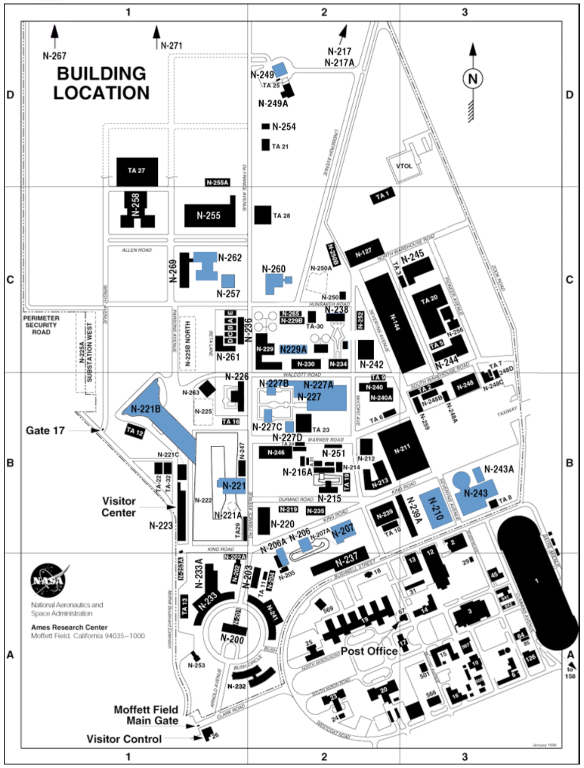
NASA Ames Research Center
Self-Guided Tour of Primary Facilities

Ames Research Center,
located at the south end of the San Francisco Bay

Historic Preservation Office
Fall 2012

The Ames campus is secure federal facility that is not open to the general public. Only individuals already possessing appropriate authorization may tour the campus in person.

A FACILITIES IN CODE A: OFFICE OF THE DIRECTOR OF AERONAUTICS



12-FOOT PRESSURE WIND TUNNEL, N-206 AND N-206A

Restored in 1994, this tunnel was the only large-scale, pressurized, low turbulence, subsonic wind tunnel in the United States. It provided unique high-Reynolds number testing capabilities for the development of high-lift systems on commercial transport and military aircraft, and for high angle of-attack testing of maneuvering aircraft. This facility was closed in 2003 due to budgetary constraints.

BALANCE CALIBRATION LABORATORY, N-207

Operations at this lab include calibrating balances for the wind tunnels at Ames, as well as for outside projects. Ames recently finished modifications on the Automated Balance Calibration Machine. The lab's current inventory of machine-to-balance adapters can accommodate 6.4- to 10-centimeter (2.5- to 4-inch) balances. Work is currently in progress to accommodate single-piece balance configurations, as well as smaller TASK balances. The machine is a unique tool-in-wind tunnel balance calibration technology. It can generate simultaneous combinations of three forces and three moments within its load envelope. Without the physical limitations of dead-weight manual loading, the Automated Balance Calibration Machine can be used to bring calibration load schedules closer to real tunnel load conditions, thus increasing the accuracy of the calibration.

FLIGHT SYSTEMS RESEARCH LABORATORY, N-210

This laboratory contains offices and computer laboratories for developing and evaluating air traffic management automation tools. The computer laboratories contain high-performance computer workstations in systems furniture to provide an interactive environment for software development and scientific analysis. At the north end of the building there is a high bay that is used for storage. The work conducted in the Flight Systems Research Laboratory is the core of NASA's contribution to the fields of airspace operations.

NATIONAL FULL-SCALE AERODYNAMIC COMPLEX, N-221 AND N-221B

The National Full-Scale Aerodynamics Complex (NFAC) is currently managed and operated by the United States Air Force Arnold Engineering Development Center. NFAC is home to the two largest wind tunnels in the world: the 40x80-foot and the 80x120-foot wind tunnels. These wind tunnels provide aerodynamic testing capabilities to the Department of Defense, NASA, other government agencies, and commercial industries. Test articles include full-size and large-scale powered models of fixed and rotary wing aircraft, diesel tractor-trailer trucks, wind turbines, and parachute decelerator systems. With a rich history of tests dating back to the 1940s, the NFAC wind tunnels have made major contributions to the United States' aerospace capabilities. Notable tests at NFAC include the F-84 Thunderjet, F-4 Phantom, parachutes for the Apollo space capsule, the Space Shuttle, AV-8B Harrier, the XV-15 and V-22 Tilt-Rotor aircraft, AH-56 Cheyenne and UH-60 Blackhawk helicopters, and the X-35 Joint Strike Fighter.

A common drive system of six fans provides air flow through both test sections. The fans are arranged in two rows of three, and each fan is forty feet in diameter. The 22,500 horsepower motors driving each fan together use over 100 MW of electricity at full speed while moving over 60 tons of air per second.

The 40x80-foot wind tunnel, N-221, was activated by NACA in 1944 and has been entered into the National Register of Historic Places. Wind speeds in the 40x80-foot test section can reach 345 mph and the scale system supporting the vehicles can measure up to 100,000 pounds of lift.

The largest test section in the world is the NFAC 80x120, N-221B, that was added onto the 40x80 circuit in 1987. Velocities in the 80x120-foot test section reach 115 mph, and the model support scale system can measure up to 400,000 pounds of lift. The 80x120-foot test section was key to developing and qualifying the parachutes for both the Mars Exploration Rover and Mars Science Laboratory programs.

Anechoic Chamber and Anechoic Wind Tunnel, N-221

The anechoic chamber measures approximately 20x20x12 feet, and is used to measure the acoustic signature of a variety of objects, as well as for calibrating the noise determining characteristics of advanced microphone arrays. Within the anechoic chamber is a small subsonic open jet wind tunnel, which can produce a small jet of flow through the chamber at speeds up to mach 0.4 .

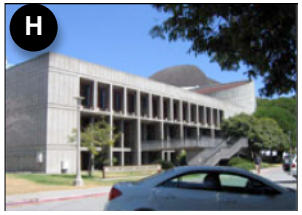
Unitary Plan Wind Tunnel, N-227 and N-227A-D

The Unitary Plan Wind Tunnel complex has been a critical contributor in making the United States the leader in aerospace since its commissioning in 1956. This complex is where generations of commercial, military and advanced concept aircraft as well as NASA space vehicles, including the space shuttle, have been designed and tested. Every major commercial transport and almost every fighter built in the United States over the last 50 years has been tested in these tunnels. In addition, a number of conceptual as well as final design models of the Space Shuttle and of the Mercury, Gemini, and Apollo capsules were tested here. In 1985, the Unitary Plan Wind Tunnel facility was designated as a National Historic Landmark by the National Park Service because of "its significant associations with the development of the American Space Program." The Unitary Plan Wind Tunnel facility is the most heavily used wind tunnel in all of NASA. Currently, there are two operational wind tunnels in this complex.

A key aspect of this facility is the interchangeability of models among the Unitary test sections to allow testing across a wide range of conditions from Mach 0.2 to Mach 2.5 between the two operating tunnels. The 11x11-foot Transonic Wind Tunnel is a closed-return, variable-density tunnel with a fixed-geometry, ventilated test section, with evenly distributed slots on all four walls, and a dual-jack flexible nozzle. It is one of two separate tunnel circuits powered by a common drive system. The 9x7-foot Supersonic Wind Tunnel has also been used extensively in the development of virtually every domestic fixed wing airframe that operates in supersonic regimes and has played a critical role in space exploration. This facility has provided ascent and reentry aerodynamic data for every NASA-designed, manned space-flight program, including the Space Shuttle. The facility has performed testing of parachutes for future unmanned probes to Mars and like the 11-foot has been used for extensive launch abort tests among others for the NASA's current manned space flight efforts.

High Pressure Air Compressor Building, N-229A

This facility contains two large (5,500-horsepower) reciprocating compressors, as well as all of the auxiliary equipment required to operate the compressors. Included in N-229A is the control room for distribution of high-pressure air to the Unitary Plan Wind Tunnel and the National Full-Scale Aerodynamics Complex, a mechanic shop, a switchgear room, a welding shop, and a boiler room.



Flight and Guidance Simulation Laboratory, N-243 and N-243A

The Vertical Motion Simulator (VMS)

enables scientists to conduct advanced research in a unique flight simulation complex. The facility provides researchers with exceptional tools to explore, define, and solve issues in both aircraft and spacecraft design. It offers fast and cost-effective solutions using real-time piloted simulation, realistic sensory cues, and the greatest motion range of any flight simulator in the world. The Vertical Motion Simulator is integrated with FutureFlight Central (FFC) and the Crew-Vehicle Systems Research Facility (CVSRF) to provide simultaneous cockpit and air traffic control perspectives. This unique capability enables systems-level analyses of concepts across multiple domains and creates the building blocks for simulating the myriad operations encompassed within the national airspace system.

At the VMS, flexibility in both hardware and software allows any type of vehicle to be simulated and evaluated, whether existing or conceptual. Existing vehicles simulated include airships, helicopters, fighter jets, and the Space Shuttle Orbiter. Conceptual vehicles simulated include Tilt-Rotor, Tilt-Wing, High-Speed Civil Transports, and Advanced VSTOL aircraft. The VMS is also an important resource for simulating next-generation space transportation vehicles.

Outdoor Aerodynamic Research Facility, N-249

Originally built in 1969 and upgraded in 1994, this facility is currently mothballed. It was used for static testing of V/STOL models and rotary wing models, for acoustic testing, and for the analysis of aircraft models prior to testing in the 40x80-foot or 80x120-foot wind tunnels.

The Outdoor Aerodynamic Research Facility consists of an open-air test facility with a model mounting test pad, data acquisition equipment, control room, and other necessary support equipment for remote model or aircraft operation.

A static hybrid rocket test stand is currently located and operated at this Outdoor Aerodynamic Research Facility.

Crew-Vehicle Systems Research Facility, N-257

The Crew-Vehicle Systems Research Facility (CVSRF) is an unparalleled national resource that supports NASA, the FAA, and many industry research programs. Designed to provide researchers with an environment where they can study the National Airspace System from the perspective of the aircraft crew and air-traffic control. CVSRF offers researchers a suite of simulation facilities and utilities that can be used to assess and develop Air Traffic Management concepts and tools, analyze flight crew and avionic performance, and to develop and improve new simulation and training tools.

CVSRF includes a full-motion Boeing 747-400 flight simulator, a full-motion Advanced Concepts Flight Simulator (ACFS), and a fully equipped Air-Traffic Control simulation laboratory. The ability to conduct high-fidelity, full-mission simulations transforms the experience for the pilot and flight crew from one of simply flying the isolated aircraft to a more realistic, fully interactive process in which the crew can engage in "gate-to-gate" procedures and communications with a variety of air traffic controllers and scenarios. CVSRF's capacity to perform such high-fidelity simulations is unique in the world. An additional attribute of this facility is its high-level architecture, which allows the facility to tie in to other simulations around the country to simulate civil and military operations in the national airspace. Locally, CVSRF is connected to the Vertical Motion Simulator and FutureFlight Central.

Fluid Mechanics Laboratory, N-260

The Fluid Mechanics Laboratory (FML) is a 23,000 sq ft facility, constructed in 1986, that supports general fluid mechanics, aerodynamics, and aeroacoustics research. The FML contains six subsonic wind tunnels and two water flow facilities, along with several laboratory facilities for laser and flow measurement technique development. The largest tunnel at FML measures 48x32x120 inches, and fastest tunnel at FML runs at approximately Mach 0.6.

Human Performance Research Laboratory, N-262

Research at this laboratory focuses on human performance and automation in aerospace systems. Areas of study include human vision,

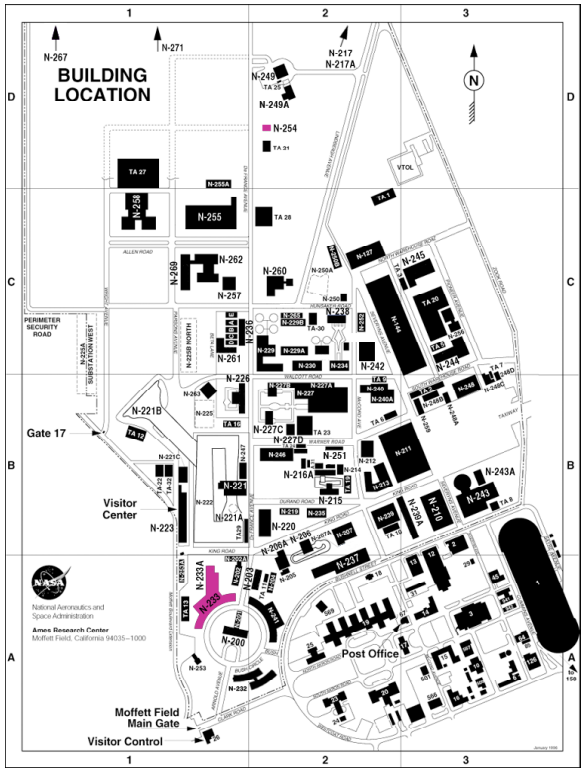
audition, attention, motor control, fatigue, human factors maintenance, communication, team problem-solving, training, human workload, control theory, virtual reality, and virtual environments. Areas of development include: (1) computational models of human perceptual, cognitive, and decision systems; (2) perceptual optimization of visual displays and imaging systems; (3) three-dimensional auditory displays; (4) machine vision algorithms for autonomous vehicle control; (5) advanced human-centered IT; and (6) human factors expertise to address high-priority aerospace challenges.

Also in N-262 is NASA's FutureFlight Central (FFC), a national Air Traffic Control/Air Traffic Management (ATC/ATM) simulation facility dedicated to solving the present and emerging capacity problems of the nation's airports. The two-story facility offers a 360-degree full-scale, real-time simulation of an airport, where controllers, pilots and airport personnel interact to optimize expansion plans and operating procedures, and to evaluate new technologies. The physical structure of FFC is fully customizable so that any air traffic tower in the world can be realistically simulated. The facility has established a precedent for enabling stakeholders to achieve consensus through a common vision of the future. FFC can be linked to other high-fidelity simulators via a High Level Architecture and is locally connected to the Vertical Motion Simulator and the Crew-Vehicle Systems Research Facility.

In addition to simulating airports, FFC is configured to serve as a visualization tool. The 360-degree field of view can depict any scenario desired, be it UAS operations in the Middle East, the plains of Mars, or the deep sea canyons off the Monterey Coast. This powerful capability provides researchers with a fully-immersive experience that allows them to explore new concepts and procedures in their area of interest.

I

Facilities in Code I: Office of the Director of Information Technology



Central Computer Facility, N-233 and N-233A

The Central Computer Facility houses the computer and networking systems that provide the basic IT infrastructure for the day-to-day operation of ARC. Included in this suite of systems are a large number of UNIX–based servers that provide the center's email and messaging services, the internal (intranet) web sites, and external web sites used for outreach to the public. This facility also houses the Network Operations Center from which the center's ARCLAN campus network is managed and operated, along with its related server systems and user help desk. The Central Computer Facility also houses the center's business data processing and database systems, which support personnel and financial resource management functions throughout the center. The N-233A wing of this facility houses an archival data storage system used by the Numerical Aerospace Simulation Supercomputer Facility (located in N-258). This storage system utilizes robotic magnetic tape storage "silos" to provide very high-capacity file storage for their R&D users. This storage system is linked to the N-258 supercomputers via a high-speed fiber optic communications system. In addition, N-233A also houses an IT systems development and integration laboratory supporting the activities of the Central Computer Facility (Code JT) and the Code I advanced computer networking projects.

Ames Internet eXchange, N-254

The Ames Internet eXchange (AIX) is located in N-254 at NASA Ames Research Center. The facility hosts various network service providers including AT&T, Verizon, Centurylink and Level 3 Communications, to provide the center and agency with a diversity of carriers and services that results in more capabilities and flexibilities, and lower cost Wide Area Networking (WAN) services to NASA. These services are used to support Ames Research Center and NASA by providing NASA peering sites only available via the AIX (e.g., Yahoo, Microsoft, AT&T), enabling network support for various Ames and NASA projects (e.g., Yuri's Night, Great Worden Quake, Katrina), and includes support for over a dozen of NASA Research Park tenants. The AIX is also used to facilitate connections between federal agencies, universities and other research networks. Additionally, the AIX is the model for distributed connectivity at Trusted Internet Connection (TIC) locations, and will be used as NASA's first TIC of the five that are planned.

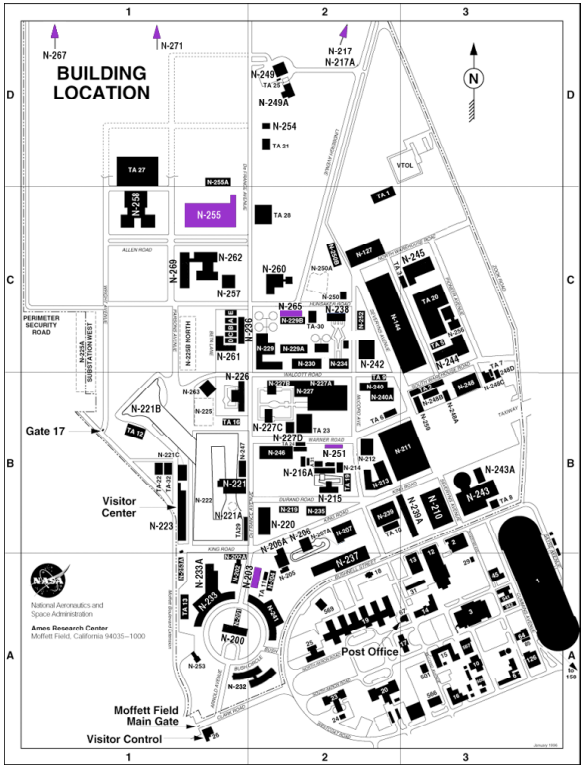
Ames Video Control Center and Video Tele-conferencing Service, N-240 and N-203

The Ames Video Control Center (VCC) and Video Teleconferencing Service (ViTs) facilities support all internal and external video gateway infrastructures for facilitating high-end video distribution services for center customers through coaxial and fiber cable, or IP circuits. Systems and services supported from these facilities include:

- NASA integrated video telecommunications room
- Center's video network (VIDNET) television (TV)
- Digital video server for real-time video streaming special events
- Multimedia technical support for meetings and teleconferences
- Video distribution head end for both analog and digital circuits
- Video distribution via terrestrial (duplex) and satellite (receive)

(ViTs and VCC are housed in facilities operated by Codes J and R, respectively. The main entries for those facilities appear below under the corresponding codes.)

J Facilities in Code J: Office of the Director of Center Operations



Imaging Technology Laboratory, N-203

This facility contained offices and laboratories for the processing of color (AR-5), and black and white aerial film for the Airborne Remote Sensing Research Program. Four

persons operate and maintain the 1811 and 11CM Versamat film processors located on the second floor, and the effluent treatment plant located in the basement. Photo processing no longer takes places within this facility. The facility currently houses administrative support staff for center.

This facility also houses the Ames Video Teleconferencing Service (ViTs) facility, which is maintained by Code I. ViTs, which is configured in a meeting room layout, supports a NASA-wide integrated video teleconferencing system compatible with like systems and facilities at every NASA Center.

Magnetic Standards Laboratory and Test Facility, N-217 and N-217A

Two magnetic test facilities are located in buildings N-217 and N-217A. They were used infrequently during the late 1990s and were being considered for closure in 2000 The 3.7 meter (12-foot) facility located in building N-217 is designed to calibrate magnetic sensor systems, determine magnetic cleanliness, and measure low-frequency electromagnetic radiation of items not exceeding 1 meter (3.3 feet) in any dimension. The 6-meter (20-foot) coil facility, located in N-217A, was built to accommodate testing of items that are too large for the 3.7-meter (12-foot) facility. In addition to the capabilities of the 3.7-meter (12-foot) facility, the 6-meter (20-foot) facility can duplicate the strength and direction of the earth's magnetic field anywhere on earth, in earth orbit, or in deep space. The ambient field in the working area of the coils can be canceled to permit engineering or biological studies in near-zero field. Noninvasive measurements of the magnetic field produced by the human heart, for example, were performed in this facility. This facility has measurement sensitivities of less than 1 microgauss.

Motor Pool, N-251

The Motor Pool contains facilities for the management of the center's transportation needs. It includes a fuel station, offices, equipment repair bays, vehicle wash area, and parking areas for conducting the operation, maintenance, and repair of the diverse vehicular fleet.

Facility Supply Support Center N-255

This 81,639–square foot building houses the postal and supplies operations for Ames Research Center.

Hazardous Substances Transfer Site, N-265

This facility serves as an accumulation and packaging area for hazardous wastes generated at various locations throughout the center. Hazardous wastes are accumulated and packaged in areas segregated by hazard class and type.

Disaster Area Relief Team, N-267

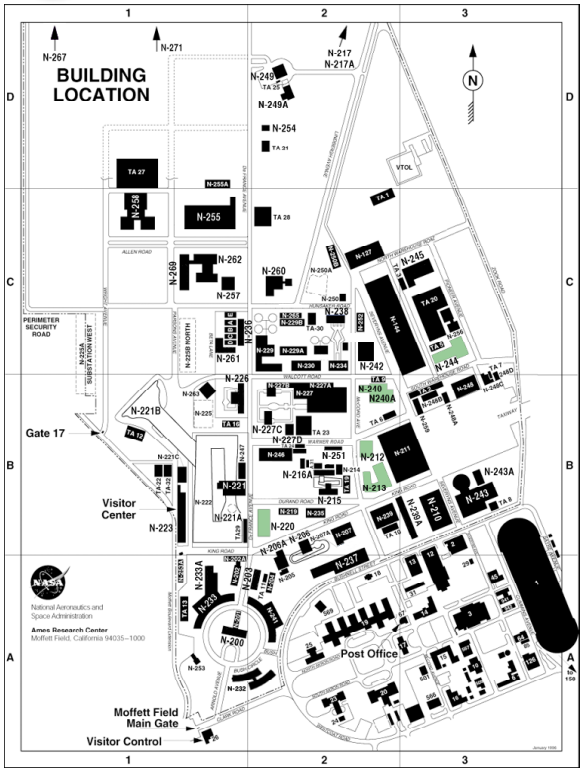
This 6,367–square foot building houses the Disaster Area Relief Team (DART) facilities. Training and exercise drills are conducted here.

Industrial Wastewater Treatment Pre-treatment Plant, N-271

This plant was constructed to remove metals and dissolved solids from industrial wastewater and from groundwater, enabling treated effluent to be used as makeup water in the boiler for the Arc Jet Facility and in the Unitary Plan Wind Tunnel cooling tower. Treatment and reuse of the center's industrial wastewater, and use of treated groundwater, lessen the demand for San Francisco Water Department potable supply, as well as substantially decreasing discharges to the Palo Alto Regional Water Quality Control Plant and Stevens Creek.

R

Facilities in Code R: Office of the Director of Engineering



Model Development, Advanced Composites Group, N-212

This facility houses the Advanced Composites Group. The Advanced Composites Group is a technical support group for all research disciplines at Ames. Its capabilities include composite fabrication, plastic fabrication, and other non-metallic fabrication processes. The Advanced Composites Group contributes to the design and manufacturing of a wide variety of test equipment and models. The Advanced Composites Group's expertise with many materials and processes has made this facility vital to the success of many high profile projects at Ames. This facility contains spray booths for finish applications, autoclaves for composite fabrication, and many machine tools.

Electronics Assembly Clean Room, Fabrication, and Test Laboratories, N-213

Several electronics research facilities are equipped to fabricate, assemble, and test electronic systems including circuit boards and electronics such as in-flight hardware. Fault identification and diagnosis of specialty testing equipment or methodology is available by special arrangement or request.

Technical Services Facility, N-220

The Development Machining and Electromechanical Instrumentation Branch, in Building N-220, is a branch of the Aeronautics and Space Flight Hardware Development Division. Machining, instrumentation, mechanical inspection, electronic, and CAD/CAM services are performed at this facility. This facility primarily develops prototype hardware for the Ames research community, including experimental scientific apparatus for shuttle or airborne missions, aerospace wind tunnel models, facility modifications, and biosensors. The personnel at this facility consist of highly skilled engineering technicians that assist with designs and perform all fabrication on very complex scientific instruments and models.

Flight Processing Center and Multi-Mission Operations Center, N-240 and N-240A

The Flight Processing Center (FPC) facility consists of project office space, conference rooms, hardware development laboratories, science laboratory space, off-line assembly areas, and ISO 7 (10K) and 8 (100K) clean room facilities for project customers. The FPC facilities provide the essential capabilities and environment to successfully develop, test, and process hardware systems to meet instrument, spacecraft, and payload requirements in all phases of development. The FPC provides expert services associated with the integration, test, and processing of system hardware in support of NASA research and flight activities.

The Ames Multi-Mission Operations Center (MMOC) enables and supports flight and science operations for Ames spaceflight missions. The MMOC is composed of the facilities, networks, IT equipment, software, and support services needed by flight projects to effectively and efficiently perform all mission functions, including planning, scheduling, command, telemetry processing, and science analysis. The MMOC has mission operations facilities in two buildings at Ames, N-240 and N-244, an

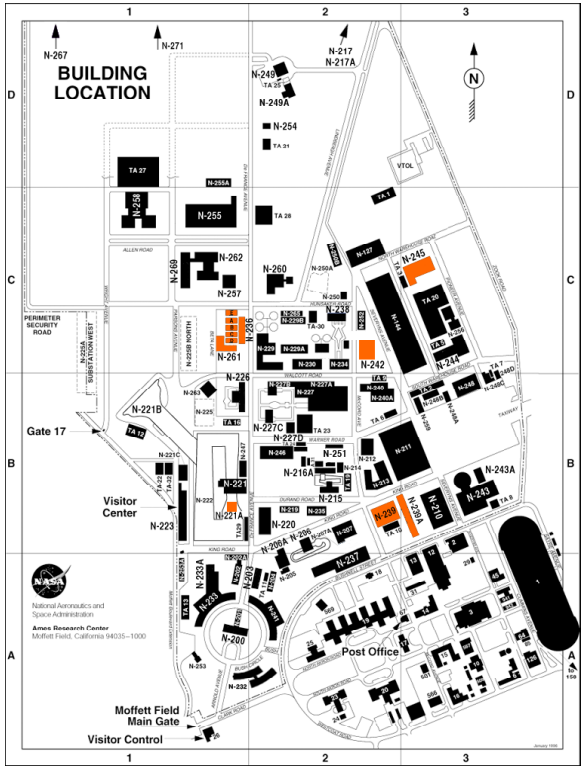
arrangement that provides geographic diversity and resiliency in the event of a facility disaster. The facilities include two general-purpose Mission Operations Centers, the Kepler Science Operations Center, and the SOFIA Science Center.

Building N-240 also houses the Ames Video Control Center (VCC), which is maintained by Code I. VCC supports all internal and external gateway infrastructures that facilitate high-end video distribution services for center customers through coaxial, fiber cable and IP circuits, to include (but not limited to) the center distribution Video Network (VIDNET) and video streamer cores, and video distribution head end for analog and digital video circuits supporting terrestrial duplex and satellite receive-only services.

Space Projects Facility N-244

The Space Projects Facility contains the offices and laboratories for developing and managing space projects. It includes facilities for conducting mission operations and laboratories for developing infrared detectors, cryogenics, control systems, communication systems, data systems, and other support systems and experiments for space projects. It also includes a clean room facility and an environmental test laboratory.

S Facilities in Code S: Office of the Director of Science



20-G Centrifuge Facility, N-221A

The 20-G Centrifuge is 17.7 meters (58 feet) in diameter and can be used to evaluate flight hardware as well as to test the effects of hyper-gravity on humans, other animals, and plants. Mounted on the centrifuge are three enclosed cabs. Cab A, mounted at one end of the rotating arm, contains a simulated spacecraft crew seat, including vibration effects, in which a human volunteer sits during tests. Cab B, at the other end of the rotating arm, contains a simulated jet fighter seat for human subjects and a swing frame which is often used for non-human subjects or can be configured to meet an investigator's needs. Cab C, located near the center of the arm (the center of rotation), can also be adapted to an investigator's needs or can be used either as a near-center control for angular velocity or to study the effects of gravity gradients. The 20-G Centrifuge is capable of producing forces up to 20 times that of terrestrial gravity and is NASA's only centrifuge currently human-rated (to 12.5 g). During centrifuge operations, a combination of 47 control and 56 instrumentation slip rings allows for control of onboard experiments from the control room and communication between control room operators and onboard subjects. The centrifuge speed is computer-controlled which allows for the development of preprogrammed gravity profiles. A programmable logic controller monitors all critical mechanical and electrical systems to ensure that the systems are within design specification limits.

Human Performance Centrifuge Facility, N221-A

The Human Performance Centrifuge is a 6.25-ft radius centrifuge providing up to 5 g of acceleration at the outer diameter and a payload capacity of up to 500 pounds. Up to two human subjects can be accommodated while lying in a prone position with heads located near the center of rotation. G forces range from 1, at the subjects head, to a maximum of 5, at the feet. Electronic equipment for monitoring physiological parameters such as cardiovascular

function, temperature, oxygen consumption, and other basic data may be mounted onboard. Instrument quality slip rings and a wireless network are available to transfer signals off-board for real time monitoring.

Space Biosciences Laboratories and Animal Care Facility, N-236 and N-236A-E

The Space Bioscience Research Laboratories support research and development for NASA missions spanning radiation detection and biology, space biology, and the development of countermeasures to preserve human health in space.

The Animal Care Facility supports NASA missions utilizing vertebrate animal research. Commercial animal research is also supported in this facility through a public/private partnership under an Enhanced Use Lease agreement.

Astrobiology and Life Sciences Research Laboratory, N-239

The Astrobiology and Life Sciences Research Laboratories contain the Human Environmental Test Facility and the Advanced Studies Laboratories (ASL), used for research in biomedicine, astrobiology, ecosystem science, Closed Ecological Life-Support Systems (CELSS), Environmental Controls and Life Support Systems (ECLSS), nanotechnology, and Synthetic Biology. The Astrobiology facilities include basic and applied research laboratories in astrochemistry, the cosmic evolution of biogenic elements and molecules, planetary pre-biotic chemistry, geology, the early organization and evolution of life, the evolution of complex organisms, and ecological studies. Some laboratory facilities include instrument development capabilities and analytical equipment for the characterization of gas and aqueous chemistry, instruments for the detection of various biomarkers including sugars and organics, microbiology facilities, including the culture of microbial mat communities and planetary protection testing, electron and RAMAN microscopy facilities, molecular biology capabilities, and bioinformatics computational capabilities. Laboratories in this facility are operated by NASA personnel and the University of California.

Life Sciences Research Laboratory Centrifuges, N239A

This facility contains three centrifuges used in animal and plant research. (At the present time, these centrifuges are not operationally certified.)

The 24-ft Diameter, or Chronic Hyper-Gravity Centrifuge, is designed to create hyper-gravity conditions up to 4.15 g for small animals and plant research. It has 10 radial arms and carries up to 20 enclosures at variable radii for holding animals and equipment. Additional enclosures are located near the center axis of rotation and off-board to provide appropriate rotation and vivarium controls. Slip rings provide in-cage TV monitoring and instrumentation capability. Hyper-gravity exposures can occur from days to months with stops as needed.

The 8-ft Diameter or International Space Station Test-Bed Centrifuge is designed to create hyper-gravity conditions up to 4 g for small animals and plant research. It has 4 enclosures for holding animal or plant payloads and equipment. An onboard liquid cooling system is also available for payloads requiring cooling. Slip rings provide data connectivity from the enclosures to the control room monitoring area. Hyper-gravity exposures can occur from days to months with stops as needed.

The Low Vibration Rotational Device (LVRD) is a single arm centrifuge with 10-ft radius. It has a swing frame that can be positioned at various distances from the hub. Up to 6 g of hyper-gravity exposure can be provided. Hydrostatic bearings provide for precise angular accelerations (0.1deg/sec2) with a rise time of 0.1 g/sec and minimal vibration. Instrument quality slip rings are available for off-board monitoring of experimental data. The LVRD may be configured with an onboard CO2 incubator to study the effect of short- or long-duration hyper-gravity exposure on cultured cells. Temperature, percent CO2, relative humidity, and g level data are transferred off-board through the slip ring assembly. Studies up to 3-weeks duration may be run on the centrifuge with stops every 2 to 3 days for media replenishment.

Mars Unit, N-242

This facility supports testing in a small wind tunnel simulating surface conditions on

Mars. It also houses production of thermal protection tiles primarily used in support of the arc jet facility.

Vestibular Research Facility, N-242

The Vestibular Research Facility contains state-of-the-art equipment for ground-based studies of vestibular function (which affects one's sense of balance). This facility hardware enables the study of responses to smooth, linear motion, or to combinations of linear and angular motion over the frequency range of natural head movement.

The Vestibular Research Facility permits the study of how complex linear and/or rotational accelerations are transduced, encoded by the vestibular system, and processed by the brain. Interactions between linear and angular vestibular stimuli, and visual and proprioceptive inputs (peripheral, central, and motor), are examined using electrophysiological, reflexive, and behavioral methods.

Space Sciences Research Laboratory, N-245

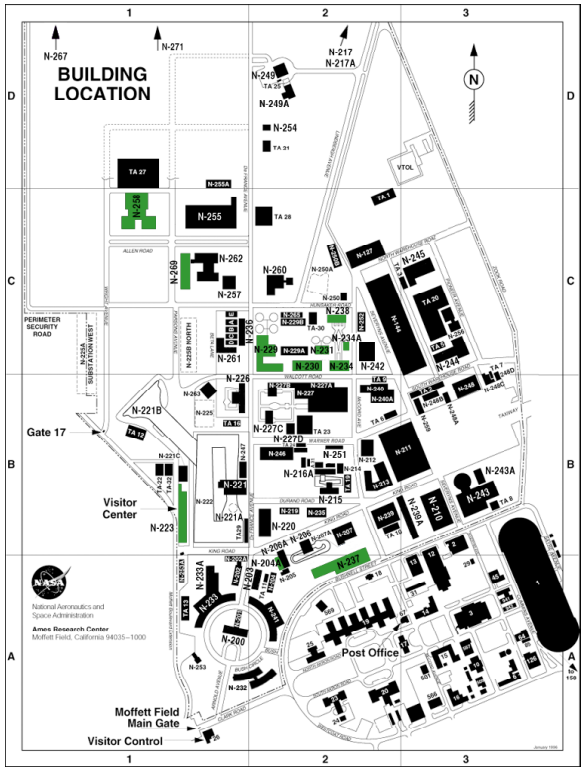
The Space Sciences Research Laboratory is dedicated to research in astrophysics, exobiology, and planetary science. These research programs are structured around the study of origins and evolution of stars, planets, planetary atmospheres, and biological organisms.

The Space Science Division's programs include: (1) the study of interstellar gas and dust that form the raw material for stars, planets, and life, (2) the processes of star and planet formation, (3) the search for planetary systems around other stars, (4) the evolution of planets and their atmospheres, (5) the structure, dynamics, and chemistry of planetary atmospheres, (6) the origin of the biogenic elements and molecules and their distribution in space, (7) the origin of life and its early evolution on Earth, and (8) the search for past or present life throughout the solar system.

Space Bioscience Research Laboratories, N-261

The laboratories support research and development for NASA missions spanning radiation detection and biology, space biology, and the development of countermeasures to preserve human health
in space.

Facilities in Code T: Office of the Director of Exploration Technology



Ames Vertical Gun Range, N-204A

The Ames Vertical Gun Range (AVGR) is a unique NASA facility that is commonly used to simulate high-

speed, celestial body impacts on a small scale. Data obtained from such studies can be utilized to establish a clearer understanding of the physics and phenomena associated with crater formation processes; projectile (impactor) failure modes and mechanisms; and, debris dispersion and characterization. The AVGR first began operations in 1966 in support of the Apollo program as a means to better understand lunar surface geomorphology. More than four decades later, this facility continues to provide invaluable data for NASA's Planetary Geology and Geophysics program. During its illustrious history, the AVGR has supported NASA's Exobiology and Solar System Origins programs, and provided critical enabling data for such missions as Cassini, Stardust, Mars Odyssey, Mars Exploration Rovers (MER), Deep Impact, and Lunar Crater Observation and Sensing Satellite (LCROSS).

Research and Development Research Support Facility, N-223

This facility supports materials development for thermal protection systems and plasma experiments.

Electric Arc Shock Tube East, N-229

The Electric Arc Shock Tube is used for basic science research on flow phenomena at hypervelocity speeds. The electric arc-driven shock tube facility consists of one driver system and two parallel-driven tubes. The driver can be operated in a variety of configurations depending on test requirements. The energy to the driver is supplied by a capacitor energy storage system consisting of 220 capacitors. By using different combinations of series-parallel connections, the capacitance of the bank can be varied. This facility contains two large (5,500-horsepower) reciprocating compressors, as well as all of the auxiliary equipment required to operate the compressors. Included in N-229 is the control room for distribution of high-pressure air across the center, a mechanic shop, a switchgear room, a welding shop, and a boiler room.

Physical Sciences Research Laboratory, N-230

This facility houses the Photophysics, Materials Research, and ISP Sensor Development Laboratories.

The Photophysics Laboratory includes two laser-application laboratories for spectroscopic research and optical instrumentation development, a small supersonic wind tunnel facility for the demonstration of laser diagnostic techniques in high-speed flows, and a large stratosphere-simulation vacuum chamber where laser diagnostic methods were developed for use during space shuttle flight. The lab's high-energy pulsed lasers include ultraviolet excimer gas lasers, multi-wavelength Nd:YAG (neodymium - yttrium, aluminum, and garnet) lasers, and tunable dye lasers.

Research at the Materials Research Laboratory includes an investigation of graphite-epoxy composites and metal matrix composites. The laboratory's hydraulic testing machines are used for mechanical experiments on composite materials used in aeronautic applications.

The ISP Sensor Development Laboratory supports the manufacture of heat flux gauges approximately 0.5 inch in diameter and 0.022 inch thick, used in the Arc Jet Facility, Building N-234. To produce the gauges, screen-printed sensors are fired in a furnace to 1550 degrees Celsius to eliminate organics and achieve a solid metal film. The laboratory is used for material inspections and calibration. The calibration process involves repeated temperature steps of up to 1100 degrees Celsius.

Arc Jet Complex, N-231, N-234, N-234A, and N-238

The Ames Arc Jet Complex has a rich heritage of over 40 years in Thermal Protection System (TPS) development for every NASA Space Transportation and Planetary program, including Apollo, Space Shuttle, Viking, Pioneer-Venus, Galileo, NASP, Mars Pathfinder, Stardust, Mars Exploration Rovers, X-33, X-34, SHARP-B1 and B2, X-37, Phoenix, Mars Science Laboratory, and Orion. This TPS history includes a long heritage in the development of the arc jet facilities. The Ames arc jets are designed to produce hypersonic test conditions representative of the high velocity, high altitude portions of an entry trajectory. These are used to simulate the aerothermal heating and forces that develop on the heat shields, leading edges, and other areas of the

spacecraft requiring thermal protection during hypervelocity passage through planetary atmospheres. TPS samples run in the arc jets from a few minutes to over an hour, from one exposure to multiple exposures of the same sample, in order to understand and improve the TPS response to a hypersonic flow aerothermal environment. The Ames Arc Jet Complex is a key enabler for customers involved in TPS design, development, test, and evaluation. Arc jet data is critical for validating TPS thermal models, heat shield design, instrumentation, and repair techniques, and for supporting flight qualification and sustaining engineering requirements.

Hypervelocity Free-Flight Facility, N-237

The Hypervelocity Free-Flight Facilities provide a unique suite of testing capabilities to study the aerodynamics of hypervelocity flight, atmospheric entry, and the response of materials to hypervelocity impact. The HFFF comprise two ballistic ranges: the Aerodynamic (HFFAF) and the Gun Development (HFFGDF).

The HFFAF is NASA's only Aeroballistic Range and consists of a model launching gun, a sabot separation tank/vacuum chamber, a test section with 16 orthogonal photo stations, a test cabin, and the largest combustion-driven shock tube in the United States. This multifaceted facility can be configured to perform shock tunnel testing, aeroballistic testing, counterflow aeroballistic testing, or hypervelocity impact testing. The 22.9-meter (75-ft) long test section can be filled with various gases to simulate flight in planetary atmospheres. The 40.6-cm (16-in) diameter shock tube is capable of producing high-enthalpy airflow at Mach 7. This flow may be used for fixed-model testing or as a counter-current to the gun-launched models for combined velocities up to 11 km/s (36,000 ft/sec).

The HFFGDF consists of a model launching gun, a sabot separation tank/vacuum chamber, a flight tube, and an impact chamber. This facility is primarily used to expand and enhance the performance characteristics of the model launching guns used in the HFFF. This range can also be used to perform hypervelocity impact studies to simulate micro-meteoroid and orbital debris impact.

Both ranges were constructed in 1964 and utilize an arsenal of light-gas and powder guns to accelerate particles that range in size from 3.2 to 25.4 mm (0.125 to 1 inch) in diameter to velocities ranging from 0.5 to 8.5 km/s (1,500 to 28,000 ft/s).

NASA Advanced Supercomputing Facility, N-258

The NASA Advanced Supercomputing (NAS) Division provides NASA's primary high end computing (HEC) capability, operating powerful supercomputers, massive data storage systems, and high-speed networking to support a vast array of large computations needed to advance the Agency's missions of science, aeronautics research, and space exploration. This includes the modeling, simulation, analysis, and decision support activities for all of NASA's four mission directorates. The goal is to develop and deliver the most productive high-end computing environment in the world, enabling NASA to extend technology, expand knowledge, and explore the universe. The NAS Division, known worldwide for its innovation and expertise in HEC, was built in 1986, following a long history of computing leadership at Ames extending back to the early 1950s.

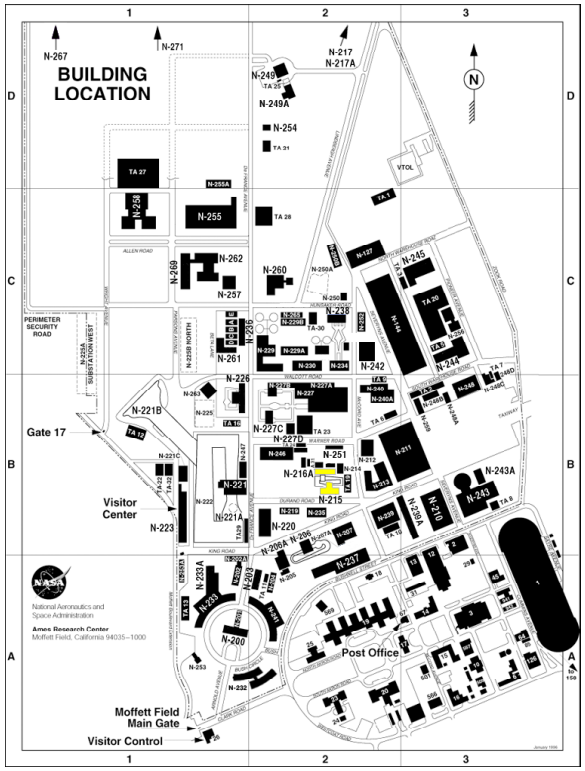
NAS HEC operations include a comprehensive set of user services to ensure that resources are effectively utilized by modeling and simulation experts from NASA centers, academia, and industry across the nation and around the clock. A 24x7 control room responds immediately to user issues and ensures that HEC systems remain fully and continuously operational. Application experts resolve complex problems and enhance the performance of computational modeling, simulation, and analysis applications. To assist users in interpreting the massive and complex data sets resulting from computations, a visualization and data analysis team develops application-driven software tools and pioneered hyperwall and concurrent visualization capabilities. Supercomputing and data system administrators continuously customize and optimize system configurations to ensure that even the most demanding requirements can be met. And finally, end-to-end networking services enable application scientists and engineers from geographically dispersed locations to efficiently access computational resources and quickly transfer massive datasets.

Automation Sciences Research Facility, N-269

The Automation Sciences Research Facility provides an integrated environment for investigating the interaction between humans and highly automated systems. Within the Automation Sciences Research Facility, the neuro-engineering library is used to support intelligent flight control (neural networks applied to flight systems). The DARWIN testbed connects the wind tunnels with the aircraft manufacturers for better design and testing control and result dissemination. The intelligent mechanism lab has been the site of several field missions demonstrating remote/telecontrol and presence. The photonics lab supports the study of bacteriorhodopsin for optical processing.

N-269 also houses the Future Flight Central facility, administered by Code A. The Future Flight Central facility provides a 360-degree view/simulation of an air traffic control tower. Examples of current projects at this facility include: (1) implementation of terrain mapping visualization systems for remotely operated vehicles; (2) acquisition, processing, and visualization of acoustic data in wind tunnel tests; and (3) investigation of bacteriorhodopsin (an experimental protein) as an optical processing and sensing medium.

Y Facilities in Code Y: U.S. Army Aeroflightdynamics Directorate



Army Aeroflight-dynamics Directorate 7x10-Foot Wind Tunnel 1, N-215

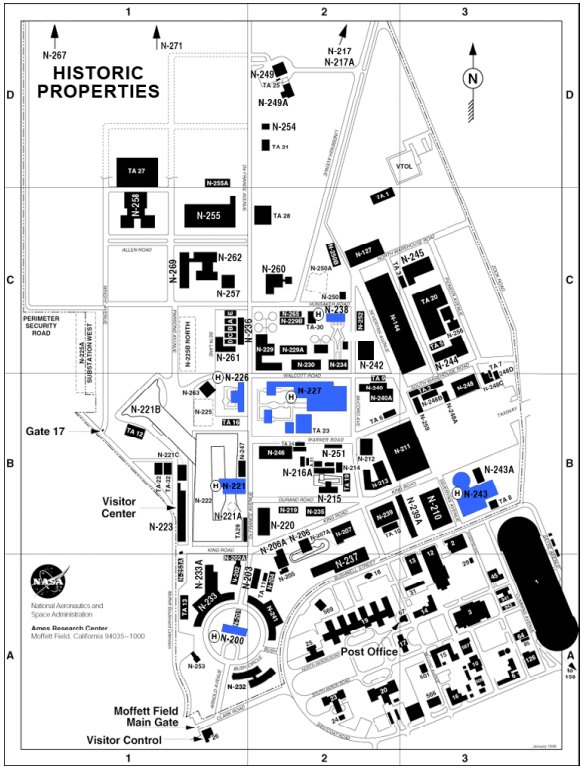
This is the first wind tunnel built and operational at NACA Ames Research Center. The tunnel has been operated by the U.S. Army since 1997. The tunnel is closed circuit, low speed, and pressurized to 1 atmosphere. It is the only tunnel in the United States dedicated to helicopter and rotary wing research. It is used for research in support of low-speed aerodynamics, using small-scale aircraft, V/STOL aircraft, and other aeronautical systems. Wind speeds within the tunnel are continuously variable up to 402.5 kilometers per hour (250 miles per hour).

Army Aeromechanics Lab Model Preparation Area, N-216A

This area includes a model rotor hover test chamber with very thick concrete walls. It also includes a shop used in the development of models to be run in the 7x10-foot Wind Tunnel and the development of parts for the tunnel.

H Additional Historic Properties

Buildings N-226 and N-200 have been reviewed for historic merit and are believed to be eligible for nomination to the National Register of Historic Places.

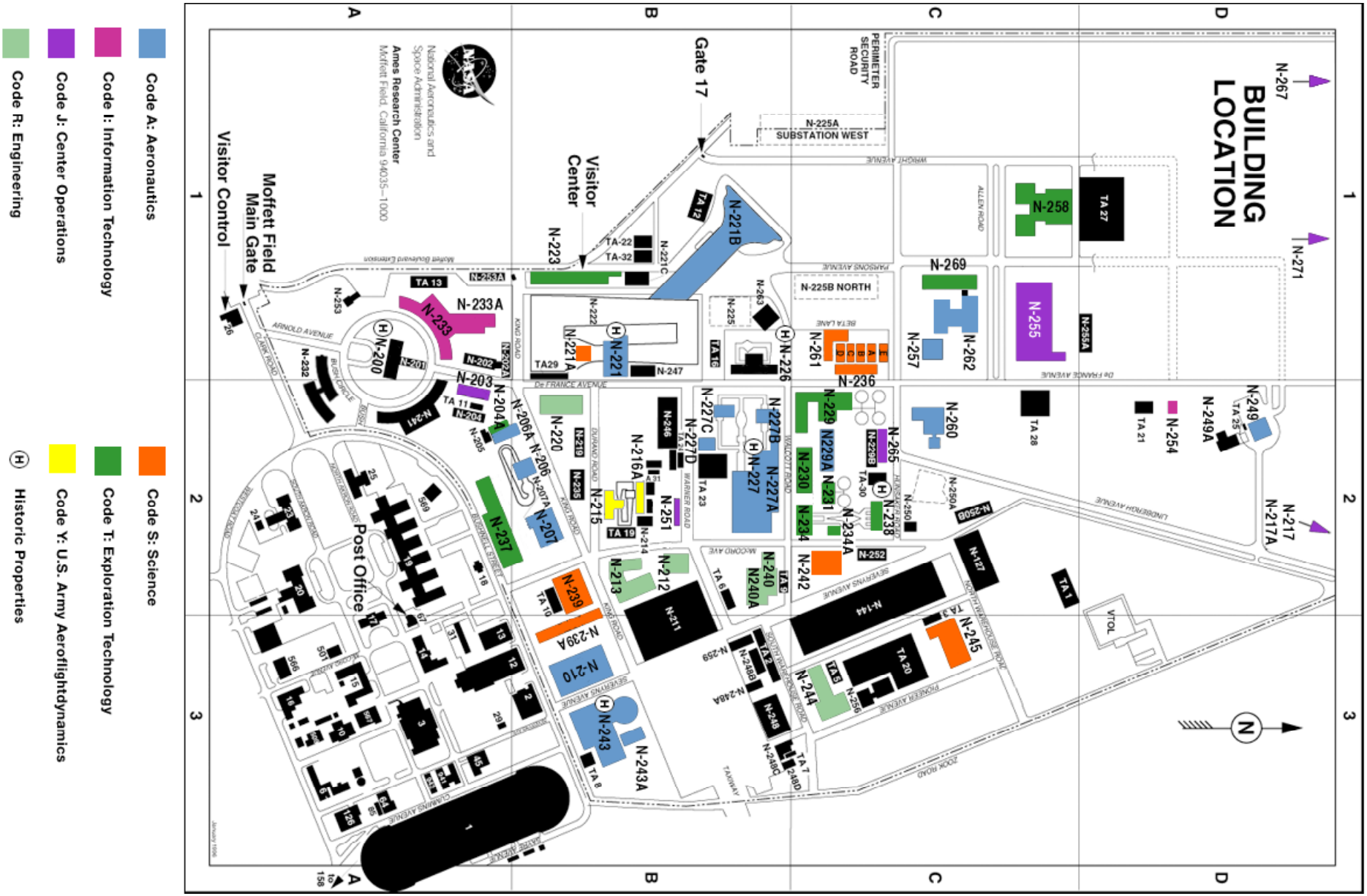


Administration Building, N-200

Building N-200 has been reviewed for historic merit and is believed to be eligible for nomination to the National Register of Historic Places. This was one of the earliest buildings on the NASA Ames Research campus. It was designed under the direction of Smith DeFrance, the Ames Research Center's first director, and became the main administration building. It is significant at the national level under National Register Criterion A and B (California Register Criterion 1 and 2) for its use as the Ames Aeronautical Laboratory Administration Building (1942 - 1958) and later as the Ames Research Center Administration Building (1959 - Present). It was originally constructed to house all administrative and office activities at the center, including the offices of the Director and Assistant Director, Center Management, Personnel, Procurement, and Central Files. Additionally, the building was the original home to several research divisions, the library, and the cafeteria. This building is significant in the areas of space exploration and settlement (1943 - Present), and in the areas of science and invention. Additionally, the building is significant for its association with Smith DeFrance, H. Julian Allen, John F. Parsons, and Harry J. Goett. Although the interior has been largely altered and there have been several exterior renovations (i.e., the addition of an elevation tower and canopy), Building N-200 still retains qualities that convey its historical significance. This building possesses integrity of location, design, setting, materials, workmanship, feeling, and association.

6x6-foot Super-sonic Wind Tunnel, N-226

Building N-226 has been reviewed for historic merit and is believed to be eligible for nomination to the National Register of Historic Places. Building N-226, which houses the 6x6-foot Supersonic Wind Tunnel, is significant at the national level under Criterion 1 (Events) for its direct association with supersonic flight research and for its use as a supersonic wind tunnel testing facility (1948 - 1988). Additionally, this building is significant under Criterion 3 (Design/Construction) as an exceptional engineering accomplishment in the context of wind tunnel construction. Building N-226 played a crucial role in the discovery of supersonic flight research, which subsequently led to improved designs of supersonic aircrafts and missiles. Although the building has been altered in its interior, the alteration does not affect the building's integrity. Thus, this building possesses integrity of location, design, setting, materials, workmanship, feeling, and association.


BUILDING LOCATION
Code A: Aeronautics
Code I: Information Technology
Code J: Center Operations
Code R: Engineering
Code S: Science
Code T: Exploration Technology
Code Y: U.S. Army Aeroflightdynamics
Historic Properties
Moffett Field Main Gate
Visitor Control
Visitor Center
Gate 17
Post Office
National Aeronautics and Space Administration
Ames Research Center
Moffett Field, California 94035-1000
N-225A SUBSTATION WEST
N-225B NORTH
PERIMETER SECURITY ROAD
N-221B
N-233A
N-200
N-255
N-258
N-269
N-144
N-127
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N-210
N-239A
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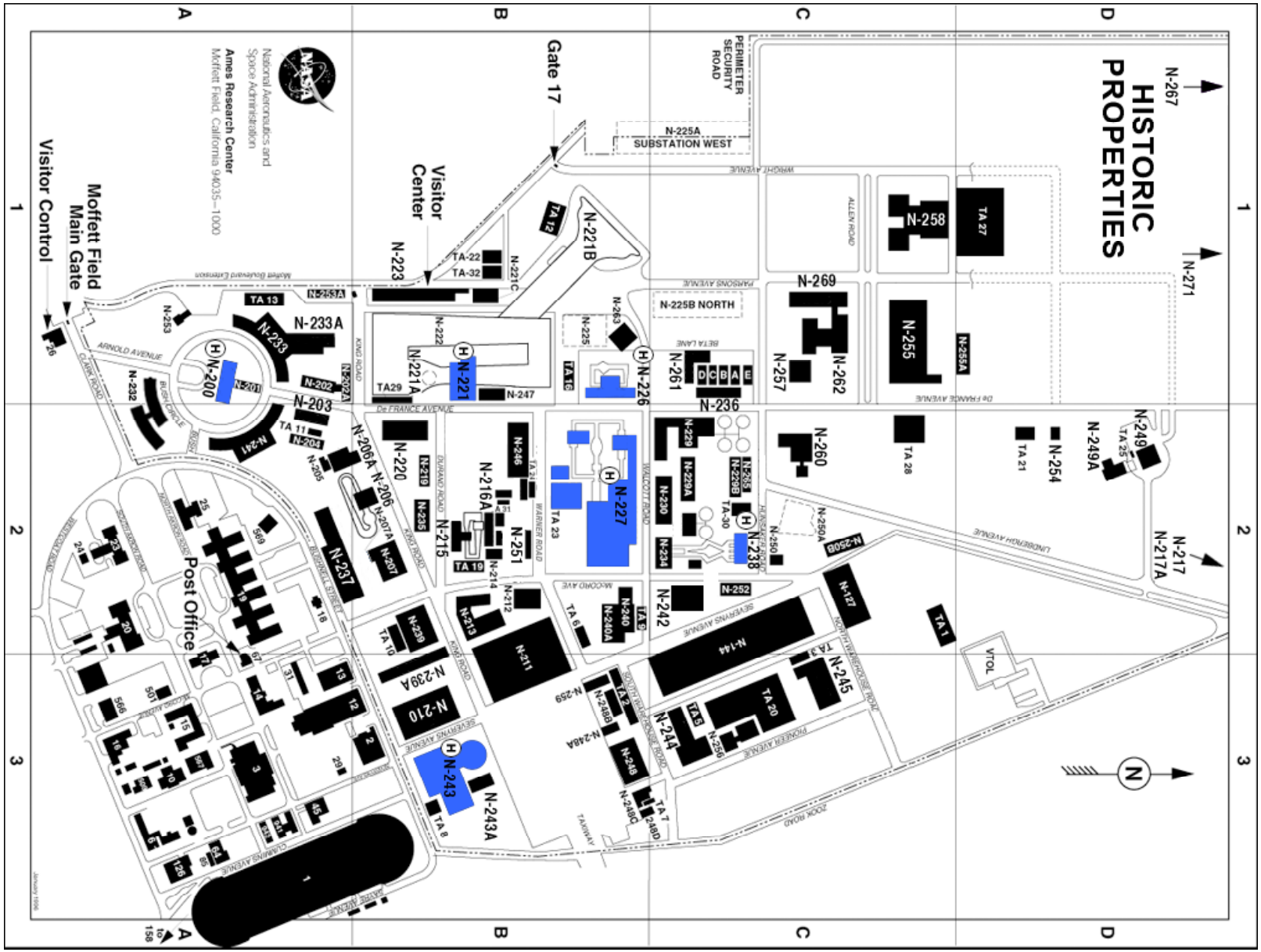
WRIGHT AVENUE
ALLEN ROAD
PARSONS AVENUE
BETA LANE
DE FRANCE AVENUE
UNDERWOOD AVENUE
WALCOTT ROAD
WARNER ROAD
DURAND ROAD
KING ROAD
SEVERYNS AVENUE
PIONEER AVENUE
ZOOK ROAD
TAXIWAY
ARNOLD AVENUE
CLARK ROAD
BUSH CIRCLE
BERKELL STREET
CHAMBERS AVENUE
GATE AVENUE
Moffett Boulevard Extension
January 1996


HISTORIC PROPERTIES
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SUBSTATION WEST
N-225B NORTH
PERIMETER SECURITY ROAD
Gate 17
Visitor Center
Moffett Field Main Gate
Visitor Control
National Aeronautics and Space Administration
Ames Research Center
Moffett Field, California 94035-1000
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VTOL
DE FRANCE AVENUE
LINDBERGH AVENUE
POINTER AVENUE
SEVERYNS AVENUE
WALCOTT ROAD
WARNER ROAD
KING ROAD
ARNOLD AVENUE
CLARK ROAD
BUSH CIRCLE
ZOOM ROAD
TAXIWAY
JANE AVENUE
CHAMPIONS AVENUE
January 1996

Building Key

alphabetical by status and organization code

Historic Properties
6x6-foot Supersonic Wind Tunnel, N-226 (B-1)
Administration Building, N-200 (A-1)
Arc Jet Complex, N-231, N-234, N-234A, and N-238 (C-2)
Flight and Guidance Simulation Laboratory, N-243 and N-243A (B-3)
National Full-Scale Aerodynamic Complex, N-221 and N-221B (B-1)
Unitary Plan Wind Tunnel, N-227 and N-227A-D (B-2)

Code A: Office of the Director of Aeronautics
12-foot Pressure Wind Tunnel, N-206 and N-206A (B-2)
Anechoic Chamber and Anechoic Wind Tunnel, N-221 (B-1)
Balance Calibration Laboratory, N-207 (B-2)
Crew-Vehicle Systems Research Facility, N-257 (C-1)
Flight and Guidance Simulation Laboratory, N-243 and N-243A (B-3)
Flight Systems Research Laboratory, N-210 (B-3)
Fluid Mechanics Laboratory, N-260 (C-2)
High Pressure Air Compressor Building, N-229A (C-2)
Human Performance Research Laboratory, N-262 (C-1)
National Full-Scale Aerodynamic Complex, N-221 and N-221B (B-1)
Outdoor Aerodynamic Research Facility, N-249 (D-2)
Unitary Plan Wind Tunnel, N-227 and N-227A-D (B-2)

Code I: Office of the Director of Information Technology
Ames Internet eXchange, N-254 (D-2)
Ames Video Control Center, N-240 (B-2)
Ames Video Teleconferencing Service Facility, N-203 (A-2)
Central Computer Facility, N-233 and N-233A (A-1)

Code J: Office of the Director of Center Operations
Disaster Area Relief Team, N-267 (D-1)
Facility Supply Support Center, N-255 (C-1)
Hazardous Substances Transfer Site, N-265 (C-2)
Imaging Technology Laboratory, N-203 (A-2)
Industrial Wastewater Pre-treatment Plant, N-271 (D-1)
Magnetic Standards Laboratory and Test Facility, N-217 and N-217A (D-2)
Motor Pool, N-251 (B-2)

Code R: Office of the Director of Engineering
Electronics Assembly Clean Room, Fabrication, and Test Laboratories, N-213 (B-2)
Flight Processing Center and Multi-Mission Operations Center, N-240 and N-240A (B-2)
Model Development, Advanced Composites Group, N-212 (B-2)
Space Projects Facility, N-244 (C-3)
Technical Services Facility, N-220 (B-2)

Code S: Office of the Director of Science
20-G Centrifuge Facility, N-221A (B-1)
Astrobiology and Life Sciences Research Laboratory, N-239 (B-2)
Human Performance Centrifuge Facility, N-221A (B-1)
Life Sciences Research Laboratory Centrifuges, N-239A (B-3)
Mars Unit, N-242 (C-2)
Space Bioscience Research Laboratories, N-261 (C-1)
Space Biosciences Laboratories and Animal Care Facility, N-236 and N-236A-E (C-1)
Space Sciences Research Laboratory, N-245 (C-3)
Vestibular Research Facility, N-242 (C-2)

Code T: Office of the Director of Exploration Technology
Ames Vertical Gun Range, N-204A (A-1)
Arc Jet Complex, N-231, N-234, N-234A, and N-238 (C-2)
Automation Sciences Research Facility, N-269 (C-1)
Electric Arc Shock Tube East, N-229 (C-2)
Hypervelocity Free-Flight Facility, N-237 (A-2)
NASA Advanced Supercomputing Facility, N-258 (C-1)
Physical Sciences Research Laboratory, N-230 (C-2)
Research and Development Research Support Facility, N-223 (B-1)

Code Y: U.S. Army Aeroflightdynamics Directorate
Army Aeroflightdynamics Directorate 7x10-Foot Wind Tunnel 1, N-215 (B-2)
Army Aeromechanics Lab Model Preparation Area, N-216A (B-2)

Building Key

ALPHABETICAL

6x6-foot Supersonic Wind Tunnel, N-226 (B-1)
12-foot Pressure Wind Tunnel, N-206 and N-206A (B-2)
20-G Centrifuge Facility, N-221A (B-1)
Administration Building, N-200 (A-1)
Ames Internet eXchange, N-254 (D-2)
Ames Vertical Gun Range, N-204A (A-1)
Ames Video Control Center, N-240 (B-2)
Ames Video Teleconferencing Service Facility, N-203 (A-2)
Anechoic Chamber and Anechoic Wind Tunnel, N-221 (B-1)
Arc Jet Complex, N-231, N-234, N-234A, and N-238 (C-2)
Army Aeroflightdynamics Directorate 7x10-Foot Wind Tunnel 1, N-215 (B-2)
Army Aeromechanics Lab Model Preparation Area, N-216A (B-2)
Astrobiology and Life Sciences Research Laboratory, N-239 (B-2)
Automation Sciences Research Facility, N-269 (C-1)
Balance Calibration Laboratory, N-207 (B-2)
Central Computer Facility, N-233 and N-233A (A-1)
Crew-Vehicle Systems Research Facility, N-257 (C-1)
Disaster Area Relief Team, N-267 (D-1)
Electric Arc Shock Tube East, N-229 (C-2)
Electronics Assembly Clean Room, Fabrication, and Test Laboratories, N-213 (B-2)
Facility Supply Support Center, N-255 (C-1)
Flight and Guidance Simulation Laboratory, N-243 and N-243A (B-3)
Flight Processing Center and Multi-Mission Operations Center, N-240 and N-240A (B-2)
Flight Systems Research Laboratory, N-210 (B-3)
Fluid Mechanics Laboratory, N-260 (C-2)
Hazardous Substances Transfer Site, N-265 (C-2)
High Pressure Air Compressor Building, N-229A (C-2)
Human Performance Centrifuge Facility, N-221A (B-1)
Human Performance Research Laboratory, N-262 (C-1)
Hypervelocity Free-Flight Facility, N-237 (A-2)
Imaging Technology Laboratory, N-203 (A-2)
Industrial Wastewater Pre-treatment Plant, N-271 (D-1)
Life Sciences Research Laboratory Centrifuges, N-239A (B-3)
Magnetic Standards Laboratory and Test Facility, N-217 and N-217A (D-2)
Mars Unit, N-242 (C-2)
Model Development, Advanced Composites Group, N-212 (B-2)
Motor Pool, N-251 (B-2)
NASA Advanced Supercomputing Facility, N-258 (C-1)
National Full-Scale Aerodynamic Complex, N-221 and N-221B (B-1)
Outdoor Aerodynamic Research Facility, N-249 (D-2)
Physical Sciences Research Laboratory, N-230 (C-2)
Research and Development Research Support Facility, N-223 (B-1)
Space Bioscience Research Laboratories, N-261 (C-1)
Space Biosciences Laboratories and Animal Care Facility, N-236 and N-236A-E (C-1)
Space Projects Facility, N-244 (C-3)
Space Sciences Research Laboratory, N-245 (C-3)
Technical Services Facility, N-220 (B-2)
Unitary Plan Wind Tunnel, N-227 and N-227A-D (B-2)
Vestibular Research Facility, N-242 (C-2)

Building Key

NUMERICAL BY BUILDING NUMBER

N-200, Administration Building (A-1)
N-203, Ames Video Teleconferencing Service Facility (A-2)
N-203, Imaging Technology Laboratory (A-2)
N-204A, Ames Vertical Gun Range (A-1)
N-206 and N-206A, 12-foot Pressure Wind Tunnel (B-2)
N-207, Balance Calibration Laboratory (B-2)
N-210, Flight Systems Research Laboratory (B-3)
N-212, Model Development, Advanced Composites Group (B-2)
N-213, Electronics Assembly Clean Room, Fabrication, and Test Laboratories (B-2)
N-215, Army Aeroflightdynamics Directorate 7x10-Foot Wind Tunnel 1 (B-2)
N-216A, Army Aeromechanics Lab Model Preparation Area (B-2)
N-217 and N-217A, Magnetic Standards Laboratory and Test Facility (D-2)
N-220, Technical Services Facility (B-2)
N-221, Anechoic Chamber and Anechoic Wind Tunnel (B-1)
N-221 and N-221B, National Full-Scale Aerodynamic Complex (B-1)
N-221A, 20-G Centrifuge Facility (B-1)
N-221A, Human Performance Centrifuge Facility (B-1)
N-223, Research and Development Research Support Facility (B-1)
N-226, 6x6-foot Supersonic Wind Tunnel (B-1)
N-227 and N-227A-D, Unitary Plan Wind Tunnel (B-2)
N-229, Electric Arc Shock Tube East (C-2)
N-229A, High Pressure Air Compressor Building (C-2)
N-230, Physical Sciences Research Laboratory (C-2)
N-231, N-234, N-234A, and N-238, Arc Jet Complex (C-2)
N-233 and N-233A, Central Computer Facility (A-1)
N-234, N-234A, N-238, and N-231, Arc Jet Complex (C-2)
N-236 and N-236A-E, Space Biosciences Laboratories and Animal Care Facility (C-1)
N-237, Hypervelocity Free-Flight Facility (A-2)
N-238, N-231, N-234, and N-234A, Arc Jet Complex (C-2)
N-239, Astrobiology and Life Sciences Research Laboratory (B-2)
N-239A, Life Sciences Research Laboratory Centrifuges (B-3)
N-240, Ames Video Control Center (B-2)
N-240 and N-240A, Flight Processing Center and Multi-Mission Operations Center (B-2)
N-242, Mars Unit (C-2)
N-242, Vestibular Research Facility (C-2)
N-243 and N-243A, Flight and Guidance Simulation Laboratory (B-3)
N-244, Space Projects Facility (C-3)
N-245, Space Sciences Research Laboratory (C-3)
N-249, Outdoor Aerodynamic Research Facility (D-2)
N-251, Motor Pool (B-2)
N-254, Ames Internet eXchange (D-2)
N-255, Facility Supply Support Center (C-1)
N-257, Crew-Vehicle Systems Research Facility (C-1)
N-258, NASA Advanced Supercomputing Facility (C-1)
N-260, Fluid Mechanics Laboratory (C-2)
N-261, Space Bioscience Research Laboratories (C-1)
N-262, Human Performance Research Laboratory (C-1)
N-265, Hazardous Substances Transfer Site (C-2)
N-267, Disaster Area Relief Team (D-1)
N-269, Automation Sciences Research Facility (C-1)
N-271, Industrial Wastewater Pre-treatment Plant (D-1)