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Bringing the Future Within Reach—

Celebrating 75 Years of the NASA John H. Glenn Research Center

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Image 15: Construction of the Flight Research Building in summer 1941. The hangar was the first structure at the new Aircraft Engine Research Laboratory (GRC-2001-C-00334).

1. *Rising from the Mud*

“What only a few months ago was a mass of steel structures, concrete forms, and deep holes in the ground . . . rapidly is becoming the world’s largest aircraft engine research laboratory.”

—Ray Sharp





Image 16: Visitors view the hangar construction in 1941 (GRC-2011-C-00331).

Rising from the Mud

On Sunday, 3 September 1939, Britain and France declared war on Germany as Clevelanders gathered to watch the National Air Races at the future site of the National Aeronautics and Space Administration (NASA) Glenn Research Center. Over 70,000 people witnessed Art Chester's record-breaking win in the 200-mile Greve Trophy Competition. The following day a significantly larger crowd watched the intrepid Roscoe Turner capture his third and final Thompson Trophy.³ The races, a Cleveland Labor Day tradition since 1929, provided an outlet for a public trying to grasp the ramifications of Germany's invasion of Poland that Friday. The United States would not enter the war for two more years but soon undertook preparations for that possibility. These measures led to the creation of what would become Glenn and its remote test site, Plum Brook Station.

Congress established the National Advisory Committee for Aeronautics (NACA) in 1915 to coordinate the nation's aeronautical research, which at the onset of World War I, seriously lagged behind its European counterparts.⁴ The 12-member committee, composed of representatives from the military, industry, and other institutions, initially supported the military and aircraft industry in a purely advisory capacity. In 1917 the committee began constructing the Langley Memorial Aeronautical Laboratory in Virginia in order to conduct research of its own. Langley built a series of increasingly advanced wind tunnels during the ensuing years to support the research activities. George W. Lewis, the NACA's Director of Aeronautical Research, served as a liaison between the committee and the lab. By the mid-1930s NACA advances such as its eponymous engine cowling and collection of



Image 17: Crowds swarm to the edge of present-day NASA Glenn to view the 1932 National Air Races. The intensely popular event was the most evident sign of Cleveland's ties to aviation, but the city also possessed a strong aircraft manufacturing industry and the nation's largest and most innovative airport (The Cleveland Press Collection, Michael Schwartz Library, Cleveland State University).

wing shapes helped establish the preeminence of the U.S. airline industry.⁵

Spurred by the realization that German aviation technology was ahead of the United States, the NACA hurriedly expanded its research capabilities in the early 1940s. This resulted in the Ames Aeronautical Laboratory in Moffett Field, California, and the Aircraft Engine Research Laboratory (AERL) in Cleveland, Ohio, which is now known as Glenn. Wartime shortages and contractual concerns initially hindered the construction of the AERL. The AERL's first test facility began operation in May 1942, but construction of the lab continued for nearly two more years. The research staff began arriving from Langley in 1943, and the largest facility, the Altitude Wind Tunnel (AWT), was completed in January 1944. By that time the NACA's new engine laboratory was already contributing to the war effort.

Groundwork for an Engine Laboratory

Famed aviator Charles Lindbergh was also a long-standing member of the NACA's Executive Committee. He and George Lewis made several trips to Europe in the mid-1930s to review foreign aeronautical research capabilities. They discovered that the German aircraft industry had not only restored itself after being decimated during World War I but had surpassed the United States in several areas.⁶ Germany was developing aircraft that could fly higher and faster than U.S. aircraft and had a large, robust aeronautical research establishment. German engineers paid particular attention to engine research, an area that the NACA had largely ignored. Lewis and Lindbergh's findings, coupled with the increased belligerence of the Nazi regime, left many in the NACA and Congress anxious.⁷

The NACA formed a Future Research Facilities Special Committee in late 1938 to identify the types of facilities needed to expand its research. The Langley campus was too congested to accommodate these new facilities, so the NACA decided to build its new high-speed flight laboratory elsewhere. Lindbergh led a team that analyzed different locations vying for the site, including Cleveland.⁸ The Cleveland Chamber of Commerce's bid emphasized the city's proximity to universities and natural resources, the eminence of the Cleveland Municipal Airport, and the

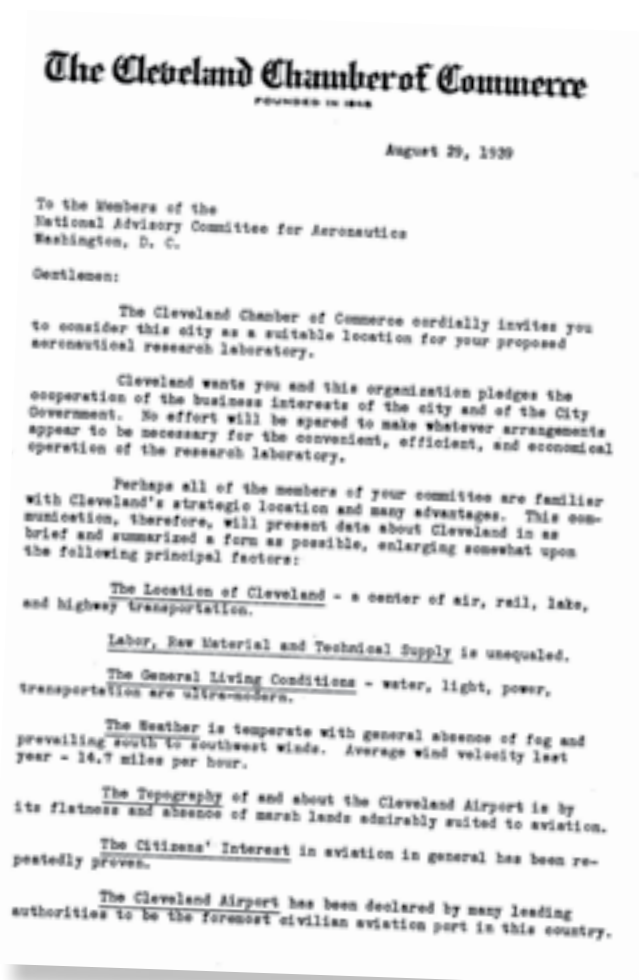


Image 18: Cleveland Chamber of Commerce invitation to the NACA for what would become the Ames lab.

city's continued support for aviation.⁹ In the end, the NACA decided to build its new Ames Aeronautical Laboratory in Sunnyvale, California, but newspapers reported that Cleveland had been the second choice.¹⁰

The Lindbergh committee also reported on the nation's dearth of aircraft engine research. In 1938 only 12 or so of Langley's more than 160 researchers were working on engines.^{11,12} In October 1939 the NACA began studying what types of facilities would be needed for an engine research laboratory. The report, issued on 23 January 1940, called for a new \$10 million laboratory that would include an engine test stand, a fuels and lubrication facility, and—after some debate—a wind tunnel for engines.¹³ Congress approved funds for the new laboratory in June 1940, just as the war in Europe escalated.¹⁴

After six months of comparatively modest levels of fighting, Germany had quickly conquered Denmark and Norway in April 1940, Belgium and the Netherlands in May, and France in June. Soon after, Italy declared war on France and Britain, and German U-boats began targeting ships ferrying supplies from the United States to Britain. The Battle of Britain, which commenced in July, turned into the aerial Blitz of London in early September.¹⁵

It was in this atmosphere that the NACA decided where to place its new engine laboratory. When 62 sites submitted bids in July 1940, the NACA quickly dismissed 16 for not meeting the prerequisite criteria. In August, a review team visited the top 20 potential sites, including 5 in Ohio. The group visited with local officials, inspected the locations, and discussed infrastructure and utilities.¹⁶ They visited Cleveland on August 22.¹⁷

The NACA brought Rudolph Gagg in from Wright Aeronautical to supervise the design of the laboratory. During an 8 October 1940 meeting, Gagg strongly recommended the selection of Cleveland. At that point, Glenview, Illinois, had a slight lead in the NACA's

intricate site-ranking scheme. The committee reconvened the following week in Cleveland, ostensibly to gather additional data, but in reality to secure commitments from city officials. The scientific ranking process had whittled the site list down to the point where politics could take over. Frederick Crawford and Clifford Gildersleeve, of the Cleveland Chamber of Commerce, led a negotiating group that consisted of officials from the Cleveland Municipal Airport, the Air Race Association, and the power company.¹⁸

There were several issues standing between Cleveland and the new lab, including the location, utility rates, and the grandstands for the air races. The airport agreed to relocate the proposed site from Brookpark Road to a more secluded plot between its northern fenceline and the Rocky River valley. This site served as a parking lot for the air races.¹⁹ Crawford assured the NACA representatives that the air races, which were not run in 1940, were permanently over, and the stands along the edge of the property would be removed. Crawford also brokered a deal in which the electric company would provide discounted rates if the lab agreed to operate its large facilities overnight when demand for electricity was low.²⁰ On 24 October 1940, the



Image 19: Aerial view of the National Air Races and parking lot in September 1938 (GRC-1991-C-01875).



Image 20: Groundbreaking ceremony for the AERL in January 1941. Left to right: William Hopkins, John Berry, Ray Sharp, Frederick Crawford, S. Paul Johnston, George Brett, Edward Warner, Sidney Kraus, Edward Blythin, and George Lewis (GRC-1982-C-06410).

NACA formally selected Cleveland as the site for the new aircraft engine research lab. The press announced the selection four weeks later.²¹

Building the Laboratory

On the blustery afternoon of 23 January 1941, several prominent Ohio politicians joined NACA officials and a handful of local reporters for the AERL groundbreaking ceremony. After a lunch downtown at the prestigious Hotel Cleveland, the group rode out to the airfield for a few brief remarks and a photo opportunity with the decorative pick and shovel. Despite the smiles, the war in Europe loomed in everyone's mind. When asked why the new lab was needed, NACA committee member Edward Warner replied, "The difference between winning a war and losing it may be the difference between [a] 1000 and 2000-horsepower motor, or the difference between [the] ability to fly at 20,000 feet or 30,000 feet." He darkly added,



Image 21: Surveyors taking measurements for the NACA's engine lab in August 1941 (GRC-2011-C-00347).²²



Image 22: Helen Ford (center) and Charles Herrmann (right) in front of the lab's first administrative building, the Farm House, in October 1941 (GRC-2006-C-01209).



Image 23: The radio shack office was located along Brookpark Road just east of the lab's entrance, in 1942 (GRC-2011-C-00346).

"The consequences of the work done here may mean the continuance of our ability to exist."²³

Charles Herrmann, a construction engineer from Langley, set up an office in a small radio shack on the edge of a frozen airfield. He was joined in the coming weeks by Helen Ford, an assistant administrator from NACA Headquarters, and inspector William Waite. The group considered themselves as pioneers establishing an outpost in the north. The once-teeming grandstands now appeared hazy in the wintry distance.²⁴

Herrmann and Ford hired local construction crews to build the buildings and facilities, supervised the work of the inspectors, and interviewed potential employees. In addition to these tasks, Ford managed to keep the fire in the two-room radio house burning and supply coffee for the growing number of construction engineers. Herrmann and Ford regularly worked into the night to ensure that the projects continued on schedule.²⁵



Image 24: The AERL design team works in an office above Langley's Structural Research Laboratory during April 1941 (GRC 2007-C-02563).

Meanwhile at Langley, the AERL design team was at work in an office above the Structural Research Laboratory designing the test facilities, laboratories, and offices that would soon populate the AERL site.²⁶ The six principal structures were the Engine Research Building, the hangar, the Fuels and Lubrication Building, the Administration Building, the Engine Propeller Research Building, and the AWT, with the Icing Research Tunnel (IRT) added in 1943.

James Braig arrived from Langley in the spring to supervise the storage of the incoming equipment and supplies underneath the only available structure, the grandstands. On 30 July 1941, the slowly growing staff of construction engineers and inspectors relocated to an empty residence, “the Farm House,” along the main road entering the site.²⁷



Concurrently, another major construction effort was underway 60 miles to the west in Sandusky, Ohio. In late 1940 the U.S. War Department had begun making plans to build several dozen munitions manufacturing facilities. It would be another year before the

nation entered World War II, but the government did not wish to repeat the mistakes that it had made before World War I. The nation's failure to coordinate its ordnance manufacturing capabilities in advance of that conflict had hampered the military's effectiveness.



Image 25: View northward toward the lab's entrance at Brookpark Road in August 1941. The Farm House is on the left (GRC-2011-C-00350).

Endnotes for Chapter 1

3. "Fliers Race for Coveted Trophy," *The Zanesville Signal* (4 September 1939).
4. Jerome Hunsaker, "Forty Years of Aeronautical Research" *Smithsonian Report for Aeronautics* (Washington, DC: Smithsonian Institution, 1956).
5. Richard P. Hallion, "America and the Air and Space Revolution: Past Perspectives and Present Challenges," National Aeronautical Systems and Technology Conference (13–15 May 2003), pp. 12–16 and 21.
6. George W. Lewis, "Report on Trip to Germany and Russia: September–October 1936," File 11059, 1936, NASA Headquarters Historical Collection, Washington, DC.
7. Alex Roland, *Model Research* (Washington, DC: NASA SP–4103, 1985), chap. 7.
8. John F. Victory, "Remarks at Cleveland Chamber of Commerce Luncheon Commemorating the Tenth Anniversary of Foundation of the Lewis Flight Propulsion Laboratory," 23 January 1951, NASA Glenn History Collection, Cleveland, OH.
9. Cleveland Chamber of Commerce, "An Invitation to the National Advisory Committee for Aeronautics," 29 August 1939, NASA Glenn History Collection, Directors' Collection, Cleveland, OH.
10. John D. Holmfeld, "The Site Selection for the NACA Engine Research Laboratory: A Meeting of Science and Politics" (Bachelor's thesis, Case Institute of Technology, 1967).
11. Benjamin Pinkel interview, Cleveland, OH, by Virginia Dawson, 4 August 1985, NASA Glenn History Collection, Oral History Collection, Cleveland, OH.
12. James Hansen, *A History of the Langley Aeronautical Laboratory, 1917–1958* (Washington, DC: NASA SP–4305, 1985).
13. "Report of the Special Committee on New Engine Research Facilities" File 11059, 24 January 1940, NASA Headquarters Historical Collection, Washington, DC.
14. Holmfeld, Bachelor's thesis.
15. Reg Grant, *World War II: Europe* (Milwaukee, WI: World Almanac Library, 2004).
16. Holmfeld, Bachelor's thesis.
17. "Cleveland Bids," *Cleveland Plain Dealer* (22 August 1940).
18. Holmfeld, Bachelor's thesis.
19. Holmfeld, Bachelor's thesis.
20. Holmfeld, Bachelor's thesis.
21. "City Gets \$8,400,000 Plane Lab," *Cleveland Plain Dealer* (25 November 1940).
22. Lawrence Hawkins, "More Power to Us," *Cleveland Plain Dealer* (23 February 1941).
23. Hawkins, "More Power to Us."
24. Helen Ford, "From a Historical Viewpoint," c1944, NASA Glenn History Collection, Directors Collection, Cleveland, OH.
25. Ford, "From a Historical Viewpoint."
26. Ernest G. Whitney, "Lecture 22—Altitude Wind Tunnel at AERL," 23 June 1943, NASA Glenn History Collection, Cleveland, OH.
27. Helen Ford to Miss Scott, 23 December 1942, NASA Glenn History Collection, Directors' Collection, Cleveland, OH.
28. Steve Gaither and Kimberly Kane, "The World War II Ordnance Department's Government-Owned Contractor-Operated (GOCO) Industrial Facilities: Indiana Army Ammunition Plant Historic Investigation," December 1995, NASA Glenn History Collection, Plum Brook Ordnance Works Collection, Cleveland, OH.
29. Frank N. Shubert, "Mobilization: The U.S. Army in World War II, The 50th Anniversary," www.army.mil/cmh-pg/documents/mobpam.htm (accessed 11 June 2015).
30. Gaither, "The World War II Ordnance."
31. "Five Railroads Located in Plant Area," *Sandusky Star Journal* (6 January 1941).
32. "Purchasing Agent Tells Perkins Township Families of Acquiring of Properties," *Sandusky Star Journal* (8 January 1941).
33. "New Site for Perkins Cemetery," *Sandusky Star Journal* (17 January 1941).
34. "Production to Begin Soon at Plum Brook Powder Plant," *Cleveland Plain Dealer* (26 October 1941).
35. "Farmers Leave New TNT Area and County Roads Will Be Closed to Public October 12," *Sandusky Star Journal* (22 September 1941).
36. Mark Bowles, *Science in Flux: NASA's Nuclear Program at Plum Brook Station 1955–2005* (Washington, DC: NASA SP–2006–4317, 2006).
37. "Local Concerns Get Big Contracts," *Cleveland Plain Dealer* (19 January 1941).
38. Virginia Dawson, *Engines and Innovation: Lewis Laboratory and American Propulsion Technology* (Washington, DC: NASA SP–4306, 1991).
39. Michael Vaccaro to Allen Gamble, "Nomination of Dr. Edward R. Sharp for the First Annual Presentaton of the Career Service Award," 26 August 1955, NASA Glenn Collection, Sharp Collection, Cleveland, OH.
40. Henry Reid to Staff, "Reorganization of the Construction Division," 20 September 1940, NASA Glenn History Collection, Cleveland, OH.