EDITORIAL COMMENT

Western Pennsylvania: Past Journeys – Future Ventures

> **"Clearly, our region is unique in its transportation infrastructure. It has been forced over the course of time, through a series of social evolutions and industrial revolutions, to continually change — and to continually improve."**

Guest Editor

Donald P. Fusilli, Jr., P.E., JD

President and CEO, Michael Baker Corporation

"Left Pittsburgh this day at 11 ock with a party of 11 hands 7 of which are soldiers, a pilot and three young men on trial they having proposed to go with me throughout the voyage."

This is the first journal entry of Meriwether Lewis as he and William Clark embarked on their historic journey in 1803, to the mostly unknown, western territories of a then fledgling nation. Western Pennsylvania and, in particular, Pittsburgh, immediately became known as the "Gateway to the West." The relevance of Western Pennsylvania to the past, present, and future of transportation has never been more significant.

Clearly, our region is unique in its transportation infrastructure. It has been forced over the course of time, through a series of social evolutions and industrial revolutions, to continually change — and to continually improve. That change and improvement is not restricted to conventional modes of transportation, as today we must concern ourselves with transportation of information, as well as whole populations. Pittsburgh has adapted quickly and is now recognized as a critical hub in the emerging "information highway."

Even before Lewis and Clark's famous trek, Pittsburgh was an integral "hub" of all modes of transportation of the time. Horse and wagon trails led from Philadelphia, New York, Baltimore, and other points east, directly to Pittsburgh. Our waterways have served as critical links for trade, commerce, and industry for well over two centuries. Many may be unaware that Pittsburgh, because of its renown in the mid-1800s as a transportation hub, became a natural stop along the "Underground Railroad," the system that helped transport people fleeing slavery to points north from the South. Since then, Pittsburgh has become better known as the "City of Bridges," second only to Venice, Italy, in that regard. Much has been documented on the extent of Pittsburgh's bridges, but their relevance to social and economic growth can never be over-emphasized. The expansive trolley system of the late-19th century, although a patchwork conglomeration of several operators, eventually became consolidated and served Pittsburgh well for many, many years after. In fact, The Pittsburgh Railways Corporation, in 1901, operated nearly 400 miles of single track, carried nearly 180 million passengers a year, and achieved milestone revenues of nearly $7 million — not bad for a transportation startup destined for an eventual demise in the mid-1950s. Western Pennsylvania and Pittsburgh have long served as a critical hub of aviation transportation and is also location to many aviation firsts and discoveries including Samuel Pierpont Langley's landmark experimentations with aerodynamics at, what is today, the University of Pittsburgh. Merle Moltrup, a Beaver Falls native, who in 1927, was the first Air Mail Carrier to make a mail service delivery from Pittsburgh to Cleveland. But, one only need consider the impact on the area from the world-class, award-winning Pittsburgh International Airport to understand the importance of aviation to the region.

It is my pleasure and honor to present stories from the past and solutions to the future transportation needs of the Western Pennsylvania region in this important issue of *Pittsburgh Engineer*. One cannot make commentary on transportation in Pittsburgh, without mentioning the U.S. Army Corps of Engineers and the long-standing relationship they've developed with both the region and the City of Pittsburgh. In this issue, we highlight the Corps and the Port of Pittsburgh; we examine how Western Pennsylvania must continue to focus its social and economic growth by aligning those efforts with advancements in all modes of transportation that service this vital region; we expand our knowledge of Pittsburgh's airports and local air transportation systems; we feature a complete Centerfold Transportation Timeline, provided by Engineering Society of Western Pennsylvania; we explore the long and valued history of Pittsburgh's incline, trolley, and transit systems; we gain a deeper understanding of the whys, hows, and whos of Pittsburgh's bridges and tunnels; we learn of the historical significance of both Pennsylvania's Turnpike system and The Horseshoe Curve Railway in Altoona, Pa.; we hear from recognized experts on all of these modes of transportation, and more. And finally, we examine how our transportation past has impacted our present, and how our efforts in improving transportation today will lead us into tomorrow.

Again, it has been both my pleasure and honor to be asked to serve as guest editor for this issue of *Pittsburgh Engineer*. As someone with a deep historical interest and one that believes that history helps shape our future, I embrace the valuable content of the articles presented here. Our transportation challenges are before us, but we face them with a healthy progression from the past. If happening for the first time all over again, there is little doubt that Lewis and Clark would change many things regarding their epic challenge of exploring the West. One thing they most certainly would not change — beginning in Pittsburgh.

Regional Transportation: A Legacy of Adaptability and Renewal

The challenge of refurbishing the Fort Pitt Bridge and Tunnel

By Mark A. Miller
Corporate Marketing Communications Manager
Michael Baker Corporation

The legacy of transportation in Western Pennsylvania is one of adaptability — both by necessity, and by design. From the earliest days of European exploration, this region has been a key strategic hub for movement of people and goods from east to west.

Before St. Louis took the moniker, Pittsburgh had been known as the original "Gateway to the West." Today locals are reminded of that designation through facilities such as Gateway Center, in downtown Pittsburgh, near the confluence of the Allegheny, Monongahela, and Ohio rivers, where explorers including Lewis and Clark, first set off on their westward adventures.

Pittsburgh has played an integral part of our national transportation history. First, as wagons arrived from Philadelphia, then as the rivers were used to move people and goods to ports in Cincinnati, St. Louis, and eventually joining the Mississippi River to the Gulf of Mexico and the ocean. In time, highways and railroads were developed to support the import and export needs of Pittsburgh's industrial powerhouses — steel, coal, coke, glass and many others.

But as the mills multiplied along the river valleys, the growing workforce began putting down roots along the surrounding hills. Phenomenal growth in population, especially around the turn of the 20th century, made getting around the city increasingly difficult. An early problem was getting across the rivers, leading to a boom in bridge construction.

> **"Now, 65 to 70 percent of passengers are coming for origination and destination purposes. People need to get to the airport — they're not driving anywhere else."**

The 100-gate Midfield Terminal facility at Pittsburgh International Airport

No discussion of regional transportation would be complete without a reference to bridges. Other than Venice, Italy, no other city in the world has as many bridges as Pittsburgh. As cited in the book "Pittsburgh Bridges" by Walter C. Kidney, it reads in part, "Without bridges, the Pittsburgh region would be a series of fragmented valleys, hillsides, river plains, and isolated communities. With them, we come together to form a mighty unity. Some 1,600 bridges bind our city and county together, making places accessible that otherwise would not be accessible and resulting, in many cases, in ingenious engineering structures full of color and drama."

While bridges may be the most dramatic example of adaptability in building the region's transportation legacy, they are certainly not the only examples. The changing needs of local industry and workers influenced the transportation systems greatly, as have changing capabilities and technologies supporting those transportation options.

Adaptability Marks Recent Transportation History, Too

In much the same way, the recent history of transportation in the region encompasses some notable advancements and successes, along with some areas that continue to warrant further attention, but all grounded in the call for and demand of adaptability. For example, the important interconnectivity of surface and air transportation — a seeming dichotomy that in reality makes perfect sense.

"It is imperative that we have good highway access to the airport," said Kent George, executive director of the Allegheny County

Mon/Fayette Expressway, I-70 to PA-51 Project

Airport Authority. "Overall, we're in very good shape, with the Airport Expressway and I-376 from the Pennsylvania Turnpike. The reason our ground access is so good is that it's clear, easy and accessible.

"Improvements to the roads around the airport are imperative today because the airport has changed," he said. "Before the US Air bankruptcy, we were a connecting airport with 70 percent of passengers moving from one plane to another within the airport. Now, 65 to 70 percent of passengers are coming for origination and destination purposes. People need to get to the airportc — they're not driving anywhere else.

"The influx of Southwest Airlines and other low-cost carriers has expanded our customer base to 5 million people living or working within a 90-minute drive of the airport," George added. "The better highway structure we have, the more it reduces the chances of those passengers driving to other airports."

Back on the ground, transportation in Pittsburgh has been influenced by conditions that mirror national trends, adding to the ongoing need for adaptability.

"We have seen a change in the behavior and composition of working households," explained Chuck DiPietro, transportation planning director of the Southwest PA Conference. "There's a second worker in households today. There's a propensity to do a lot more travel, and most of us travel to work. Everyone's busier now, including recreation. Everything's a trip. The number of trips per household has exploded. Pittsburgh has had a fairly stable population, but that same number of people is taking more trips, driving more cars than in the past. We've become much more mobile.

"One of the things we have to remember in thinking about transportation in this region is maintaining and preserving what we've got before moving into new areas," he said. "Relieving congestion and increasing access makes our economic competitiveness better. Rather than start from scratch, if you can use what's in place, that's better."

Pittsburgh begins with a one-of-a-kind physical presence, but its place in the larger picture makes its transportation issues worth the effort to address.

> **"The Mon Valley Expressway is a very important transportation project because it touches down at five different brownfield sites — sites that are critical to economic development in those communities,"**

"It may cost more to transport goods because of our topography, but 65 percent of the U.S. population lives in the Northeast, the largest pool anywhere in the nation," said Barbara McNees, executive director of the Greater Pittsburgh Chamber of Commerce. "Why do Sony, FedEx Ground, UPS and others have major operations here? Because we're in the heart of where customers are. But we need to take advantage of the existing infrastructure."

The need to improve the existing infrastructure resulted in one of the region's most comprehensive, most daunting, and most unavoidable projects in history — the Fort Pitt Bridge and Tunnel refurbishing — an event that affected virtually every motorist in every part of Southwestern Pennsylvania in one way or another. It brought the absolute essence of good transportation systems here into stark relief — while also proving that when divergent parties in the region share a common transportation-related goal, nothing is impossible.

"That project took ten years of preparation," recalled DiPietro. "When it was under construction we had alternates ready, permanent improvements that many people later said were even better than the repaired bridge and tunnels. It meant packaging a variety of projects to make the big project go smoothly.

"At the beginning, the feeling was that we can't close that bridge, gridlock will result," he said. "But

Design rendering of the I-79 Missing Ramp

the plan got put together. We had to sink some dollars into it before it happened, and we needed to include everybody, all stakeholders. But in the end it worked so well that you can take that model today and apply it to any project anywhere."

"The Fort Pitt project took a lot of work," added McNees. "We put everybody we could in a room who would be touched by the project, and mapped out what we were going to do. At the end of the day, the 16th St. Bridge project was delayed, the Liberty Tunnel interchange was upgraded sooner, we had worked out the alternate routes, and agreed to turn off the traffic signals. We were able to work out a schedule so that it all worked. We put up a website and started 'Coneman,' the superhero mascot for the project.

"The professional sports teams, the Cultural District, the business community — they all communicated with their audiences to make sure people knew what was going to happen and how they could still get around," McNees said. "We looked at other cities and came up with the plan that we thought would work for Pittsburgh.

"The other great thing about the Fort Pitt project was when the Riverlife Task Force stopped the original plans to install concrete barriers on the bridge," she said. "They made it clear that we have a great 'front door' and that the community said that concrete barriers to block that view was just not acceptable."

McNees' involvement in the Fort Pitt project gives her a special perspective on the interrelationship between area business interests and the transportation system.

"When you look at the geography of Pittsburgh, you're already challenged in terms of transportation," she said. "That's why the business community has been very active in trying to assert itself into deciding what the transportation priorities should be. The missing ramps from I-79 to the Parkway West was unacceptable, for instance. The business community is getting more involved so that this region can be more competitive. The Findlay connector to the airport and the Cranberry connector between I-79, Route 19, and the Turnpike were two results of that involvement."

Some of the most successful new developments in the region actually owe their existence to Pittsburgh's industrial legacy. But the transportation systems that served the steel mills so well don't necessarily meet the needs of today's retail, commercial, and residential developments springing to life on those very sites. Once more, adaptability is the watchword.

"There's a pattern now of new development of brownfields like the Waterfront, where the land is reused, but transportation around it hasn't been upgraded," acknowledged DiPietro. "Transportation improvements are needed there to keep up the quality of life. It's cost-effective to coordinate transportation and economic development, because that site is so perfectly tied to established population centers like Homestead, Squirrel Hill, and the South Hills."

"It's a good problem to have," noted McNees. "I'd much rather have the problem of finding money to fix transportation systems than worry whether a site will ever be developed again."

"The Mon Valley Expressway is a very important transportation project because it touches down at five different brownfield sites — sites that are critical to economic development in those communities," said Allegheny County Executive Dan Onorato. "These are attractive properties that need to be developed."

> "Light rail would stop at all locations, and offer park-and-ride, too. That kind of connection would get 10,000 cars off that highway every day."

Artist rendering of the proposed MAGLEV station in downtown Pittsburgh

Looking Ahead, More Adaptability Will Be Required

All in all, the call for adaptability to make improvements in transportation across Western Pennsylvania remains as strong and as central to success as ever. When looking ahead, the same idea applies and perhaps in even stronger terms.

"Every year my office puts together an Allegheny County economic development book for the governor and our Congressional delegation," Onorato said. "We build consensus here, then it's my job as the leading political office holder here to push it in Harrisburg and Washington. Through this process, for example, we were able to get a million dollars in federal funding through the transportation bill for a study of light rail link between Downtown and Oakland along Second Avenue."

"The region has had to come together, and it has — which is really saying something," said McNees. "Ten counties and Pittsburgh need to reach consensus and say here's what's needed, prioritize projects and speak as one voice. Legislators understand and appreciate the progress being made here in establishing a process of regional development.

"When every municipality and every economic development group went out on its own, it was never enough to get the jobs done completely or well," she noted. "The Southwest PA Commission came to us last year and pointed out that we were really not getting our fair share of PennDOT dollars here. We saw the potential for projects and started a concerted letter-writing campaign. Now we have seen a 60 percent increase in that funding stream."

"Our first priority for the future is to take care of the decaying infrastructure, the interstate highways, bridges, bottlenecks like Route 28," echoed DiPietro. "We're not going to be able to build a new system of roadways here. We will be able to upgrade some, with very limited expansion."

"The Pittsburgh International Airport has been ranked by Conde Nast the No. 1 airport in the U.S., and No. 3 in the world," said George of the Airport Authority. "JD Power ranking places us always in the top five. Surface transportation in and out of airport factors into those rankings. But as good as we are, a rail connection to Downtown is still missing.

"Maglev may be a very good option over the long haul, but doesn't really meet the needs of the airport today," he said. "Someday we can get on Maglev and go to Downtown and Monroeville, but what's really needed is to connect the airport with Robinson Town Centre, Carnegie, Greentree, Downtown, Oakland. Getting the airport and Oakland better connected in particular is extremely important. Light rail would stop at all locations, and offer park-and-ride, too. That kind of connection would get 10,000 cars off that highway every day."

"Connecting the airport to Downtown to Oakland — everybody wants to see this happen sooner rather than later," McNees confirmed. "These are the types of issues that our business community members care about. The transportation system is always posing challenges."

So, in the end, it comes to the need to move people and goods to and from the places where innovation and production can be found. Thanks to the natural beauty of the region — and the simultaneously challenging and advantageous topography enjoyed here — transportation systems here continue to adhere to the centuries-old winning formula of adaptability as the key to progress.

The Nation's Original Toll Road

By Gary L. Graham, P.E.
Bridge Engineering Manager
Pennsylvania Turnpike Commission

The origin of the Pennsylvania Turnpike Commission (PTC) goes back to the glory days of the railroads. A new east-west passage through Pennsylvania called the South Penn Railroad was to be constructed to compete against the formidable Pennsylvania Railroad. The alignment was cleared, the railroad bed surveyed, and the boring of nine tunnels started. However, due to a settlement between the competing railroad owners, work on the South Penn Railroad was stopped. The abandoned railroad bed sat idle for many years.

Then, in 1934, an idea was proposed of building a four-lane, all-weather, toll road utilizing the old abandoned South Penn Railroad bed. On May 21, 1937, Act No. 211 was signed into law, authorizing the construction of a 160-mile toll highway between Middlesex, Cumberland County, and Irwin, Westmoreland County. It also created the Turnpike Commission to supervise the project. The law stipulated, however, that not a cent of State tax money should be spent; it was up to the Commission to handle the financing through the sale of bonds. The bonds were to be paid off by revenues generated through tolls.

Ground was broken on October 27, 1938, and in 23 months time, motor vehicles were traveling the "Dream Highway". The original section employed over 1,100 design engineers and 155 contractors from 18 states for a total work force of 20,000. More than 5,000 men worked on seven tunnels at one time.

On October 1, 1940, the road built on the South Penn Railroad alignment was officially opened to traffic at a total cost of $70 million. America's first long-distance superhighway was an immediate success. More than 26,000 vehicles were using it daily. That skyrocketed to over 2.4 million in twelve month's time. This was far more than the 715 cars per day estimated in a 1939 study by the Bureau of Public that also stated toll roads would be big money losers (so much for studies).

For the first time in the history of roads in Pennsylvania a superhighway existed which provided free flow of traffic 160 miles across the State. The Turnpike was termed the foundation of a nationwide system of superhighways and sixteen years later the National System of Interstate and Defense Highways was legislated and funded by Congress. The PTC was the forerunner of all other toll roads in the country.

Due to the success of the original section of the Turnpike, other extensions followed. It was extended to Valley Forge in the east in 1950, and then onto the New Jersey border in 1954. To the west, the Turnpike was extended to the Ohio line in 1951. The Northeast Extension opened in 1957, and took the Turnpike north to Scranton. In 1992, the Beaver Valley Expressway was completed, and in 1993, the Amos K. Hutchinson Bypass was completed, both in the western part of the state, bringing the total mileage to approximately 500 miles of toll road.

The Liberty Tunnels — A Look Back in Time

By Matthew Jon Leech
Undergraduate Student, College of Earth and Mineral Sciences
The Pennsylvania State University

Why the Tunnels Were Created

The early 1900's was a booming period for the city of Pittsburgh. With the city expanding in nearly all directions, Mount Washington acted as a barrier between the city and the South Hills. The only way the city was accessible from the South Hills was by way of a series of inclines, or through the West End. This slowed the development of the South Hills area leaving it to be mostly rural farmland. Many people thought that if the ease of accessibility to the South Hills was improved, this would lead to an increase in land value and development of the South Hills.

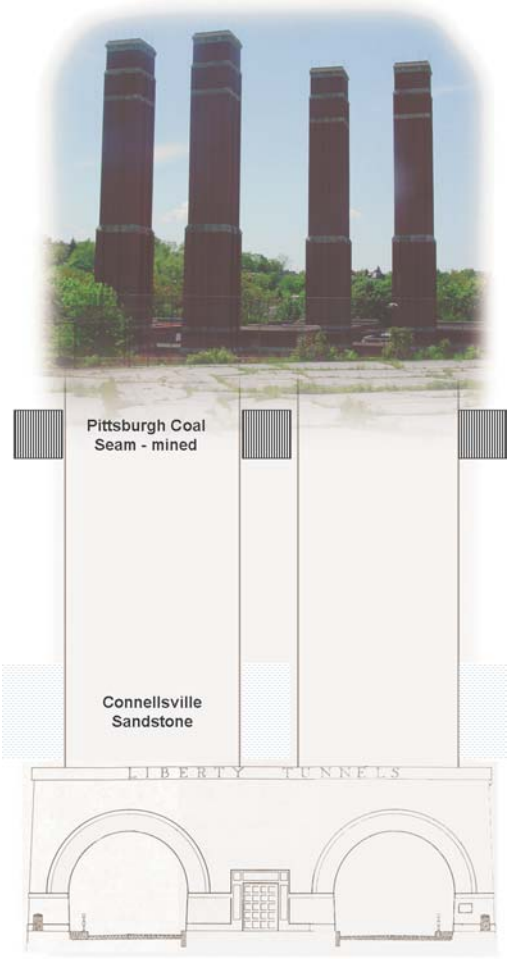
The first passage through Mt. Washington was a coal railroad run by the Pittsburgh & Castle Shannon Railroad which began to carry passengers through the mined Pittsburgh Coal Seam in 1871. This tunnel entered Mt. Washington above South Hills Junction and exited Mt. Washington next to an incline station at Nimick St. (now known as Neff St.).

The first tunnel that traveled through the base of Mt. Washington was a streetcar tunnel built in 1904 by William Flinn, a politician and contractor. This was the first direct route from the South Hills, but still with limited accessibility.

It was the advent of the automobile which pushed residents of the South Hills to persuade the County Commissioners to construct an automobile tunnel through the base of Mount Washington. The County Commissioners agreed that a tunnel was necessary for the growth of the South HIlls, but did not act upon this idea immediately. There were many proposals for this tunnel through the early 1900's, but it wasn't until 1919 that the County Planning Commission awarded the contract to Booth and Flinn, Ltd. starting the construction of the Liberty Tunnels.

Location of the Tunnels

Both politics and geology played a major role in the location of the tunnels. Neighborhoods on both the North and South portals of the tunnel proposed locations that would be most favorable for themselves.



> "The first passage through Mt. Washington was a coal railroad run by the Pittsburgh & Castle Shannon Railroad which began to carry passengers through the mined Pittsburgh Coal Seam in 1871."

One proposal called the Shingiss-Haberman plan was known as the high tunnel. In this proposal the northern portal was to be placed on Mt. Washington above East Carson St. and Arlington Ave. which was then known as Brownsville Ave. The southern portal was to be near South Hills Junction at Haberman Ave. and Warrington Ave. then known as Washington Road. The tunnel would then be connected to a double-decker bridge crossing the Monongahela River and connecting to Shingiss St. near Duquesne University.

The setback of this plan was that the location of this tunnel was directly underneath the mined coal seam. This would most likely have led to the collapse of the mined coal seam during construction which in turn would have resulted in an unstable tunnel roof.

The proposal which followed a low line was known as the Bell Tavern plan. This plan placed the southern portal at Saw Mill Run and the northern portal at the P.J. McArdle Roadway. This proposal was selected and became what is now known as the Liberty Tunnels.

Construction of the Tunnels

Construction of the tunnels began in 1919 with the boring of the

> "At the time of its construction, the tunnels were looked upon as an engineering marvel."

tunnels being completed in July of 1922. It wasn't until January 1924 that the tunnels were completed and opened to traffic. Steam driven machinery was used to make this massive bore through the mountain.

The tunnels have a length of 5,889 ft, a vertical clearance of 14 ft. 6 in., and a width of 28.6 ft. The tunnel has a slightly upward slope towards the Saw Mill Run portal, placing it 20 feet higher than the northern portal.

The tunnels were bored through the base of what is known as the Connellsville Sandstone. This sandstone layer is extremely resistant, and therefore is practical for the location of the tunnels. It provides support for the tunnel roof, making the tunnel extremely strong and stable.

Although the tunnels were completed in 1924, it wasn't until 1928 that the Liberty Bridge was opened. With the opening of the bridge, a direct route from the South Hills to the City of Pittsburgh emerged helping to speed the growth of the South Hills.

Unusual Features of the Tunnels

At the time of its construction, the tunnels were looked upon as an engineering marvel. This two-mile cut through a 400 foot mountain was one of the longest tunnels of its time.

The most unusual feature of the tunnels is the ventilation shafts. The tunnels were first constructed with no ventilation shafts due to the limited amount of traffic traveling through the tunnels. It wasn't until a mass-transit strike temporarily shut down the trolley service that the residents of the South Hills began to rely heavily on their automobiles. With an increased number of automobiles entering the tunnels, the amount of carbon dioxide gas became dangerously high, and the amount of cars entering the tunnels had to be regulated.

The solution to this problem was the creation of two pairs of 200-foot vertical ventilation shafts which continuously pumped clean air into the tunnels. The ventilation shafts are controlled by a mechanical plant located on the top of Mount Washington. The tunnel engineers worked alongside the U.S. Bureau of Mines to design these ventilation shafts with their construction completed in 1925.

Passageway to the City:

The Liberty tunnels were truly the key to the rapid expansion of the South Hills. The varied topography of the city of Pittsburgh and its engineering features are what give the city its character. The tunnels have withstood the test of time, and still to this day transport a large volume of people to and from the city on a daily basis.

Flight in Pittsburgh: Flying Through History

When Greater Pittsburgh International Airport opened in 1952 it was considered the "Taj Mahal" of airports. The airport terminal would serve southwestern Pennsylvania for 40 years.

By Danielle Trautman
Communications Department
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Birds undoubtedly inspired attempts and advances in flight, as they soar effortlessly through the air. This inspiration led to many early attempts at the possibility of humans in flight, varying from Leonardo da Vinci's Ornithopter flying machine design to the hot air balloon. Soon, an array of gliders had surfaced with a variety of attempts in flight. It wasn't until 1903 that the Wright Brothers successfully accomplished flight with the *The Flyer* at Kitty Hawk.

Today, advances in flight have brought aviation to be the primary means for long trips in business, vacation, cargo and military. Southwestern Pennsylvania has a strong role in the history of the aviation industry, having led the way in mail cargo, control tower operations and expanding airport services.

Pittsburgh's first airfield was Mayer Field, started in Bridgeville by Casper P. Mayer in 1919. Unfortunately, this small airfield only lasted until the end of World War II. Rodgers Field soon became Pittsburgh's first municipal airport, named in honor of the first man to fly an airplane from New York to California, Pittsburgh native Calbraith Perry Rodgers. Rodgers Field remained in operation until the opening of Allegheny County Airport in 1931.

1947, April 26: 20th Air Mail Anniversary

Bettis Field

The beginning of flight in Pittsburgh began with the founding of the Aero Club of Pittsburgh in 1909. Bettis Field, also known as Pittsburgh-McKeesport Airport, later became the air flight hub of the area and served as the landing area for the arrival of civilian mail via early mail planes, including Miss McKeesport, Miss Youngstown and Miss Pittsburgh. The first airmail flew into Bettis Field from Cleveland on April 27, 1927. Bettis Field was also the landing spot for Col. Charles Lindbergh shortly after his trans-Atlantic flight and a frequent destination for Amelia Earhart, America's most famous aviatrix.

Under his philosophy of "Build a nest and the birds will come," Clifford Ball found his calling in aviation. Ball helped in founding Bettis Field and it was here that he began a company that flew Pittsburgh's first airmail. However, in 1928 Pittsburgh pilots began to carry more than just mail cargo. At $20 per person, Clifford Ball flew passengers to Cleveland while they would sit on top of the mailbags. The first passenger was vaudeville performer Will Rogers.

Ball started Path of the Eagle airline, which changed hands through Pittsburgh Aviation Industry Corp., Pennsylvania Airlines, Pennsylvania-Central Airlines Corporation, and Capital Airlines. Eventually, Capital Airlines was acquired by United Airlines.

> **"At $20 per person, Clifford Ball flew passengers to Cleveland while they would sit on top of the mailbags."**

Allegheny County Airport

"Repeated each day on the wide sweep of the Allegheny County Airport a drama of what is probably man's greatest scientific accomplishment of the 20th century — Flight. There on a regular schedule, the big planes arrive and depart. It is fitting that the Allegheny County Airport should be a principal terminal on the great network of airlines across the American continent for it was in Allegheny County that the first scientific approach to solution of the problem of human flight was made. Samuel Pierpont Langley began testing flying machines in 1880 at the Allegheny Observatory and authored the book: Experiments in Aerodynamics." — George E. Kelly

On September 11, 1931, the Allegheny County Airport opened and became the successor to Bettis Field, consisting of 432 acres, three runways and a 24-hour operating control tower. With passengers increasing from 7,772 to over 1,000,000 in 1952, this became one of the largest airports in the U.S. at the time. The Air Reserve Units and the Air National Guard also used the field as their base during this time.

1931, September 11: Allegheny County Airport opens and becomes the successor to Bettis Field

A large group of dignitaries dig in as ground is broken on Pittsburgh International Airport on June 26, 1987.

Airlines also grew at Allegheny County Airport. Pennsylvania Air Lines and Central Airlines merge to create the Pennsylvania Central Airlines Corporation (PCA) in 1937 based at Allegheny County Airport. Mail flights were still taking place regularly from Allegheny County Airport. In 1939 All American Aviation, Inc. began flying regularly scheduled airmail flights with the first two routes to Philadelphia and Huntingdon, WV.

In 1936, five years after opening, an air traffic control station is opened at Allegheny County Airport to alleviate congestion, raise safety and increase air traffic. Though commercial scheduled aviation ended at Allegheny County Airport when Greater Pittsburgh Airport opened in 1952, Allegheny County Airport remains open today, supporting over 1,500 jobs in western Pennsylvania. Its operations include corporate aviation, air medical services, flight training and aviation maintenance and serves as the base for Pittsburgh Institute of Aeronautics, Pittsburgh Flight Training Center, STAT MedEvac, and the Allegheny Flying Club.

Pittsburgh International Airport

Ground was broken for Greater Pittsburgh International Airport on July 18, 1946 with six years of construction to come. Considered the "Taj Mahal" of airports, the Greater Pittsburgh International Airport opened in 1952 and served southwestern Pennsylvania for 40 years. Clifford Ball was also the first director of Greater Pittsburgh Airport upon its opening.

Big changes were soon on their way for flight in southwestern Pennsylvania. In 1987, US Airways signed a memorandum of understanding with Allegheny County that allowed work to begin on a new airport. The next year, 11 airlines had signed a 30-year lease. After five years and $837 million, the new Pittsburgh International Airport (PIT) opened with 800 public telephones, an 8 million-gallon fuel farm, 1,340-foot moving sidewalk from the parking lot to the Landside Terminal and 74 restrooms. Ribbon cutting for PIT took place on October 1, 1992.

The Terminal at Pittsburgh International Airport is a series of three buildings linked by a variety of people moving transportation means. With the airplanes at one end and the parking lot at the other, travelers need only take a few steps to cross more than half a mile from the landside to airside terminal. A model to other airports around the world, the design of the terminal

Pittsburgh International Airport today: Still a world-class facility.

> **"JD Power and Associates named PIT among the top five airports in its two most recent customer satisfaction surveys."**

was planned to simplify aircraft movement on the airfield and ease pedestrian traffic to the gates.

Pittsburgh International Airport (PIT) is a world-class facility that accommodates more than 14 million travelers in nearly 400,000 aircraft operations per year. With about 380 non-stop flights per day to 80 destinations, Pittsburgh International Airport is served by 21 air carriers as well as being a US Airways focus city. PIT has been frequently recognized for its quality in meeting traveler's needs. The OAG Worldwide listed the facility to its short list of the world's best airports for four consecutive years. The market research leader, JD Power and Associates named PIT among the top five airports in its two most recent customer satisfaction surveys. Conde Nast Traveler's Magazine named PIT among the best in the United States and in the world in its People's Choice Award.

Airports today have more than the ticket counters, baggage belts and airplanes. With a variety of passenger services and businesses operating out of airports such as Pittsburgh International Airport, daily operations include more than air flights. While pilots, engineers and scientists are making further advances in flight, many airports are also making advances in retail and additional functions that an airport can incorporate.

Opening in 1997, the AIRMALL at Pittsburgh International Airport was the first retail operation of its kind in a U.S. airport. Operated by BAA Pittsburgh Inc., the AIRMALL continues to receive accolades for the quality of its shops and restaurants featuring variety and regular mall prices for passengers. More than 100 of these shops and restaurants are available for passengers to visit during their wait between passing through security and boarding their flight.

Pittsburgh International Airport has also taken a major step into the world of wireless communication, allowing its travelers to reap the rewards with the new WiFi service. Free high-speed wireless Internet service is now offered throughout all four airside concourses, the core, AIRMALL food courts and in the US Airways Club in the airside core. Now passengers waiting for their flights at any of the gates or food court areas can access the Internet with their laptop computers or PDAs (personal digital assistants) — without any fees.

Since opening, PIT has been recognized on numerous occasions for its efficient and creative ways to assist travelers and has become a major economic generator for southwestern Pennsylvania. In the last year, airlines have launched new service from PIT, new routes have been added, and development surrounding the airfield is continually growing.

U.S. Army Corps of Engineers – Pittsburgh District A Reflection on Transportation

By Joyce Voynick and COL Stephen L. Hill with paraphrased excerpts from "The Headwaters District — A History of the Pittsburgh District, U.S. Army Corps of Engineers" by Dr. Leland R. Johnson

The Pittsburgh area has a rich heritage in the development of our county and the waterways in our region. Transportation of critical resources, made possible by the development of navigable inland waterways, significantly contributed to the economic wellbeing and subsequent industrial expansion of our nation. The rivers in our area provided a vital transportation lifeline for the early pioneers both in their quest to move westward and by providing those early settlers with the goods and products that would fuel the nation's economic prosperity. Today our rivers serve a dual purpose – they provide a very important means of transit for numerous commercial products and they meet a growing public thirst for recreational activities such as the Bassmasters Classic conducted on the Allegheny, Monongahela and Ohio Rivers this year. The U.S. Army Corps of Engineers played a critical role in the early development of inland waterways and remains fully engaged in the current operation and maintenance of a multitude of facilities that support transportation and recreation needs. It is likely that the continued prosperity and economic wellbeing of our nation will, to some extent, hinge on the successful use and continued development of these economically viable lifelines know through the region as the "Three Rivers".

Figure 1 – Keelboats replaced several previous bateaux and were designed to ascend the Ohio by sailing before prevailing winds or, when winds were unfavorable, by crewmen walking along the gangway pushing on poles to force the boat upstream.

The U.S. Army Corps of Engineers is an organization comprised of approximately 34,600 Civilian and 650 uniformed military members worldwide who work hand in hand as leaders in engineering and environmental matters. The Pittsburgh District of the U.S. Army Corps of Engineers is charged with operating and maintaining multipurpose reservoirs along with locks and dams to ensure continuation of navigation on the Monongahela, lower Allegheny and upper Ohio Rivers.

Pittsburgh District, known as the Headwaters District (which refers to the sources and upper waters of a stream), serves the region surrounding the Allegheny, Monongahela and Beaver Rivers and their tributaries to their sources, and the upper Ohio River. Many pioneer marine engineers and waterways shippers lived and served within the boundaries of the Pittsburgh District. The first flatboats, keelboats, steamboats, barges and towboats were built throughout the Pittsburgh region as it developed during critical periods in our nation's history as the cradle of American inland river commerce. The Army Engineers started their first experiments with waterway improvements clearing snags and constructing dams to open river channels for reliable commerce. The Pittsburgh District tried so many innovative waterways engineering methods that it became the empirical "experiment station" for the entire inland rivers system.

The history of transportation and development of viable waterways in the region dates back to 1739 when Captain Le Mercier, chief of Canadian engineers, cleared snags for navigation from what is currently known as French Creek for French troops advancing into the present day Pittsburgh region. Captain Le Mercier became the first engineer to improve a stream for navigation in the Ohio River basin and set the course for what would eventually become one of the largest inland navigation areas in the country.

Navigating the Ohio River during even the best seasons, summer and fall, was demanding and hazardous. Preparation throughout the year was critical and led to in-

creased navigation success and profit. Boats were constructed in the fall, shippers loaded cargo in the winter and readied vessels for departure as soon as the ice broke in the spring. George Morgan, looking for ways to increase profit, built the first keelboat on the Ohio at Fort Pitt in 1768. The keelboat, called "la barge" in Louisiana, had an 18 inch runway along which the crew walked when poling the boat upriver. Keelboats ranged from 40 to 80 feet in length, 7 to 10 feet in width and drew about 2 feet of water when loaded. However, there were a few large "barges" that were up to 120 feet in length, 20 feet in width with a four foot draft. Keelboats greatly reduced transportation costs and, by the year 1800 were used for hauling the necessities of life upstream on the Allegheny, returning with agricultural staples shipped down by the pioneers.

The mass migration over the mountains and down the inland rivers after the American Revolution was the largest migration since the medieval crusades. The pioneers gained access to the Allegheny River at Olean, the Conemaugh River at Johnstown, the Youghiogheny River at West Newton, the Monongahela River at Brownsville or the Ohio River at Pittsburgh, Wellsburg or Wheeling. In 1788, 323 boats passed down the Ohio, carrying 5,885 people, 2,714 horses, 937 cattle, 245 sheep, 24 hogs and 267 wagons. In contrast, last year about 230 million tons of cargo transited the Ohio, with coal comprising about 50% of the freight, followed by petroleum, chemicals, farm products and manufactured goods.

When the Army supply market ended in 1782 merchants with interests in Pittsburgh began to diversify their enterprises. William Turnbull, Peter Marmie and others opened a distillery, built a sawmill on the Allegheny, retailed boats which were built at Elizabeth on the Mon and tried to establish a saltworks on the Mahoning River near present day Youngstown. In 1790, Turnbull and Marmie also developed the Alliance Iron Furnace on Jacobs Creek, a tributary of the Youghiogheny. It is claimed that this furnace, the first west of the Alleghenies, started the iron and steel industry central to the area economy.

Figure 2 – At the time of its completion, Tygart Dam was the largest concrete gravity dam east of the Mississippi River.

> "Today there are 23 locks and dams on the three rivers in the Pittsburgh District."

Under the guise of Spanish citizenship, pioneers of the Pittsburgh region slipped produce through the Spanish blockade and by 1798 over a million dollars worth of commodities arrived at Spanish controlled Natchez in Ohio River flatboats. By 1802 the flatboat commerce had grown to 45,906 tons valued at $4.5 million. Flatboats went west and south from all ports in the Headwaters District, but the port with the greatest volume of flatboat commerce was present day Wellsburg, West Virginia. Perhaps the first "modern" river terminal in the region, Wellsburg millers built a four story warehouse over Buffalo Creek to load flatboats with flour using a pulley system with a rate of five barrels a minute. Of the 23,591 barrels of flour arriving at New Orleans in 1805-07, 69% originated at the port of Wellsburg.

The fundamental commercial institutions of the Pittsburgh region were shaped by flatboat commerce. Farmers paid for their land and their necessities in installments of produce which the merchants shipped downriver. Farmers, merchants, real estate speculators, millers and bankers came to rely on an elaborate marketing system composed of mills, warehouses, flatboats and a credit system in trade.

During the early 19th century commerce continued to increase and created a need for more reliable means to transport a growing volume of goods. For example, during a drought period in April 1819 a boat drawing only 14 inches of water took 35 days to float from Pittsburgh to Cincinnati. The owner said he grounded at least 50 times on ripples where the river was only 10 inches deep. A survey of the Ohio River that same year indicated there were 102 major obstructions between Pittsburgh and the Falls of the Ohio at Louisville. In 1821 work began with state funding to make permanent improvements by removing fishdams, rocks and timbers and deepening the channel by confining river flow to deeper channels. The first federal dam on the Ohio, constructed in 1824 by Stephen Long, was a wing-type dam built at a compacted sand and gravel bar that had only 15 inches of water over it during dry spells. Sand and gravel accumulated around the Long wing dam, making it nearly impervious, and it served navigation until 1872 when it was repaired and extended.

Navigation continued to evolve and improvements led to increased commerce and population growth. Unfortunately record flooding events demonstrated the powerful impacts of unrestrained water and the public began to request assistance to protect the growing economic base in the Ohio River basin. Initial requests to the Army Corps of Engineers yielded little assistance because of legal limitations regarding federal support through the Corps. The Corps was bound by law to undertake only projects that would benefit navigation. During a critical period in 1884, public clamor for flood protection was so intense that Congress, despite strong hesitation to expand authorities, took the first steps to provide flood control in the Ohio River basin.

To reduce flooding situations, the Corps of Engineers' Pittsburgh District constructed a series of 16

reservoirs, beginning in 1938 with Tygart Dam in Grafton, West Virginia and finishing with Stonewall Jackson Lake in Weston, West Virginia in 1988. These reservoirs serve multiple purposes including retaining up to 40% of the run-off during high water or heavy rainfall events to reduce downstream flooding. The reservoirs also meet other water resource requirements including recreational use.

Many improvements in navigation have occurred since the early efforts in the 19th century. The first Federal dam on the Monongahela was built in 1879; Davis Island, the first lock and dam on the Ohio, was built in 1884; followed by the first lock on the Allegheny River in 1902. Today there are 23 locks and dams on the three rivers in the Pittsburgh District. These locks and dams serve a critical function, facilitating navigation by maintaining pools of sufficient depth to permit the transit of commercial navigation. Without the locks and dams, water depths in some locations would drop to less than a foot and prohibit the flow of commercial traffic.

The most recent addition on the Pittsburgh rivers is a new dam at Braddock. The new Braddock dam is an integral part of the improvement of our aging river infrastructure. This historic lock and dam replacement, renowned for its innovative "in-the-wet" construction methods, will serve the region and nation for the next 50-100 years. Other current efforts to improve and sustain the regional inland waterways system include the on-going work on the lower Mon River. The new Charleroi Locks, scheduled for completion by 2019, will set in motion another series of actions that will eliminate the need for the current Locks and Dam 3 at Elizabeth.

Figure 3 – The new Braddock gates

Our transportation systems, especially those on the rivers, are increasingly valuable. The Army Corps of Engineers role in the past was to help design, construct and maintain a system of projects that would facilitate navigation, control potential flood waters and provide ancillary recreation opportunities. More recently, Army Engineers have sought to improve methods to rehabilitate, replace and sustain these critical components of the nation's infrastructure. However, maintaining and sustaining are not enough in our fast moving and competitive world. The future of our nation depends on our efforts to increase the reliability of our transportation systems while decreasing their risk of failure. In an aggressive effort to increase navigation system reliability, the Port of Pittsburgh in cooperation with the Corps of Engineers and other partners are developing new initiatives. One promising initiative is the "SmartLock," a program that will automate some aspects of navigation by providing river pilots tools similar to those used by airplane pilots when landing or flying in bad weather. Already a successful program, this capability is positioned to revolutionize river commerce yet one more time. In the future you can expect to hear river pilots talk about "flying the ball" and you will know that they are using technology developed in the Pittsburgh region.

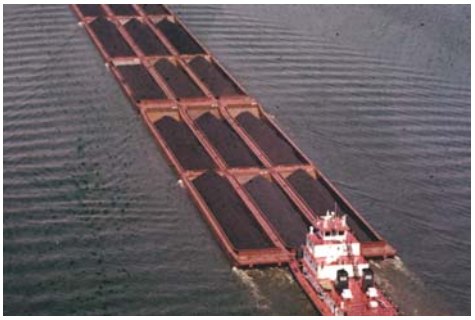

Figure 4 – Coal river transport

SmartLock is significant for another reason as well. The events of 9/11 changed many aspects of our world and the impact is being seen locally. The majority of the nations' imports arrives at coastal ports, are processed, and then transported by truck or rail to final destinations. Unfortunately, as imports increase, so have the delays caused by security screening and processing. In some cases this is occurring to the extent that coastal port processing times are comparable to transport times for goods shipped through Gulf Coast ports, up the Mississippi and northern tributaries like the Ohio River. These new shipping dynamics, along with increasing fuel prices, are likely to create an opportunity or even need to increase shipping on our inland waterways. Increased traffic will surely require the increased reliability anticipated by the SmartLock system.

Increased reliability is important because it can create a more profitable, economical and environmentally sound shipping method on the rivers. An old method that is taking hold in this newly created environment is "Container on Barge" or COB. COB maximizes many different aspects of river transportation and is possible only if our transportation systems are reliable. Watch for COB across the country and consider the positive impacts on fuel costs and decreased environmental contamination caused by other modes of transportation.

The series of locks and dams on the rivers, along with flood control reservoirs, provide navigable waterways in the Pittsburgh area. Our transportation system — the one on the rivers — is a national gem. The river system is a lifeline much like it was over 200 years ago. The Army Corps of Engineers with a growing team of partners and users will continue our efforts to sustain and improve this valuable and critical system. The future of river transportation is bright and necessary. The economic and security of this nation depend on these rivers and we all will benefit from their continued development, improvement and reliability.

The U.S. Army Corps of Engineers' Pittsburgh District — a team on multi-functional professionals poised to face the challenge of the future — delivering integrated regional solutions that minimize risk and enhance reliability for the Nation's infrastructure, water resources and environment.

A Quick Overview of Public Transit in Pittsburgh

By Edward H. Lybarger,
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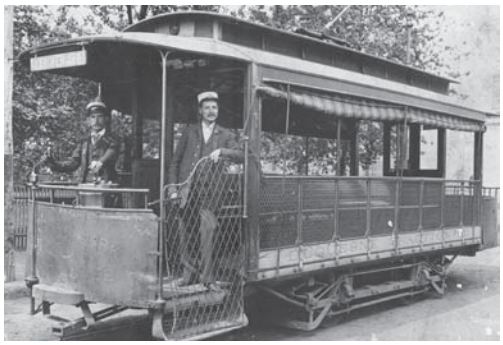
Public transportation as we know it in the Pittsburgh region began, as it did in most communities, with the omnibus. These glorified stagecoaches were franchised by cities to operate over fixed routes, which they did on more-or-less fixed schedules. While the omnibus was faster than walking, and less expensive to ride than a horse was to own, early roads were hardly conducive to rapid transit, often turning to mud in inclement weather.

Over the protests of those fearful of anything new, horse-drawn railcars appeared on the streets of New York in 1832. The steel (or iron) wheel on a steel (or iron) rail was a major leap in technology, for it simultaneously made for a (relatively) smooth-riding surface while reducing the rolling friction enough to double the operating speed. Fewer horses were required and their jobs were easier.

Horse-drawn streetcars appeared in Philadelphia in 1858 and in Pittsburgh a year later. The Citizens Passenger Railway Company opened for business on August 5, 1859, on a route extending from the present Sixth Street along Penn Avenue to 34th Street. Once the popularity of this service was established, other companies followed quickly, eventually expanding to a network totaling 35 miles of track serving the city well for the next thirty years.



1890s Electric Car

But the horse cars had their drawbacks — a maximum speed of just five miles per hour, high feed, stabling and veterinary costs, and the undesirability of tons of animal waste deposited on the streets daily. In October 1888, a cable railway system was in place along Fifth Avenue, running from Downtown through Oakland and ending in East Liberty, replacing the horses. Two more cable car lines were built before the "ultimate" answer emerged.

Cable railways entailed heavy, expensive and invasive infrastructure under the streets, and although again faster than their predecessors, tended toward unreliability and high operational costs. As they were being built, in fact, the city's first experiments with electrical propulsion were taking place. Early installations on the South Side and in the City of Allegheny taught valuable lessons which were quickly learned.

By the spring of 1890, Pittsburgh's first permanent and successful electric streetcar line was in operation from Downtown to Glenwood. The Second Avenue Traction Company demonstrated conclusively the superiority of electric propulsion over previous modes. Other operators quickly converted to the new trolleys, named after the rolling wheels that rode the high-voltage electric wires in the first experimental lines. And in typical entrepreneurial fashion, new entrants lined up to request franchises so they could employ this lucrative technology.

1905 High-Floor Car

Expansion in the 1890s was rapid, until the industry got caught up in an economic downturn (we would call it a recession today) during 1893-94, leading to a first major round of mergers and consolidation. Then, as now, it was practical to buy out your competitor to prevent price wars. By the end of the decade, only three main operators remained, and they in turn combined at the beginning of 1902 to form the Pittsburgh Railways Company, which itself was part of a conglomerate known as the Philadelphia Company, parent of Equitable Gas and, from 1912, Duquesne Light, along with a number of smaller entities.

Because the new trolley company had many obligations to its underlying predecessors and their bondholders, and to the municipalities in the form of taxes and street maintenance requirements, little revenue was left for new equipment to handle increasing loads. PRCo quickly became unpopular in the eyes of the public because of their apparent indifference to the riders' needs, and the feeling intensified when the local owners sold the company in 1906 to the San Francisco-based United Railways Investment Company.

Though the new owners retained local management and slowly re-equipped the system with larger, state-of-the-art low-floor streetcars, the goodwill of the public had been lost — a situation that would haunt the company for decades, regardless of all the positive improvements that were undertaken. It was easier to remember, for example, that transfer privileges were withdrawn on holidays (large traffic days) to increase the company's revenue than to acknowledge that several hundred new streetcars were acquired (on two occasions, no less) at great cost to provide a better ride.

The low-floor vehicle, so popular in transit operations today, was conceived by PRCo General Manager P. N. Jones and placed in ser-

Low-Floor Car

vice in 1910. Although those first cars were trailers, Jones soon prevailed on his former colleagues at Westinghouse Electric to develop a smaller-diameter, lighter-weight motor that would fit under these car bodies. By 1914, the first of 840 low-floor motor cars were in service, along with 225 trailers, to serve the system that would reach maximum size four years later with 606 miles of track.

PRCo struggled through the 'teens and entered its first receivership in 1918, occasioned by wartime inflation, service disruptions due to weather and maintenance lapses, and accident claims, along with the City's refusal to permit a fare increase to pay for all this. The bankruptcy allowed the company to abandon some of its underlying obligations (along with the predecessor companies claiming them), while a valuation was established (under state auspices) for rate-setting purposes. Municipalities were no longer able to set fares, as the courts upheld a ruling by the Public Service Commission that it alone was in control of rates.

> **"The PCC car's riding qualities, seating comfort and acceleration characteristics (faster than most autos of the day) made it an effective competitor and helped to stanch patronage losses."**

Before the receivership was lifted in 1924 the company embarked on a major capital program that included 618 of those low-floor cars, and much track and bridge improvement work. At about the same time, the company (and its parent) were sold again, this time to the Standard Gas & Electric Company of Chicago, whose Byllesby Engineering and Management group was brought in to run the show. Unfortunately, passenger counts had peaked in 1923, and no one knows what their progressive management could have done with transit in an era of growth.

There would be no more growth until the Second War; revenues began to decline immediately, but until late 1929 the levels were sustainable. The automobile was here to stay, and the Great Depression took away what the auto missed. PRCo and other transit operators well understood the need to further modernize in an attempt to stay competitive. To that end, they formed their Presidents' Conference Committee, charged with the development of a modern streetcar.

In 1936, the streamlined PCC car was a reality, and within two years more than 200 of them were on Pittsburgh streets, supplementing cars that were little more than ten years old. The PCC car's riding qualities, seating comfort and acceleration characteristics (faster than most autos of the day) made it an effective competitor and helped to stanch patronage losses. Pittsburgh Railways would go on to own 666 of these popular cars.

Although bus service in the area began as early as 1911, it was not until the 1920s that it came into its own. By this time, the economics of extending rail lines were no longer favorable, and roads had improved to the point where reliable motor coach service could be operated into areas needing transit. In 1925, PRCo formed a subsidiary, the Pittsburgh Motor Coach Company, which bought out the Pittsburgh Auto Transit Company. The latter firm had been in operation since 1913, and ran from East Liberty to Downtown. PMC developed many new routes through the next three decades, as did the 30-some independent bus operators in Allegheny County.

During the Depression, PRCo became unable to pay all its obligations to bondholders of the old underlying companies, and again entered bankruptcy in 1938. While the bankers and lawyers (and the politicians) all struggled to figure out how they could benefit from the reorganization proceedings, World

PCC Car in Homestead

1980 LRVs on the Overbrook Line

War II intervened. The lack of new autos, plus gasoline and tire rationing, brought back rider counts reminiscent of the 1920s. This cash flow permitted the purchase of 465 PCC cars during the receivership, but the war's wear and tear on the infrastructure was devastating. A handful of trolley lines had been converted to bus by the end of the war, but most still ran and were in need of renewal.

By 1949, automobile supply had caught up with demand, and transit patronage again took a nosedive. PRCo came out of bankruptcy in 1951 into a declining market, and almost immediately began replacing shuttle routes with buses. This process was extended to through routes during the next two years, and eliminated the biggest money losers. The company's labor relations had become contentious in this period of declining revenues, and a lengthy strike in 1954 (among others) drove even more riders away for good. Many of the independent bus lines were having tough times, as well, as the steel industry reached full maturity and began the first stages of decline.

Community leaders had for some years been calling for a unified, county-wide transit operation, and their dreams were fulfilled in 1964, when the publicly-subsidized Port Authority of Allegheny County (PAT) took over 33 private companies and began their integration. Rail lines were converted to bus as quickly as new vehicles could be acquired, yet fare increases brought about more rider losses. In the early 1970s, PAT began to aggressively market transit, and made it highly visible through bold paint schemes on buses and trolleys, while promoting new express service to many areas. Also during this era, PAT proposed a controversial rapid transit system to replace the last of the South Hills streetcars.

That plan foundered amid community rejection in the affected areas, and in the 1980s the trolley lines were upgraded to modern light rail standards and re-equipped with modern cars. Most recently, a rail corridor dating from the 1870s was rebuilt and was reopened in 2004. Bus-only roadways lead east, south and west from the city for fast getaways, and a small number of through-route buses have been added, the one to Pittsburgh International Airport the most popular. Otherwise, the Port Authority route map in 2005 looks remarkably like the one of 40 years ago.

Passenger counts on the buses continue to droop as the city's population tumbles (it is about half of what it was in 1950) and automobiles are almost universal. Transit funding is again a major issue, just as in the days before the Port Authority, when it was claimed that only public ownership would permanently solve the funding shortfall problem.

Light rail is showing steady to rising ridership, and plans are to take the system north of the Allegheny River, where future extensions could go in each of two directions. But unresolved is the future of the corridor with the greatest need – Downtown to Oakland and beyond. Had the politicians of a decade ago not interfered, we might be riding it today!

DUQUESNE INCLINE OPENS MACHINE ROOM

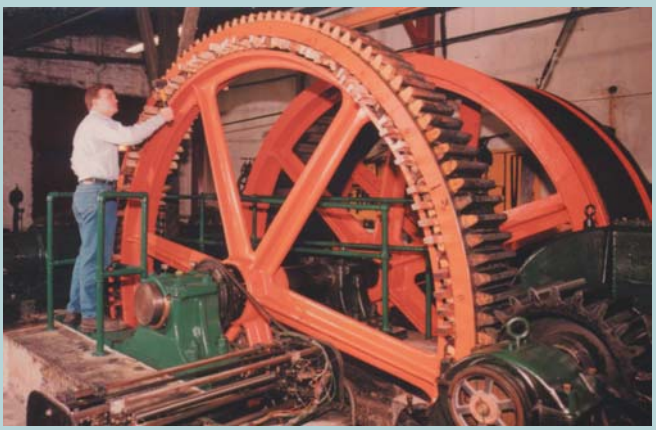
By David J. Vater, Registered Architect

One of the few remaining mechanical devices representative of the industrial prowess of old Pittsburgh, the age of steam, the era of steel, and the dawn of modern engineering, the Duquesne Incline faithfully climbs and descends Mt. Washington on its 800 foot long tracks pulled by braided steel cables and massive revolving gears installed in 1877, 128 years ago by Pittsburgh engineer Samuel Diescher.

Earlier this year, thanks to a Federal T-21 grant, and with the installation of a new stairway and viewing mezzanine, the equipment room at last opened to the public. Visitors can now view the ingenious machinery in actual operation, including a pair of safety cable sheave wheels, the six bull wheels, the 12' diameter cast iron drive gear with 130 pairs of removable wooden teeth that turns the massive cable drum which simultaneously winds one cable on to lift a passenger car and unwinds one cable off lowering the other car. Moments after bells clang alerting passengers that the incline is about to start, all the gears and cables begin to move. Watching the machinery in operation is a wonderful lesson in physics, especially for children.

Samuel Diescher (1839 – 1915) born in Budapest, Hungary, studied engineering in Germany and Switzerland, and in 1866 immigrated to the United States at the age of 27. His Pittsburgh office designed the machinery for the first Ferris wheel at the 1893 World's Columbian Exhibition in Chicago. In 1912 he designed a mechanical apparatus to generate electricity from the ocean for the United States Wave Power Company. He also designed local bridges, highways, street railways, coke works, water works, rolling mills, and over a dozen inclines in North and South America.

The Duquesne Incline is open 365 days a year. It was named a National Historic Mechanical Engineering Landmark in 1977.



The Horseshoe Curve: 150 Years of Engineering Heritage in the Railroad City

By Dana L. Shoemaker
Railroaders Memorial Museum
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PR & Development Director

When visiting the lush mountains of western Pennsylvania, one can feel a sense of frontierism, with nature still in control, and it could almost seem impossible that almost 110 million gross tons of economy-driving freight move through them each year, pulled by Norfolk Southern diesel engines that squeal around the world famous Horseshoe Curve in a style that has not changed since the Curve's opening for westbound service in 1854. It almost seems ironic that these same mountains are literally the reason that the Horseshoe Curve was created so industry could literally climb the mountains.

The story begins in April of 1846, when the Pennsylvania state legislature passed an act that incorporated the Pennsylvania Railroad (PRR) in order to be competitive with the northern opening of the Erie Canal by the state of New York in 1825 and the start of the Chesapeake and Ohio Canal and Baltimore and Ohio Railroad in 1828. The Commonwealth of Pennsylvania realized that its own Pennsylvania Mainline Canal was an aging system of transportation and moved to establish its own railroad in order to not have business taken away north and south of its borders.

Using the canal routes for most of its track path, the PRR began to lay track westward under the supervision of John Edgar Thompson, civil engineer, who eventually became the president of the PRR. The project advanced along the Susquehanna and Juniata rivers until it came to the base of the Allegheny Mountains at Altoona, where the necessity of developing a creative way of getting over the ridges had to be devised.

Just west of Altoona, the flat valley where track was being put down abruptly met with a mountainside that had deep ravines on both sides, which created grades that were too steep for railroad operations. From the geography, Thompson recognized that there would be a way to bridge the gap by literally filling in, with dirt and earth, a massive area that would deliver the tracks from one ridge to the next. By slicing off the foot of another mountainside, a semicircle would be created, which would support the track system and progress rail traffic westward to Pittsburgh. The construction of this semicircle was done by about 450, mostly Irish, workers, totally by hand. The workers were paid about twenty-five cents each for a twelve-hour day.

The semicircle, more famously known today as the Horseshoe Curve National Historic Landmark, made travel in 1854 from Philadelphia take only about 15 hours to Pittsburgh, compared to 20 days by wagon before the canal system or to 4 days by the canal system and Allegheny Portage Railroad in 1834. Further, a railroad guide that was published in 1862 said that the view from the Horseshoe Curve was the "…the grandest view on the whole route. A vast extent of landscape is spread out before the eye… This horseshoe bend is one of the greatest engineering triumphs of the age."

As travel east and west was made easier by the Horseshoe Curve, passengers were said to have crowded to the windows of the railcars to view the landscapes below, and non-passengers began to take time to watch trains go by on the ridges or from an old dirt road that was once an Indian trail that ascended to the mountainside.

In 1925, the Horseshoe Curve was given its first monument by the PRR — a decorative stone horseshoe that was 34 feet long that was embedded into the side of the mountain leading up to the Curve and tracks.

As the area developed, due to the Altoona municipal reservoir system below along Kittaning Point Road, the road to the Curve was eventually hard-surfaced around 1922, making it easier for non-passengers to access the area to view the tracks above and the landscapes below. In 1940, the PRR gave the city of Altoona a permit to use part of the land near the Curve to accommodate visitors who came to watch trains.

The Curve became an icon of railroading in America, as well as it helped to give birth to the city of Altoona, the home of the PRR. The knowledge that the Curve was a symbol of prosperity did not belong only to those who lived in the United States, but was also information that fell into the hands of the Third Reich, which had plans to sabotage the Curve and Gallitzin Tunnels, as evidenced by the capture of eight saboteurs on June 13, 1942 off of Amagansett, Long Island, New York and off Jacksonville, Florida. It's reported that the saboteurs all had at one point lived in the United States, and that between them they had $170,000 in cash and plans for two years of sabotage, which included twelve key targets — one of which was the Horseshoe Curve in Altoona, PA.

In its 150 years in existence, the Horseshoe Curve has gone from a solution to transgressing the Allegheny Mountains to accommodate westward expansion, to a National Historic Landmark over which many passengers, to the likes of Abraham Lincoln, Theodore Roosevelt, Harry Truman, Jimmy Carter, and many other famous people like George Burns and other vaudeville stars have traveled.

Today the Horseshoe Curve is available to everyone to view trackside, thanks to the National Park Service, which helped to upgrade the amenities and site in 1992 to be a beautiful place to train-watch, to photograph the Allegheny Mountains, and to learn about the site or to just relax. And thanks to Norfolk Southern, which owns and operates the freight lines and to AMTRAK, which runs the passenger service trains that run on the Curve throughout the day, observers can witness the exhilaration of 150 years of railroading on the Horseshoe Curve and a piece of what helped the Railroad City below to become known as the "Railroad Capitol of the World".

(Information for this article was taken from Railroaders Memorial Museum archives and tour guide publications.)