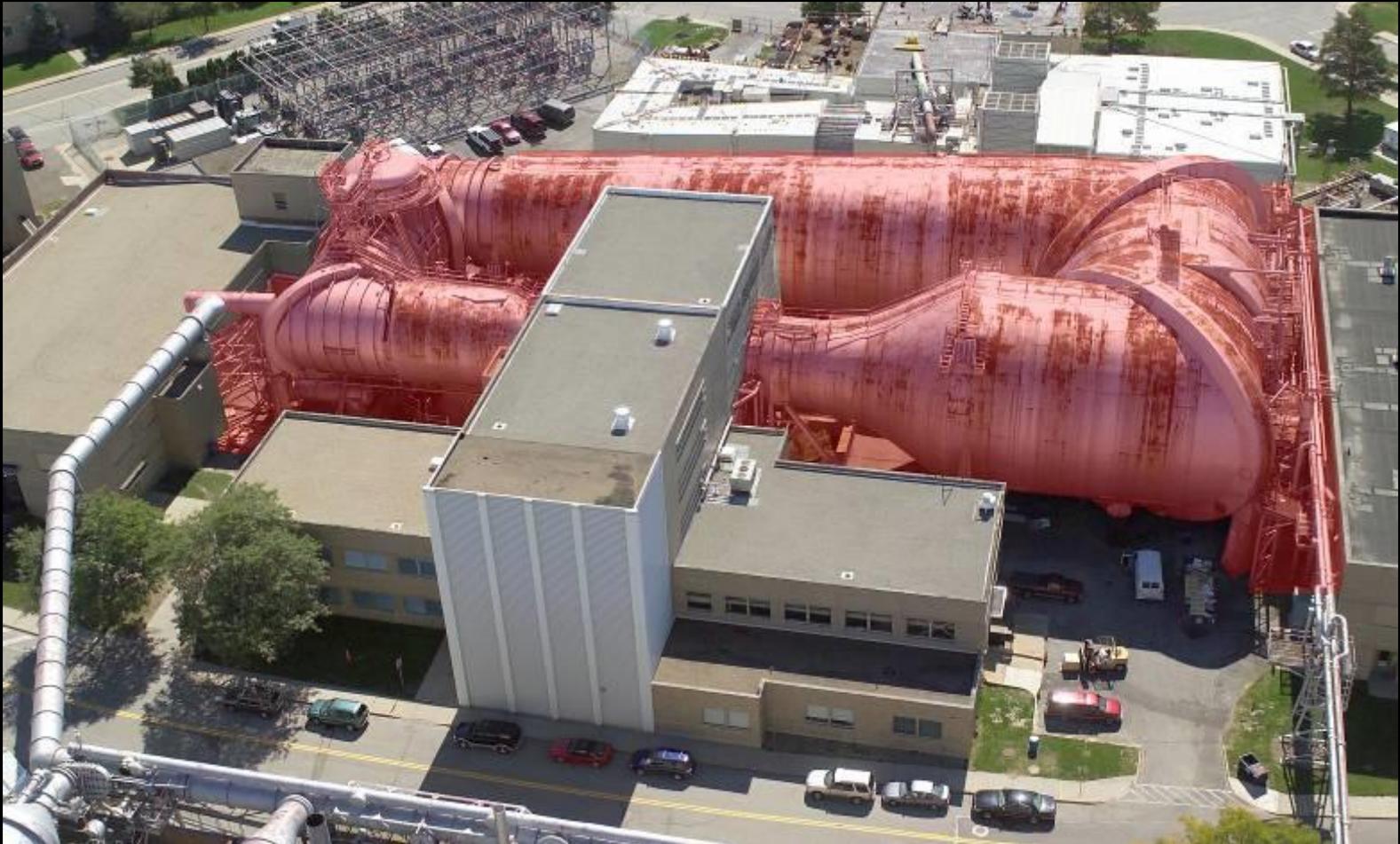




PSL and AWT

DEMOLITION

Les Main



AWT



AWT Justification

NASA Headquarters has concurred with and advocated the proposed demolition of AWT. The facility, as configured, has been out of service for more than 30 years. The tunnel underwent major modifications to support specific test goals for the Centaur Program. No significant research work has been done in the tunnel circuit since the end of the Centaur Program.

The Government completed a preliminary engineering study in the mid 1980s to substantially modify the AWT circuit for use as a new Icing Research Tunnel Facility. NASA Headquarters rejected the proposal based on cost.

There are no current proposals for either near term or long term use of the tunnel circuit other than as a potential Visitor's Center Tour stop. Although the AWT is unique based on its sheer size alone, the maintenance costs for the facility are now so high as to be justified only by the largest of research programs. A recently completed cost estimate to do minor exterior repairs and repaint the tunnel circuit and utilities was in excess of \$4.0M. There has been no recent interest from DOD, other government agencies, or private companies to use any significant portion of the AWT circuit. The current NASA GRC proposal is to remove the entire AWT circuit except for the Test Section within the High Bay of the Building 7 complex. The only major costs involved with retaining the Test Section would be for capping both exposed ends of the Test Section and residing the High Bay after existing asbestos panels are removed.

Scope & Description

This Project at the Glenn Research Center is proposed for demolishing the bulk of the existing Altitude Wind Tunnel (AWT) circuit and adjacent AWT facilities and utilities currently part of the Building No. 7 and No. 8 complex.

Base Bid:

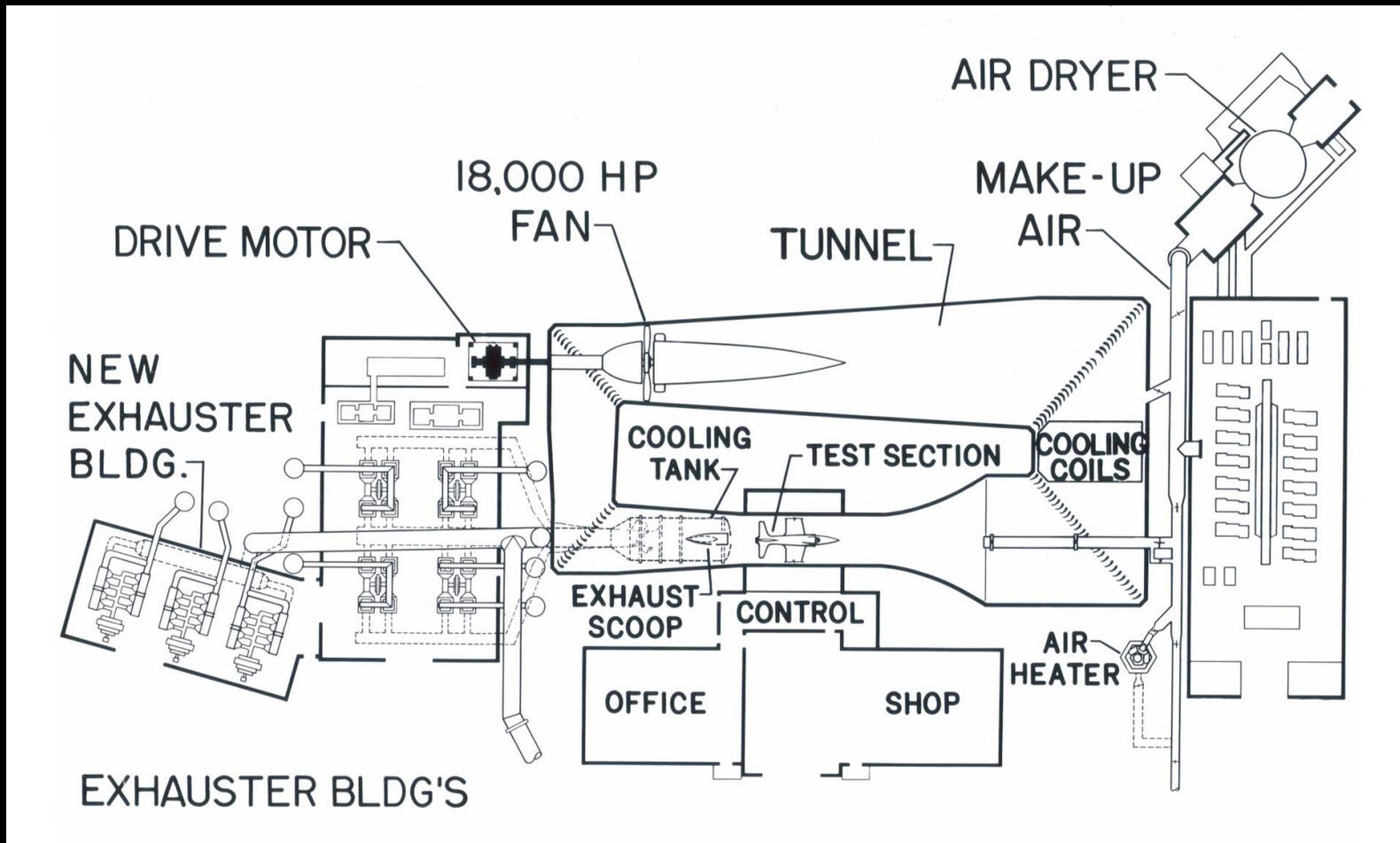
Remove the complete existing AWT circuit shell structure and exterior liner and insulation outside of the Building 7 High Bay area down to the top of concrete support piers and anchor foundations. Removal shall include all platforms, ladders, railings, structural steel support framing, and miscellaneous framing attaching to the tunnel shell. All metal from the demolition of the AWT will be weighed at GRC and taken offsite for recycling.

Furnish and install a new insulated metal panel siding system the exposed ends of the Test Section.

Completely remove Building No. 78 and the Vacuum Pump House to a minimum of 2.0 ft. below grade.

Remove all AWT loop concrete support piers and anchor foundations, except the anchor foundation of the west side of the High Bay portion of Building No. 7. Remove concrete to a minimum of 2.0 ft. below grade (the anchor foundations and the support piers extend approximately 14 feet below grade). Remove the Cooler Pit walls to a minimum of 2.0 ft. below the adjacent grade. All concrete removed during the demolition of piers and foundations will be weighed at GRC and taken offsite for recycling.

Due to the historic nature of this tunnel complex, NASA will preserve the Wind Tunnel Test Section located inside Building 7 as a permanent visitor tour stop and set up for historical interpretation base upon the AWT's contributions to aircraft and aircraft engine development and contributions to the early Space program. Refurbishing the interior of the Test Section is not part of this project.



AWT schematic



Options:

Option No. 1: Remove completely the first floor Generator equipment and foundations to the first floor level in Building No. 8. Remove the ventilation fan in the ventilation shaft.

Option No. 2: Remove the AWT Main Drive Motor and support structure down to the third floor level at the southwest corner of Building No. 8.

Option No. 3: Remove the anchor foundation concrete on the west side of the Building No. 7 High Bay to a minimum of 2.0 ft. below grade.

Option No. 4: Regrade and repave the AWT demolition site.

Option No. 5: If the existing asbestos panels are removed, furnish and install all new replacement siding.

Customer Project Goals

The structures shall be removed safely according to Project Specifications and OSHA and Glenn Safety Office requirements. The Project shall be executed to minimize adjacent environmental at grade damage consistent with the project scope and budget. All hazardous material abatement shall be carried out in compliance with all Federal, State and Local environmental regulations and the GRC Environmental Programs Manual. All metal from the demolition of the Altitude Wind Tunnel will be recycled. The Project shall also be designed and field construction implemented to minimize the potential for damaging adjacent facilities. It is expected that there will be a range of impacts to adjacent facilities and occupants due to the demolition activity scheduled for this Project site. The AWT site is very congested which will require implementation planning to minimize impacts. Active facilities adjacent to the Project site include Buildings 7, 8, 9, 11, 78 and Substation B. There are numerous service utilities impacted by the Project and they will be terminated in ways to minimize service interruptions to adjacent system users. Some utilities will be rerouted. Demolition truck traffic will add to general site congestion and heavy demolition equipment will damage some existing pavement areas. Paving of the area opened up by the demolition will be paved as a method of storm water control, but will be of adequate strength to allow parking.



AWT and PSL Assessment

ENVIRONMENTAL

Trudy Kortez



AWT and PSL Demolition Environmental Issues

- Per regulatory requirements, a Draft Environmental Assessment (EA) has been prepared and will be advertised as available for review during a mandatory 30 day public comment period within the next 3-6 months.
- This document assures NASA's compliance with the National Environmental Policy Act which requires us to assess all environmental, technical, and economic factors prior to implementing a proposed action.
- The Draft EA assesses the baseline environment and the environmental impact due to the project(s).
 - Baseline + Proposed Action = Environmental Impact



Environmental Assessment

The National Environmental Policy Act requires all Federal Agencies to consider environmental, technical, and economic factors prior to implementing a proposed action.

A Draft Environmental Assessment is currently in internal review at Glenn Research Center and NASA Headquarters. Once the draft is finalized, it will be issued for public comment for 30 days. This is a regulatory requirement and all comments will be addressed in the final version of the EA. If anyone is interested in receiving a notification of the availability of the draft EA, please let me know after the meeting and I can see that you are added to a mailing list.



AWT and PSL Demolition Environmental Issues

- Currently, the Draft EA addresses the following areas:
 - Land Use
 - Climate and Air Quality
 - Water Resources (Surface and Groundwater)
 - Ambient Noise
 - Geology and Soils
 - Natural Resources
 - Threatened and Endangered Species
 - Socioeconomics
 - Cultural Resources (Historic Preservation)
 - Hazardous Materials and Waste Disposal
 - Transportation
 - Environmental Justice



Environmental Assessment

So, in the draft EA, we have made the following assessment. That the only issues with short term, temporary impacts are land use, air quality, and noise. The only long term impact deals with the cultural resources, or historic preservation issue. The short term impacts are due to construction equipment which will be used to demolish the structures causing temporary increased vehicle air emissions and also a temporary noise increase from those same vehicles and demolition work. Short term land use impacts are due to a decrease in parking space and altered pedestrian traffic, but long term land use would be positively impacted as these two projects by providing real estate for future new land uses.



Environmental Consequences of Proposed Action

Affected Area	Short Term Impacts	Long Term Impacts
Land Use	X	
Climate and Air Quality	X	
Surface Water		
Groundwater		
Ambient Noise	X	
Geology and Soils		
Natural Resources		



Environmental Consequences of Proposed Action

Affected Area	Short Term Impacts	Long Term Impacts
Threatened and Endangered Species		
Socioeconomics		
Cultural Resources (Historic Preservation)		X
Hazardous Materials and Waste Disposal		
Transportation		
Environmental Justice		
Cumulative Impacts		



1. We have met with the OHPO. They have come and have toured the facilities. They have reviewed our analysis and informally concur with our determinations. They are receptive to our proposed mitigation of adverse effects. They are interested in seeing what type of response the general public has to this proposed demolition. They have yet to make a written recordation of their opinion on the proposed demolition.
2. NASA has considered alternatives other than demolition of the facility. Moving the facilities is unrealistic. Rehabilitating these facilities would waste millions of dollars on facilities that are no longer needed. Adaptive reuse was considered for other Wind Tunnel uses, but Glenn's Aeronautic program support is greatly diminished with the low national resolve for aeronautic research – and no Adaptive Reuse need is available. Doing nothing is not a safe or wise approach.
3. Anne Power will speak more about the exciting ways in which we plan to document the facility's history so that we can tell the story for future generations.
4. As Citizens and Taxpayers, our audience can voice their concerns and opinions. We are open to suggestions. No irrevocable decisions have been made yet.
5. We also need to invite the Advisory Council on Historic Preservation to review and comment – that is one of our next steps.



Section 106 Historic Preservation Process

1. Consulting with the Ohio Historic Preservation Office
2. Considered alternatives to demolition, but found them cost prohibitive or not feasible:
 - Move, Rehabilitate, Adapt and Reuse, Do nothing
3. Working to Resolve Adverse Effects by:
 - Documentation of facilities: Drawings, Photographs and Files
 - Book and CD ROM
 - Display Boards for Tour stop or museum
 - Historical Marker
 - Keep Test Section space and chamber
4. Public involvement and comment (you can participate)
5. Consulting with National Advisory Council on Hist.Pres.



AWT and PSL Demolition Environmental Issues

Ms. Trudy Kortes, M.S.
Environmental Engineer/
National Environmental Policy Act Program Manager
NASA Glenn Research Center
Environmental Management Branch
Phone: 216-433-3632
Trudy.F.Kortes@nasa.gov



Altitude Wind Tunnel (AWT)

HISTORY

Anne Power



NASA Glenn Research Center has been at the forefront of jet and rocket engine studies in general, particularly under altitude conditions. The Altitude Wind Tunnel and the Propulsions Systems Laboratory were primary components of the center's research. The ability to test full-size engines instead of just a single cylinder, as was previously done, resulted in a more rapid transition from design to flight testing.

The Altitude Wind Tunnel, which first began operation in 1944, was the first wind tunnel in the country capable of testing full-scale engines under simulated altitude conditions. The facility was converted from a wind tunnel to a vacuum chamber in 1962 and was renamed the Space Power Chamber. The new Space Power Chamber was utilized through the early 1970s for Centaur system testing and separation tests.



Altitude Wind Tunnel



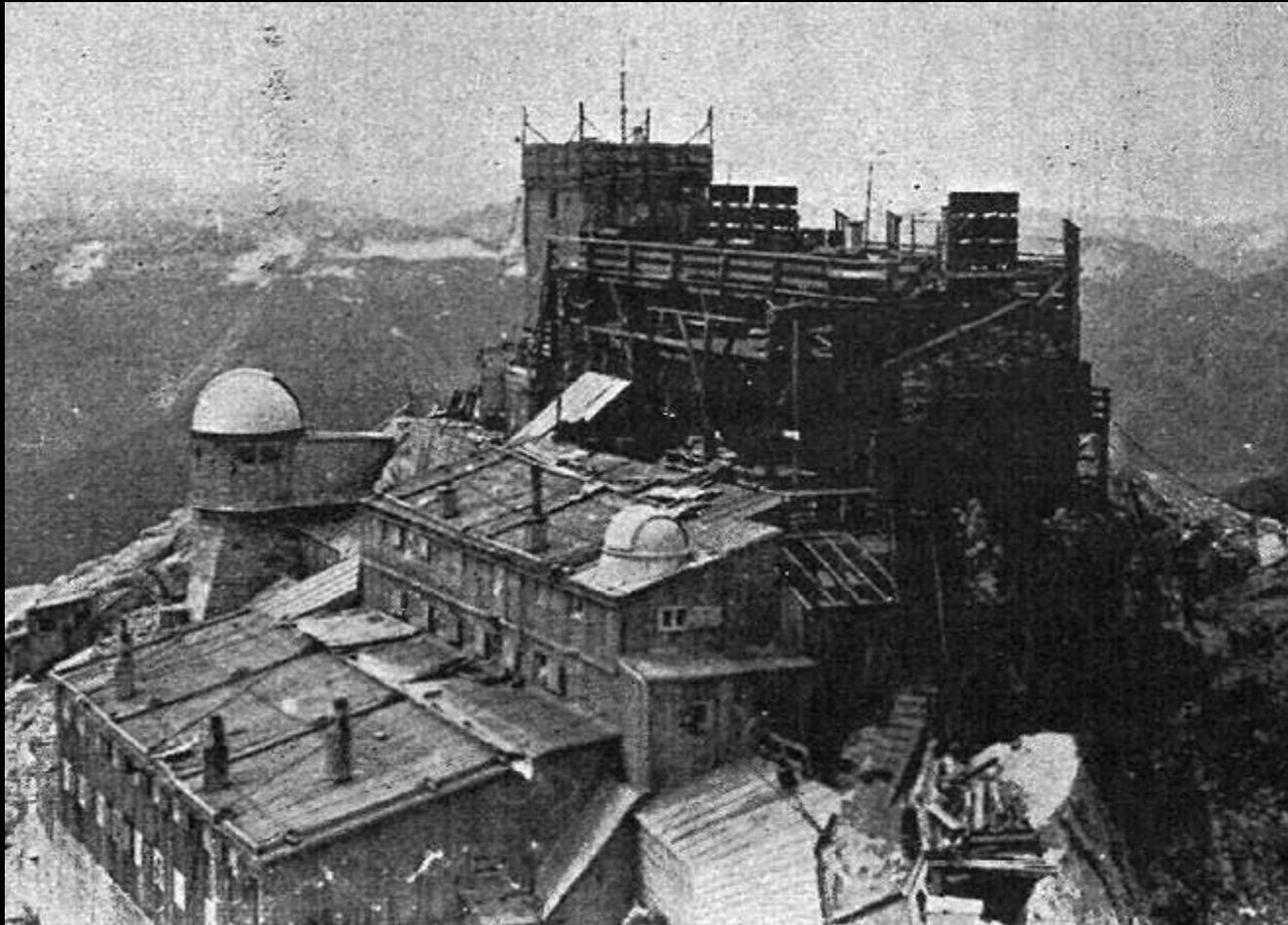
Space Power Chamber (SPC)



AERL & AWT Construction

After the Wright Brothers' 1903 flight, American aeronautical research was quickly superseded by the Germans and British. As a result the US began the National Advisory Committee for Aeronautics in 1915 to perform general aeronautical research for the American aviation industry. The Europeans continued to dominate the field, though. In 1939, with another world war eminent, the NACA sought to create two new laboratories, one specifically to study aircraft engines.

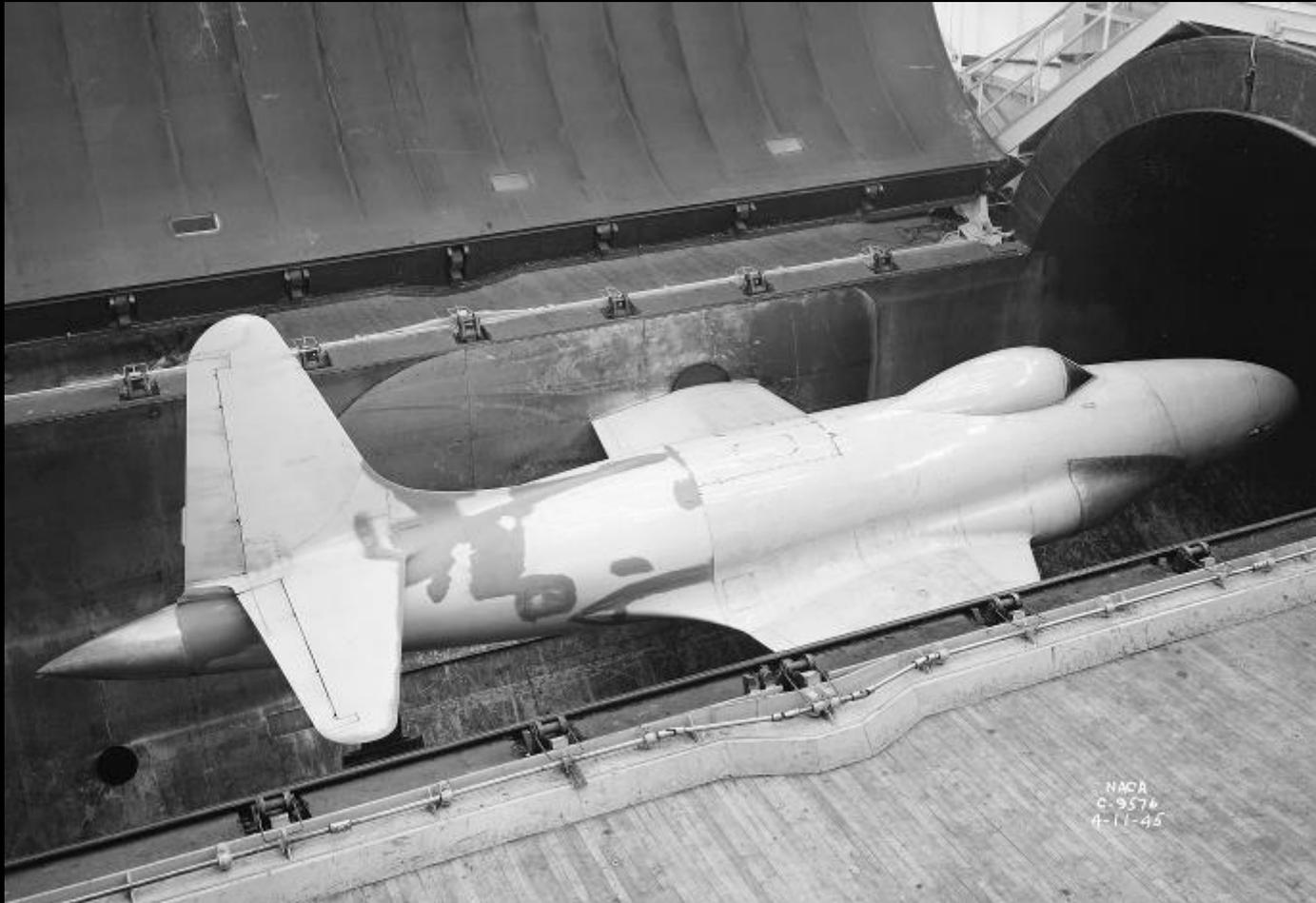
This new Aircraft Engine Research Facility was located in Cleveland, Ohio and is now the NASA Glenn Research Facility. The centerpiece for the new engine lab would be the Altitude Wind Tunnel [AWT]. The new facility was the nation's first wind tunnel capable of testing full-scale engines in simulated altitudes. Engine power, speed, drag, vibration, and cooling could all be analyzed in altitude conditions. The massive exhaust system and refrigeration system could simulate altitudes up 50,000 feet and produce speeds of 500mph. The tunnel's support buildings and systems were also used to operate another Glenn facility, the Icing Research Tunnel.



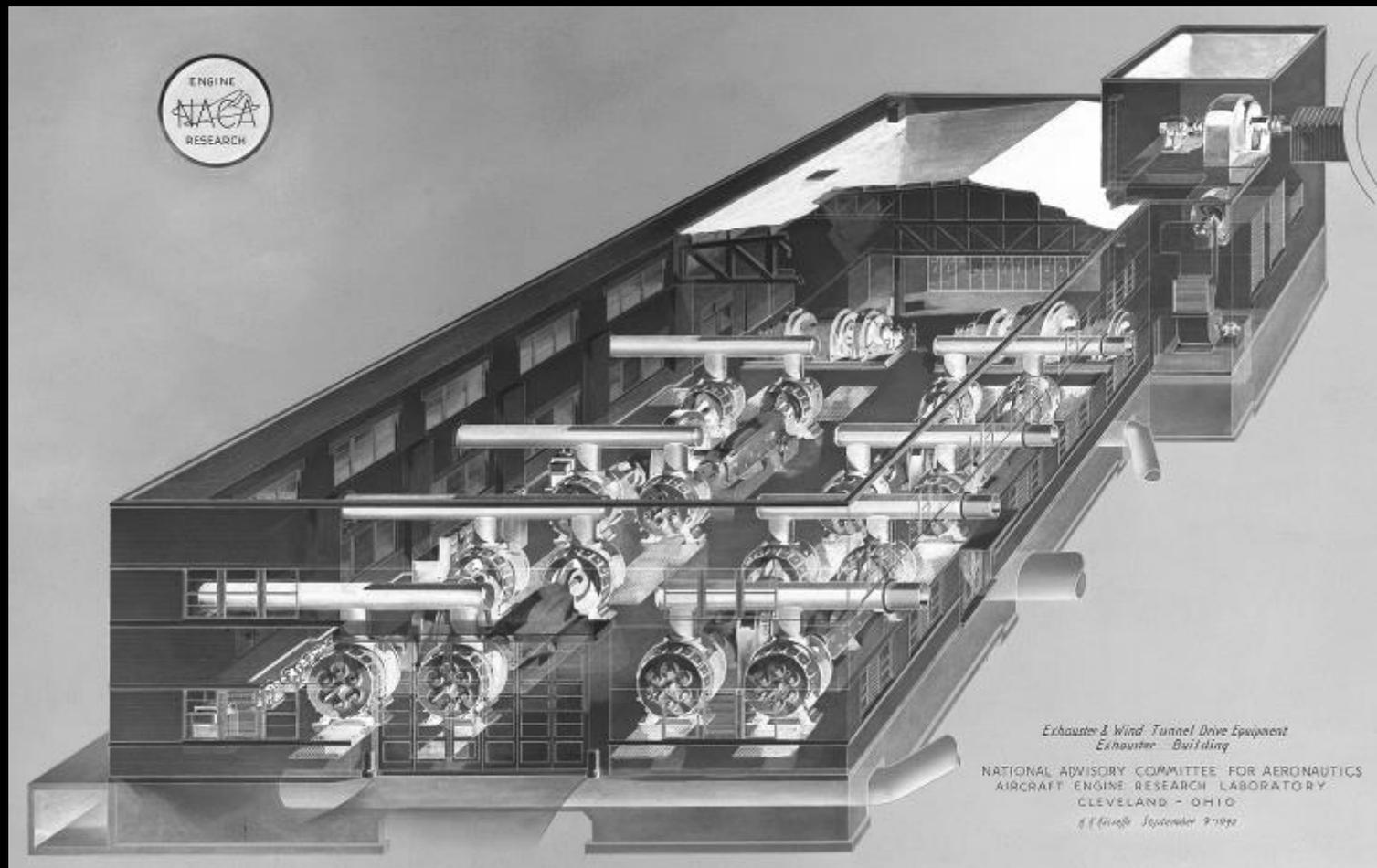
High-Frequency Research Station in Germany



Aircraft Engine Research Laboratory construction



AWT test section



AWT exhausters and drive motor



AERL & AWT Construction

In the rush to assist in the war effort, construction of the AERL was completed ahead of schedule, but at twice the original cost. The design of the massive Altitude Wind Tunnel was a tremendous engineering challenge. It was announced early in the process that the building of the AWT would require more engineering man-hours than the Boulder Dam. Design of the tunnel began in early 1941, its foundations were installed the following spring, and the first test was on February 4, 1944.



Interior of AWT during construction



Exterior of AWT



AWT turning vanes



Wartime Research

Almost all of the NACA's research during the war concentrated on improving existing military aircraft. A notable exception was the Altitude Wind Tunnel's very first test, the Bell YP-59A Airacomet. The Airacomet was powered by the GE I-16, which was the first turbojet engine in the United States. The I-16 was based on a Whittle jet engine, which was secretly brought from Britain to the United States in 1941. Despite the enhancements made in the Altitude Wind Tunnel, the Airacomet remained too problematic and inefficient to be used for World War II combat.

Much of the center's efforts during the war were concentrated on solving cooling problems for the new Boeing B-29 bomber's Wright R-3350 engines. The aircraft had been rushed through production for the war, but the R-3350s often burned up or failed at higher altitudes. The engines underwent a series of investigations over the course of six months in 1944. NACA researchers were able to resolve the cooling problem and increase fuel efficiency by 18%. These improvements were not integrated into the engine design until after the war. US Strategic Bombing Commander, Curtis LeMay, opted to forsake the high-altitude precision bombing for low-altitude incendiary bombing which caused more casualties but would not strain the B-29's engines.



Bell YP-59A Airacomet—first jet engine in the United States



B29's Wright R-3350 engine in AWT



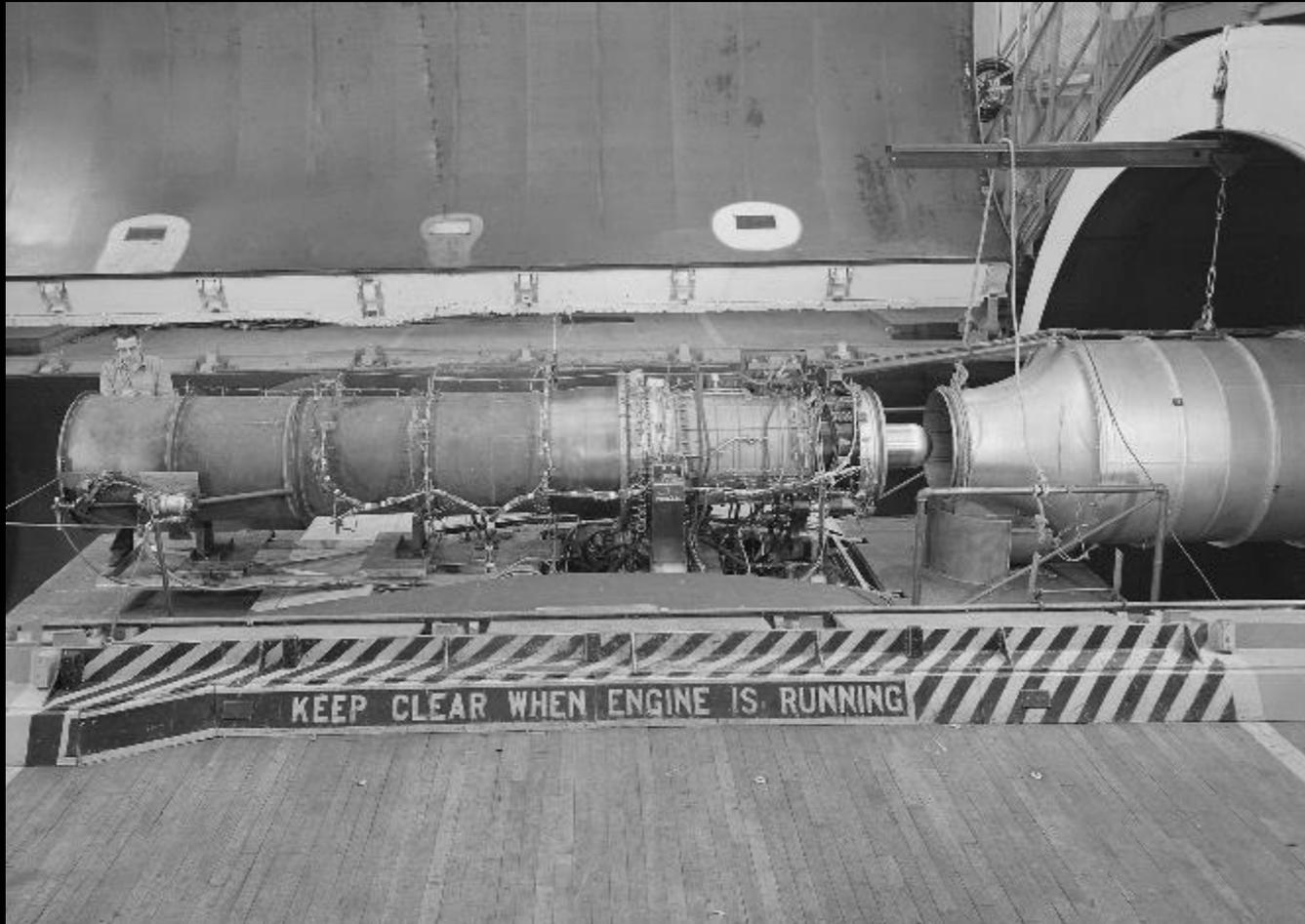
B29 on the hangar apron



Early turbojets

Following the war, the NACA was finally able to delve into new research, particularly with turbojet and ramjet engines. Turbojet studies actually began in late 1944 with studies on the Westinghouse 19B and 19XB engines, the GE TG-180 engine and afterburner, and the Lockheed YP-80A Shooting Star, which was the first jet aircraft entirely manufactured in the United States. Air distribution, windmilling, and basic operating problems with the Shooting Star's GE I-40 engine were improved. The YP-80A evolved into the F-80 and was used extensively in the Korean War.

The Altitude Wind Tunnel underwent several upgrades in the late 1940s and early 1950s to increase the tunnel's speed and altitude capabilities. This included reducing the size of the test section. Originally entire fuselages could be inserted, but even with the smaller size test section, entire engines and nacelles could be used. Testing continued on ramjets, turbojets, and the jet-powered turboprops.



Westinghouse 24C turbojet engine

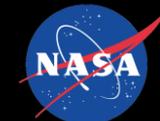


Lockheed YP-80A Shooting Star—first U.S.-built jet engine

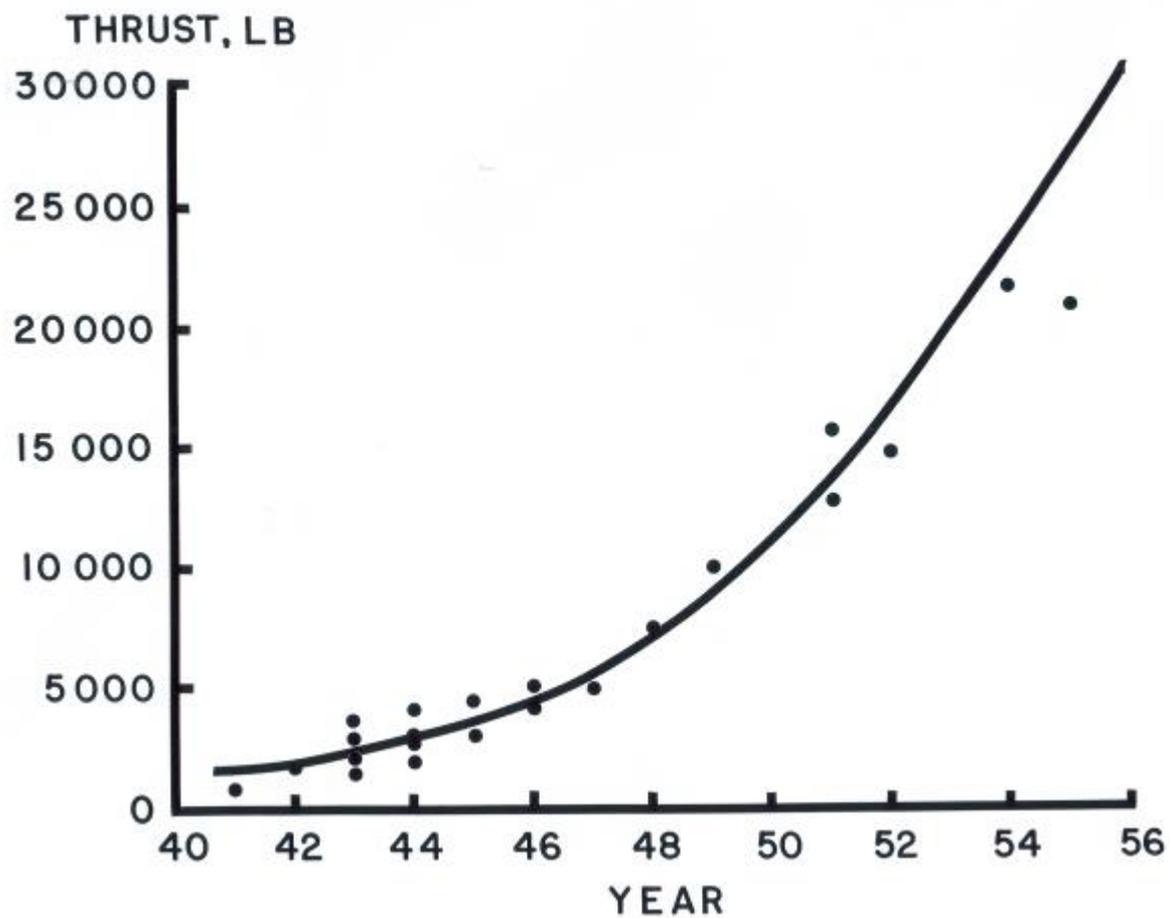




J-65 jet engine in AWT



TURBOJET ENGINE DEVELOPMENT



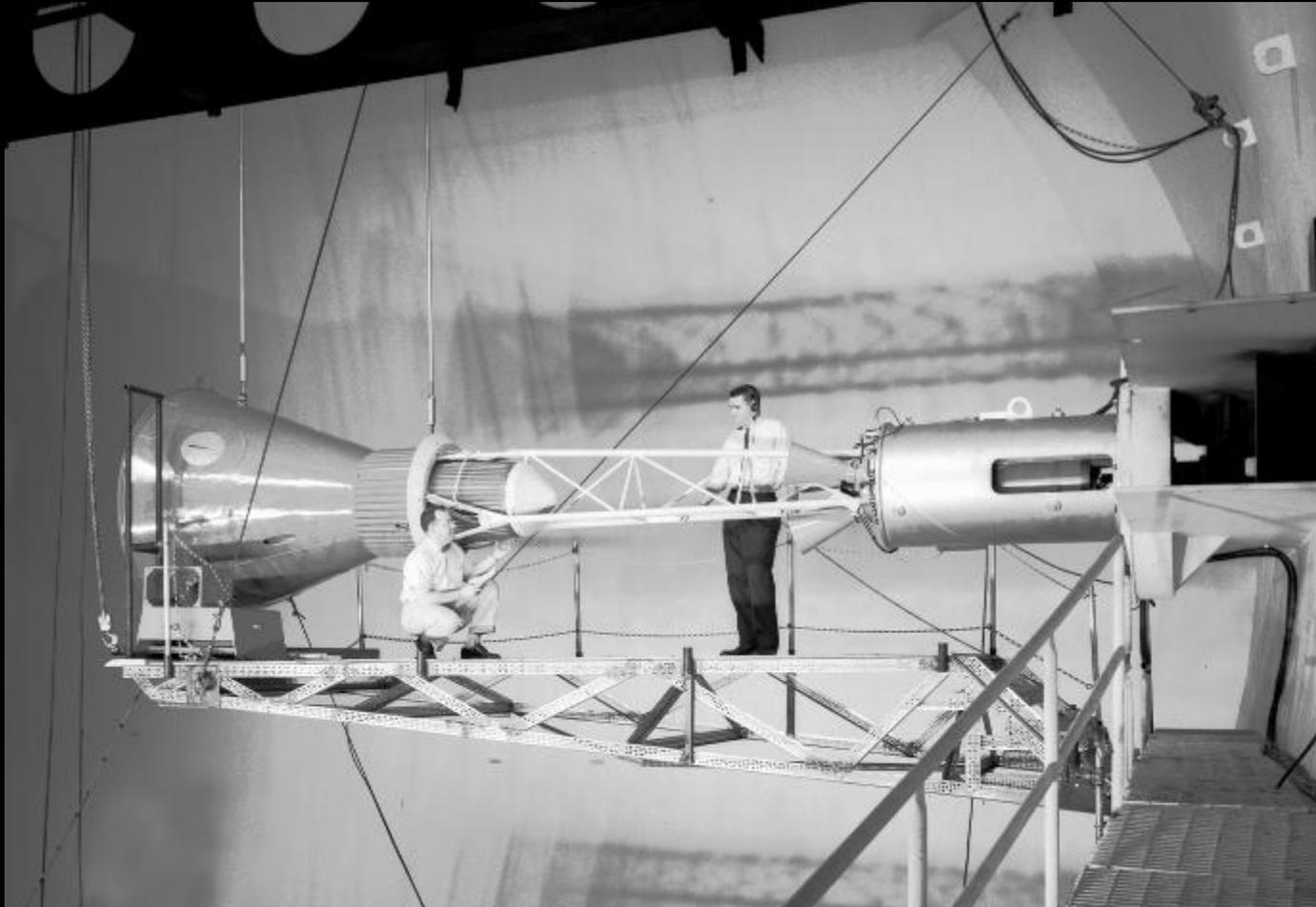


Mercury Program

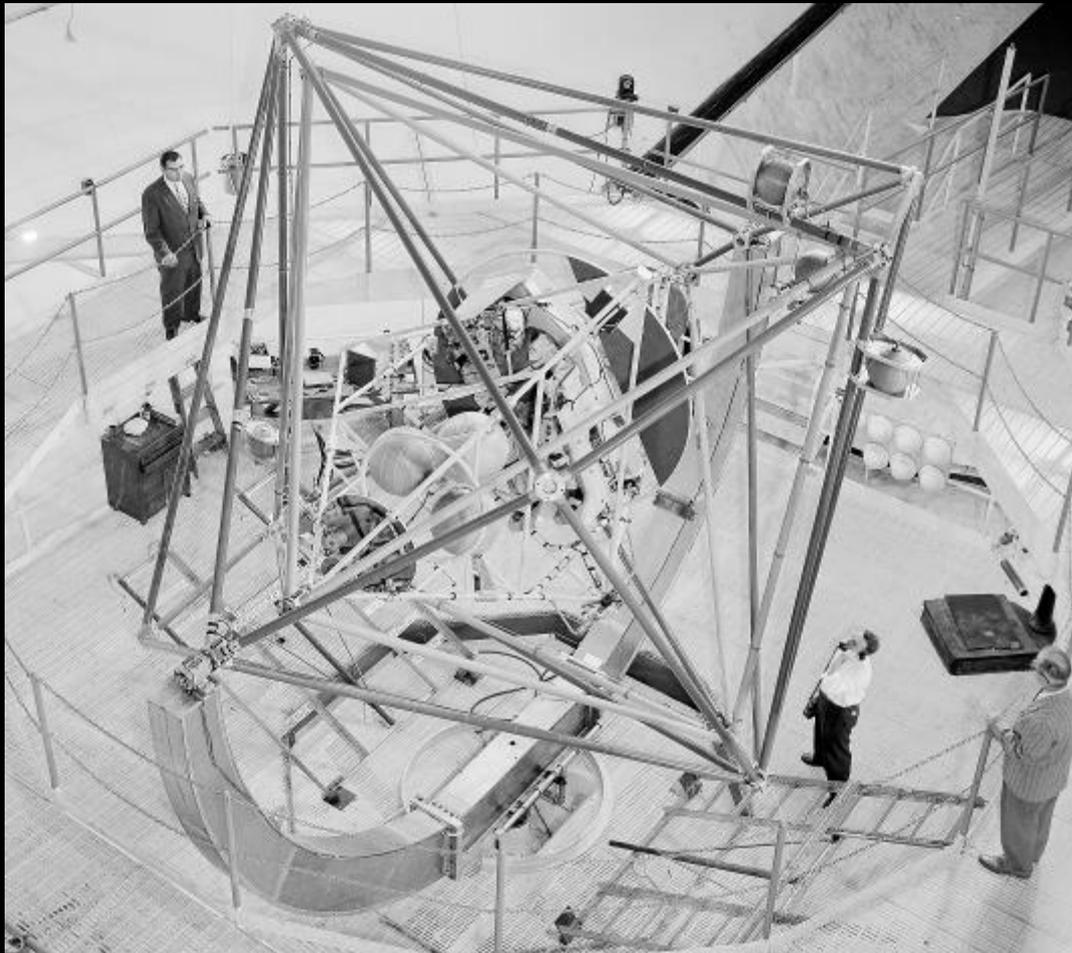
By the late 1950s, though, other more advanced facilities, including the new Propulsion Systems Laboratory, were relied on for more and more engine testing. As the space program emerged and the center became part of NASA, the facility began to be utilized for its cavernous space rather than its wind tunnel capabilities. Escape rocket tests for the Mercury capsule were performed inside the wide section of the tunnel. In 1959, the original astronaut corps traveled to Cleveland to be test their ability to bring a tumbling Mercury capsule under control in the Multi-Axis Spin-Test Inertia Facility Trainer apparatus which was also installed inside the Altitude Wind Tunnel.



Vast interior of AWT



Mercury capsule in AWT for escape rocket jettison test



Mercury astronaut in the MASTIF



Space Power Chamber

Between 1958 and 1960, the lab refocused its efforts almost completely towards the space program. Although the AWT had already played a prominent role with the Mercury Program, its continued use was in question. Unwilling to let this historically significant facility fall into obsolescence, NASA Lewis administrators decided to convert the tunnel into vacuum chamber.

During this conversion process, two massive bulkheads were installed inside the tunnel, creating two vacuum chambers. It also included rewelding the tunnel's joints, installing a new vacuum pump house, and creating a dome that could be removed to insert test equipment. On September 12, 1962 the Altitude Wind Tunnel was officially renamed the Space Power Chamber or SPC.



Conversion of AWT to SPC



Bulkhead installed inside AWT

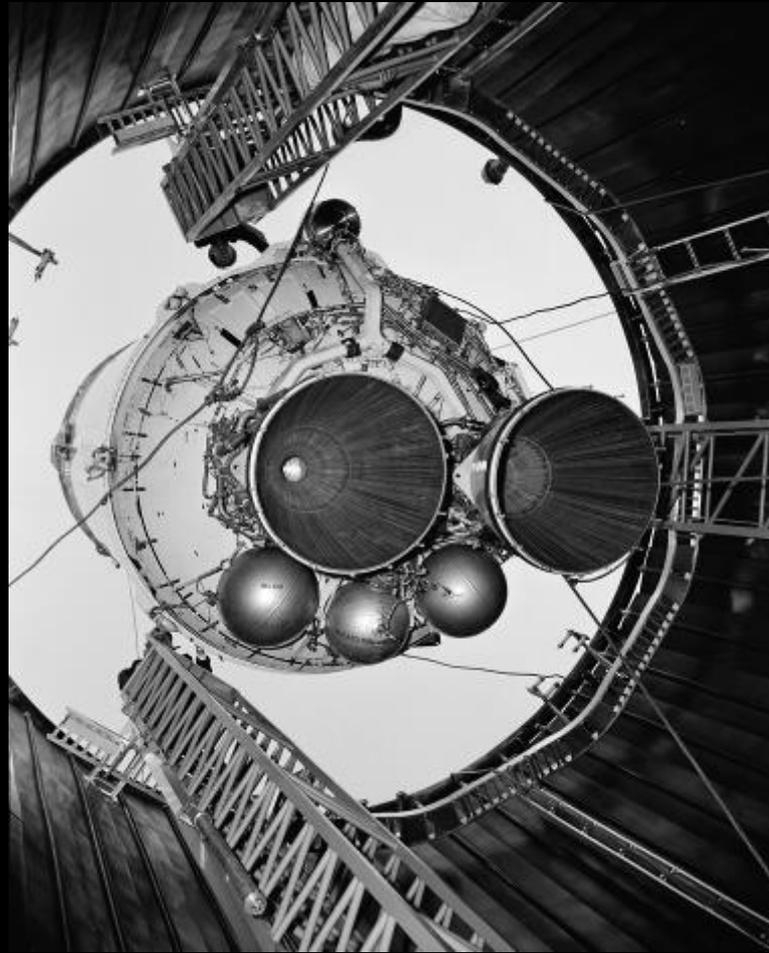


Vacuum pumps installed in SPC

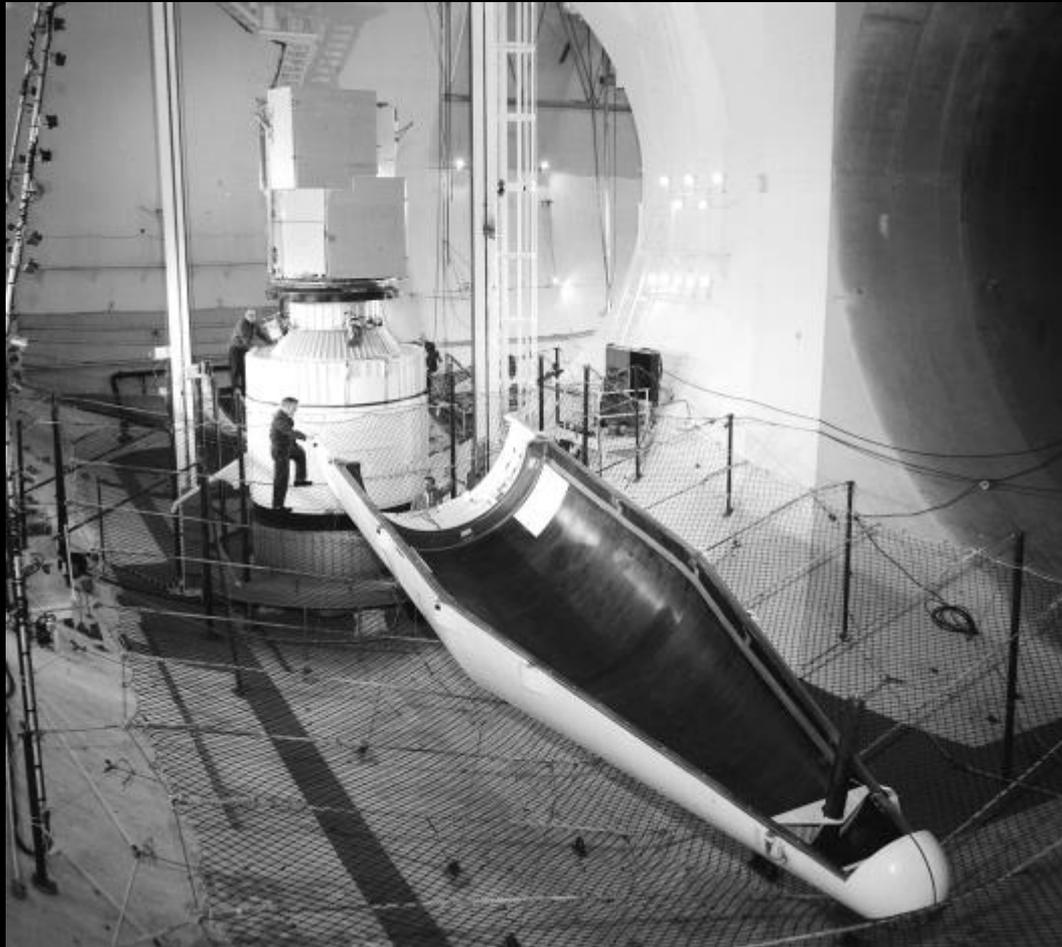


Centaur

In 1961, Center Director Abe Silverstein convinced NASA to transfer the Centaur Program from Marshall Space Flight Center to NASA Lewis. A mock-up Centaur rocket was installed in the Space Power Chamber to study entire systems tests in a space environment. The other end of the tunnel was used for shroud separation tests. These tests contributed to the Surveyor, Orbiting Astronomical Observatory, and many other Centaur missions.



Centaur rocket installed in SPC



Orbiting Astronomical Observatory nose fairing test



Rehab

By the mid-1970s fewer tests were conducted in the Space Power Chamber and it fell into obsolescence. There was a proposal in the early 1980s to overhaul the facility and convert it back into a wind tunnel for icing research tests. After several years of preliminary studies, the \$150 million renovation was scrapped and the facility has remained unused.



SPC interior today



AWT today