The Interstate Highway System: 50 Years of Perspective

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On June 29, 1956, President Dwight Eisenhower signed historic legislation that authorized construction of the Interstate Highway System and created a pay-as-you-go Highway Trust Fund to generate the federal government's 90+ percent share of the system's cost. Although Eisenhower is justifiably credited with making it a reality, the Interstate System is actually the result of a series of concepts that were refined over several prior decades within the engineering and political arenas. Developing the system required a visionary financing strategy that would satisfy diverse philosophical and economic view points. Designing the system presented unprecedented challenges for standardizing elements that would improve safety and be appropriate for a truly national highway system. The current 46,700-mile Interstate System generated transportation efficiencies and enabled societal mobility to unanticipated degrees. This paper traces the system's conceptual development; describes its major political, societal, financial, and technical challenges; and evaluates its influences on the American way of life.

Conceptual Development

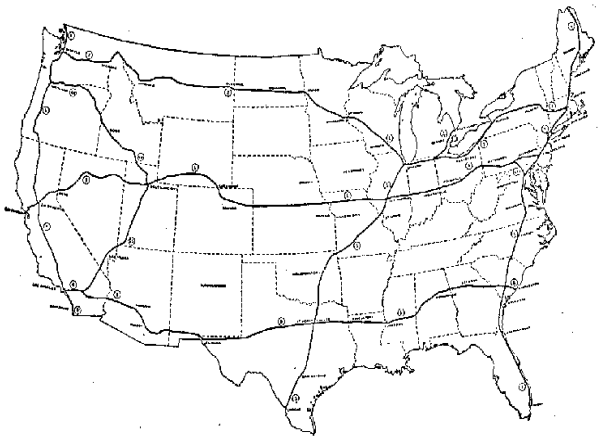
The federal government undertook its first interstate road building project in 1806, when it authorized federally funded construction of the National Road (now US 40). President Thomas Jefferson approved legislation to build the 20-foot-wide highway on 60-foot-wide right-of-way. The War of 1812 slowed construction of the first section from Cumberland, Maryland, to the Ohio River. After spirited debate about federal versus state powers, the federal government transferred ownership of the road to the states about 1835.

The National Road was a macadam highway traversed by herded livestock and covered wagons. The introduction of automobiles to America in the 1890s changed the country's road requirements. Prominent individuals and new organizations began to promote interstate roadways. The American Road Makers, which eventually evolved into the American Road and Transportation Builders Association (ARTBA), was founded in 1902 to promote development of a Capital Connecting Government Highway that would link all state capitals with each other and with the national capitol. A 1913 *Road Maker Magazine* article suggested that the 18,000-mile-long, 16-foot-wide "Proposed Interstate Highway System" be paid for by a tobacco tax.

One of the most visionary and successful transcontinental highways was developed by the Lincoln Highway Association (LHA). The LHA was organized in 1912 by Carl Fisher, who had just built the Indianapolis Motor Speedway. Using private and corporate donations, it strung together existing roads with some new sections to create a 3,385-mile route between New York City and San Francisco. Among the donors were Theodore Roosevelt, Thomas Edison, and Woodrow Wilson — but not Henry Ford, who believed that the nation's roads should be built by the government, not individuals or companies. The LHA continued to pursue its goal of creating a "coast-to-coast rock highway" until 1928.

As the Lincoln Highway was taking shape, the federal government began re-establishing its role with respect to the nation's road systems. The Federal Aid Road Act of 1916 authorized $75 million in matching funds over five years for highway construction, but only for states with an appropriate highway department. The Federal-Aid Highway Act of 1921 upped the federal government's ante to $75,000,000 annually and requested that states identify 3 percent of their primary roads as being 'interstate in character,' ensuring they connected with routes in adjacent states. In 1926, the federal government promulgated a national system of numbering these interstate highways.

Public and political momentum for a better interstate highway system continued to build over the next decade. Highway engineer and historian Lee Mertz wrote that "A search of the records of the day confirms that the idea of superhighways spanning the nation had caught the fancy of the press, the President, the Congress and perhaps the public. . . . At least a dozen bills and resolutions were introduced in the Congress between 1936 and early 1938 and at least two hearings were held." President Franklin Roosevelt was actively involved in this process, proposing a grid of three north-south and three east-west "super highways" spanning the country. In the Federal Highway Act of 1938, Congress directed the Bureau of Public Roads (BPR) to investigate the feasibility of such a system. *Toll Roads and Free Roads*, the BPR's 1939 report, recommended a 26,700-mile system, saying, "Although . . . they would represent as a system less than 1 percent of the total rural highway mileage of the country, they would unquestionably accommodate at least 12.5 percent of the total rural [vehicle-miles of travel]."



Roosevelt's six proposed superhighways

The Federal-Aid Highway Act of 1944 authorized the designation of a 40,000-mile National System of Interstate Highways connecting major cities. Progress was slow because of financial and political aftermath of World War II and the Korean Conflict. Pushing forward with the effort, prodding Congress to develop a funding mechanism, and getting construction underway were the accomplishments that earned Eisenhower the unofficial title "Father of the Interstate System" (officially, the System was designated the Dwight D. Eisenhower System of Interstate and Defense Highways in 1990).

Political Challenges

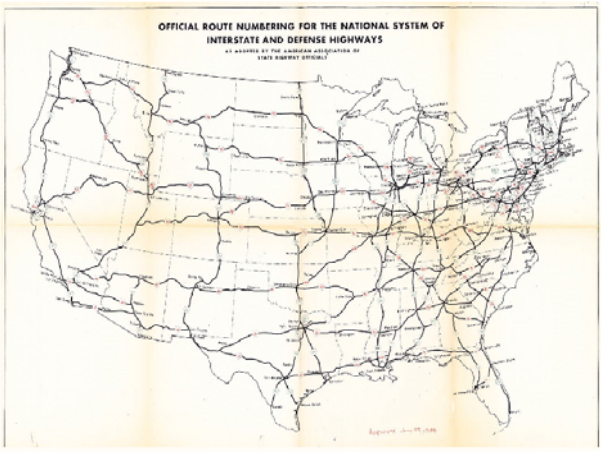
Eisenhower became President in 1953, bringing with him two powerful experiences that motivated his dedication to create an Interstate Highway System. One was his participation in a 1919 military truck convoy that traveled from Washington, DC, to San Francisco, primarily on the Lincoln Highway. Eighty-one vehicles and 300 Army personnel took 62 days to travel 3,250 miles, hampered both by mechanical breakdowns and inadequate roads and bridges. Years later, Eisenhower used the far superior Autobahn to move troops and equipment during the Allied invasion of Germany.

Convinced of the importance of building a high-quality interstate highway system in the United States, Eisenhower began working to gain the cooperation of Congress, state governments, industry and user associations, and the public at large. He faced two political issues that had hampered development of an interstate highway system for decades: reluctance of states to relinquish control over the location and design of the roads, and disparate views of the appropriate method and apportionment of funding.

Eisenhower's strategy began with enlisting public support for the interstate highway system. His first major statement was an address to the 1954 Governors' Conference. The speech, actually delivered by Vice President Nixon, relayed Eisenhower's assessment that the nation's obsolete highway network was imposing five penalties, which no doubt rang true with the public. He compared the annual death and injury toll to the "casualties of a bloody war," noting that nearly 40,000 people were killed and more than 1.3 million were injured annually on the nation's highways. He listed the waste of billions of dollars in detours and traffic jams, the clogging of the nations courts with highway related suits, and inefficiency in

the transportation of goods. Finally, he deplored the "appalling inadequacies to meet the demands of catastrophe or defense should an atomic war come." In the end, he appealed to the governors to help solve this problem by studying the issue and recommending to him a plan for cooperative action between federal government and the states.

The next step in Eisenhower's strategy was to form the President's Advisory Committee on a National Highway Program (popularly known as the Clay Committee after it's chairman). Lucius Clay described its mission as figuring out "how we may get [highway improvements] quickly, economically, and how they may be financed sensibly and within reason." In 1955, Eisenhower asked Congress to approve the committee's recommendation. Although the Clay Committee's plan was rejected by Congress, it did stimulate the introduction of several alternative plans that differed primarily in the methods of generating and apportioning funds. Ultimately, Congress approved the Federal-Aid Highway Act of 1956, which authorized and funded the National System of Interstate and Defense Highways. Implementation proceeded quickly; more than half of the new Interstate highway mileage was built by 1966.



Planned Interstate Highway System, 1958

Interestingly, Eisenhower was substantively unaware of a key tactic in getting Congressional approval for the Interstate System. In 1955, the BPR prepared and distributed to all members of Congress a 100-page document titled *General Location of National System of Interstate Highways* but commonly referred to as the *Yellow Book*. The book, which showed 122 urban Interstate routes proposed for cities in 43 states, was instrumental in convincing legislators of the system's value to their constituents. Eisenhower had been told that the book documented the legislative history of the Interstate System, and he did not read it. When he did learn of the substantial investment in urban Interstate mileage in 1959, it was too late to recast the System into his original vision of a primarily rural system. The urban portions represented only 13 percent of the 41,000-mile system, but they would account for 50 percent of the total cost.

Societal Challenges

Inclusion of urban Interstate highways was not a new idea. In 1939, for example, *Toll Roads and Free Roads* observed that "bypass routes are of advantage mainly to a relatively small part of the highway traffic normally approaching a city," while "the greater part of the heavy traffic at a city entrance is an in-and-out movement of local generation." Herbert Fairbank and Thomas MacDonald, BPR engineers who wrote the document, also emphasized the importance of urban freeways in *Interregional Highways*, a report Roosevelt presented to Congress in 1944. In contrast, the more political view may have been as expressed in the letter of submittal for *Toll Roads and Free Roads*: "Primary importance is attached to the designation and progressive improvement of a system of direct interregional highways designed to facilitate the long and expeditious movements that may be necessary in the national defense, and similarly wide-ranging travel of motorists in their own vehicles — travel which, in addition to its immediate recreational benefits, is a powerful force for national unity." The submittal letter was signed by the Secretaries of Agriculture and War, who were, respectively, a former farmer from Iowa and a former businessman and governor from Kansas.

Eisenhower preferred a system that bypassed cities, but a large portion of the general public wanted local access. William Willy, president of the Western Association of State Highway Officials (WASHO), said in 1958, “Number one [issue] is probably the by-passing problem. Try as we might, we have not been able to halt the loud outcry of the motel, restaurant, and service station people.”

Experience has validated Fairbank’s and MacDonald’s opinions about including urban freeways in the Interstate System. Yet, routing those urban sections created one of the most significant social challenges of the construction phase. The BPR engineers saw urban Interstates as crucial to reviving cities degraded by residents’ migration to suburbs. Eventually, when construction actually began, the slums those two men envisioned improving became the preferred path for new freeways. Those neighborhoods’ low property value made them a logical choice for right-of-way acquisition. Furthermore, as Lowell Bridwell wrote in *The Freeway in the City*, published by FHWA in 1968: “Some internal freeways have been deliberately located through the worst slums to help the city in its program of slum clearance and urban renewal. The federal government has greeted the concept with enthusiasm.”

The residents of those neighborhoods were not so enthusiastic. At times, they protested, and some historians believe this issue contributed to the racial unrest that erupted in riots such as the Watts section of Los Angeles in 1965 and Detroit in 1967. Sometimes the residents sued. A classic example is a legal and administrative battle that lasted more than 20 years, ultimately blocking Interstate 40 from proceeding through Memphis. A group of citizens organized and tenaciously pursued the effort to preserve the 50-year-old, 342-acre Overton Park.

I-40, Memphis

As for rural areas of the country, WASHO’s Willy cited control of access as another significant problem, saying, “Here in the West this concept is proving highly unpalatable to our ranchers and farmers, who have long been accustomed to almost totally unrestricted freedom of movement.” He mentioned instances where the Interstate System was routed through ranches in an alignment that “left the water hole on one side and the grazing land on the other.”

Financial Challenges

As significant as the societal challenges were, it was concerns about funding the program that nearly kept the Interstate System stalled. Disagreements over how to collect and apportion funds had been the primary roadblock since the 1930s. While Roosevelt was promoting the concept of transcontinental highways, several financing plans were suggested. In 1935, the *Washington Post* reported on testimony Roosevelt’s Treasury Department procurement chief gave before a Senate committee: “at first [he] declared the Government would sell gasoline along roads it built. Later he denied the Government would enter the gasoline business and predicted, it, instead, would derive revenue from concessions along its routes.”

By 1938, Roosevelt envisioned his six (later, eight) superhighways as toll facilities. When he asked the BPR to verify the validity of the plan, it produced *Toll Roads and Free Roads*. That report stated categorically that “since a liberal estimate of revenue for the period 1945-60 is less than 40 percent of a conservative estimate of debt service, maintenance, and operating costs for the same period, a toll system on the roads . . . is not feasible.” On the other hand, the report stated, “It does not follow that there is not a sufficient traffic to warrant and require facilities of a higher standard than are provided at present. On the contrary, the studies show the potential use of such facilities in many sections is more than sufficient to justify their provision.”

However, the report promoted another funding plan that Roosevelt had espoused for several years. In the Letter of Transmittal he sent to Congress with the report, Roosevelt explained the plan this way: "Under the exercise of the principle of 'excess-taking' of land, the Government, which puts up the cost of the highway, buys a wide strip [up to 1 mile wide] on each side of the highway itself, uses it for the rental of concessions and sells it off over a period of years to home builders and others who wish to live near a main artery of travel." He pointed out that this would fund the road construction "in large part" from the land value increase that would result from the proximity to the modern highways.

World War II placed the funding debate on hold, but the idea of an interstate highway system remained alive. The Federal-Aid Highway Act of 1944 called for the states to designate routes for the National System of Interstate Highways, but it did not include any mechanism for federal funding of the system. In 1952, Congress finally authorized a very limited amount of financial help for the states to get the system started—$25 million annually for two years in 50–50 matching funds. When Eisenhower took office in 1953, only 17 percent of the existing roads that would be incorporated into the system had been improved to meet the required standards.


Eisenhower accepts Clay Committee report

Under Eisenhower's pressure to fully create the Interstate System, Congress finally tackled the problem of paying for the roads. The President envisioned financing the system through collection of tolls on the roads, but the Clay Committee reflected the preference of the state governors by proposing financing the system by selling bonds that would be repaid with gasoline tax revenues. Congress, however, was reluctant to approve any funding mechanism that would increase the national debt.

Finally, at the suggestion of the Secretary of the Treasury, Congressman Hale Boggs of Louisiana devised the alternative of financing the System on a pay-as-you-go basis. He proposed taxing highway user products, such as gasoline and tires, and depositing the revenues in a new Highway Trust Fund. Money from the Fund would then be dispersed to repay states for building the Interstate System and other federal-aid highway projects. The plan was incorporated in the Federal-Aid Highway Act of 1956, along with a provision that put the federal share of funding the Interstate System at 90 percent. The House bill passed by a vote of 388 to 19, and the Senate version passed by a voice vote.

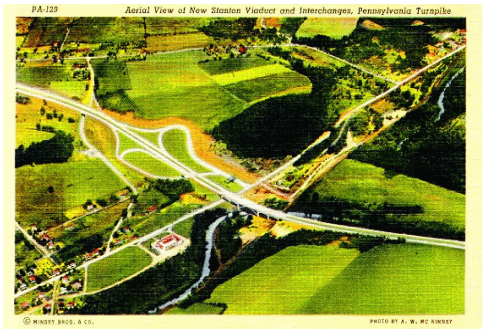
Accurately predicting the cost of the Interstate System proved to be difficult. The 1956 Act authorized $27.5 billion over a 13-year period for construction of the Interstate System. By 1958, the estimated cost of the system rose to $39.9 billion. The federal gasoline tax, which had risen from 2 cents to 3 cents per gallon in 1956, was boosted by another 1 cent per gallon in 1959. Public and political resentment of this increase generated accusations of extravagance, waste, and fraud in federal highway programs. Investigations by Congress, the Government Accountability Office (GAO), and the BPR found "some abuses, but also found they affected a relatively small part of the program," according to FHWA Administrator Mary Peters. In 2004, she told a National Fraud Awareness Conference hosted by WSDOT that in response to the findings, FHWA established an audit office, which was later transferred to the Office of Inspector General.

Technical Challenges

The authors of *Toll Roads and Free Roads* acknowledged that a significant change had taken place in the early 1930s: "Then, rather suddenly, the speed capacity of motor vehicles was increased and new standards of highway design, particularly in relation to curvature, gradient, and surfaced width became necessary." The report included some design recommendations, such as providing wider right-of-way and controlling distractions such as billboards and roadside businesses, which the authors described as

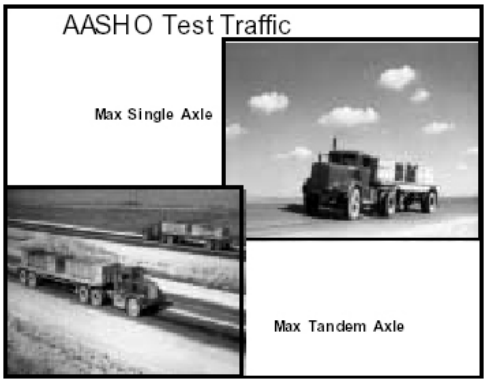
"positive menaces" to drivers. Mertz writes that an early draft of the document "recommended that Congress pass a uniform highway traffic law applying to all roads constructed in whole or in part with Federal funds. Such a law would prescribe the maximum weights, dimensions, and speeds of vehicles and minimum requirements as to their tractive ability and their braking, lighting and tire equipment."

That proposal did not make it into the final draft, but some highway designers were already beginning to apply such ideas. For example, the Pennsylvania Turnpike, which opened in 1940, featured acceleration ramps, superelevation on curves, grades not exceeding 3 percent, and a minimum of 600 feet of "sight distance from motorist to traffic ahead." The Turnpike served as a model for freeway design and eventually became part of the Interstate System. Experience gained from the operation of the Turnpike and other innovative roads such as the Arroyo Seco Parkway (also called the Pasadena Freeway) in Los Angeles helped guide the evolution of freeway design.



Pennsylvania Turnpike Interchange

Beginning in the mid-1940s, federal highway authorities cooperated with AASHO (now AASHTO, the American Association of State Highway and Transportation Officials) on developing design standards for the Interstate System. Several research studies were undertaken. For example, in August 1957, an about-to-be-opened section of the new Capital Beltway near Greenbelt, Maryland, was used to evaluate proposed color combinations for Interstate highway guide signs. Hundreds of drivers drove the test section over a two-week period, in a variety of weather and lighting conditions. The clear majority preferred white capital-and-lower-case lettering on a green, reflective background.



AASHO Road Test Trucks

The AASHO Road Test was another example of this early research. A 7-mile-long track consisting of six loops and a tangent section and including sixteen short-span bridges was constructed in Ottowa, Illinois. The track was divided into 836 sections, each with a different pavement design, including both concrete and asphalt sections. From October 15, 1958, until November 30, 1960, a fleet of 81 Army trucks loaded with concrete blocks drove the track 18 hours a day to evaluate the performance of the pavement and bridge designs. Based on the observed performance (or destruction) of the pavement sections, researchers were able to develop design equations relating anticipated loading to pavement design.

Over the years, testing of pavement designs has continued in various formats. For example, FHWA sponsored construction of the WesTrack facility in Nevada. Beginning in March 1996, four robotic, 152,000-pound trucks drove a 1.8-mile-long loop track up to 22 hours a day, seven days a week, for two years. The track was divided into 26 test sections for evaluation of various asphalt pavement designs.

In addition to geometric and pavement design issues, the Interstate System prompted the need for refining traffic control device design. Not only did uniformity of design become more important with the increasing popularity of long-distance travel, but the roadway designs themselves presented new challenges to motorists. Multilane divided highways require clear lane markings that distinguished between same-direction and opposite-direction lanes. With high speeds and limited exit locations, motorists need clear, easy-to-read guide signs. Particularly on diamond interchanges, clear directional signing is essential, including WRONG WAY and DO NOT ENTER warnings to prevent drivers from

entering the highway via an exit ramp. The *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD) had been recognized as a national standard since 1935, but in the Interstate era, a specialized manual was adopted and published in 1958. The *Manual for Signing and Pavement Marking of the National System of Interstate and Defense Highways* emphasized guide signs, pavement markings, and delineators. The 1961 MUTCD included more freeway signing material than previous editions, and, for the first time, states had to comply with the MUTCD to be eligible for federal highway funds.

With increasing experience, new technologies, and changes in vehicle characteristics, highway design standards have continued to evolve. In some cases, unusual site conditions have challenged designers to create innovative designs that still meet the standards. One example is a 12.5-mile section of Interstate 70 through Glenwood Canyon in Colorado; the environmentally sensitive site was preserved by constructing a cantilevered roadway using cranes mounted atop the canyon walls. A portion of Interstate 10 in Phoenix was built below grade and covered with a park. Portions of Interstate 75 in Florida include underpasses to allow wildlife to cross safely. The environmentally sensitive Interstate highway H-3 in Hawaii includes long-span viaducts up to 100 feet high; completed in 1996, it was the most expensive Interstate project to date, costing $100 million per mile. In comparison, the average estimated cost of Interstate highway in 1956 was $700,000 per mile.

Hanging Lakes Tunnel, I-70, Colorado

Influences on American Life

Life—and driving—in America has changed drastically since the Interstate Highway System was envisioned, planned, and built. The Interstate System has played at least a partial role in making those changes. One of the most dramatic is the efficiency of freight transportation. The system represents 1.1 percent of the public road mileage in the country, but it carries 41 percent of all truck-miles of travel (trucks carry 67 percent of all domestic freight, by weight). Operating costs for tractor-trailers are 17 percent lower on the Interstates than on other highways, and the System's travel time reliability has been credited with making "just in time" delivery a reality.

Automobile travel has changed as well. In 2003, the number of personal vehicle-miles driven on Interstate highways was 703 billion, which is 72 billion more than the number driven on all U.S. highways in 1956. Over that period, the population has increased 73 percent, while the number of registered vehicles has increased by 254 percent. Today, 24 percent of all highway travel is on the Interstate, where intercity travel time is 20 percent less than on other highways. The Interstate is significantly safer, with a fatality rate of 0.8 per 100 million vehicle miles, while the rate on all roads is 1.46. By comparison, the national highway fatality rate in 1956 was 6.05. The enhanced safety of Interstate highways in comparison with conventional highways is due to the separation of opposing directions of travel, the removal of intersections (including rail-highway grade crossings), the lack of pedestrians, and the more favorable geometric and roadside design features.

On one hand, the Interstate System facilitated the growth of cities. In 1956, 13 percent of the planned system was considered urban; today that figure is 29 percent. On the other hand, the system fed rural areas by increasing long-distance travel and stimulating business development at interchanges. Families moved out to suburbs, and many companies moved their operations out of cities to less expensive rural locations with Interstate access. Increased cross-country traffic concentrated on Interstate routes

stimulated the franchising of fast food and lodging establishments. The author of *The Roads that Built America* asserts that the massive effort of building the Interstate in the South created labor shortages that made workforce integration a practical necessity.

For all practical purposes, the Interstate System is complete. Funding, however, is still required. A 2003 AASHTO study concluded that the current rate of investment would have to increase by 42 percent, to $92 billion a year just to keep the system in good condition and prevent an increase in traffic congestion.

References

"Celebrating 50 Years: The Eisenhower Interstate Highway System," Federal Highway Administration, http://www.fhwa.dot.gov/interstate/homepage.cfm.

"Federal-Aid Highway Act of 1956: Creating the Interstate System," Weingroff, Richard F., in *Public Roads*, Summer 1996.

"Ike, ARTBA & the Interstates: Building a Better America!" Yago, John, in *Transportation Builder*, October 2005.

"Linking the Power of the Past to the Promise of the Future," AASHTO: Interstate 50th Anniversary Web Site, http://www.interstate50th.org.

McNichol, Dan. *The Roads that Built America: The Incredible Story of the U.S. Interstate System*, Barnes & Noble, New York, 2003.

Mertz, Lee. *Origins of the Interstate*, http://www.fhwa.dot.gov/infrastructure/origin.htm.

Mertz, W. L., and Joyce Ritter. *Building the Interstate*, http://www.fhwa.dot.gov/infrastructure/build.htm.

The Interstate Highway System: Saving Lives, Time and Money, but Increasing Congestion Threatens Benefits, The Road Information Program, 2003, http://www.tripnet.org/InterstateStudyJan2003.PDF.

Toll Roads and Free Roads, U.S. GPO, Washington, D.C., 1939.