



## 1 • Aeronauts

**B**enjamin Franklin was weary. Seventy-seven years old in the fall of 1783 and suffering from increasingly debilitating attacks of gout, he had concluded exhausting negotiations with the British to end the long war of the American Revolution. Even the myriad diversions of Paris seemed incapable of reviving his characteristic zest. With eagerness bred of anticipation, Franklin arrived at the Jardin de la Muette on November 21 to witness the latest experiment of the brothers Joseph Michael and Jacques Etienne Montgolfier, whose hot-air balloons had created a stir throughout the city. Franklin was not disappointed. When Francis Pilâtre de Rozier, accompanied by the Marquis d'Arlandes, cast off in the great blue and gold balloon on mankind's first aerial voyage, the multitude heartily applauded the two adventurers. Twenty minutes later, de Rozier and his companion made a rough but triumphant landing on the opposite side of the Seine. Franklin wrote an English friend of the rapid progress he had seen in the new art of aerostation and remarked: "A few months [ago] the idea of witches riding thro' the air upon a broomstick, and that of philosophers upon a bag of smoke, would have appeared . . . impossible and ridiculous."<sup>1</sup>

What enthralled Franklin and others in Paris in 1783 was the culmination of a vision that had captivated people for thousands of years. Chinese mythmakers as long ago as 1760 B.C. imagined the emperor speeding across the heavens in a flying chariot. Thirteen hundred years later, Greek legend taught that Daedalus created feathered wings for himself and his son Icarus. Others explored the mysteries of the air in medieval England. About 1010 A.D., the monk Eilmer of Malmesbury built and flew a primitive glider,<sup>2</sup> and in the thirteenth century the philosopher and scientist Roger Bacon speculated about the complexities of manned heavier-than-air flight. In Renaissance Italy, Leonardo da Vinci sketched birds in the air and at rest and drafted designs for kites, parachutes, and helicopterlike machines.

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Lighter-than-air flight, however, emerged as an alternative method of lifting man into the skies. As early as the 1600s, the Jesuit monk Francesco de Lana suggested a craft supported by vessels of thin hammered copper pumped void of air. The theory is impracticable because atmospheric pressure would crush any sphere light enough to float through the air.

The Montgolfiers took the first hesitant steps into the atmosphere. Joseph Priestley's books on the properties of gases may have provided the inspiration for the brothers' experiments, but their observations of sparks rising from an open fire probably were equally influential. In November 1782, Joseph Montgolfier had filled a small silk bag with smoke and watched it rise to the ceiling. Further investigations followed, resulting in a successful public test of a larger unmanned balloon on June 5, 1783, at Annonay. Encouraged by the results of this demonstration, the brothers had journeyed to Versailles, where with the assistance of de Rozier, they constructed a still larger hot-air balloon of paper-backed light fabric; this carried three animals aloft in September. Then on October 15, slightly more than a month before the epical free ascension, de Rozier had made a tethered flight. As significant as these early efforts were, the pioneers failed to grasp the principles underlying their creation. The Montgolfier brothers assumed that gases given off by the burning fuel generated the required lift, when in reality their craft rose because heated air was less dense and hence lighter than the cooler ambient atmosphere. For years, hot-air balloonists relied on a noxious combination of half-rotted straw and chopped wool to produce these mysterious gases.<sup>3</sup>

Early technology in lighter-than-air flight followed two distinct avenues, hot-air balloons as used by the Montgolfiers and hydrogen inflated balloons, as employed by their contemporary and fellow countryman J. A. C. Charles. Charles's first experiment took place in August 1783 when his unmanned balloon, fashioned of varnished silk, flew fifteen miles before coming to earth, only to be destroyed by startled and superstitious peasants. At Paris on December 1, 1783, Charles made a dramatic twenty-seven-mile flight with a fellow aeronaut. Through Charles's experiments, the gas balloon attained predominance over the Montgolfier type. Usually filled with hydrogen generated by dissolving iron filings in vats of sulfuric acid, the gas balloon with its suspended light wicker basket took on its definitive

shape and design; few modifications were made to it before the end of the 1800s.<sup>4</sup>

Americans avidly followed these developments in France. Franklin conveyed his early enthusiasm for lighter-than-air flight to associates and friends in Philadelphia, and the city soon emerged as a focal point for ballooning in the new republic. Indeed, until the early twentieth century, historians had assumed from an account published in a Paris newspaper that America's first balloon ascension occurred in Philadelphia on December 28, 1783, when a carpenter named James Wilcox was purported to have gone up in an elaborate contraption rigged under forty-seven small balloons. Wilcox's excursion supposedly ended after only five minutes, when he deliberately burst a number of the balloons to prevent being carried across the Schuylkill River. Allegedly the responsibility of David Rittenhouse and Francis Hopkinson of the Philosophical Society of Philadelphia, the Wilcox flight has been thoroughly scrutinized and found to be nothing more than an elaborate hoax, likely intended as a joke on balloon-mad Europeans.<sup>5</sup>

Despite Hopkinson's role in the Wilcox deception, he and others in Philadelphia took ballooning seriously. In a letter to Thomas Jefferson in March 1784, Hopkinson wrote: "A Gentleman in Town is making an Air Balloon of 6 feet Diameter; it is now almost completed." About the same time Dr. John Foulke began experiments with balloons in Philadelphia. A young graduate of the University of Pennsylvania, he had completed his medical studies in Paris and thus had had an opportunity to study the Montgolfier and Charles balloons. After returning to Philadelphia, he released a small paper hot-air balloon from the courtyard of the Dutch minister's residence on May 10, 1784. This was the first recorded balloon flight in America. The next day, one of Foulke's balloons ascended from the home of the French minister—in Hopkinson's words, "to the great Amusement of the Spectators." Lectures on aerostatics by Foulke enhanced his reputation to such an extent that a friend in England praised him as the Montgolfier of America.<sup>6</sup>

That same spring Dr. John Morgan, a prominent physician and brother of George Morgan, the colonial trader and Revolutionary war Indian agent, led a group of Philadelphians who solicited funds to build a large balloon. The American Philosophical Society was supportive of the enterprise and many of its members expressed great

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interest in the new science of aerostatics. On June 30, a public subscription appeared in the *Pennsylvania Gazette* calling for construction of “a large and elegant Air Balloon” sixty feet high and fifty feet in diameter. Listed were eighty-five well-known residents of the city who were backing the project out of their “love of science and the honour of their country.” This eloquent appeal to Philadelphians’ curiosity and patriotism failed, however, and Morgan’s great balloon was never built.<sup>7</sup>

The collapse of Morgan’s ambitious endeavor to obtain financial support was due in part to the negative reaction of Philadelphia’s citizenry to the spectacular but unsuccessful ascension of Peter A. Carnes later that summer. Having been responsible for a brief flight in a tethered hot-air balloon by young Edward Warren near Baltimore on June 24, Carnes was anxious to try the craft on his own in free flight. He scheduled the exhibition for July 4, but was forced to postpone the attempt. Finally, on July 17, with all in readiness at the city’s prison yard and with some ten thousand Philadelphians watching expectantly, Carnes began the ascension. Benjamin Rush, a friend of Morgan and well known for his lectures in medicine, was ecstatic about the balloon: “Its size, its motion, which was slow and majestic . . . conspired to fill every mind with sensations that were new, solemn, and delightful.” The crowd’s bliss soon turned to chilling apprehension when a sudden gust of wind forced the balloon against one of the prison walls, knocking Carnes from the wicker basket. The balloon then soared free to about one thousand feet before catching fire and falling to earth. The near-disaster cooled Carnes’s enthusiasm for aerostatics and dampened the hopes of Morgan and others who had sought to introduce ballooning on this side of the Atlantic.<sup>8</sup>

Nearly nine years passed before Jean Pierre Blanchard made the first successful manned free balloon flight in the United States. Held in esteem as one of Europe’s foremost balloonists when he arrived in Philadelphia on December 17, 1792, the daring and talented Frenchman already had made the first aerial crossing of the English Channel—with the American John Jeffries on January 7, 1785—as well as notable first ascensions in a number of countries on the Continent. Newspapers in Philadelphia followed his almost every move, touting his republicanism and detailing the elaborate preparations he made for the flight. Blanchard inflated his yellow silk balloon with hydrogen and was ready to fly on the morning of January 9, 1793. Those

who bore the steep \$2 to \$5 cost of tickets gathered in the Washington Prison yard at Sixth and Walnut streets to witness the extravaganza; among them was President George Washington, one of the sponsors of Blanchard's undertaking. Many more strained to view the spectacle from outside the prison walls, nearby vacant lots, and adjacent rooftops, leading to complaints from the aeronaut about the inherent parsimoniousness of Americans. Shortly after ten o'clock, amid band music and the roar of cannons, Blanchard began his forty-fifth ascension. The wind wafted the balloon across the Delaware River into New Jersey, while Blanchard coolly executed physiological and aerological observations. He brought the craft down in Gloucester County after a voyage lasting forty-six minutes. Upon his return to Philadelphia that evening, Blanchard attended a reception and received the official congratulations of the president.<sup>9</sup>

Blanchard's ascension was an immense popular achievement, but a financial failure. In an attempt to salvage some recompense, he placed his balloon on display in an arena on Chestnut Street where the public could view its inflation twice a day for twenty-five cents. He also began advertising for a second flight, but this ascent had to be postponed when vandals seriously damaged his balloon. Undeterred, on June 5 Blanchard went ahead with a hot-air balloon experiment that featured a parachute descent by a dog, cat, and squirrel. Paying customers were few, as most preferred to watch the show from outside. Twelve days later, he sent the animals up for another parachute drop and again came away disappointed by the Philadelphians' strong desire not to part with their money. A third exhibition on June 21 was more profitable, and it encouraged the aeronaut to remain in the city to exhibit balloon models and equipment. When a plea for funds to pay for another manned ascension early in 1794 elicited an unsatisfactory response, Blanchard vowed not to try another flight in the city "until the arts are brought to such perfection as to furnish him with the means necessary to success." He left for Charleston, South Carolina, and then went on to New York, but his appearances were not profitable and he apparently made no further American balloon flights.<sup>10</sup> As discouraging as Blanchard's Philadelphia experiences were, his efforts awakened popular interest in aeronautics and paved the way for the great American balloonists of the next century.

Vauxhall Garden, a popular pastoral retreat near Broad and Walnut streets in Philadelphia, was the site of several notable balloon ascen-

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sions early in the nineteenth century. On July 2, 1800, the *Daily Advertiser*, without giving details, reported an ascension from Vauxhall of a balloon large enough to carry eight. A balloon flight and parachute leap for September 8, 1819, was announced by a French aeronaut named Michel. A riotous mob, having paid admission to an unsuccessful exhibition the previous day and impatient with delays in filling the craft with hydrogen, wrecked his balloon, stole liquor, and burned down a substantial portion of the garden. Michel lost his cash box and some \$800, but surely felt fortunate to escape the tumult unharmed. Louis Charles Guillé, another Frenchman, had previously advertised for an ascension at Vauxhall on September 20, but due to the unrest caused by Michel's disaster, wisely canceled the exhibition. In the fall of 1820, however, Guillé made two successful ascensions from Camden, New Jersey, safely parachuting a monkey to earth during one of them.<sup>11</sup>

For some years there was a hiatus in aeronautical activity in Pennsylvania. Interest revived only when Charles Ferson Durant returned to the United States after training abroad under the great French aeronaut Eugène Robertson. Durant began a series of spectacular and widely publicized ascensions in New York and Boston in 1830–1834. In the summer of 1834, “balloon fever” swept through Philadelphia like a sudden epidemic, breaking out as a result of several long flights by the Baltimore aeronaut James Mills. On the afternoon of June 26, Mills lifted off from a fenced-in area on Broad Street near Pine in the city, tossing out copies of an original poem he had composed for the occasion. He soon passed over the Delaware, crossed southern New Jersey, and attained a height of approximately two miles before spying the glittering waters of the Atlantic in the distance. He valved off gas and then “thought it prudent to come down more rapidly because the accelerated velocity . . . gave me reason to dread being carried off to sea.” When an anchor failed to halt his momentum, Mills reluctantly decided to abandon the craft. He leaped free over a swamp in Burlington County and watched the balloon, relieved of his weight, rise swiftly and disappear in the direction of the ocean. The hazardous flight lasted more than an hour, and even though the adventure culminated in the loss of his balloon, Mills reported on his return to Philadelphia the next day that the voyage had given him “immense enjoyment.” With a new balloon the aeronaut went on to make four more ascensions in the area over

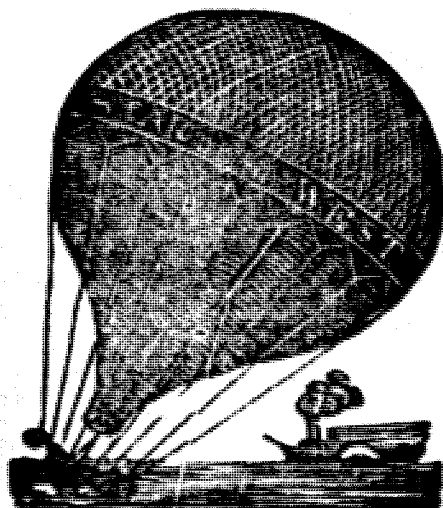
the next twelve months, including one on November 1, 1834, which extended from Lancaster, Pennsylvania, to New Castle, Delaware—a distance of one hundred miles in a little over two hours.<sup>12</sup> Mills, like Blanchard before him, must have been sorely disappointed with the meager profits from his flights in and around Philadelphia, particularly after he took into account the cost of a replacement balloon. He made the aerial exhibition a commonplace occurrence in the eastern part of the state before his tragic asphyxiation by gas escaping from a balloon in York in the early 1840s.

In western Pennsylvania, residents of Pittsburgh followed the exploits of these balloonists for some time prior to witnessing their first aeronautical display. On the evening of July 4, 1835, a large crowd jammed into an amphitheater, constructed specifically for the occasion at one end of Penn Street, to observe the inflation and launch of a small, unmanned hydrogen balloon. Advertisements promised a “Living Quadruped” would descend by parachute from the balloon once it reached a designated height. Although the flight of the unpiloted balloon was an apparent success, the exhibition ended in disaster when a grandstand collapsed, injuring several people and killing one woman.<sup>13</sup>

Regular professional balloon ascensions came to the Pittsburgh area in 1837 with Richard Clayton, an English-born watchmaker from Cincinnati. As many as three thousand saw Clayton ascend from a pavilion in Allegheny City late on the afternoon of August 30. Rising rapidly in his craft, *Star of the West*, Clayton sailed east at about four thousand feet before encountering heavy thunderstorms in the mountains. By the time he put down without mishap eight miles from Johnstown near the Pennsylvania Canal, his hour-long journey had spanned approximately sixty miles. The simple mountainfolk gathered around the balloon that appeared like an apparition to them and, in Clayton’s words, mistook it “for some demon or monster riding in the teeth of the approaching storm. . . . One woman, in particular, fell upon her knees and prayed to God to save her from his wrath.”<sup>14</sup>

Clayton’s initial success precipitated repeat performances. On September 12, he took off from Allegheny City and flew as far as the village of Williamsport (now Monongahela) on the Monongahela River south of Pittsburgh. At another balloon exhibition on July 31, 1839, Clayton highlighted his ascension from the Allegheny City arena with a magnificent fireworks display.<sup>15</sup> His accomplishments in

**CLAYTON'S  
THIRTEENTH AERIAL VOYAGE.**



**R.** CLAYTON, who made an *Aerial Voyage* from Cincinnati to the Allegheny Mountains, 350 miles, in 9½ hours, and who has since made the most romantic excursions through the air, ever performed by man, will, on WEDNESDAY, August 30th, at half past 4 o'clock, P. M., ascend with his Aerial Ship from ALLEGHENYTOWN, near Pittsburgh.

He will take his departure from an amphitheatre, that has been erected for the purpose at a great expense, and which is capable of accommodating from three to five thousand persons.

The stupendous aerostatic vessel in which R. C., will on this occasion ascend, contains between one and two thousand yards of pongee silk; and for the generation of the necessary quantity of gas to inflate it, the following amount of materials is required:—nearly 2 tons weight of Sulphuric Acid, (oil of vitriol,) 3,000 pounds of iron turnings; and 10 tons weight of water. The doors of the Amphitheatre will be opened at 3 o'clock, P. M.

Tickets of admission 50 cents—Children 25 cents. aug 18

Richard Clayton, an aeronaut from Cincinnati, introduced professional ballooning to the Pittsburgh area. This advertisement from the *Daily Pittsburgh Gazette* of August 28, 1837, shows Clayton's balloon *Star of the West*. His August 30 ascension from Allegheny City carried him sixty miles east to Johnstown.



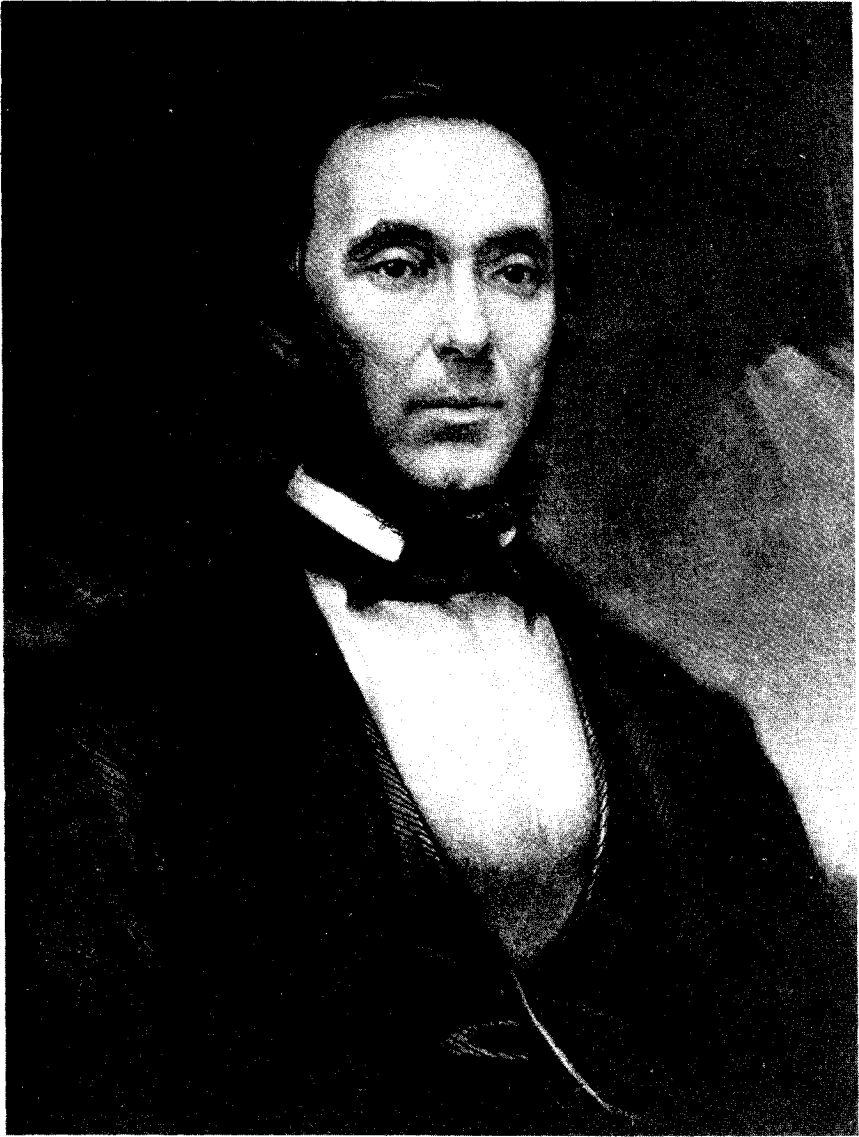
many respects paralleled those of Mills a few years earlier in the east. By a succession of well-publicized ascensions, one of which resulted in a notably long flight, he brought professional aerostation to the growing population centers on the western slopes of the Alleghenies.

Antebellum American balloonists carefully cultivated their reputations as flying scientists. Known almost universally as “professors,” the aeronauts considered themselves highly skilled professionals in pursuit of greater knowledge and understanding of the physical world. This self-image meshed well with the expansion of interest in the natural sciences—physics, biology, astronomy—in the nineteenth century and enhanced popular expectation of aerial achievements.

John Wise won the respect of many Americans as the premier flying professor of the pre-Civil War era. Born in Lancaster on February 24, 1808, he had experimented with small Montgolfier-type hot-air balloons at the age of fourteen. He went on to learn the cabinetmaker’s trade and seek employment in Philadelphia. There in the spring of 1835 he sewed together a crude muslin balloon and announced an ascension for April 30, only to have poor weather cause a two-day postponement. The great occasion finally arrived on the afternoon of May 2, when, from a lot on the corner of Ninth and Green streets, Wise flew for the first time. Though short—only about nine miles—the voyage was the beginning of a remarkable forty-four-year career.<sup>16</sup>

Mishaps seemed to haunt Wise’s early years in aeronautics. He made five more flights in the muslin balloon before seeing it destroyed during an unsuccessful ascension in Lancaster in October. Probably glad to be done with the old apparatus, he built a smaller, more efficient balloon out of silk, but at an exhibition in Lancaster on May 7, 1836, it was accidentally ignited by a lantern after Wise had made a forced landing in darkness, and burned. Wise returned the following year to Philadelphia with a new balloon; one flight in September came to near disaster after a sudden rent in the fabric of the envelope, or gas bag, brought him down just on the New Jersey side of the Delaware River. On another flight from Philadelphia in late October, Wise barely avoided landing in the center of a forest fire.<sup>17</sup>

Perseverance, foolhardiness, or both caused Wise to continue in his dangerous pursuit long after other aeronauts had retired to less



His career spanning forty-four years, John Wise, a native of Lancaster, was possibly the best-known nineteenth-century American aeronaut. Wise improved balloon construction and refined flying techniques. His most notable achievement was a nonstop flight from St. Louis to Henderson, New York, in 1859. (Smithsonian Institution)

hazardous professions. In the course of his experiments over the next two decades, his innovations in equipment and technique led to greater safety in the art and science of aerostation. An accident in August 1838 led to a revelation; his balloon burst during a rapid ascent from Easton, but the gas bag conveniently folded in on itself against the supporting network, filled with air, and served as an impromptu parachute. As a result, he designed a tear-away panel attached to a rip cord that, when pulled in an emergency, allowed him to deflate the envelope quickly and use it to descend to earth. The invention, soon adopted by other aeronauts, also permitted the balloonist to let gas out of the bag after landing, thereby avoiding the danger of being dragged across the ground before a stiff breeze. Another problem in balloon construction had always been the need for a fabric sealant that was light, durable, easy to apply, and impervious to gas. Wise discovered, through trial and error, a varnish that filled those requirements. He hoped, too, to find an alternative to sewing the seams of balloons. This had always been a time-consuming, meticulous, and expensive process, but Wise could discover no cement strong or flexible enough to meet his needs. In addition to his work with balloon design, he came to the early conclusion from his meteorological observations that air current patterns in the upper reaches of the atmosphere flowed from west to east, thus theoretically permitting extended balloon voyages.<sup>18</sup>

Although Wise elevated aeronautics to a science and fully deserved the appellation "professor," he never forgot the cardinal principle that the balloonist's livelihood depended upon how well the audience was entertained. As exhibitions became more commonplace throughout the country and the fundamentals of lighter-than-air flight became generally well known, crowds inevitably fell off. Fireworks and music bolstered attendance somewhat, but they were not sufficient in themselves. Wise therefore sought new ways to attract customers. On July 4, 1840, he participated in a dual balloon ascension in Philadelphia with William Paullin, another Philadelphia aeronaut. In Danville, where Wise offered free rides in a balloon tethered to a tree, hundreds paid the substantial \$1 admission just to watch. And for longer voyages, Wise accepted passengers who could afford fees up to \$150. During a spectacular show in Carlisle in 1843, he traversed the streets of the town at a low altitude in a captive balloon; then, seated only on a narrow platform attached directly to the balloon, he made a breathtakingly swift

vertical ascent from the town square. In association with the Columbus, Ohio, promoter John M. Kinney, he barnstormed the west in the early 1850s. He ascended throughout Ohio in 1851 and 1852, but parted company with Kinney following an abortive 1853 Independence Day exhibition in Pittsburgh. Wise's aerial demonstration, preceded by extensive advertising, had begun in an amphitheater in the city's Ninth Ward. Five thousand looked on as a sudden gust forced the balloon against the fence surrounding the pavilion, tearing the delicate silk gas bag. Incensed, the aeronaut accused his sponsor of not providing sufficient gas to inflate the balloon, and a near-riot ensued when the crowd attempted to locate Kinney to redeem their tickets. Kinney instead promised a free ascension four days later. By that time, however, Wise had severed relations with his former backer and had returned to the east, never again to attempt a flight from Pittsburgh.<sup>19</sup>

Undeniably a showman, Wise still retained a clear vision of the future of balloons and aerial navigation. After war broke out between the United States and Mexico, he suggested, in October 1846, the construction of a huge balloon one hundred feet in diameter, capable of bombarding Vera Cruz from the skies. The war department never seriously entertained Wise's proposal. His most intense and lasting dream, though, was of a balloon voyage across the Atlantic, utilizing the westerly winds he knew prevailed at certain altitudes. As early as 1843, Wise approached wealthy Philadelphians to solicit funds for the project, only to be turned away; he next petitioned Congress for the required \$15,000, but again encountered silence. In 1851 he renewed his plea in Washington and this time received the support of Illinois Senator Stephen Douglas. Other lawmakers ridiculed the idea, and the \$20,000 request died in the Naval Affairs Committee.<sup>20</sup>

Determined to prove that a balloon voyage to Europe was indeed practicable, Wise and four partners formed the Trans-Atlantic Balloon Company to finance construction of a lifeboat-equipped balloon, fifty feet in diameter, which was christened *Atlantic* upon its completion in 1859. On the evening of July 1, Wise, fellow aeronaut John La Mountain, and two others took off from St. Louis intending to fly nonstop to New York City. Drifting before the west-to-east upper air currents, the voyagers passed over the midwestern plains, Lake Erie, and Niagara Falls before encountering a fierce storm above Lake Ontario. After a frightening descent, Wise and his com-

panions finally landed safely in Henderson, New York, having navigated more than eight hundred miles in less than twenty hours.<sup>21</sup> The almost unbelievable flight, unequalled until the twentieth century, proved conclusively that balloons could make long nonstop flights, and lent credence to Wise's belief in the feasibility of a transatlantic crossing by air. The Civil War, however, forestalled any further plans he may have had to test his theories in practice.

A number of other balloonists rose to prominence in Pennsylvania before 1860. Samuel Archer King, born in 1828 in Tinicum, Delaware County, made his first ascension in Philadelphia on September 25, 1851, and soon was renowned for his entertaining Fourth of July balloon flights in the eastern part of the state. In 1858 he brought the drag rope to American ballooning, an invention that provided a simple means of stabilizing altitude without wasting excessive quantities of ballast or gas. Say, for instance, that a thousand feet of heavy manila rope was hung below the basket; as the balloon dipped below one thousand feet of altitude, a portion of the rope would contact the earth. The balloon immediately would be relieved of a burden equal to the weight of the length of rope dragging along the surface, and, as if a quantity of ballast had been released, the craft would start to rise. As the balloon ascended, it again assumed the full weight of the rope, which acted as a regulator keeping the balloon in equilibrium without forcing the aeronaut to discharge gas. King also introduced aerial photography with an impressive series of pictures taken high above Boston in 1860. The French aeronaut Eugène Godard became an instant celebrity during tours across Pennsylvania in 1856 and 1857. His exhibitions, in addition to parachute jumps, featured his acrobatic brother Auguste performing tricks while suspended beneath the balloon on a trapeze. One of the passengers Godard took on a brief flight from Allegheny City in October 1857 found the altitude so exhilarating that he later remarked it had affected him "somewhat like a laughing gas." Benjamin Lynn, later editor of the *Erie Dispatch*, earned fame by an ascension from Erie with B. A. Baldwin on May 18, 1859. A wind shift blew the pair out over Presque Isle into the lake. As darkness was falling, the aeronauts set the balloon down in the water, where a ship speedily recovered them and their craft.<sup>22</sup>

William Paullin, who had made a tandem flight in 1840 with John Wise, attained considerable recognition on his own in the pre-Civil War era. Born in Philadelphia on April 3, 1812, he first flew in that

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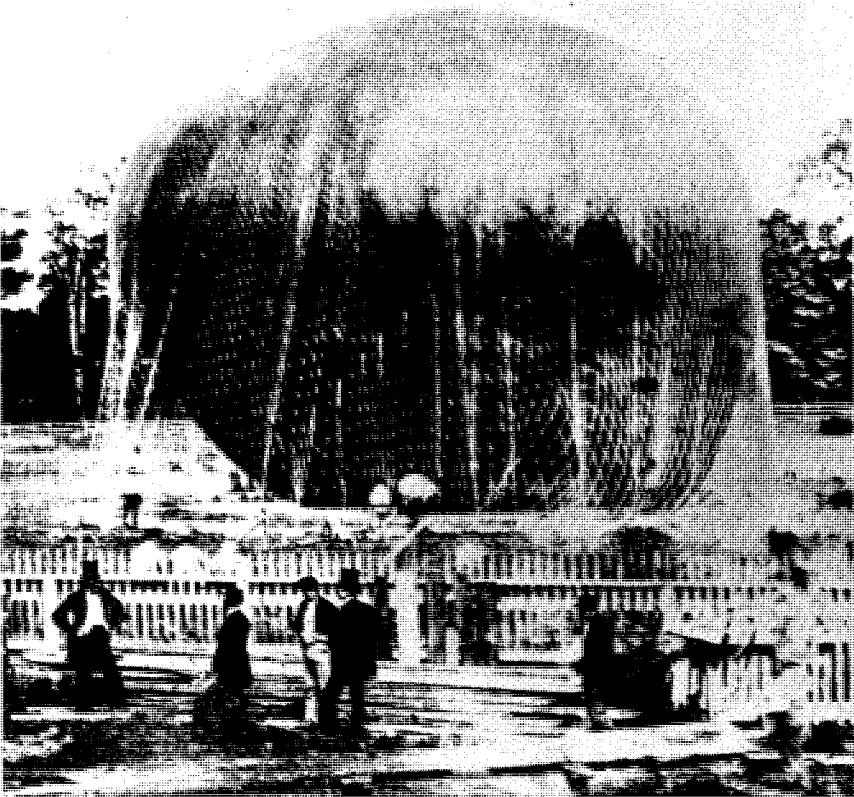
city in August 1833 in a hydrogen balloon, and on July 27, 1837, became the first aeronaut in the United States to make a successful ascension in a craft inflated with illuminating gas. Though less efficient than hydrogen, it was more commonly available in those nineteenth-century cities like Philadelphia that were just beginning to be lighted by coal gas, and, above all, it significantly reduced the cost of balloon exhibitions. Paullin was perhaps better known for a remarkable series of first ascensions in Latin America. Between 1841 and 1847, he made flights in Chile, Cuba, Haiti, Puerto Rico, and Mexico, thus introducing aeronautics to countries where it had hitherto been unknown. His later ascensions in some of the western states were also important for expanding interest in ballooning in America.<sup>23</sup>

Another leading Pennsylvania aeronaut in the prewar years was John H. Steiner, a German-born resident of Philadelphia. On June 18, 1857, Steiner, already a veteran of thirty-nine ascensions, cast off from Erie intent upon achieving the first balloon crossing of Lake Erie. A squall ended the flight considerably to the west of town and well out of sight of land. Steiner surely would have drowned if a steamship bound for Detroit had not come fortuitously to the rescue. Steiner built a new and larger balloon in Erie in August, but covered only four miles before a gas leak brought him down. A year later, in August 1858, Steiner accomplished what was purported to have been the first balloon flight in Toronto, Ontario. Most of his exhibitions, though, were in the Midwest, an outstanding one being a 230-mile race from Cincinnati in October 1858 that he won against Godard. Infected by the transatlantic mania in the late 1850s, Steiner proposed an aerial crossing in July 1858, but it did not stimulate enough interest to attract the necessary financial backing.<sup>24</sup>

In this period, Thaddeus Sobieski Constantine Lowe was surpassed only by John Wise as America's preeminent advocate and practitioner of aerostation. Born in Jefferson Mills, New Hampshire, on August 20, 1832, Lowe made his first flight—in Ottawa, Ontario—in 1858. Profitable ascensions in New England in 1859 and the success of the Wise-La Mountain flight convinced Lowe that a balloon journey across the Atlantic should be his next step. In November, much to the consternation of Wise, who was still pressing for support of his own venture, Lowe constructed the huge *City of New York* preparatory to the transatlantic attempt. To his dismay, the craft's namesake was unable to furnish the required amount of hydrogen to

complete inflation, and the ambitious project quite literally never got off the ground.<sup>25</sup>

Lowe's efforts, while futile, nevertheless sparked the interest of Dr. John C. Cresson, president of Philadelphia's Point Breeze Gas Works and prominent at the Franklin Institute, who promised Lowe sufficient gas to fill the great balloon. Severe winter weather soon intervened to force abandonment of the transatlantic flight until the next spring. Lowe spent several months in South Carolina before returning to Philadelphia to prepare again for the voyage. On June 28, 1860, he made a sensational trial ascension in the giant 500,000-cubic-foot balloon, renamed *Great Western*. Buoyed by the results



For a time, the chief rival of John Wise was T. S. C. Lowe, whose early experiments in aerostation had the support of Dr. John C. Cresson, president of Philadelphia's Point Breeze Gas Works. Here Lowe's transatlantic balloon *Great Western* is being inflated at Philadelphia in September 1860. (Sherman Fairchild Collection, Smithsonian Institution)

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of this brief flight, Lowe made ready for the Atlantic trip, but bad luck continued to dog him. As inflation of the gas bag neared completion on September 8, gusty winds tore the envelope to shreds and abruptly ended all chances of the voyage that year.<sup>26</sup>

Had Lowe's plans not aroused the attention of Joseph Henry, secretary of the Smithsonian Institution and broadly acclaimed for his pioneering work in electromagnetism, it appears likely that the aeronaut's career might have been terminated with equal suddenness. Henry agreed with Lowe that a balloon crossing of the Atlantic could be made, but counseled that further test flights were necessary before undertaking the dangerous voyage. Lowe accepted Henry's suggestion and went west to Cincinnati, where he assembled a smaller craft in which he planned to travel to the east coast. He took along Jacob C. Freno, a Philadelphia lawyer, to assist him. Freno seems to have been drawn to ballooning in the late 1850s chiefly as an avocation, but his capabilities were impressive enough for Lowe to engage him later as an aeronaut with the Union balloon corps. Lifting off before sunrise on the morning of April 20, 1861, in his balloon *Enterprise*, Lowe encountered strong winds that eventually carried him nearly four hundred miles in nine hours. He landed safely near the town of Union in northwestern South Carolina, only to be arrested and jailed as a Northern spy. When released, he returned with his balloon to Cincinnati before traveling on to Philadelphia, but the outbreak of the Civil War caused indefinite postponement of his transatlantic schemes.<sup>27</sup>

Professional ballooning came virtually to a halt in Pennsylvania when most aeronauts patriotically offered their skills and knowledge to the federal cause in the Civil War. John Wise was one of the first to step forward, though not as a balloonist. He had formed a company of volunteers in Lancaster and wrote to Secretary of War Simon Cameron in May 1861 to suggest its use as an infantry unit with the Union army. Cameron referred the proposal to Pennsylvania Governor Andrew G. Curtin. While Wise's offer languished on Curtin's desk, Major Hartman Bache, acting chief of the Bureau of Topographical Engineers, on July 1 brought Wise into the army as a military balloonist. In little more than two weeks, Wise completed a war balloon, hauled it to Washington, and inflated it with gas. The laborious process of guiding the craft to the front at Bull Run, where General Irvin McDowell's forces were already fleeing before the



Confederates, ended in failure after the gas bag was caught and torn in dense woods. Back in Washington, the aeronaut repaired the balloon and successfully conducted artillery observations near the city. If Wise was elated by this limited performance, the emotion was short-lived, for on July 26, while again under transport to the Union lines, the inflated craft broke loose and had to be downed by rifle fire over Arlington, Virginia. This setback proved too much for Wise's superior officer, Captain Amiel W. Whipple, who blamed the aeronaut for both failures. Thoroughly disheartened, Wise resigned and departed Washington for Lancaster on August 13. Later, when ill health cut short Wise's brief service with a Pennsylvania cavalry troop, he settled down at his home in Lancaster to compose his autobiography, *Through the Air*. The book appeared in 1873 and is one of the most literate accounts of nineteenth-century ballooning. Wise did not resume his aeronautical pursuits until after the war.<sup>28</sup>

Through the labors of T. S. C. Lowe in the summer and fall of 1861, systematically organized aeronautics finally came to the Union army. Lowe's offers of technical expertise fell on deaf ears, and only through the timely intervention of Professor Henry was the war department willing to consider Lowe's overture. At Henry's insistence, Lowe took *Enterprise* to Washington for an impressive series of demonstration ascensions, during which he dispatched telegraphic messages using a fine insulated wire strung behind his balloon—the first such communication in history. These experiments convinced President Lincoln to have Lowe officially installed in late July as head of the newly formed federal aeronautical corps. In the meantime, Lowe and his balloon had been pressed into service by Captain Whipple for observations at Falls Church, Virginia, on June 23–24. These operations, however, generated conflict between Lowe and John Wise, whose military balloon had received top priority for use of the gas facilities at the Columbian Armory. Lowe closed out his early work for the army with a daring free flight beyond the Union lines on July 24.<sup>29</sup>

Lowe had to overcome considerable skepticism about the military value of balloons before he was allowed to establish the Union aeronautical corps. After frustrating delays, he received orders on August 2 to begin construction in Philadelphia of a balloon specifically designed for front-line observations. Completed on the twenty-first, the balloon, named *Union*, proved its worth in service to the extent that the war department authorized construction of six

similar craft. Under Lowe's close supervision, work on the new balloons started in Philadelphia on October 9, and they were substantially completed by November 10. During this time, Lowe grappled with the difficult problem of wartime transportation of balloons, and found the answer by inflating the balloons where they were required in the field with horse-drawn, mobile hydrogen generators. As the corps grew, Lowe invited other aeronauts to join him. Among the Pennsylvania balloonists, William Paullin, John Steiner, and Jacob Freno volunteered. Professional jealousy precluded the service of John Wise, and an apparent oversight meant that Samuel King was not recruited.<sup>30</sup>

The aeronautical corps under Lowe showed much promise, but made only a modest contribution to the war effort over the next seventeen months. General George B. McClellan put Lowe's balloons to intensive use along the Potomac in the late fall and early winter of 1861–1862. To facilitate movement of the unit, Lowe converted a coal barge to a balloon carrier. Commissioned into the navy as U.S.S. *George Washington Parke Custis*, the vessel served as home base for aeronautical operations on the Potomac front through the end of the year. In November, Lowe dispatched one of his balloons for service with the Union force under General Thomas Sherman that captured Port Royal, South Carolina. General McClellan found Lowe's corps of especial value during the long and bloody Peninsular Campaign before Richmond in 1862. Lowe used his balloons to spot the Confederate evacuation of Yorktown on May 3 and to report enemy troop movements in the battles of Fair Oaks (May 31 and June 1) and Gaines's Mills (June 28).<sup>31</sup>

As Lowe was working his corps into the Army of the Potomac, John Steiner, whom he had come to rely on heavily as his chief assistant, was detached in February 1862 to assume command of a balloon unit with the Department of the Missouri. On the twenty-fifth, Steiner arrived in Cairo, Illinois, with the balloon *Eagle*. For five months, he encountered frustrating indifference on the part of Major General Henry W. Halleck, who kept the unit inactive in Cairo while the army moved down the Mississippi. On only one occasion did Steiner get his balloon into action: at Island No. 10, below New Madrid, Missouri, he went up to observe troop movements and direct mortar fire for Commodore Andrew H. Foote's river gunboat flotilla.<sup>32</sup>

Lowe failed to convince his superiors of the worth of the balloon in combat. His corps operated under the command of four different

army branches and continually suffered from lack of supplies and support. At Antietam in September 1862, for instance, Lowe's force did not take part in battle because the army commandeered its transport. Several factors precipitated the demise of the corps, among them the loss of the unit's chief advocate after McClellan's relief from command in November 1862, squabbles among the aeronauts themselves (especially between Lowe and Freno, who was a habitual gambler), Lowe's poor health, and the fact that members of the corps served the army without rank or authority. On May 8, 1863, after observations in the Battle of Chancellorsville, Lowe resigned rather than accede to a pay cut previously ordered by his new commanding officer, Captain Cyrus B. Comstock. The balloon force struggled on without leadership until the army disbanded it in August. Lowe himself turned away from aeronautics after the war, although he did offer a passenger-carrying balloon service from New York's Central Park in 1865 and 1866. In 1863, he and his wife moved to Norristown where Lowe experimented with refrigeration, gas manufacturing, and production of metallurgical coke before settling in southern California in 1888.<sup>33</sup>

With peace came a resurgence in aeronautical activities as prewar balloonists resumed their profession and new personalities came to the fore. One of the first Pennsylvania aeronauts to begin flying again was John Wise, who in the summer of 1871 made several ascensions in a new balloon from Chambersburg and Gettysburg. Wise had earlier introduced his son Charles and grandson John to ballooning, and the trio became particularly well known for their flights at the Centennial Exhibition in Philadelphia in 1876–1879.<sup>34</sup> Yet Wise found it impossible to ignore the transatlantic dream he had given up in 1860. He therefore began plans for construction of a huge balloon capable of spanning the Atlantic and in 1873 enlisted another aeronaut, Washington Harrison Donaldson, to assist him with the project.

Donaldson was perhaps the most celebrated and colorful of the postbellum American aeronauts. Born in Philadelphia on October 10, 1840, he became a professional entertainer at the age of seventeen. His acts included ventriloquism, knife-throwing, magic, and tightrope walking, but his specialty was circus acrobatics. When these feats lost their thrill, Donaldson decided to take up balloon exhibitions. On August 30, 1871, in Reading, he ascended for the first time. The audience response to the act, which included elec-

trifling midair gymnastics from a hoop above the gondola, was such that Donaldson incorporated the stunts in nearly all his shows. In the late summer of 1874 and spring of 1875 he performed with P. T. Barnum's Roman Hippodrome in Philadelphia on numerous occasions. On one flight from the arena at Broad and Norris streets in 1874, no fewer than seven passengers accompanied Donaldson in the sixty-foot diameter balloon, *P. T. Barnum*. In September and October 1874, he came to Allegheny, where five flights in ten days attracted large crowds to the city's Union Park.<sup>35</sup> Donaldson criss-crossed Pennsylvania with his displays of aerial derring-do, but inevitably he sought greater challenges. In 1873, upon learning of Wise's proposal for a transatlantic crossing, he jumped at the chance to participate.

They must have made a strange pair—the young and gallant former circus gymnast and the sixty-five-year-old flying professor—when they approached the publishers of the *New York Daily Illustrated Graphic* in June 1873 and requested financial support for the enterprise. Evidently they were convincing, because the newspaper provided funds for a gigantic 600,000-cubic-foot balloon, appropriately named *Daily Graphic*. The design of the craft incorporated all of what Wise deemed essential for a successful voyage, including a lifeboat. Unfortunately, its construction did not live up to expectations, for during a test inflation on September 10 in Brooklyn, the envelope's poorly sewn seams split wide open. Irritated with his partner and in disagreement with the owners of the newspaper, Wise pulled out of the project. Donaldson then oversaw modifications to the balloon and, with two reporters, attempted the flight on October 6, only to be forced down by a storm near New Canaan, Connecticut. After the *Daily Graphic* fiasco, Donaldson returned to circus ballooning, but for only a short time. He drowned in Lake Michigan after an ascension from Chicago on July 15, 1875. In an ironic coincidence, Wise vanished on September 29, 1879, over the same body of water during a long flight from St. Louis.<sup>36</sup>

The failure of Wise and Donaldson did nothing to dampen the enthusiasm of other aeronauts for transatlantic flights. In July 1873, John A. Light, a Philadelphia balloonist noted for ascensions at fairs around the state, along with Henry C. De Ahna, another Philadelphian, proposed a voyage across the ocean using a small balloon; there is no evidence they made the attempt. Samuel King was more serious. After several hundred ascensions, including a 400-

mile flight from Buffalo to Salem, New Jersey, in the summer of 1874, King thought he had the experience to be a legitimate contender in the transatlantic derby. On April 5, 1879, King wrote the *New York Herald* explaining that the Atlantic could be conquered. To drum up support for his proposal and to test his theories, King attempted a flight from Minneapolis to Boston on September 13, 1881, with a U.S. Signal Service observer, but adverse weather cut short the journey. Notwithstanding this failure, King insisted the ascension proved that a 300,000-cubic-foot balloon, constructed of a special rubberized fabric, would retain sufficient hydrogen to allow a nonstop crossing in four or five days. The federal government was not impressed enough, however, to risk King's modest estimate of \$14,000 to implement the project. King maintained his connections with the signal service and made four flights between January and May 1885 for purposes of meteorological observations. Altogether, King compiled more than four hundred fifty balloon ascensions before his death in Philadelphia on November 3, 1914.<sup>37</sup>

Among post-Civil War Pennsylvania aeronauts, Samuel Sylvester Thurston and his son Alexander also stood out. The Thurstons, owners of a hotel in Meadville, took up ballooning soon after they moved to Crawford County in 1867. Before his death in 1888, Samuel Thurston made 286 ascensions throughout the country. Alexander continued in his father's footsteps, appearing at holiday celebrations in the state. On one ascension from Meadville on July 4, 1896, Thurston and a passenger attained an altitude of 10,000 feet. In May 1910, Thurston and Harry E. Fabel in the balloon *Meadville* completed a 175-mile voyage to Driftwood in Cameron County in only ten hours.<sup>38</sup>

Somehow the balloon seemed to capture the imagination of nineteenth-century America. It was a rare Fourth of July celebration, county fair, circus, or centennial festivity in Pennsylvania that did not include a balloon ascension and parachute jump. The novelty of these exhibitions apparently meshed well with a society only just beginning to explore the joys of leisure time. Gentlemen and ladies frequently turned out, though for the latter the shows were not considered entirely proper. Ascensions all too often attracted rowdies and undesirables who, at least early in the century, caused many an event to end in a brick- and bottle-throwing riot. Intense,

well-publicized rivalries among balloonists—especially between Wise and Lowe in the late 1850s—heightened public interest and increased the gate receipts of the promoters. If they did nothing else, the aeronauts merit consideration for fulfilling what appears to have been the genuine need of Americans in the 1800s for adventure and entertainment.

The quick and easy money lured many amateurs and even outright frauds. A Dr. Boynton in Pittsburgh in 1859 advertised for a “scientific exhibition” at the city hall that would feature a balloon ascension, but never made good on his promise. Professor Samuel Wilson a year later built a large balloon in Pittsburgh that he extravagantly claimed would “remain in the air long enough to pass around the globe.” It broke loose from its moorings during inflation and carried Wilson off. He clung desperately to the craft and landed safely in Clarion County. The flight did nothing to enhance Wilson’s tarnished reputation as an aeronaut, for a similar accident in Illinois a year or so previously had taken two frightened young children aloft.<sup>39</sup>

Women, usually confined to home-related activities, often found an outlet in aeronautics, and a handful became accomplished balloonists. In January 1855, Lucretia Bradley went up at Easton in a balloon John Wise had sold her the preceding fall, only to have the craft explode in midair. She survived the accident, but it evidently soured her on ballooning, and she retired shortly thereafter. Another protege of John Wise, Lizzie Ihling, attempted a flight at Huntingdon on July 4, 1876. A sudden storm lashed the balloon just as she was about to ascend, causing such extensive damage that the flight had to be canceled. Three months later, again under Wise’s tutelage, she made an hour-long flight from the fairgrounds at Bellefonte in the balloon *Amazon*. Glamorous Madame Carlotta, the “Lady Aeronaut” and wife of Carl E. Myers, a respected post-Civil War balloonist, commonly appeared at Independence Day celebrations in Pennsylvania before 1900, and Madame Alice Zeno thrilled audiences in Pittsburgh at the turn of the century with parachute jumps from hot-air balloons.<sup>40</sup>

None of those who experimented with lighter-than-air craft during those years could honestly claim that the balloon was a practical means of transportation until some method of propulsion or control was perfected. Even though the ultimate solution to the problem evaded inventors until the advent of the lightweight internal

combustion engine, balloonists were not deterred from trying. Blanchard, after his momentous Philadelphia ascension in 1793, displayed an aerial carriage pulled by a mechanical device resembling an eagle—most likely a primitive ornithopter, or flapping-wing flying machine. In September 1819, David B. Lee of Philadelphia failed in an attempt to fly an elliptically shaped balloon that he may have intended to be navigable. Another Philadelphian, James Bennett, submitted a design for a heavier-than-air craft to Congress. Lee challenged Bennett in 1822, claiming that the latter merely copied his own plans for a similar machine. The dispute became moot when Congress rejected Bennett's proposal.<sup>41</sup>

An early step toward a truly steerable balloon or dirigible came through the work of a Corry resident, Charles F. Ritchel. A native of Maine, Ritchel became interested in flight toward the end of the 1860s. He moved to Corry around 1871 and, with the help of a friend W. H. Lyman, designed a man-powered flying bicycle, which they subsequently built in Bridgeport, Connecticut. The crude machine consisted of a frame of brass tubing suspended beneath a cylindrically-shaped balloon, and the operator, from a seat, pedaled the craft through the air and maneuvered it by means of a forward-mounted propeller. On May 8, 1878, Ritchel successfully demonstrated the airship indoors at the Exhibition Building on the centennial grounds in Philadelphia with a small boy at the controls; it first flew in the open air a little over a month later, at Hartford. Ritchel subsequently embarked on a four-year tour with this and four other human-propelled dirigibles of his own design. His machines had only limited capabilities in the air, never exceeding velocities of three or four miles an hour and could only be flown when there was no wind. Yet Ritchel remained opposed to engine-powered flight, preferring instead to rely on human locomotion.<sup>42</sup> His invention, by no means practical, only marginally closed the gap between the balloon and a true dirigible.

Dirigible balloons continued to attract Pennsylvania inventors in the late nineteenth and early twentieth centuries. In 1874, Charles B. Wainwright of Philadelphia devised and patented a rudder and steering mechanism for balloons. Nine years later, Joel Ray, also a resident of Philadelphia, received a patent for an airship consisting of an elongated gas bag, tapered at both ends, beneath which hung complicated machinery with propellers at both ends to move the craft through the air. Ray, however, did not specify the type of engine he intended to power the dirigible. A third Philadelphian,

Charles E. Hite, in 1897 filed a patent for an airship similar to Ray's, but he called for an improbable heating and "suction" device for propulsion. Carl E. Myers was another drawn to experimentation with navigable balloons. On July 4, 1897, he demonstrated his "sky-cycle" at Pittsburgh—actually an adaptation of Ritchel's concepts. Pedaling furiously, Myers was able briefly to hold the machine stationary before it drifted off before the wind.<sup>43</sup> Despite great expenditure of effort, neither Myers, nor Ritchel, nor any others before the turn of the century offered any practical solution to the problem of true aerial navigation.

Shortly after the turn of the century, several Americans adapted lightweight internal combustion engines to small dirigibles. One of the first was Thomas Scott Baldwin, an aeronaut and parachutist who flew the first successful American airship in San Francisco in 1904. Other builders soon adopted the Baldwin dirigible as the model for their own craft. Two brothers, Lincoln and Hillery Beachey, along with Earl Hess, in late 1905 began construction of a small dirigible in Toledo, Ohio. The three men completed the airship in Pittsburgh in August 1906, and Lincoln Beachey made at least one flight with it from Luna Park, one of the city's principal amusement centers. On tour with another airship, Beachey delighted spectators during Philadelphia's Founder's Week, October 5–12, 1908. The aeronaut, controlling the pitch of the machine by shifting his weight from front to back, flew out over the Delaware, circled the masts of the battleship *Idaho*, and dropped a message to the vessel's commander. A. Roy Knabenshue, another famous professional airman, brought his dirigible to Pittsburgh in the fall of 1908. Starting from the city's Schenley Park on October 6, Knabenshue cruised over the downtown area while "immense crowds" gathered at every street corner to catch sight of the aeronaut.<sup>44</sup> Despite these exciting performances, the dirigibles remained small, slow, and impractical. By 1910, public interest shifted to the faster, more maneuverable airplane.

As professional balloon ascensions lost their appeal after 1900—such events, usually augmented by parachute jumps, had become regular occurrences at outdoor gatherings in the state—amateur ballooning flourished, especially in the Philadelphia area. The Aero Club of Philadelphia, with Samuel A. King as a prominent member, sponsored almost weekly ascensions by 1910. Arthur T. Atherholt, a commission merchant, was one of the most successful club mem-



bers. In September 1910, he and Conyers B. Graham competed in *Pennsylvania II* in the national races at Indianapolis. Two years later, Atherholt was in Stuttgart, Germany, for the Gordon Bennett Balloon Race, but officials disqualified his entry when the balloon could not be inflated before the time limit expired. In a borrowed balloon, Atherholt and John Watts flew more than one thousand miles to Pskov, Russia. Dr. Thomas Edwin Eldridge, another club member, specialized in altitude flights. Eldridge and two companions on June 16, 1910, soared to 17,050 feet in *Philadelphia II* to set a new state record. The club admitted women on an equal basis. Violet Ridgway, a Philadelphia socialite, made a notable ascension from the old Point Breeze racetrack in South Philadelphia in October 1909, and Julia Hoerner participated in races at St. Louis in November of that year.<sup>45</sup>

Military ballooning dominated the period of American involvement in World War I, the balloon proving its usefulness for both observation and artillery spotting as it had during the Civil War, and in many cases demonstrating superiority over the airplane in this capacity. Tethered by steel cables and configured to resemble plump sausages, the first observation balloons arrived in France in February 1918. All told, seventeen balloon companies saw action overseas, and at peak strength the army's Balloon Section numbered 17,000 officers and men. The only man to lose his life in action was Lieutenant C. J. Ross, a Titusville native assigned to the Eighth Balloon Company, who parachuted from his balloon in September 1918 after an attack by German planes. Tragically, pieces of the burning balloon fell on Ross's parachute, igniting it, and Ross hurtled three thousand feet to his death. While only captive balloons saw combat, both the army and the navy valued free balloons for training lighter-than-air personnel during and after the war. Starting in 1919 and continuing through the 1920s, army and navy balloonists were regular entries in national balloon races, the competition deemed a useful adjunct to regular training routines.<sup>46</sup>

Pittsburgh hosted two national balloon races in the 1920s. Fourteen entrants competed in the 1928 National Elimination Balloon Race on May 30 for the right to participate in the international Gordon Bennett race at Detroit that year. The first contestants lifted off from Bettis Field late in the afternoon, only to encounter a series of violent thunderstorms. For a time officials lost contact with all of the balloons. Two aeronauts were killed by lightning, and two

others were hospitalized with severe injuries. Only one balloon, *Army Number 1*, commanded by Captain William E. Kepner, emerged relatively unscathed to land at Weems, Virginia, and take the winner's trophy. A year later, the national races returned to Pittsburgh. In drizzly weather, on May 4, twelve balloons went aloft from Pitt Stadium. Brisk winds carried the balloons northeast into New York state, where many ran into cold and snow. The only local entry, *The Pittsburgher*, crewed by Walter Chambers and his wife, put down at Utica, New York. The winner was *Navy Number 1*, piloted by Lieutenant T. W. G. Settle and Ensign Wilfred Bushnell. It landed at Prince Edward Island, having covered a straight-line distance of 572 miles.<sup>47</sup>

Amateur ballooning has remained a popular sport down to the present day. Tony Fairbanks of Swarthmore, an active balloonist since the 1930s, helped to found the Balloon Club of America in 1952, but the pastime became prohibitively expensive for most enthusiasts because of rapidly escalating costs of hydrogen and other lifting gases. A renaissance came in the mid and late 1960s, largely due to the adoption of lightweight nylon fabric and small, highly efficient propane burners for hot-air balloons. As a result, balloons could be purchased for as little as \$6,000. Hot-air balloonists now hail from Philadelphia, Pittsburgh, Scranton, Lancaster, Hollidaysburg, Erie, and York. On September 16, 1978, seven of them gathered in West Chester for a colorful "hare and hound" race, won by Chris Powell of Scranton.<sup>48</sup> This event, and others like it in Pennsylvania, indicates that the balloon still retains a place in our modern, fast-paced world after nearly two centuries.

There is no question that the nineteenth-century aeronauts pursued what turned out to be a dead end in the technological progress of aeronautics. In spite of continual improvement in the state of the art by Pennsylvania balloonists—including lighter weight materials, more efficient fabric coatings, tear-away panels, the drag rope, portable gas generators, and the use of common illuminating gas—there was virtually nothing in the 1800s that could be construed as logical technological development in the modern sense. None of the aeronauts could apply the technology of the balloon to resolution of the basic problem of flight, that is, navigating the air independent of the wind.

At the same time, it is easy to overlook many of the genuine accomplishments of the balloonists. First, they conclusively proved that man could move through the air, sometimes at great altitudes and for tremendous distances; before the Montgolfiers, most knowledgeable people would have vigorously denied that such a thing was even remotely possible. The second major achievement of these pioneers was to foster public receptiveness of flying. Until the 1830s, a balloon ascension was a rare occurrence; twenty years later, it had become far less unusual as thousands personally viewed flights and perhaps hundreds of thousands more read about them. In the practical sense, men like Wise, Lowe, King, Paullin, and others continued to refine the design and construction of balloons and devise new procedures for operating them with the greatest safety and efficiency. Finally, the aeronauts expanded our basic knowledge of the atmosphere through scientific investigation and recording of meteorological phenomena. The contributions of these men and women provided a foundation for the great advances of aeronautics in the twentieth century.