwaukee-Chicago, Sacramento-San Francisco-San Jose and the Northeast Corridor, are experiencing the fastest growth.

rebounds and the growth patterns of recent years are reestablished, and the fleet of cars and locomotives continues to age.[6]

In the long term, the Passenger Rail Working Group (PRWG), which was formed as part of the National Surface Transportation Policy and Revenue Study Commission, determined that an annual investment of $7.4 billion through 2016, totaling $66.3 billion, is needed to address the total capital cost of a proposed intercity rail network. It is further estimated that an additional $158.6 billion is needed between 2016 and 2030 and an additional $132.3 billion must be invested between 2031 and 2050 to achieve the ideal intercity network proposed by the PRWG.[5] These costs do not include the mandated safety upgrades for freight rail lines that carry both passenger as well as freight traffic and for those routes that carry toxic chemicals as required by the Rail Safety Improvement Act of 2008.[7]

While the investments set forth by the PRWG are significant, the benefits would be significant as well. The PRWG estimated a net fuel savings of nearly $4 billion per year by diverting passengers to rail if the proposed vision was adopted.[5] In addition, the investments would reduce the need for even greater capacity investments in other modes.

Intercity passenger rail faces particular concerns not faced by other modes of transportation, such as the lack of a dedicated revenue source. Amtrak owns and/or operates 656 miles of track that are maintained and upgraded using funds from its general operating budget, impacting its ability to fund other projects. The annual congressional appropriations process has provided minimal funding in recent years, leading to a major backlog of deferred track maintenance on the track that Amtrak owns and operates, more than half of which is shared with commuter and freight railroads. For the remainder of its 21,095-mile network, Amtrak relies on freight rail lines that make maintenance and upgrade decisions on the basis of their own business models and shareholders' interests while preserving Amtrak's statutory rights for access. Freight and passenger rail interests are becoming more aligned as both require increases in rail network capacity, but successful alignment of interests will require both a public and private investment.[1]

RESILIENCE

Because of its efficiency and reduced energy consumption, rail is an important component of the nation's transportation network, supporting the economy through both commerce and tourism. But due to a lack of adequate investment, limited redundancy, intermodal constraints, and energy system interdependencies, the rail system is not resilient. Current rail security strategies are risk-based as determined by corridor assessments, corporate security reviews, intelligence analyses, and objectively measured risk metrics. To improve resilience, future investments must address life-cycle maintenance, rapid recovery, multihazard threats and vulnerabilities, and technological innovations.

RAISING THE GRADES CASE STUDIES

CHICAGO, IL ★ Chicago Region Environmental and Transportation Efficiency Program

The Chicago Region Environmental and Transportation Efficiency Program (CREATE) is a joint effort between freight and passenger railroads and city and state governments to improve the movement of goods and people through the area. Chicago's role not only as a population center but also as a major freight processing area—approximately one-fourth of U.S. freight rail traffic originates in, terminates in, or travels through the Chicago area—means that improvements will impact shipments to the entire country. Billions of dollars will be invested in critical capital improvement projects to increase the efficiency of the region's railroads.[9]

It is estimated that new overpasses and underpasses at railroad crossings will save motorists 3,000 hours per day.[9] Additional funding is required to complete this plan, which will provide both public and private benefits to the economy, environmental benefits, and significant congestion relief. CREATE projects will free up needed capacity, reduce pollution from both locomotives and highway vehicles, increase reliability and reduce conflicts between passenger and freight rail. *Photos courtesy of the CREATE partners.*

RAISING THE GRADES
CASE STUDIES

LOS ANGELES / LONG BEACH, CA ★ Alameda Corridor

Completed in 2002, the Alameda Corridor is a 20-mile-long rail cargo expressway that links the ports of Long Beach and Los Angeles—the two busiest container ports in the country—to the transcontinental rail network near downtown Los Angeles.[8] A series of bridges, underpasses, overpasses, and street improvements separates freight trains from passenger rail and automobile traffic, facilitating a more efficient transportation network.[8] In addition, the elimination of at-grade crossings reduces traffic congestion, time lost by local drivers and air and noise pollution created by idling trains and automobiles. *Photo courtesy of AECOM.*

BOSTON, MA / WASHINGTON, D.C. ★ Amtrak's Northeast Corridor

Amtrak's Northeast Corridor continues to set the standard for providing a viable intercity transportation alternative to congested highways and airways. In addition to Amtrak passenger service, 8 transportation or commuter agencies use the Corridor through contract agreements with Amtrak.[10]

Ridership on the Acela Express grew 20% from fiscal year 2006 to fiscal year 2007.[10, 12] In addition, Amtrak's share of the New York–Washington air and rail travel market was 56% in fiscal year 2007.[11] *Photo courtesy of Amtrak.*

CONCLUSION

Rail is increasingly seen as a way to alleviate growing freight and passenger congestion experienced by other modes of transportation. In addition, rail is a fuel efficient alternative for moving freight long distances.

Anticipated growth over the coming decades, as well as demographic shifts, will tax a rail system that is already reaching capacity in some critical bottlenecks. A substantial investment in rail infrastructure will maximize efficiencies and ultimately reap broad benefits for passengers, shippers, and the general public. ★

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Americans spend 4.2 billion hours a year stuck in traffic at a cost to the economy of $78.2 billion, or $710 per motorist. Poor conditions cost motorists $67 billion a year in repairs and operating costs. One-third of America's major roads are in poor or mediocre condition and 45% of major urban highways are congested. Current spending of $70.3 billion per year for highway capital improvements is well below the estimated $186 billion needed annually to substantially improve conditions.

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THAT WILL WORK **NOW**

A = Exceptional
B = Good
C = Mediocre
D = Poor
F = Failing

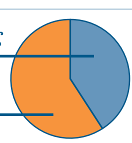
AMERICA'S INFRASTRUCTURE G.P.A. **D**

ESTIMATED 5-YEAR FUNDING REQUIREMENTS FOR **BRIDGES AND ROADS**

Total investment needs
$930 BILLION

Estimated spending
$380.5 BILLION

Projected shortfall
$549.5 BILLION



★ **REFORM** the federal highway program to emphasize performance management, cost-benefit analysis, and accountability;

★ **DIRECT** federal transportation policies, programs, and resources to enhance U.S. global competitiveness, interstate commerce, passenger travel, and emergency preparedness;

★ **INCREASE** spending significantly at all levels of government to repair, improve, and expand the nation's surface transportation system;

★ **INCREASE** funding for long-term, advanced highway research;

★ **ADDRESS** the long-term viability of fuel taxes for transportation funding, and explore the viability of the most promising options to strengthen this funding;

★ **ESTABLISH** a national policy goal of achieving zero deaths on America's roadways and **INCREASE** funding in the Highway Safety Improvement Program by 10%.

CONDITION

Our nation's economy and our quality of life require a highway and roadway system that provides a safe, reliable, efficient, and comfortable driving environment. Although highway fatalities and traffic-related injuries declined in 2007, the drop is most likely attributable to people driving less. Still, in 2007, 41,059 people were killed in motor vehicle crashes and 2,491,000 were injured.[4] Motor vehicle crashes cost the U.S. $230 billion per year—$819 for each resident in medical costs, lost productivity, travel delays, workplace costs, insurance costs, and legal costs.[1]

Next to safety, congestion has become the most critical challenge facing our highway system. Congestion continues to worsen to the point at which Americans spend 4.2 billion hours a year stuck in traffic at a cost of $78.2 billion a year in wasted time and fuel costs—$710 per motorist.[1] The average daily percentage of vehicle miles traveled (VMT) under congested conditions rose from 25.9% in 1995 to 31.6% in 2004, congestion in large urban areas exceeding 40%.[2] And as a result of increased congestion, total fuel wasted climbed from 1.7 billion gallons in 1995 to 2.9 billion gallons in 2005.[5]

Poor road conditions lead to excessive wear and tear on motor vehicles and can also lead to increased numbers of crashes and delays. According to the Federal Highway Administration, while the percentage of VMT occurring on roads classified as having "good" ride quality has steadily improved, the percentage of "acceptable" ride quality steadily declined from 86.6% in 1995 to 84.9% in 2004, with the lowest acceptable ride quality found among urbanized roads at 72.4%.[2] These figures represent a failure to achieve significant increases in good and acceptable ride quality, particularly in heavily trafficked urbanized areas.

Compounding the problem are steadily increasing demands on the system. From 1980–2005, while automobile VMT increased 94% and truck VMT increased 105%, highway lane-miles grew by only 3.5%. From 1994–2004, ton miles of freight moved by truck grew 33%.[6] The increase in freight traffic is of particular concern because of the increased dependency of commerce upon the efficiency of the roadways and the added wear and tear caused by trucks. Without adequate investment and attention, the negative trends will continue, as will the adverse consequences.

It is clear that significant improvements and system maintenance will require significant investments.

The National Surface Transportation Policy and Revenue Commission studied the impact of varying investment levels (medium and high) and produced the following ranges of average annual capital investment needs (in 2006 dollars):

- ★ $130 billion–$240 billion for the 15-year period 2005–2020;
- ★ $133 billion–$250 billion for the 30-year period 2005–2035;
- ★ $146 billion–$276 billion for the 50-year period 2005–2055.

TABLE 11.1 ★ Top 10 Most Congested Cities in the U.S.

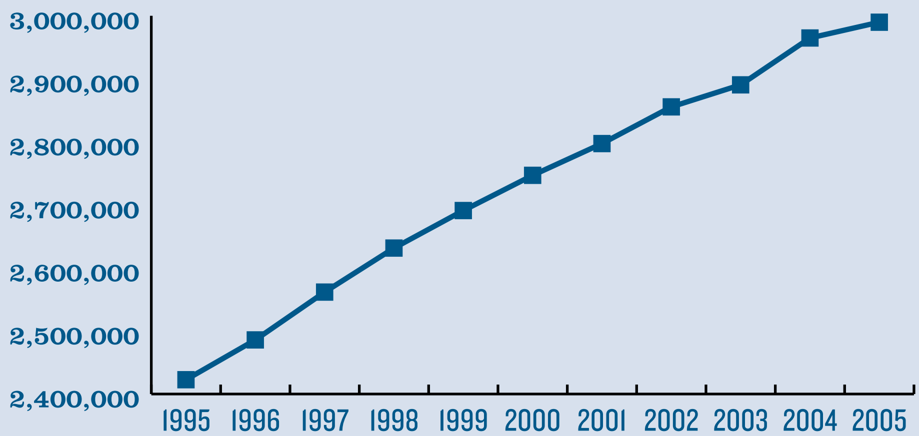
RANK	CITY	HOURS OF DELAY PER TRAVELER
1	Los Angeles/Long Beach-Santa Ana, CA	72
2	San Francisco-Oakland, CA	60
2	Washington, DC-VA-MD	60
2	Atlanta, GA	60
5	Dallas-Fort Worth-Arlington, TX	58
6	Houston, TX	56
7	Detroit, MI	54
8	Miami, FL	50
9	Phoenix, AZ	48
10	Chicago, IL-IN	46

SOURCE *Urban Mobility Report*, Texas Transportation Institute, 2007

The lower end of the ranges reflect the estimated costs of maintaining key conditions and performance measures at current levels, while the higher end ranges would allow for an aggressive expansion of the highway system, which would provide improved conditions and performance in light of increasing travel demand.[3] Even at the lower range of estimates, an enormous gap exists between the current level of capital investment and the investment needed to improve the nation's highways and roads.

The average daily percentage of vehicle miles traveled (VMT) under congested conditions rose from 25.9% in 1995 to 31.6% in 2004, congestion in large urban areas exceeding 40%.

FIGURE 11.1 ★ Highway Vehicle Miles Traveled: 1995–2005



SOURCE *Transportation Statistics Annual Report: 2007,* U.S. Department of Transportation, Bureau of Transportation Statistics, 2008

RESILIENCY

The Interstate Highway System was constructed as part of the nation's strategic homeland defense, illustrating the important role of transportation in mitigation, defense and recovery.

The ability of our transportation system to withstand threats from hazards of all types, both natural and human-caused, and to restore service promptly following such events, is known as resilience.

Building disaster-resistant roads and highways reduces hazard mitigation costs, limits exposure, and maintains operational continuity. A multihazard approach utilizing next-generation codes, standards, and practices is necessary to minimize the extent of a disaster.

CONCLUSION

The challenges imposed by our highway infrastructure require a large increase in capital investment on the part of all levels of government and other sources as well. The failure to adequately invest in the nation's highways and roads will lead to increased congestion and delays for motorists and the further deterioration of pavement conditions and will pose increased safety concerns. An overstressed infrastructure will also slow freight delivery, create unpredictability in supply chains, diminish the competitiveness of U.S. businesses, and increase the cost of consumer goods. There must also be a significant change in the way we manage the system, which should include

RAISING THE GRADES CASE STUDIES

FAIRFAX COUNTY, VA ★ I-495 Virginia HOT Lanes Project

Designed to help alleviate congestion on Virginia's busiest highway in the third worst congested region in the country, the I-495 High Occupancy Toll (HOT) lanes project will add 4 lanes to a 12-mile stretch of the Capital Beltway. The estimated $1.7-billion project will employ electronic tolling and dynamic pricing to manage traffic flow and will replace more than $260 million in aging infrastructure, including more than 50 bridges, overpasses, and major interchanges.

ABOVE: Conceptual renderings of the future Capital Beltway HOT Lanes Project. *Photo courtesy of Transurban.*

MISSOURI ★ Median Crash Barriers

Through an analysis of the state's crash data, MoDoT recognized an emerging problem of severe cross-median crashes on its most heavily traveled roadways. To address this safety concern, Missouri began an effort to install median cable barriers system-wide on its major interstates. Simple cable barriers lining all highway medians offered a low cost solution to this problem. The cable barriers have performed successfully in Missouri, catching over 95% of vehicles entering the median. Most importantly, the barriers are saving lives. As an example, Interstate 70 suffered 24 cross-median fatalities in 2002. The installation of system-wide cable barriers since then has virtually eliminated this crash type, as only two cross-median fatalities occurred in 2006. *Photo courtesy of the Roadway Safety Foundation.*

the use of emerging technologies and innovative operational strategies.

Legislation to replace SAFETEA-LU, which expires on September 30, 2009, must address the following issues if it is to set the stage for the major reforms needed to ensure the viability of our surface transportation system. First, it must more clearly define the federal role and responsibilities, and from that definition, the framework for a performance-based and fully accountable system can emerge.

Second, it is clear that the current funding model for the Highway Trust Fund (HTF) is failing. The latest projections by the U.S. Department of Treasury and Congressional Budget Office indicate that by the end of FY 2009, the HTF will have a negative balance of $4–5 billion if no corrective action is taken. While acknowledging the need to move to a new, sustainable funding system in the long term, the National Surface Transportation Policy and Revenue Study Commission has recommended an increase of 5–8 cents per gallon in the gas tax per year over the next 5 years to address the current projected shortfall.[3] We cannot continue to rely upon gasoline and diesel taxes to generate the HTF revenues, when national policy demands a reduction in both our reliance upon foreign sources of energy and our nation's carbon footprint. An increase in the gas tax is necessary in the short term, but our national policy must move toward a system that more directly aligns fees that a user is charged with the benefits that the user derives.

Finally, the legislation must encourage innovative thinking and solutions from all sectors: public, private, and academia. ★

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RAISING THE GRADES CASE STUDIES

MILWAUKEE, WI ★ The Marquette Interchange Renovation

By the early 2000s, the Marquette Interchange, which provides access to 37% of the state's jobs and links to one-third of the state's freeways, carried 300,000 vehicles per day and averaged three crashes daily. The $810-million improvement project—which is ahead of schedule and under budget—provides additional ramp lanes, increases ramp and merge distances, straightens curves, and places entrances and exits on the right-hand side of the highway to improve safety. The interchange's bridges have been built for a 75-year design life. *Photos courtesy of the Wisconsin Department of Transportation.*

Transit use increased 25% between 1995 and 2005, faster than any other mode of transportation. However, nearly half of American households do not have access to bus or rail transit, and only 25% have what they consider to be a "good option." The Federal Transit Administration estimates $15.8 billion is needed annually to maintain conditions and $21.6 billion is needed to improve to good conditions. In 2008, federal capital outlays for transit were only $9.8 billion.

TRANSPORTATION

FACTS ABOUT TRANSIT

TRANSPORTATION

TRANSIT

2009 GRADE **D**

RAISING THE GRADES SOLUTIONS THAT WILL WORK NOW

- **AUTHORIZE** a new federal surface transportation policy using a needs-based approach to determine funding;
- **INCREASE** access to public transit services to reduce congestion in urban areas and connect to suburban and rural areas;
- **IMPLEMENT** a "mode-neutral" planning process that examines the specific needs of metropolitan areas and regions and implements the most effective transportation mode to meet those needs.

A = Exceptional
B = Good
C = Mediocre
D = Poor
F = Failing

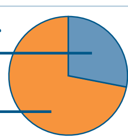
AMERICA'S INFRASTRUCTURE G.P.A. **D**

ESTIMATED 5-YEAR FUNDING REQUIREMENTS FOR **TRANSIT**

Total investment needs
$265 BILLION

Estimated spending
$74.9 BILLION

Projected shortfall
$190.1 BILLION



CONDITIONS

In recent years, transit use has increased more rapidly than any other mode of transportation. Ridership increased by 25% from 1995 to 2005—to 10.3 billion trips a year, the highest number of trips in 50 years. An estimated 34 million trips are taken on public transportation each weekday and of those trips, 59% are taken by individuals commuting to and from work, 11% by individuals traveling to and from school, and 9% by individuals traveling to and from leisure activities.[1] By moving workers and shoppers, transit is increasingly becoming a major economic factor.

In 2004, there were 640 local public transit operators serving 408 large and small urbanized areas and 1,215 operators serving rural areas. In addition, there were 4,836 specialized services for the elderly and disabled in both urban and rural areas, representing a total increase in these types of services since 2002. These systems operate more than 120,659 vehicles. Transit rail operators controlled 10,892 miles of track and served 2,961 stations. Between 2000 and 2004, the number of urban transit vehicles increased by 13.4%, track mileage grew by 3%, and the number of stations grew by 4.8%. Also during that time, the number of passenger miles traveled by all transit passengers increased at an annual rate of 1.3% between 2002 and 2004. Passenger growth on transit rail lines grew at an even greater rate, 4.3%.[2]

SAFETEA-LU, which will expire on September 30, 2009, authorized more than $45 billion in transit investments. However, the increased popularity of transit—as evidenced by robust increases in transit ridership and strong support for local funding initiatives—has led to growth in both the number and size of transit systems in the U.S. While new investment brings badly needed transit service to more Americans, existing systems continue to require investments to replace aging infrastructure; thus, the revenue that is available must be spread further than ever before. At the same time, dwindling revenues in the Highway Trust Fund impact the transit sector's financial health at a time when more Americans are relying on it for travel.

While mass transit can be an affordable and environmentally friendly travel alternative to automobiles, the American Public Transportation Association (APTA) estimates that approximately half of Americans do not have access to reliable transit systems. A 2005 survey conducted by the U.S. Department of Housing and Urban Development and the U.S. Census Bureau found that only 54% of American households have access to bus and rail transit and only 25% have what they consider a good alternative to such transit.

Indicating an increase in service demand, 23 of 32 (72%) of local ballot initiatives for public transportation—or initiatives with a public transit component—were passed in 2008, authorizing nearly $75 billion in expenditures.

TABLE 12.1 ★ Traffic Delay Reduction Due to Public Transportation

POPULATION GROUP AND NUMBER OF AREAS	AVERAGE ANNUAL PASSENGER-MILES OF TRAVEL IN MILLIONS	HOURS OF DELAY IN MILLIONS	PERCENT OF BASE DELAY	DOLLARS SAVED IN MILLIONS
Very Large	37,691	430	1,700%	$8,091
Large	5,459	64	700%	$1,193
Medium	1,665	15	400%	$270
Small	287	1	300%	$26
Other	6,324	31	500%	$574
National Urban Total	**51,426**	**541**	**1,300%**	**$10,154**

SOURCE *Urban Mobility Report*, Texas Transportation Institute, 2007

The Federal Transit Administration (FTA) rates system conditions on a five-point scale—one being poor and five being excellent. FTA's *2006 Conditions and Performance Report* indicates that the condition of the nation's transit infrastructure remained largely unchanged during the past four years. The estimated average condition of the urban bus fleet was 3.08 in 2004, a minor improvement from 3.07 in 2000. The average bus age was reported to be 6.1 years, down slightly from 6.8 years in 2000. The estimated average condition of rail vehicles was 3.5 in 2004, down from 3.55 in 2000.[2]

While bus and rail fleet conditions have remained essentially the same, rail transit station conditions have worsened. Only 49% of stations are in adequate or good repair and 51% are in substandard or worse condition. In 2000, 84% of stations were rated as adequate or better. The Federal Highway Administration notes that differences in ratings are due to a change in the methodology used to evaluate station conditions since the last report.[2] The condition of such other structures as tunnels and elevated structures has improved: 84% were in adequate or better condition in 2004 compared to 77% in 2000.[2]

Funding increased modestly between 2000 and 2004. Indicating an increase in service demand, 23 of 32 (72%) of local ballot initiatives for public transportation—or initiatives with a public transit component—were passed in 2008, authorizing nearly $75 billion in expenditures.[1] Much of this local revenue is intended to match federal investments. Total capital spending from all sources was $12.6 billion in 2004, up from $12.3 billion in 2002, and up more than 140% during the past 15 years. Federal contributions totaled $9.8 billion in 2008.[2]

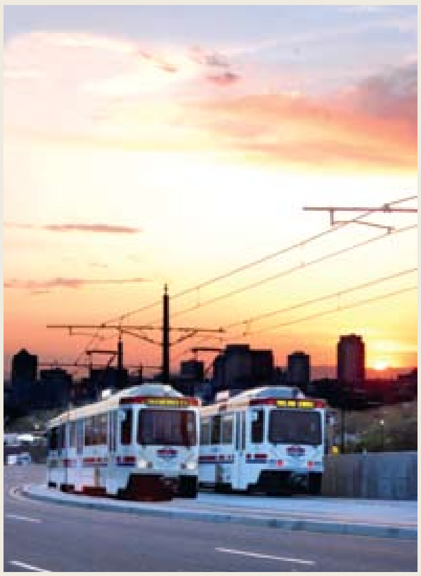
The FTA estimates that an additional $6 billion should be spent annually to maintain current conditions; however to improve conditions, a total of $21.6 billion needs to be spent annually.[2] These estimates are supported by the recent findings of the Federal Surface Transportation Study and Revenue Commission. Assuming a constant level of investment relative to 2006 dollars, transit ridership will continue to increase unimpeded to between 18 and 20 billion trips annually. If funding is increased, however, transit ridership will be able to increase more rapidly and the physical condition of the nation's transit systems will improve.[3] With a "medium" level of funding—between $14 and $18 billion a year—the Commission estimates that between 26,000 and 51,000 new vehicles could be added to the system and that between 1,100 and 1,500 additional miles of rail track could be laid. In addition, average condition will increase to 4.0 and the system will be able to accommodate between 12 and 14 billion trips annually by 2020. During that same time period, with a "high" level of funding—between $21 and $32 billion annually—between 51,000 and 96,000 new vehicles could be added to the fleet and between 3,000 and 4,400

TABLE 12.2 ★ Revenue Sources for Transit Financing in Millions of Dollars: 2004

	FEDERAL	STATE	LOCAL	TOTAL	%
General Fund	1,391	2,043	2,692	6,126	16%
Fuel Tax	5,564	505	148	6,217	16%
Income Tax		187	98	285	1%
Sales Tax		2,106	4,765	6,871	17%
Property Tax		63	490	553	1%
Other Taxes		1,044	784	1,828	5%
Other Public Funds		1,844	4,682	6,526	17%
Total Public Funds	**6,955**	**7,792**	**13,659**	**28,406**	**72%**
Passenger Fares			9,114	9,114	23%
Other Revenue			1,979	1,979	5%
System-General Revenue			**11,093**	**11,093**	**28%**
Totals	**6,955**	**7,792**	**24,752**	**39,499**	**100%**

RAISING THE GRADES
CASE STUDIES

SALT LAKE CITY, UT ★ Utah Transit Authority Transit Express (TRAX)



Since its inception as a way to move spectators during the 2002 Olympic Winter Games, the Salt Lake City transit system, Transit Express (TRAX), has served the city and its surrounding suburbs as a quick and affordable way to travel. When the first line opened in 1999, estimates predicted that the system would move approximately 15,000 people a day. However, current statistics from APTA show that ridership has increased exponentially, to approximately 53,000 customers a day in the last quarter of 2008. There are now plans to add at least 3 new lines to the 19-mile system, extending it to the airport and farther into the growing suburbs. *Photos courtesy of Utah Transit Authority Transit Express.*

RAISING THE GRADES CASE STUDIES

DENVER, CO ★ Regional Transportation District Transit System

The Denver-area Regional Transportation District operates a complex transit system that includes bus and light-rail service from the suburbs to the city center. The development of six light-rail lines has eliminated the need for many bus lines and other special services, including bus service to the airport and sporting events, which helps alleviate congestion on the region's roadways. During the first quarter of 2008, ridership on light rail increased 7.19% from the same period in 2007, according to APTA. *Photo courtesy of LightRail*Now*, photo by Dave Dobbs.*

MISSOULA, MT ★ Missoula Urban Transportation District (Mountain Line)

The Missoula Urban Transportation District, or Mountain Line, began operating in 1977 with three used buses on four routes. Since then the agency has grown to operating 6 days per week and now boasts 30 buses, 12 routes, and 55 employees. In 2008, the Mountain Line provided more than 800,000 rides to customers in this community of approximately 90,000 residents. In July 2008—typically a slower time of year for the agency—the Mountain Line experienced its highest summer ridership levels ever, showing a 30% increase over the previous year. Customer service calls indicated a swell of first-time riders seeking to decrease the cost of commuting to work. Despite decreasing gas prices, ridership remains high. *Photo courtesy of Missoula, Montana Office of Planning and Grants.*

miles of track could be laid. The number of annual trips could increase to between 13 and 17 billion.[3]

The 2008 *State and National Public Transportation Needs Analysis*, commissioned by APTA and the American Association of State Highway and Transportation Officials, estimated the total funding requirements for various growth percentages. Assuming a moderate annual passenger growth rate of 3.52%, $59.2 billion must be spent annually by all levels of government in order to improve both infrastructure condition and service performance. Total expenditures by all levels of government in 2007 were $47.05 billion.[4]

RESILIENCE

Transit systems are key contributors to a region's economic vitality and emergency preparedness. And when properly implemented, transit systems offer significant environmental benefits. The current U.S. transit system is not highly resilient because of a lack of integrated systematic planning, security mitigations, and adequate funding. While underground transit systems typically perform well during natural hazards, they remain vulnerable to terrorist attacks. Despite these vulnerabilities, transit systems are often called upon to move people in times of disaster. Those vulnerabilities must be overcome to ensure that transit systems will perform well when needed.

While mass transit can be an affordable and environmentally friendly travel alternative to automobiles, the American Public Transportation Association (APTA) estimates that approximately half of Americans do not have access to reliable transit systems.

CONCLUSION

The increased ridership on transit systems across the country and local support for new and expanding systems is a clear sign that Americans want transit to take a larger role in the country's surface transportation system. Yet years of underfunding and unreliable service threaten the economic and environmental benefits that transit can provide.

Transit systems must become an integrated part of any community's transportation planning process and receive adequate funding to encourage further growth. Greater emphasis must be placed on connecting rural and suburban areas through transit to ease congestion, provide assistance to Americans with limited mobility, and develop local economies.

Current conditions, coupled with an uncertain economic climate, raise concerns for transit. Future investments must focus on additional, systemwide travel options; technological innovations; lifecycle funding; modernization to support future growth; increased network redundancy and connectivity; and improved design and construction standards to withstand both natural and man-made extreme conditions. ★

SOURCES

1 American Public Transportation Association, *2008 Public Transportation Factbook*, June 2008.

2 U.S. Department of Transportation, *Status of the Nation's Highways, Bridges, and Transit: 2006 Conditions and Performance*, 2007.

3 National Surface Transportation Policy and Revenue Study Commission, *Final Report*, 2008.

4 American Public Transportation Association and the American Association of State Highway and Transportation Officials, *State and National Public Transportation Needs Analysis*, September 2008.

RAISING THE GRADES
CASE STUDIES

ORANGE COUNTY, CA ★ Orange County Transportation Authority

Even in the car-dominant culture of Southern California, the Orange County Transportation Authority (OCTA) ranks as one of the busiest transportation authorities in the nation, operating a 650-vehicle bus system with approximately 65.5 million customer boardings annually. APTA recognized OCTA as the number one transportation agency in 2005 for achievement in safety and paratransit service, as well as record ridership growth. The system also works to protect the environment by operating a large fleet of clean-burning vehicles. OCTA continues to experience exceptional ridership growth, reaching 6.3 million boardings in October 2008—the highest in the agency's 36-year history. *Photos courtesy of Orange County Transportation Authority.*