

UNITARY PLAN WIND TUNNEL
MODERNIZATION PROJECT, FY93-95
Moffett Field, California
National Aeronautics and Space Administration

November 1993

ENVIRONMENTAL ASSESSMENT

1. Introduction

This Environmental Assessment has been prepared in accordance with the National Aeronautics and Space Administration regulations as set forth in 14 CFR subpart 1216.3, Procedures for Implementing the National Environmental Policy Act. This document provides the detailed procedures necessary to implement:

- The National Environmental Policy Act (NEPA) Regulations (40 CFR Parts 1500-1508) issued by the Council on Environmental Quality (CEQ);

This document assesses the environmental impacts associated with the proposed modernization of the Unitary Plan Wind Tunnel (UPWT) on the Ames Research Center near Mountain View, California. The Project site is located at Building N-227 on the Ames Research Center.

2. Summary of Major Considerations and Conclusions

The major considerations and conclusions of the modernized facility are as follows:

Project implementation will not result in any significant impacts to air or water quality, topography, fish and wildlife, noise, traffic and circulation, utilities, visual aesthetics, community services, local employment and economics, and land use and planning.

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Temporary noise, traffic, and air quality impacts will occur during construction of the proposed facility. However, these impacts are not considered significant.

The facility is designated as a Historical Landmark on the National Register but the Project is not altering the purpose, function, or use of the significant features that give the facility the landmark designation. Archeological resources will not be affected by the Project.

The facility currently contains various amounts of the hazardous materials asbestos, mercury, polychlorinated biphenyls (PCB's) and chloroflourocarbons (Freon R-12 refrigerant). These hazardous materials will be removed from the structures and equipment of the facility that are to be modernized. The removed hazardous materials will be properly managed as hazardous waste.

There is known groundwater contamination at the Ames Research Center; some of this contamination has been traced to unauthorized releases to the south of the ARC. There has been some minor contamination of the soil beneath the facility by petroleum based fluids used during operations. Any disturbed contaminated soil will be properly disposed of by contractors administered by the Office of Safety, Health, and Medical Services at Ames. Quantities of contaminated soil are expected to be very small since there will be little excavation required.

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It is recommended that a Finding of No Significant Impact (FONSI) be approved for this Project. This finding is based on the analysis documented in this Environmental Assessment.

3. Description of the Proposed Project

3.1 Existing Conditions

Ames Research Center (ARC) is a field installation of the National Aeronautics and Space Administration (NASA), and was established in 1939. ARC is located on a 421.4 acre (170.6 hectares) site in the northern portion of the Santa Clara Valley at the southern end of the San Francisco Bay (NASA, 1992). The ARC is contiguous to the U.S. Naval Air Station, Moffett Field, California and comprises some 34 major technical facilities and laboratories that are employed as research tools in the aeronautical, physical, space and life sciences, as well as 26 other major supporting and administrative buildings and structures.

The Unitary Plan Wind Tunnel complex is a unique facility comprised of three closed return, variable density tunnel circuits: the 11-by 11-Foot Transonic Wind Tunnel (11-Ft TWT) (Mach No. .4 to 1.5), the 9-by 7-Foot Supersonic Wind Tunnel (Mach No. 1.5 to 2.5), and the 8-by 7-Foot Supersonic Wind Tunnel (Mach No. 2.5 to 3.5). Each test section is equipped with a sting model support and assorted instrumentation necessary to conduct a wide variety of research and development testing. All three tunnels share a common drive system consisting of four intercoupled electric motors that can provide 180,000 HP continuous power, and also a make-up air system used for varying the tunnel air density to provide different test conditions.

3.2 Reasons for the Proposed Project

The facility was originally built in the early 1950's and has been heavily used since then for advanced, high speed wind tunnel testing. Because of the facility's age, high usage, and advances in wind tunnel technology, it is necessary to replace, refurbish, and improve the equipment so as to increase the facility's productivity and extend the useful life another 30 years.

3.3 Proposed Project

The proposed construction (hereinafter, the "Project") will modernize the Unitary Plan Wind Tunnel complex by automating controls for the tunnel systems, model support systems, and auxiliaries; providing flow quality improvements in the 11-Ft TWT; repairing or replacing aging facility systems; and repairing weld defects in the pressure shell to allow recertification of the facility. It will include the following tasks:

- 1) Refurbish and provide automatic controls for the total pressure controls, temperature controls, and variable geometry nozzle systems;
- 2) Refurbish and provide automatic controls for the model support systems;
- 3) Provide automatic controls for the make-up air system and the compressor lubrication system;
- 4) Enlarge and rehabilitate the control rooms;

- 5) Install flow quality improvements in the 11-Ft TWT, including flow straightening structures in the stilling chamber, incorporation of new technology into the porous slots in the test section, modification of the wide-angle diffuser, and improved control of the tunnel temperature;
- 6) Replace the cooling tower and refurbish large electrical switchgear and make-up air system; and
- 7) Repair weld defects in the pressurized portions of the tunnel circuits and make-up air system and recertify the pressurized systems for safe operation within the original design limits.

3.4 Description of Alternatives

NASA has considered one alternative to modernizing the UPWT. The No Action Alternative would require continued use of the UPWT facility in its current state. The impacts of a failure to modernize this facility would be severe. They include increasing unavailability or delay in acquiring critical test data. This, in turn, will reduce or delay increases in advanced commercial and military aircraft performance and/or will cause increased aircraft cost. In addition, NASA's inability to participate in advanced aircraft programs will rapidly diminish its leadership role in aeronautical research and development with a subsequent reduction in the Nation's leadership role in aviation.

4. Environmental Setting, Impacts, and Mitigation Measures

4.1 Air Quality

- Existing Setting

The Project site is located within the San Francisco Bay Air Basin. Within this Basin, the ARC is located in a non-attainment area for ozone (Lipman, 1992).

- Impacts

The proposed Project will have minimal impact on the local air quality. New natural gas burners will be used to reactivate silica gel air dehumidifiers and the combustion products will be exhausted to the atmosphere. There will be some short term air quality impacts from dust generated by ground work, smoke from electric arc welding, and roofing tar.

- Mitigation Measures

All air emission equipment will be properly designed to meet local and federal air pollution controls and will conform with the Clean Air Act (CAA) and the rules and regulations of the Bay Area Air Quality Management District.

No other mitigation measures are required for the temporary construction activities.

4.2 Hydrology, Water Quality, and Floodplains/Wetlands

- Existing Setting

According to the Federal Emergency Management Agency (FEMA) maps, the site is not within a 100-year floodplain (FEMA, 1982). In addition, the Environmental Resources Document for ARC indicated that the Project site would not be affected by 100 year tidal flooding (NASA, 1992). The Project site is level and storm water currently runs off the surface and down to De France Ave., Warner Rd., and McCord Ave. The parking around N-227 is paved and therefore an impermeable surface.

In order to reduce or eliminate contaminants in the storm water drain system, ARC began operation in 1992 of the Storm Water Settling Basin. All storm water drainage is directed through the open Basin where contaminants are skimmed off the surface or collected from the bottom. The effluent from the Basin goes to the wetlands marsh and storm water retention ponds at the northern end of the ARC site. If runoff were to exceed the capacity of the storm retention ponds, the water would be pumped from the ponds to Stevens Creek and then to San Francisco Bay. There are no wetlands located near the Project site (NASA, 1992).

- Impacts

There are two structures ("oil houses") that contain equipment used in circulating lubrication oil to large rotating machinery. It is typical for there to be some minor leaks of oil onto the floor of these structures. The Project is adding water sprinkler fire suppression systems to these structures which when used will result in oil contaminated waste water.

The runoff from the site and associated parking lots could affect the water quality of the San Francisco Bay by adding urban pollutants to the storm water runoff. Surface runoff from Moffett Field Naval Air station is mixed with drainage from ARC before being discharged into the Storm Water Settling Basin.

- Mitigation Measures

The storm drains in the two oil houses will be plugged to prevent contaminated waste water from entering the storm drain system. A curb will be added to contain the water inside the oil houses from the fire suppression system. This contaminated water will then be pumped into barrels and either sent to a treatment or reclamation facility or disposed of as hazardous waste.

4.3 Topography, Geology, and Soils

- Existing Setting

The Project site is located on level ground at approximately 10 feet (3.05 meters) above mean sea level (USGS, 1961, photo revised 1981). The site is situated approximately one mile south of San Francisco Bay on a flat alluvial plain (CDMG, 1961). The proposed site is located within the seismically active area of Northern California. Three major fault zones pass through the San Francisco Bay area. The San Andreas Fault is located approximately nine miles from the site. The Hayward and Calaveras Faults are located approximately nine and 13 miles to the northeast of the Project site. All three faults are active and have caused destructive earthquakes in the past (CDMG, 1961).

The maximum credible earthquake (used for design purposes) expected on the San Andreas Fault is a magnitude 8.3 on the Richter Scale and 7.5 magnitude on the Hayward and Calaveras Faults (NASA, 1992).

Several other northwest-tending faults have been identified in the Santa Clara Valley. These are: The San Jose Fault, which passes through ARC; the Palo Alto and Stanford Faults, located one and three miles southwest of ARC; and the Silver Creek Fault, five miles northeast of the site. All four faults are inactive (NASA, 1992).

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Seismic hazards at ARC include ground shaking and liquefaction.

Four soil types have been mapped on the ARC by the Soil Conservation Service (USDA, 1975). The soils include Sunnyvale silty clay, drained; Pacheco loams, clay substrata; Alviso clay; and Kitchen middens. The soil within the Project area is Sunnyvale silty clay, drained. This soil type consists of a silty clay to a depth of 11 to 18 inches (.28 to .46 meters), characterized by a dark gray color, fine texture, poor drainage, moderate alkalinity, and high fertility. The agricultural suitability of this soil is a Class II (suited for cultivation with some limitations). Groundwater in the Project area is between three and five feet below ground surface (Hogan, 1992).

- Impacts

Due to the moderate to severe degree of seismic activity in the area, there are potentially significant hazards at the Project site related to earthquakes. Severe ground shaking and liquefaction could produce property damage and could endanger public safety. Since groundwater can be found close to the ground surface, building foundations could be affected. The location of the Project site on soils formed from bay muds and alluvial parent materials suggest the possibility of differential settling. This settling can potentially cause damage to foundations and buildings. However, since the facility

was built, there have been no documented cases of foundation damage from differential settling.

- Mitigation Measures

Proper construction designs for the buildings and foundations will be used for all new construction to minimize seismic hazards, differential settlement, and effect of shallow groundwater.

All structures modified by the Project will comply with the 1988 Uniform Building Code to reduce the seismic hazards.

4.4 Historical and Archaeological Resources

- Existing Setting

An archaeological and historical survey of the ARC was completed in 1981 for the preparation of the Environmental Resources Document. This survey concluded that there was one archaeological resource located on the ARC and three historic building sites. One of the historic building sites is the Unitary Plan Wind Tunnel. In September 1990 the Unitary wind tunnel complex was designated as a National Historic Landmark because of its contributions to research and development of manned space vehicles, and commercial and military aircraft.

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In recognizing the facility as a Landmark, specific features or "significant elements" are identified that give the facility unique capabilities. The "significant elements" are defined in the National Register of Historic Places Inventory - Nomination Form. The "significant elements" are the closed return variable density tunnel circuits, the variable geometry nozzles, the 3-stage and 11-stage axial flow compressors, the test sections, and the drive system comprising of four intercoupled electric motors that can provide 180,000 hp continuously.

- Impacts

Of the "significant elements", the only one that is affected by the Project is the variable geometry nozzle in the 11-Ft Wind Tunnel. Because of cracks in the flexible wall material (T1 steel) both walls will have to be replaced. The walls will be replaced with ones made of a different steel alloy more suited to the application but with the same overall dimensions. Additional jack stations will be added to each wall to improve the structural performance of the walls and control of the aerodynamic contours. Implementing these changes will not change the purpose, function, or adversely affect the performance of the walls which were specified as the reason for them being a significant element in the facility's landmark designation. In fact, improved contour control will result in improved Mach number uniformity and aerodynamic flow quality.

The other "significant elements" will receive varying degrees of repair or refurbishment but this work also will not degrade the performance or alter the function, purpose, or use of the facility. The closed return, variable density tunnel circuits will have defective welds repaired but the internal aerodynamic lines will not be changed. The 3 stage axial flow compressor, the variable geometry nozzles, and the drive motor system will have their control systems replaced with modern versions that will result in better Mach number control, monitoring, and facility safety.

- Mitigation Measures

Modification of the "significant elements" will follow the stipulations of the programmatic agreement among NASA, the National Conference of State Historic Preservation Officers (NCSHPO) and the Advisory Council on Historic Preservation (Council). In the case of the Project, compliance with the agreement requires that the appropriate original as-built drawings and other records be provided to the Secretary of the Interior for incorporation into the National Architectural and Engineering Records in the Library of Congress. Additionally, ARC must annually summarize its activities regarding this matter to the Council and NCSHPO.

4.5 Fish, Wildlife, and Botanical Resources

- Existing Setting

The site is currently used as an operating facility and is surrounded on four sides by two lane roads and other structures. Minimal ornamental vegetation exists on the site due to the covering of concrete. There is a small employee park on the northwest corner of Warner and McCord Avenues adjacent to the Project site that consists of several benches, shrubs, and medium size trees.

Two species listed as federal and State of California-designated species are known to occur near the Project site. These species are the California Burrowing Owl (Athene cunicularia) and the California Clapper Rail (Rallus longirostris obsoletus). The closest location of the California Clapper Rail to the ARC is an area generally east and west of the mouth of Steven's Creek, approximately 3/4 mile from the most northerly boundary of the ARC (Jones & Stokes, 1979). Burrowing owls have been observed in vacant fields throughout the ARC (Sims, 1992).

- Impacts

The modernization of the UPWT facility will not impact the California Clapper Rail because the Project site is not near the Clapper Rail habitat, nor is it expected to

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impact the California Burrowing Owl. The Project will be constructing a temporary gravel parking lot in the field north of building N260 facing De France Ave. It is possible that construction activities could impact any owl inhabiting that field.

During construction the employee park will be used as a construction staging area requiring the removal of the shrubs and trees. At the completion of the Project the park will be restored.

- Mitigation Measures

If any burrowing owls are found prior to construction activities in the site of the proposed parking lot, they will be moved to other areas in accordance with procedures of and in coordination with the Santa Clara County Humane Society.

4.6 Noise

- Existing Setting

The existing facility is one of the largest noise producers at ARC. Noise (in excess of 100 dBA) is primarily produced by operation of the wind tunnel drive and air pressurization/ evacuation of the tunnels. In the early 1970's a sound enclosure was built around the 11-Ft TWT circuit to reduce noise that was reaching the community near ARC.

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- Impacts

- After the facility is modernized, the noise characteristics from operations will not be different than the existing conditions. During construction there is likely to be some noise generated from welding and heavy machinery operations but this will be less than the levels of the existing tunnel operations.

- Mitigation Measures

- No mitigation measures are planned.

4.7 Traffic and Circulation

- -Existing Setting

- The site vicinity is served by a grid of service streets, collectors, major arterials and Highway 101. Moffett Boulevard provides the main access to the ARC as well as connecting the ARC to Highway 101. Highway 101 is located approximately one mile southwest of the Project site. The Project site is served by and is bounded by four two lane roads. Public transportation is provided to the ARC by the Santa Clara County Transit System.

- Currently, there are approximately 155 parking spaces on the Project site.

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- Impacts

During Project construction, there will be no employee parking available at the Unitary site. Specifically, the 155 parking spaces now available in the area bounded by Warner Road, Walcott Road, DeFrance Avenue and McCord Avenue will be eliminated temporarily. The Project will add a temporary parking area of compacted gravel for 120 vehicles north of Building 260 facing onto DeFrance Avenue. The Project has also been assigned 140 parking spaces in the parking area south of Hunsaker Road between Wright Avenue and Parsons Avenue. In addition, the Project has obtained the use of 68 parking spaces off of Bush Circle as overflow craft parking. During construction the Project anticipates a maximum of 96 craft parking spaces will be required.

Warner Road will be closed to through traffic for portions of the construction period to accommodate construction of the cooling tower. Additionally the Project has obtained permission to narrow Warner Road to one lane of through traffic should such a closure be required to accommodate construction activities. At the completion of the Project, all original parking at the facility will be restored so there will be no net change in parking capacity, except for the addition of the 120 space gravel lot north of N260.

There will not be any impact to public transportation either during or after Project construction.

- Mitigation Measures

None are required.

4.8 Utilities and Community Services

- Existing Setting

Water, sewer, storm drain, electricity and natural gas service are currently provided to the Project site.

ARC is responsible for the protection and safety of all staff and visitors to the facility. This is accomplished through the use of an on-site security force which constantly patrols the facility. Fire protection is currently provided by the U.S. Navy and after July 1994 by the California Air National Guard at Moffett Field. The City of Mountain View may be called on to provide aid during a serious event. Emergency health is provided to employees and visitors through an on-site health unit. (NASA, 1992).

- Impacts

The Project will be connecting to the existing utility lines and power distribution network in the facility. The existing systems have adequate capacity to support the modernized facility. The police, fire, and emergency medical services will also be adequate to provide service to the Project.

- Mitigation Measures

None are required.

4.9 Visual Quality

- Existing Setting

Currently, the facility contains an office building, exposed wind tunnels, corrugated metal high bay buildings, cooling tower, electrical substation, assorted other exposed piping, and four small parking lots. The facility is surrounded on all four sides by similarly configured facilities.

- Impacts

The modernized facility will have basically the same visual appearance as the existing setting. The exceptions are a slightly smaller cooling tower and a small building addition on the south side of N227D. There will also be some minor building additions to N227B and C, but these will be into a courtyard area and not easily visible from outside the facility. The NASA Ames Architectural Review Board has approved the Project plans for meeting all necessary design and planning criteria.

- Mitigation Measures

None are required.

4.10 Public Health Considerations

Hazardous substances and wastes used and stored at ARC are controlled and managed under the direction of the Office of Safety, Health, and Medical Services.

- Existing Setting

The facility currently contains the known hazardous materials asbestos, mercury, and polychlorinated biphenyls (PCB's). Surveys over the last few years have been conducted to determine the quantities and locations of the hazardous materials. The Project is responsible for removal of these hazardous materials in the areas of the facility that will be modernized.

Non-friable asbestos has been found in pipe insulation, exterior transite cladding of the Cooling Tower, Oil House No. 2 and Building N227D (Auxiliaries building), and the wall joint compound of the control rooms.

Mercury has been used in the control rooms as part of the wind tunnel pressure measurement system. At various times in the facilities operation, mercury has spilled out of the instrumentation into the control console and onto the control room floors. Spills are immediately cleaned

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up but it is probable that residual amounts remain in the console structure and under the floor.

PCB's are known to be in electrical capacitors associated with the metal clad switchgear. They are also found in the ballasts of the control room fluorescent lights. There have been no known spills of PCB from these sources.

Additionally, other substances such as Freon refrigerant and petroleum based lubricants, are used in substantial quantities for facility operation. A Freon R-12 based refrigeration system is used in the cooling and dehumidification of the make-up air used in the wind tunnels. The system consists of compressors, expansion valves, direct expansion evaporative coils, condensers, and receiver tanks. Some spills and leakage have occurred over the years that resulted in direct evaporation of the Freon into the atmosphere. There also are Freon R-12 based air conditioning systems used in the control rooms.

Petroleum based lubricants are used extensively in the large machinery that operate the facility. Small leaks are routine but they are usually over concrete slabs or asphalt and are collected in drip pans and cleaned up quickly. One recurring spill results from the exhaust of large vacuum pumps that use a small amount of oil (1/2 pint per hour) to seal the pump vanes. The pump exhaust does not have a filter to trap the oil and consequently after leaving the exhaust stack, it falls to the

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gravel/dirt ground on the west side of N227C. In 1992 several inches of the contaminated top soil were removed and disposed of.

- Impacts

As a result of the Project, the hazardous materials mentioned above will be removed from the facility. A hazardous material removal contract will cover removal of asbestos from the piping and inside the control rooms, removal of mercury, PCB containing ballasts from the control rooms, and the electrical capacitors.

Asbestos transite on the Cooling Tower and Oil House No. 2 will be removed by the contractors responsible for replacing the cooling tower and refurbishing the control rooms, respectively. Building materials that do not contain asbestos and PCB's will be used in the new Cooling Tower, control rooms, pipe insulation, and electrical switchgear.

The major source of mercury in the control rooms is contained in the test section pressure manometers. This system will be removed and replaced with an all electronic pressure measurement system. Removal from the control rooms of all instrumentation that uses mercury is planned.

The Project is removing the entire make-up air refrigeration system and will not replace it. New make-up air dryers will be provided that do not require the low

inlet air temperature and humidity that the refrigeration system provided. The new control room air conditioners will use Freon R-22, which satisfies current Clean Air Act and Environmental Protection Agency requirements, as the working fluid.

The Project will provide installation of an oil separator and double wall holding container for the oil exhausted from the vacuum pumps in N227C.

- Mitigation Measures

All state and federal handling, storage, and disposal practices will be required in the plans and specifications to ensure that there is no threat to public health and safety. These requirements will be reviewed and approved by the Safety, Health, and Medical Services organization at ARC. The Project will also provide experienced inspectors to monitor the removal of all hazardous materials and enforce compliance with the stipulated regulations and procedures.

4.11 Local Employment and Economics

- Existing Setting

The current facility, including the offices in N227 house approximately 260 people. The workforce is expected to remain constant for the foreseeable future.

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- Impacts

The Project is not impacting the current or future staff size of the facility.

- Mitigation Measures

None are required.

4.12 Land Use and Planning

- Existing Setting

- Impacts

The Project is consistent with the current ARC 5-year Master Plan.

- Mitigation Measures

None are required.

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