

The Bicycle Revolution

Series: FHWA Highway History Website Articles

June 30, 2023



U.S. Department of Transportation
Federal Highway Administration
1200 New Jersey Ave, SE
Washington, DC 20590

The original format of this document was an active HTML page(s) located under <https://www.fhwa.dot.gov/infrastructure/history.cfm>. The Federal Highway Administration converted the HTML page(s) into an Adobe® Acrobat® PDF file to preserve and support reuse of the information it contained.

The intellectual content of this PDF is an authentic capture of the original HTML file. Hyperlinks and other functions of the HTML webpage may have been lost, and this version of the content may not fully work with screen reading software.

The Bicycle Revolution

The Rambler hasn't been on a bicycle since he got his drivers license. Until then (probably 1963), he had been a bicyclist who envied his friends whose parents had purchased "English racers." The source of the name was unknown to him, but they were slim and had gears that functioned in some mysterious way and brakes that were operated by hand, instead of by pedaling backwards.

Then the teenage Rambler, after two tries where he failed because of parallel parking, got his drivers license and lost all interest in bicycles. The Rambler has not been on a bicycle since. He never operated a bicycle with gears and hand-brakes. And wouldn't know how to operate one if he tried. And he doesn't plan to try.

Despite this irrational unwillingness to get on a bicycle, the Rambler has to admit the bicycle has sparked several revolutions in transportation since its popularization in the 1880's.

Introduction of the "ordinary"(the bicycle with the big front wheel) created a bicycle craze that swept the Nation--and the world. When the "safety" became available (equal size wheels), the revolution seemed permanent. Now, everyone could ride a bicycle. The bicycle was seen as a revolution in personal transportation that affected many aspects of life, especially in cities. Bicycle racing became one of the Nation's most popular sports-and gave the country its first black superstar athlete, "Major" Marshall W. Taylor. Bicycling changed fashions, affected politics, and created economic opportunity. Commuting by bicycle was common. "Scorching," or speeding, became a major concern of decent folk, as did curbing bicyclists whose vehicles scared country horses!

The problem was that roads outside cities were in terrible shape ("hardly jackassable" in one common phrase of the day). Since the advent of the railroad in the 1830's, roads had devolved to the lowest levels of government (counties and townships) that had the least incentive and resources to improve them. Bicyclists and their national, State, and local organizations became the earliest agitators for good roads. Even before farmers. The bicycle interests were responsible for many State road improvement laws, and also deserve much of the credit for convincing Congress in 1893 to authorize the U.S. Office of Road Inquiry in the Department of Agriculture, with a \$10,000 budget a mission of education and encouragement. (That Agency evolved into the Federal Highway Administration.) So the bicycle craze led to the good roads revolution and encouraged it (in cooperation with farming and railroad interests) during the last decade of the 19th century.

The bicycle craze also contributed to the Automobile Era. Tinkering with a variety of early horseless carriages resulted in the development of the internal-combustion powered automobile in the mid-1880's in Europe. The first gasoline-powered automobile in the United States was built in 1893 and was operated in Springfield, Massachusetts, just a few weeks before the Office of Road Inquiry went into operation. The automobile would soon supplant the bicycle in the public's affections; what had seemed like a revolution in 1890 had become an artifact of an earlier era by 1905. The automobile interests took over the Good Roads Movement.

Many early automobile leaders came from the ranks of bicycle manufacturers and repairers. Bicycle men who made their name in the automobile field include the Duryea Brothers (who built that 1893 automobile), Alexander Winton, Alexander Pope, and the Apperson Brothers. They adapted many of the techniques and technologies of the short-lived Bicycle Craze for the Automobile Era.

Another impact of the bicycle was felt in a completely different field, namely aviation. Aviation pioneers had been trying to build a self-powered airplane for many years. Gliding was one thing--many would-be aviators practiced for the

future by gliding. Powering the airplane was another problem. The internal combustion engine seemed to hold the answer, but no one had been able to find the key to make the combination of engine and flight work.

The final problem was how to guide the plane by gaining control in all three axes of motion. The problems were solved by Orville and Wilbur Wright, who were in the bicycle sales and repair business in Dayton, Ohio. Inspired by accounts in *Scientific American* and other journals, their dream was to fly. Their tinkering was helped by observing pigeons in flight, as described by Fred Howard in *Wilbur and Orville: A Biography of the Wright Brothers* (Alfred A. Knopf, 1987):

One pigeon was making an erratic sort of flight. First one wing was high, then the other. It came to them then that the pigeon had possibly adjusted the tips of its wings so as to present one wingtip at a positive angle to its line of flight and the other at a negative angle, thus turning itself into an animated windmill. When the pigeon had revolved as far as it wished, it reversed the process and began to roll the other way. "Thus the balance," Wilbur explained, "was controlled by utilizing dynamic reactions of the air instead of shifting weight." [page 33]

Having gained this insight, "the Wrights ran up against the problem of how to apply the pigeon's method to a pair of wings made of cloth tightly stretched over a rigid wooden framework." The link between the Wright Brothers' bicycle practice and their invention of the "wing-warping system" for airplane control occurred one day in their bicycle shop. Howard described the event:

It was Wilbur who stumbled on the solution. In those days of sixty-hour workweeks, the bicycle shop was open evenings during the summer. One night when Wilbur was minding the shop alone, he sold an inner tube for a bicycle tire. He removed the tube from the long, narrow box in which it came, and while talking to the customer, began absentmindedly to twist the ends of the open box in opposite directions. It suddenly occurred to him that if a frail pasteboard box could survive such a strain, it might be possible to twist the cloth-covered wooden frame of a flying machine in the same fashion without sacrificing lateral stiffness. Ripping the ends off the box made the torsion principle more apparent. When the shop closed that night Wilbur took the box home with him and demonstrated its twisting properties to Orville. Then and there the brothers decided to utilize this principle in their five-foot kite-glider. To effect lateral control they would merely twist the right and left wings in opposite directions. [p. 34]

That idle twisting of an inner tube box was transformed into the wing warping system that made the Wright Brothers 1903 flight at Kitty Hawk possible.

Howard noted that Orville Wright, some years after Wilbur had died at the age of 45 on May 29, 1912, would later downgrade this "Eureka!" moment. After historian Mark Sullivan wrote about Wilbur's inner tube box, Orville contacted him to acknowledge that the event happened but that the historian had assigned more importance to the incident than it merited. Howard explained:

The twisted box did not reveal a basic principle, [Orville] wrote; it merely suggested a better mechanical embodiment of a principle that he and Wilbur had already discussed several months before Wilbur picked up the empty inner-tube box. [p. 34]

Today, the bicycle is an increasingly important part of the American transportation system, despite the Rambler's obstinacy. Internationally, it is an even more significant component of transportation. However, to the bicycle, we also owe a measure of thanks not only for our road network, but for our automobiles and airplanes.

UPDATE: Now that the Rambler is all grown up, he can find things out that didn't interest him several decades ago. As it turns out, "English racers" were invented in England for racing. They were designed for double duty to keep their cost down for English consumers. They could be used for ordinary activities, but then transformed for racing. The fenders, for example, could be removed. The American versions that my friends rode didn't share the double-duty feature, but the Rambler still recalls how sleek they looked in comparison with his bloated old average everyday ordinary boring bicycle.
