The Interstate Highway System in Missouri:

Saving Lives, Time and Money

A report on the condition, impact, use and future needs of Missouri's Interstate highway system

June 2006

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Founded in 1971, TRIP of Washington, DC is a nonprofit organization that researches, evaluates and distributes economic and technical data on highway transportation issues. TRIP is supported by insurance companies, equipment manufacturers, distributors and suppliers; businesses involved in highway engineering, construction and finance; labor unions; and organizations concerned with an efficient and safe highway transportation network.

Executive Summary

Fifty years ago the nation embarked on its greatest public works project, the construction of the Interstate Highway System. President Dwight D. Eisenhower provided strong support for the building of an Interstate Highway System that would improve traffic safety, reduce travel times and improve the nation's economic productivity.

Serving as the most critical transportation link in the state's economy, Missouri's Interstate highways have significantly improved the lives of its residents and visitors. In Missouri, and throughout the nation, the Interstate system allows for high levels of mobility by greatly reducing travel times and proving a significantly higher level of traffic safety than other routes.

But 50 years after President Eisenhower articulated a vision for the nation's 20th Century transportation system, Missouri and the nation again face a challenge in modernizing the system of aging, increasingly congested Interstate highways. If Missouri residents are to continue to enjoy their current level of mobility on Interstate highways and bridges, the state will need to make a commitment to providing the public with a 21st Century highway system.

In this report, TRIP looks at the benefits, history and impact of Missouri's Interstate Highway System, its current use and condition and the future needs of the state's most critical transportation system. Sources of data for this study include the U.S. Department of Transportation (USDOT), the Federal Highway Administration (FHWA), the National Highway Traffic Safety Administration (NHTSA), the U.S. Census Bureau and the Missouri Department of Transportation (MoDOT). The major findings of the report are:

The Dwight D. Eisenhower National System of Interstate and Defense Highways, which has been called the most ambitious public works project built since the Roman Empire, is the most critical link in the nation's and Missouri's transportation system.

- Missouri's Interstate system, which includes two percent of all roadway lane miles in the state, carries 26 percent of all vehicle travel in the state.

- Since Interstate construction began in 1956, total vehicle miles of travel in Missouri have increased by 340 percent. Since that time, the number of vehicles in the state has more than tripled, increasing by 211 percent. Missouri's population increased by 38 percent during the same period.

The state's Interstate Highway System saves the average Missouri resident $2,499 per year in safety benefits, saved time, reduced motor fuel consumption and reduced apparel, food, housing and transportation costs. The total annual statewide savings is approximately $14.4 billion.

- Improved traffic safety provided by the Interstate system saves the state approximately $1 billion annually and the average state resident $174 annually in reduced healthcare costs and costs associated with lost productivity due to traffic crashes.

- Because it reduces travel times by providing more efficient and direct routes, the Interstate system saves each Missouri resident 69 hours of travel time annually - 400 million hours statewide.

- The Interstate system saves Missouri residents $6.4 billion annually in the value of saved time and fuel - $1,114 per person ($1,031 in time and $83 in fuel).

- Missouri's Interstate system annually reduces statewide motor fuel consumption by 191 million gallons.

- Consumer costs have been significantly lowered by the Interstate Highway System. The cost of transporting goods has been reduced because the time it takes to make trips has been decreased. And increased access between locations has enabled access to cheaper land.

- TRIP estimates that consumer costs in Missouri for apparel, food, housing and transportation are reduced by approximately $7 billion annually, or $1,211 per state resident, as a result of the Interstate Highway System.

- TRIP's estimates of reduced consumer costs are based on consumer expenditure estimates by the U.S. Department of Labor and estimates of the Interstate's impact on consumer costs collected in a survey of transportation economists.

Construction of the Interstate system in Missouri started in 1956 and was completed in 2001, providing the state with portions of seven Interstate routes, consisting of 1,181 miles of Interstate highways, connecting the state's largest urban areas and Missouri to the rest of the nation.

- The Federal-Aid Highway Act of 1956, signed into law by President Dwight Eisenhower on June 29, 1956, called for the construction of a 41,000 mile system of Interstate highways to be paid for by taxes on motorists, such as the federal motor fuel tax. The federal motor fuel tax was set at three cents-per-gallon and is now 18.4 cents-per-gallon.

- Missouri was the first state to award a construction contract under the provisions of the Federal-Aid Highway Act of 1956. On August 2, 1956, Missouri awarded its first Interstate construction contract for work on U.S. Route 66 in Laclede County. That highway is now a portion of Interstate 44.

- The first section of Interstate completed in Missouri was a one-fifth mile segment of Interstate 70 built in St. Charles County, which was completed on November 9, 1956.

- The most recent section of Missouri's Interstate system opened to traffic was a 2-mile segment of Interstate 72 in Marion County in the Northeast portion of the state, which opened in 2001.

- Twenty years after construction began, most of the state's Interstate system had been completed. By 1976, 90 percent of the state's Interstate route miles and 79 percent of total lane miles were open to traffic; 10 years later, 98 percent of the state's Interstate route miles were open to traffic and 95 percent of total lane miles were open to traffic.

Traffic congestion on Missouri's Interstate highways is increasing as travel growth significantly outpaces the addition of new lanes.

- Nearly one-half – 44 percent – of Missouri's 375 miles of urban Interstates are considered congested because they carry traffic levels that result in significant delays during peak travel hours.

- From 1990 to 2004, vehicle travel on Missouri's Interstates increased by 29 percent, from 14.1 billion miles driven annually to 18.2 billion miles driven annually. But actual lane miles on the system only increased by two percent during that same period, from 5,269 total lane miles to 5,368 total lane miles.

- From 1990 to 2004, the average annual amount of travel per Interstate-lane-mile in Missouri increased by 31 percent.

- The ten most congested sections of Interstate highways in Missouri include segments in the Kansas City and St. Louis areas. The most congested section is a westbound section of Interstate 70 from Noland Road to Interstate 35 in the Kansas City area. The second-most congested Interstate section in the state is an eastbound portion of Interstate 70 from Interstate 270 to Missouri Route 180 in the St. Louis area. A full list of the congested sections can be found in the text of the report.

Missouri faces a $10 billion shortfall over the next 10 years in funding needed expansion of the Interstate system to relieve traffic congestion and sustain economic growth in the state.

- TRIP estimates that travel on Missouri's Interstate highways is expected to increase by 40 percent by the year 2026.

- Increasing urban traffic congestion may erode some of the logistics advantages that Missouri producers and distributors have over competitors as the cost and reliability of shipping goods is negatively affected.

- The Missouri Department of Transportation reports that by the year 2016, 39 percent of the state's Interstate system (463 of 1,181 miles) will be in need of significant rehabilitation or reconstruction.

- Twenty percent of Missouri's Interstate bridges will need to have significant repairs or reconstruction by the year 2016.

- Missouri needs to expand Interstate 70 from Kansas City to St. Louis from four lanes to six lanes by 2016 to relieve congestion and support economic development in the state.

- Missouri also needs to extend Interstate 64 outside of St. Louis another 12 miles to the west along the current U.S. 40 corridor to improve access to and from the region's western suburbs.

- The cost of needed preservation and repairs on Missouri's sections of I-70 and I-44 over the next 10 years (2006 to 2016) is $7.1 billion, according to the Missouri Department of Transportation. An additional $2.9 billion is needed to fund projects on other sections of Missouri's Interstate system. However, Missouri currently does not have funding available for the $10 billion in needed Interstate expansion over the next 10 years.

Missouri's Interstates provide a network of highways with a variety of safety designs that greatly reduce the likelihood of serious accidents. Travel on Missouri's Interstate highways is approximately twice as safe as travel on all other roadways in the state.

- Missouri's Interstate highways have saved approximately 7,900 lives in Missouri since 1956.

- The number of lives saved by the Interstate was calculated by estimating the additional fatalities that would have occurred had Interstate traffic been carried by other major roadways in the state, which have higher traffic fatality rates.
- Missouri's Interstate system has saved an average of 160 lives per year over the last 50 years, based on the above criteria.

- The features that make Interstates safer than other roads include: a separation from other roads and rail lines, a minimum of four-lanes, gentler curves and often paved shoulders, and median barriers and rumble strips to warn drivers when they are leaving the roadway.

- Travel on Missouri's Interstate highways is approximately twice as safe as travel on all other roadways. The fatality rate per 100 million vehicle miles of travel on Missouri Interstate system in 2004 was 0.91, while it was 1.88 in 2004 on non-Interstate routes in Missouri.

- There were 166 traffic fatalities on Missouri's Interstate highways in 2004. Only 15 percent of the 1,130 traffic fatalities that occurred in Missouri in 2004 were on the Interstate system, even though it carried 26 percent of all travel in the state in 2004.

Overall current pavement and bridge conditions on most of Missouri's Interstate system are acceptable, but some deficiencies exist.

- Four percent of Missouri's Interstate pavements are in poor condition and another 15 percent are in mediocre condition. Twenty percent of Interstate pavements are in fair condition and the remaining 61 percent are in good condition.

- Three percent of the state's bridges are rated structurally deficient and 15 percent are rated functionally obsolete.

- A bridge is structurally deficient if there is significant deterioration of the bridge deck, supports or other major components. Bridges that are functionally obsolete no longer meet current highway design standards, often because of narrow lanes, inadequate clearances or poor alignment.

- The average age of Missouri's Interstate bridges is 36 years. Older bridges typically need significant repairs, reconstruction or replacement at approximately 50 years.

The Interstate system is the backbone of the Missouri economy, supporting increases in business productivity.

- Travel by large commercial trucks accounted for 16 percent of all vehicle travel on the state's Interstate system in 2004.

- Every year, $185 billion in goods are shipped annually from sites in Missouri and another $178 billion in goods are shipped annually to sites in Missouri, mostly by truck.

- Seventy-three percent of the goods shipped annually from sites in Missouri are carried by trucks and another 12 percent are carried by courier services, which use trucks for part of the deliveries. Similarly, 78 percent of the goods shipped to sites in Missouri are carried by trucks and another 11 percent are carried by courier services, which use trucks for part of their deliveries.

- The Interstate system has led to significant increases in economic productivity. Improvements in the highway system have allowed businesses to adopt more efficient logistics practices, which reduce costs for producers and consumers.

- The initial construction of much of the Interstate system provided a tremendous boost to business productivity as a result of more efficient goods shipment. Economists have estimated that from the initial phase of Interstate construction in 1956 to 1970, the annual rate of return for every dollar of public investment in highway construction was 54 cents, which meant that investments recovered their costs in two years.

- The completion of the vast majority of the Interstate system by the 1980s and the deregulation of the U.S. trucking industry resulted in a significant improvement in the competitiveness of U.S. business. In fact, the cost of moving freight, as measured by U.S. business logistics costs, dropped from 16 percent of U.S. Gross Domestic Product (GDP) in 1980 to nine percent in 2002.

- Missouri's Interstate highways have reduced travel times both within the state and to locations outside of Missouri. The improved mobility provided by the Interstate system has given Missouri's residents greater choices about where they live, work, shop and spend their leisure time.

Introduction

The Dwight D. Eisenhower National System of Interstate and Defense Highways has been called the most ambitious public works project built since the age of the Roman Empire and is literally the backbone of America's economy.

Initially conceived in 1939, significant construction of the Interstate system did not start until 1956 when Congress approved the financing of today's Interstate system, largely through collection of the federal motor fuel tax and other taxes on highway users.

With seven Interstates running the length of the state from Kansas and Oklahoma to the Illinois border and from Iowa to the Arkansas and Tennessee borders, and connecting the state's major urban areas, Missouri's Interstate highway system is the most critical element of the state's transportation system. Fifty years after construction of the Interstate System first started, this network of highways has become the most important set of corridors linking Missourians to people and businesses within the state and throughout the nation.

Today, the Interstate continues to provide Missouri with economic growth, improved traffic safety and convenient access while playing a role in the nation's defense.

In this report, TRIP looks at the benefits, history and impact of Missouri's Interstate highway system, its current use and condition, and the future needs of the state's most critical transportation system. Just as 50 years ago, when the nation's leaders made critical decisions on the future of the nation's highway system, today's political leaders now face the need to insure that the safety and reliability of the state's Interstate

system are maintained by investing adequately in needed repairs and improvements to meet the transportation challenges of the 21st Century.

Development of the U.S. Interstate System

In 1919, Lieutenant Dwight D. Eisenhower participated in the U.S. Army's first transcontinental motor convoy, from Washington, DC, to San Francisco. During the 62 days it took to cross the country, the convoy experienced numerous difficulties, including roads that were muddy, narrow or otherwise inadequate and bridges that often could not support the vehicles in the convoy.

A generation later, General Eisenhower saw first hand how an efficient, effective highway transportation system benefited a nation, when he noted that the German Autobahn network, opened in 1935, provided a significant military advantage to Germany.

The United States also began looking at the feasibility of constructing a series of interregional highways in the late 1930s. In 1938 Congress directed the then Bureau of Public Roads (BPR) to prepare a study on the possibility of building a national system of toll highways. The resulting 1939 BPR report concluded that it would be impossible to finance a national system of highways strictly through charging tolls, but did recommend that the U.S. build a system of approximately 26,700 miles of transcontinental highways. The BPR report also called for many of the design elements found on modern Interstate highways, including limited access, which separates highway traffic from other traffic and from trains. The report also suggested that the nation's highways should connect

with the center of large cities, should include beltways around large urban areas and should bypass small towns.

Further attempts to develop a national highway system were interrupted by World War II. But as the Allies gained the upper hand in the war, Congress started to turn its attention to post-war challenges, including consideration of a modern highway system to support the nation's growing economy and improve safety and mobility. The Federal-Aid Highway Act of 1944 authorized the BPR to designate a system of approximately 40,000 miles of Interstate highways, which proved very similar to the routes approved ultimately as the national Interstate system. But the 1944 highway bill did not specify any additional funds for construction of the highways, other than the small amount of funds currently made available by the federal government for highway construction.

The 1944 Highway Act identified the need for a national system of interconnected highways, but left out a key piece of the puzzle – how to fund a uniformly designed national highway system, which would have significant differences in construction costs and traffic volume, depending on location. Even without significant federal funding available, cities and states began to move forward on their own, with some additional highway networks being built or planned in current Interstate corridors, under various financing mechanisms. These early highway projects included toll highways such as the Pennsylvania Turnpike and the New York Thruway and early urban highways including the Los Angeles Freeway System and the Detroit Expressway System.

But for most motorists and businesses, the inadequate roadway system of the late 1940s and early 1950s contributed to growing human and economic losses, as cars and

trucks jostled for position on the nation's inadequate, narrow and winding roads and streets.

In 1954 President Eisenhower appointed a committee to draft a proposal to fund a national system of Interstate Highways. Eisenhower noted that the nation's obsolete highway system penalized Americans through increased traffic deaths, the waste of time caused by traffic delays, the increased cost of freight movement and the inability of the nation's highways to meet the mobility demands that would be caused by a regional catastrophe or national defense emergency.

The initial plan prepared for President Eisenhower called for funding a national Interstate System through bond financing, but Congress dismissed the use of bond revenue as the primary source of Interstate highway financing. In 1956, Congress overwhelmingly approved the construction of a national Interstate highway system when the financing was changed to a pay-as-you-go format that would collect a series of user fees -- most notably a 3 cent-per-gallon tax on motor fuel – into a national Highway Trust Fund.

The Federal-Aid Highway Act of 1956 called for the construction of a 41,000-mile Interstate highway system, which was to be completed by 1970 at a cost of approximately $27 billion. The design of the system was very similar to the initial 1944 plan, which called for connecting large urban areas, including routing highways into central cities, largely at the request of mayors and other local politicians who feared that their communities would be left behind without modern highway access. The Interstate system was designated to incorporate approximately 2,000 miles of existing highways, including the Pennsylvania Turnpike and the New York Thruway. The highways were to

be built to high design standards that would reduce traffic deaths and increase the amount and speed of traffic that could be carried. These design standards included: full access control to limit entrance and exit to on and off ramps, a minimum of four lanes, medians to separate oncoming lanes, and moderate curves.

The Construction of the Interstate System in Missouri

Following the signing of the Federal-Aid Highway Act of 1956 by President Eisenhower on June 29, 1956, Missouri moved quickly to orient its highway program toward the enormous task of planning and constructing the state's eventual 1,181-mile Interstate system. Following the signing of the Federal-Aid Highway Act, Missouri was the first state to award an Interstate construction contract. On August 2, 1956 the state awarded contracts for a portion of Interstate 44 in Laclede County and a portion of Interstate 70 in St. Charles County.

The first portion of Interstate highway completed in Missouri was a one-fifth mile segment of Interstate 70 in St. Charles County, which was completed on November 9, 1956.

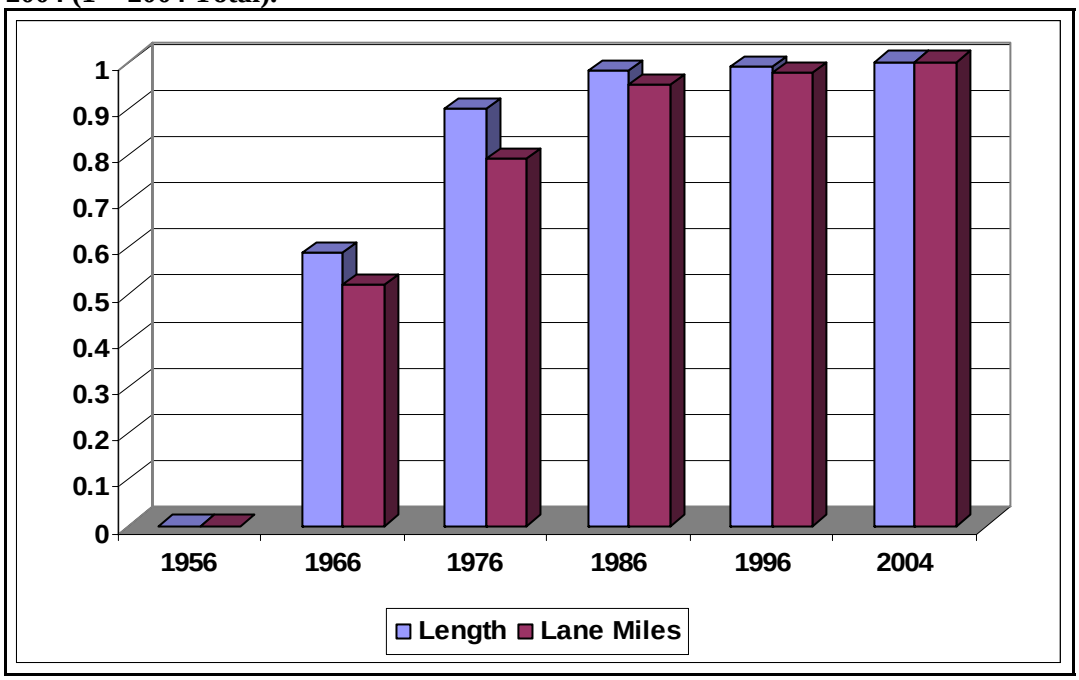
The most recent section of Missouri's Interstate system open to traffic was a two-mile segment of Interstate 72 in Marion County in the Northeast portion of the state, which opened in 2001.

Trends in Interstate Travel and Capacity

Missouri has seven Interstate routes (excluding three-digit urban portions), consisting of 1,181 miles, serving the state. These Interstates are Interstate 70, running the entire length of the state east and west, connecting the state's two largest urban areas, St. Louis and Kansas City; Interstate 44, which runs diagonally from the state's Southwest corner near Joplin and proceeds northeast across the state to St. Louis; Interstates 29 and 35, which travel northwest and north from the Kansas City area, respectively, to the Iowa border; Interstate 55, which follows a route west near the Mississippi River, from the state's Southeast corner, north to the St. Louis area, a portion of Interstate 64 in the St. Louis area and a small portion of Interstate 72 in Northeast Missouri.

The majority of the state's Interstate system was completed by 1976 and the entire system was nearly completed by 1986. By 1976, 90 percent (1,063 of 1,181 miles) of the state's Interstate center-lane miles were open to traffic and 79 percent of the total lane miles (4,251 of 5,368 miles) were open to traffic.[1] Center lane miles are the actual miles of Interstate routes and lane miles are the total number of lanes multiplied by the length. Thus a 10-mile segment of four-lane highway equals 10 center-lane miles and 40 lane miles. By 1986, 98 percent (1,157 of 1,181 miles) of the state's Interstate center-lane miles were open to traffic and 95 percent of the total lane miles (5,105 of 5,368) were open to traffic. [2]

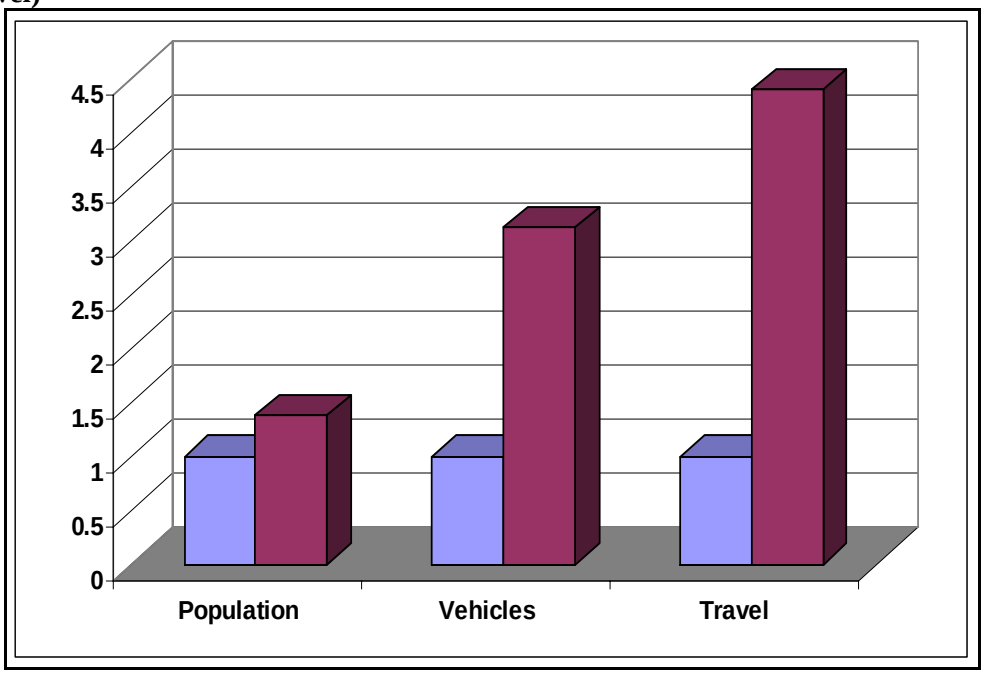
Chart 1: Total route miles (length) and total lane miles of Missouri Interstate Highways, 1956 to 2004 (1 = 2004 Total).



Source: TRIP analysis of MDOT data

Since the beginning of the Interstate era 50 years ago, Missouri has seen enormous increases in population, the number of motor vehicles and the amount of vehicle travel. From 1956 to 2004 (the latest year that data is available), the state's population increased by 38 percent from approximately 4.2 million to 5.8 million, the number of motor vehicles increased by 211 percent from approximately 1.5 million to 4.8 million and vehicle travel in Missouri increased by 340 percent, from approximately 16 billion miles driven annually to 69 billion miles driven annually.[3]

Chart 2. Percentage Increase since 1956 in Population, Vehicles and Travel in Missouri (1 = 1956 level)



Source: TRIP analysis of U.S. Census and Federal Highway Administration data

Traffic Congestion on Missouri's Interstates

The Interstate highway system was initially designed largely to provide transportation between the nation's urban areas and to support national defense. But as Interstate highways were ultimately built around and through many cities, they became the nation's most critical transportation corridors both between and within urban areas.

The Interstate highway system remains the most critical component of Missouri's transportation system. While Interstate highways account for only two percent of all lane miles of roads in the state, they carry 26 percent of all travel in the state.[4]

Travel on Missouri's Interstate highways continues to grow at a significant rate, although there has been very little expansion of the system in recent years. From 1990 to 2004, vehicle travel on the state's Interstates increased by 29 percent, from 14.1 billion

miles driven annually to 18.2 billion miles driven annually.[5] Yet during the same 1990 to 2004 period, total lanes miles on Missouri's Interstate system increased by only two percent, from 5,269 lane miles to 5,368 lane miles.[6] The result of this significant increase in travel on the state's Interstate with very little increase in Interstate lane mileage is that these highways are now carrying significantly more traffic than in the past. In fact, the average annual amount of travel per Interstate lane-mile in Missouri increased by 31 percent from 1990 to 2004.[7]

This increase in traffic on Missouri's Interstate highways has resulted in a significant increase in traffic congestion levels. Nearly one half – 44 percent – of Missouri's 375 miles of urban Interstates are considered congested because they carry traffic levels that result in significant delays during peak travel hours (164 of 375 miles).[8] The Federal Highway Administration considers any Interstate highway that carries more than 80 percent of its design capacity to be congested, because at this level of traffic, drivers experience significant delays in traffic flow. When Interstate traffic reaches 95 percent of the highways' design capacity they are rated as being severely congested, because drivers are likely to experience stop and go traffic and any incident can be expected to cause a serious breakdown of traffic flow.

The most heavily congested sections of urban Interstates in Missouri were identified by comparing current traffic volumes with overall design capacity (volume/service ratio). The state's most congested section of Interstate highway is a westbound section of I-70 from Noland Road to I-35 in the Kansas City urban area, which carries 60,000 vehicles per day, four times higher than it can accommodate without experiencing congestion.[9] The second most congested section of Interstate

highway in Missouri is an eastbound section of I-70 from I-270 to Missouri Route 180 in the St. Louis area, which carries 53,000 vehicles per day, more than three times more than it can handled without becoming congested.[10] The following chart indicates the Interstate highway segments in Missouri that experience the greatest levels of traffic congestion.

Chart 3: The Most Heavily Congested Sections of Urban Missouri Interstates

Route	Urban Area	From	To	Daily Traffic	Volume/Service
I-70 West	Kansas City	Noland Rd	I-35 South	60,000	4.00
I-170 East	St. Louis	I-270	MO-180	52,800	3.30
I-55 North	St. Louis	I-44	IL State Line	49,000	3.20
US-50 West	Kansas City	MO 291 E Jct	I-470	31,300	3.10
I-35 North	Kansas City	I-29 West	I-70 North	71,400	2.80
I-35 South	Kansas City	US-24	I-29 West	67,500	2.65
I-70 East	Kansas City	KS State Line	Noland Rd.	55,500	2.50
I-29 South	Kansas City	Barry Rd.	Davidson Rd.	41,400	2.50
US-71 North	Kansas City	Route Y	I-435	36,000	2.00
I-70 West	St. Louis	Goodfellow	Earth City Exp.	68,300	1.82

Source: Missouri Department of Transportation

Freight Shipment by Large Trucks on Missouri's Interstate Highways

Every year, $185 billion in goods are shipped from sites in Missouri and another $178 billion in goods are shipped to sites in Missouri, mostly by trucks.[11] Seventy-three percent of the goods shipped annually from sites in Missouri are carried by trucks and another 12 percent are carried by courier services, which use trucks for part of their deliveries.[12] Similarly, 78 percent of the goods shipped to sites in Missouri are carried by trucks and another 11 percent are carried by courier services, which use trucks for part of their deliveries.[13]

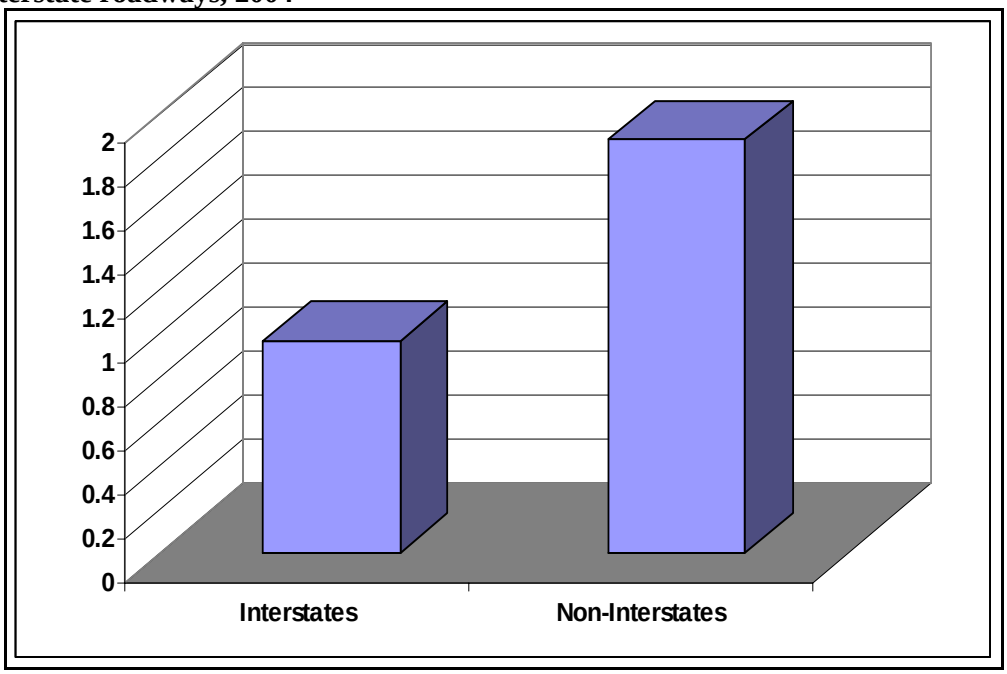
Traffic Safety on Missouri's Interstate Highways

Perhaps the most significant benefit of the Interstate system is that it has greatly improved traffic safety in Missouri and throughout the U.S. by providing travelers with a network of highways with a variety of safety designs that greatly reduce the likelihood of serious accidents.

The safety features that are required on Interstates include a separation from other roads, streets and rail lines, access limited to on and off ramps, a minimum of four-lanes to prevent the need to enter oncoming lanes for passing, and gentler curves. Most Interstate highways also have paved shoulders, and many have median barriers to avoid cross-over accidents and rumble strips to warn drivers if they are leaving the roadway.

The result of the high level of safety design standards on the Interstate is that travel on Missouri's Interstate highways is nearly twice as safe as travel on all other roads and highways in the state. The traffic fatality rate per 100 million vehicle miles of travel on Missouri's Interstate highways was 0.91, in 2004, the latest year for which data is available. The fatality rate per 100 million vehicle miles of travel in 2004 on Missouri's non-Interstate routes was 1.88 – nearly double the rate on the state's Interstates.

Chart 4. Fatality rate per 100 Million Vehicle Miles of Travel for Missouri's Interstate and Non-Interstate roadways, 2004



Source: TRIP analysis of FHWA data

Missouri's Interstate Highway System, which carried 26 percent of the state's travel in 2004, accounted for only 15 percent of the state's fatalities as a result of its superior traffic safety features. There were 166 traffic fatalities on Missouri's Interstate highways in 2004 – 15 percent of the 1,130 traffic fatalities, that occurred in Missouri in 2004.[14]

Pavement Conditions of Missouri's Interstate System

The lifecycle of highway pavements is greatly affected by a transportation agency's ability to perform timely maintenance and upgrades to ensure that surfaces remain smooth as long as possible. The pavement condition of a state's major roads is evaluated and classified as being in poor, mediocre, fair or good condition. A desirable

goal for state and local organizations that are responsible for road maintenance is to keep 75 percent of major roads in good condition.[15]

In 2004 (the latest year for which data is available), Missouri's Interstate highways had four percent of its pavements rated in poor condition and 15 percent of its Interstate highways with pavements rated in mediocre condition.[16] Roads rated in mediocre condition show signs of significant wear and may also have some visible pavement distress. Most pavements in mediocre condition can be repaired by resurfacing, but some may need more extensive reconstruction to return them to good condition. In Missouri, 20 percent of Interstate pavements are rated in fair condition and the remaining 61 percent of Interstate pavements are rated in good condition.[17]

Pavement deterioration is caused by a combination of traffic, moisture and climate. Moisture often works its way into road surfaces and the materials that form the road's foundation. Road surfaces at intersections are even more prone to deterioration because the slow-moving or standing loads occurring at these sites subject the pavement to higher levels of stress. It is critical that roads are fixed before they require major repairs because reconstructing roads costs approximately four times more than resurfacing them.[18]

Bridge Conditions of Missouri's Interstate Highways

Of the 1,023 bridges on Missouri's Interstate highways, three percent are rated as structurally deficient and 19 percent are rated as functionally obsolete.[19]

Bridges that are rated structurally deficient show significant signs of deterioration as a result of use and exposure. The FHWA defines a structurally deficient bridge as one

that requires immediate rehabilitation to remain open, is restricted to carrying lighter-weight vehicles or is closed. Bridges that are rated as functionally obsolete do not meet current design standards, which may result in reduced traffic safety, compared to a bridge meeting current standards. Functionally obsolete bridges are defined by the FHWA as those that have deck geometry, load carrying capacity, clearance or approach roadway alignment that no longer meet the criteria for the system of which the bridge is a part.

The most-heavily traveled structurally deficient Interstate bridge in Missouri, is on Eastbound Interstate 64 in St. Louis County over Brentwood Boulevard, which carries 197,000 vehicles per day. The following chart lists the ten most-heavily traveled structurally deficient Interstate bridges in Missouri.

Chart 5. The 10 most heavily traveled structurally deficient Interstate bridges in Missouri.

Route Carried	County	Route/feature intersected	Daily Traffic	Year Built
I-64 East	ST. LOUIS	BRENTWOOD BLVD.	197,000	1956
I-64 East	ST. LOUIS	US 67, US 61	192,000	1940
I-64 East	ST. LOUIS	LACLEDE STATION RD.	176,000	1957
I-64 East	ST. LOUIS	CLAYTON TER.	176,000	1957
I-29 South	PLATTE	LINE CR.	175,000	1957
I-64 East	ST. LOUIS CITY	MC CAUSLAND AVE.	173,000	1957
I-64 East	ST. LOUIS	METRO LINK	169,000	1956
I- 44 East	FRANKLIN	ROUTE OO	142,000	1960
I-170 East	ST. LOUIS	FOREST PARK PKWY.	124,000	1968
I-64 East	ST. LOUIS	I-170	98,000	1964

Source: Missouri Department of Transportation

While the state's Interstate bridges are generally in good condition, a large number of these bridges are reaching an age when they will require significant repairs and in some cases replacement. The average lifespan of an older bridge is 50 years.[20] Older bridges often need significant repairs or rehabilitation or may need to be replaced to continue to provide adequate service. The average age of Missouri's Interstate bridges is 36 years.[21]

Benefits of Missouri's Interstate System

The construction of Missouri's Interstate Highway System has had a profound impact on the state's development, impacting the quality of life of the state's residents and visitors in numerous ways including safety, expanded lifestyle choices and an enhanced economic standard of living.

By significantly increasing the number of areas that are within a reasonable driving distance, the Interstate system has greatly increased people's access to jobs, housing, recreation, healthcare, shopping and other amenities.

Similarly, the construction of the Interstate system has benefited the nation's economy by reducing the cost of and increasing the speed of goods movement. The ability to cheaply and quickly ship products to or from Missouri and many U.S. and international sites has provided lower costs and greater selection to consumers and has opened up new markets to Missouri businesses. The completion of the vast majority of the Interstate system by the 1980s and the deregulation of the U.S. trucking industry resulted in a significant improvement in the competitiveness of U.S. business. In fact, the cost of moving freight, as measured by U.S. business logistics costs, dropped from 16 percent of U.S. Gross Domestic Product (GDP) in 1980 to nine percent in 2002.[22]

The initial construction of much of the Interstate system provided a tremendous boost to business productivity as a result of more efficient goods shipment. In fact, economists have estimated that through the initial phase of Interstate construction to 1970, the annual rate of return for every dollar of public investment in highway

construction was 54 cents, which meant that investments recovered their costs in two years.

The continued tremendous increase in freight deliveries over recent years has been partly fueled by improved communications and the need for greater economic competitiveness. Improved communications provided by the Internet are integrating producers, wholesalers, retailers and consumers. Businesses have responded to improved communications and the necessity to cut costs with a variety of innovations, including just-in-time delivery, increases in small package delivery, demand-side inventory management and accepting customer orders through the Internet.

The result of these changes has been a significant improvement in logistics efficiency as firms move away from a push-style distribution system, which relies on large-scale warehousing of materials to a pull-style distribution system, which relies on smaller, more strategic movement of goods.[23]

Interstate Benefits for Individuals in Missouri

TRIP has calculated the annual financial benefit per person and statewide in Missouri, based on the value of improved traffic safety, reduced travel time, reduced fuel use and reduced consumer costs.

Safety:

By carrying significant volumes of traffic on roadways with higher safety standards and lower traffic fatality rates, the Interstate saves numerous lives annually. In fact, TRIP estimates that Interstate highways in Missouri have saved an average of 160 lives per year over the last 50 years.[24] Since 1956, TRIP estimates that Interstate

highways have saved approximately 7,900 lives in Missouri.[25] This estimate is based on a comparison of the annual fatality rate on Missouri's Interstate highways compared to the fatality rate each year on other major roads in the state. Interstate safety benefits were estimated by calculating the additional fatalities that would have occurred in each year if the travel that occurred on Missouri's Interstate highways had instead been carried by other major roads in the state, many of which often lack many of the safety features found on Interstate highways and have a significantly higher traffic fatality rate.

TRIP estimates that the improved highway safety provided by Missouri's Interstates saves the state approximately $1 billion annually in lower economic costs as a result of the reduction in fatal or serious traffic accidents, saving $174 per person annually.[26] TRIP's estimate is based on research by the National Highway Traffic Safety Administration (NHTSA), which annually estimates the economic costs of fatal and serious traffic accidents in the U.S. The NHTSA estimates are strictly of the economic consequences of serious and fatal traffic crashes, such as lost productivity and increased healthcare costs.

Time and motor fuel:

Because it features limited access, no stoplights and often more direct routes between major urban areas, the Interstate system has saved travelers time by reducing travel times and making travel more efficient. By reducing travel times, the Interstate Highway System has saved motorists time and has also increased the choices people have of where to live, work, shop and travel for recreation.

TRIP has estimated the additional time that Missouri residents would spend traveling if the state did not have its network of Interstate highways. These estimates are

based on assuming that if there were no Interstate highways in Missouri that this traffic would be carried by other major roads in the state, such as other urban freeways and urban and rural arterial roads and highways. Shifting the state's Interstate traffic onto other routes would increase traffic congestion on these other routes and also slow travel times, by shifting travel from faster-moving Interstate highways onto slower-moving roads and highways. TRIP applied traffic speed calculations developed by the Texas Transportation Institute, which annually estimates traffic congestion levels throughout the U.S., to estimate the traffic speeds that would result on other major roads in the state if they had to carry the traffic in Missouri currently being carried by the state's Interstate system.

TRIP found that without Interstate highways, Missouri residents would spend an additional 400 million hours annually traveling in vehicles, or 69 hours per person annually.[27] TRIP also found that without Interstate highways, Missouri motorists would use an additional 191 million gallons of motor fuel annually.[28] The total value of the time and motor fuel that is saved annually in Missouri by the Interstate Highway System is $1,114 per person ($1,031 in time and $83 in fuel).[29]

Reduced Consumer Costs:

The Interstate system has had a significant impact on consumer costs by reducing the time it takes to complete trips, thereby reducing the cost of transporting goods. It has also reduced costs by increasing access between locations, which has increased access to cheaper land and increased consumer choices for everything from housing and jobs to recreation and shopping.

To calculate the economic impact of the Interstate Highway System on individual consumers in Missouri, TRIP has gathered data on average consumer expenditures in the state and has estimated the impact of the Interstate Highway System on these costs. Based on data from the U.S. Department of Labor and the Bureau of Economic Analysis, TRIP has calculated the average expenditure per capita in each state on apparel, food, housing and transportation.[30] TRIP then surveyed the nation's leading transportation economists for their estimates of the percentage reduction in consumer expenditures, as a result of the Interstate system, for apparel, food, housing and transportation. TRIP used the average estimated impact in each category to calculate the average amount saved by Missouri consumers annually in each category.

Apparel and food costs are impacted by reduced logistics costs. Transportation costs, which include the cost of a vehicle, vehicle repairs and maintenance, and the cost of fuel, are similarly impacted by reduced logistics costs. The impact of the Interstate system on housing costs includes its impact on the cost of materials that are used in constructing homes as well as the impact that the Interstate system has had on lowering land prices by increasing consumer access to cheaper land, thus lowering housing costs.

TRIP estimates that the average Missouri resident saves $1,211 per year in reduced consumer costs as a result of the Interstate Highway System. The following chart indicates the annual saving per Missouri resident for apparel, food, housing and transportation costs as a result of the Interstate Highway System. The total annual statewide savings in Missouri in reduced consumer costs as a result of the Interstate Highway System is estimated to be $7 billion.

Chart 6. Annual, per person savings in Missouri, as a result of the Interstate Highway System.

	Annual savings
Apparel	**$45**
Food	**$160**
Housing	**$645**
Transportation	**$361**
Total	**$1,211**

Source: TRIP

The Interstate Highway System provides tremendous benefits every year to the people of Missouri. The total annual benefit per person in Missouri of the Interstate system is $1,692 as a result of safety improvements and reduced time, fuel and consumer expenses. The total statewide benefit in Missouri of the Interstate Highway System is approximately $6 billion per year. The following chart shows the combined annual benefit of the Interstate system per person and statewide in Missouri.

Chart 7. Total Annual Interstate Benefit Per Person and statewide in Missouri

	Per Person	Statewide (millions)
Safety	**$174**	**$1,000**
Time and Fuel	**$1,114**	**$6,413**
Reduced Consumer Costs	**$1,211**	**$6,977**
Total	**$2,499**	**$14,390**

Source: TRIP

Meeting Missouri's Future Interstate Travel Needs

Missouri faces a significant challenge in maintaining and rebuilding its aging Interstate highway system and providing additional lane capacity to meet growing travel demand. TRIP estimates that travel on Missouri's Interstate highways is expected to increase by 40 percent by the year 2026.

The Missouri Department of Transportation reports that by the year 2016, 39 percent of the state's Interstate highway system (463 of 1,181 miles) will be in need of significant rehabilitation or reconstruction to provide a smooth pavement surface.[31]

The state transportation department also reports that 20 percent of Missouri's Interstate bridges will need to have significant repairs or reconstruction by the year 2016 to keep them in good condition.[32]

Missouri also faces a significant need to widen some of its key sections of Interstate highways to accommodate the continued growth in passenger and commercial truck travel in the state. The most critical expansion need for Missouri's Interstate highway system is to widen the entire length of Interstate 70 from Kansas City to St. Louis from four to six lanes. The Missouri Department of Transportation has found that an expansion of the 199 miles of Interstate 70 in Missouri, which is currently 4-lanes, is needed by 2016 to improve traffic flow on the state's most important transportation corridor.[33]

Another critical expansion need on Missouri's Interstate highway system, as identified by the Missouri Department of Transportation, is the extension Interstate 64 outside of St. Louis by 12 miles to the west along the current U.S. 40 corridor. The

proposed expansion of Interstate 64 would improve access to and from St. Louis' growing Western suburbs.

The cost of needed preservation and repairs on Missouri's sections of I-70 and I-44 over the next 10 years (2006 to 2016) is $7.1 billion, according to the Missouri Department of Transportation. An additional $2.9 billion is needed to fund projects on other sections of Missouri's Interstate system. However, Missouri currently does not have funding available for the $10 billion in needed Interstate expansion over the next 10 years.

Conclusion

Fifty years after construction of the Interstate highway system began, Missouri and all of the U.S. continue to reap tremendous benefits from the nation's most critical transportation network. Missouri's Interstate system has saved approximately 7,900 lives since its inception in 1956 and today it continues to save Missouri residents time, while playing a critical role in supporting economic growth and enhancing the lifestyle choices of the state's residents and visitors.

The safe, reliable and timely mobility provided by the state's Interstate highways has improved the efficiency of Missouri's businesses and is integral to the functioning of the state's economy.

Prior to the approval of the funding of the Interstate system, President Eisenhower noted that inadequate highways resulted in lost time due to traffic delays, reduced economic productivity and reduced traffic safety.

Today, Missouri faces similar challenges, with growing traffic congestion, increasing car and truck travel and aging road surfaces and bridges that will soon need significant repairs and rehabilitation.

As Missouri's citizens look back on the many benefits that the Interstate highway system has provided the state, they must also look ahead to meeting the challenge of providing a 21st Century Interstate Highway System that will continue to enhance the quality of life of Missouri residents, both today and in the future.

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Endnotes

[1] Missouri Department of Transportation, 2006. Response to TRIP survey.
[2] Ibid.
[3] U.S. Census Bureau data, Federal Highway Administration data. See charts MV-1 and VM-2. Additional historical data from Highway Statistics Summary to 1995.
[4] TRIP analysis of Highway Statistics, 2004, Federal Highway Administration. Data is from charts VM-2 and HM-20.
[5] TRIP analysis of 1990 and 2004 Federal Highway Administration data. See chart VM-2 in Highway Statistics 1990 and Highway Statistics 2004.
[6] TRIP analysis of 1990 and 2004 Highway Statistics, Federal Highway Administration. See charts HM-60 and VM-2.
[7] Ibid.
[8] Missouri Department of Transportation, 2005. Response to TRIP survey.
[9] Ibid.
[10] Ibid.
[11] Bureau of Transportation Statistics, U.S. Department of Transportation. 2002 Commodity Flow Survey, State Summaries. State Table 13.
[12] Ibid.
[13] Ibid. State Table 15.
[14] Highway Statistics 2004, Federal Highway Administation. Charts FI-10, VM-2.
[15] Ibid.
[16] TRIP analysis of 2004 Federal Highway Administration data. See charts HM-63 and HM-64 in Highway Statistics 2004.
[17] Ibid.
[18] Selecting a Preventative Maintenance Treatment for Flexible Pavements. R. Hicks, J. Moulthrop. Transportation Research Board. 1999. Figure 1.

[19] Federal Highway Administration, 2005. National Bridge Inventory data.
[20] Commonwealth of Pennsylvania. 2005-06 Governor's Executive Budget.
[21] Missouri Department of Transportation response to TRIP survey, 2006.
[22] TRIP analysis of Federal Highway Administration data. See 2004 Federal Highway Statistics, charts HM-60 and VM-2.
[23] Ibid. P. 7.
[24] Estimate is based on TRIP's analysis of FHWA data for 1997 through 2004. TRIP estimated safety benefits for 2005 and 2006, based on travel and traffic safety data for the 2000 to 2004 period. TRIP assumed that in the absence of Interstate highways, travel would occur on other federal-aid highways. The number of lives saved was based on calculating fatalities for Interstate travel, if it had occurred on other federal-aid routes in Missouri.
[25] TRIP calculation is based on TRIP analysis of 1997 to 2004 data. Estimates of lives saved by the Interstate system from 1956 to 1996 are based on analysis by Wendell Cox and Jean Love in the 1996 publication "The Best Investment a Nation Ever Made."
[26] TRIP analysis of National Highway Traffic Safety Administration and Federal Highway Administration data.
[27] TRIP analysis of 2004 Federal Highway data, using speed factors from the 2005 Urban Mobility Report, which is published by the Texas Transportation Institute.
[28] Ibid.
[29] The value of time used for these estimates was $14.85 per hour, based on the value used by the Texas Transportation Institute in their annual report on urban traffic congestion. The value used to calculate fuel costs is $2.50 per gallon.
[30] The U.S. Department of Labor estimates consumer costs per capita for U.S. regions. TRIP then calculated this data for each state by using state income per capita data to estimate cost differences between states.
[31] Missouri Department of Transportation response to TRIP survey.

[32] Ibid.
[33] Ibid.