

National Aeronautics and Space Administration



Ames Research Center
Moffett Field, California 94035

June 7, 2023

Ms. Julianne Polanco
State Historic Preservation Officer
Office of Historic Preservation
Department of Parks & Recreation
1725 23rd Street, Suite 100
Sacramento, CA 95816

Attn: Mr. Mark Beason

Subject: Continuing Section 106 Consultation for Arc Jet Modernization Project at Ames Research Center, Moffett Field, California (NASA_2023_0317_001)

Dear Ms. Polanco:

The National Aeronautics and Space Administration (NASA) Ames Research Center (ARC) received your letter dated April 26, 2023, containing comments on NASA ARC's finding of effect for the proposed Arc Jet Modernization Project (project or undertaking) located on the Ames Campus of NASA ARC at Moffett Field, Santa Clara County, California. NASA ARC retained AECOM to supplement the technical study for this project with additional information per your request. The NASA ARC responses to the State Historic Preservation Officer's (SHPO's) comment requesting additional information are provided below, including additional effects assessments prepared by architectural historians (Trina Meiser, M.A., and Tricia Forsi, M.A.) who meet the Secretary of the Interior's Professional Qualifications Standards in architectural history (36 CFR Part 61).

SHPO comment:

For project component 1, Data Acquisition System Upgrade: This equipment was installed during the period of significance. Please provide a photograph and more information about what "substantial modernization" entails.

NASA response:

As described in the initial submission:

***Data Acquisition System Upgrade.** The project would replace (in kind) or update hardware of the Data Acquisition System, as necessary. The existing system was installed in the 1990s and has been modified several times to meet advancements in*

technology and other changing needs, but now requires more substantial modernization.

The Arc Jet complex serves NASA's needs to test and develop advanced thermal protection materials for spacecraft heatshields under extreme high-temperature flow environments. Designers of future space missions rely on data to be accurately recorded so that investigators can assess the test conditions and material response, which feeds directly into designs of heatshields. The current Arc Jet Data Acquisition System (DAS) was installed in the 1990s. Since then, multiple modifications and partial upgrades have led to its current configuration. [REDACTED] The type and amount of data that needs to be collected to accommodate future needs far exceeds the capability of the existing system.

The demand for data is very different today than when the system was first built. In the 1960s when the Arc Jets first ran, measurements were analog and recorded by hand, chart recorder, or with film photography under quasi-static test conditions. Today there are hundreds of channels continuously monitoring process variables and test specific data and recording data digitally. The existing hardware is incapable of keeping up with this advanced technology. Additionally, the system is operating well beyond its expected life; repairs are expensive and replacement parts are difficult to acquire.

The hardware to be replaced covers the entirety of the DAS: sensing, collection, recording, processing, display, and storage. This includes the front-end hardware (digitizers and signal conditioners), signal transmission cables, operator's workstations, data processing computers, and data storage components.

Figures 1 and 2 shows the main DAS enclosure serving the Panel Test Facility (PTF) [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED] With the doors closed, the new system will appear almost identical to the existing system.



Figures 1-3: PTF enclosure with doors closed (left) and open (center) and the AHF enclosure (right).

[REDACTED] Each facility's DAS contains similar components and will be upgraded in a similar fashion.

Effects Assessment

By retaining the current cabinets of the PTF and AHF, the proposed DAS upgrade will result in minimal change to the existing systems outer appearance while making necessary improvements for data capture. The significant characteristics of the Arc Jet Complex are its industrial/scientific laboratory spaces and the Arc Jet apparatuses contained within. Alterations to the existing DAS would improve safety and efficiency without diminishing the industrial/scientific character of the PTF and AHF. The incremental changes to the DAS spans from analog to rapidly improving digital data acquisition. Hardware and software improvements have been necessary over time, and while all of it contributes to the complex's significance, the individual components (e.g., pipes, wires, valves, controls, data systems, computing software, and utilities) are not significant in their own right. The proposed DAS upgrade conforms to the Secretary of the Interior's Standards for Rehabilitation.

SHPO comment:

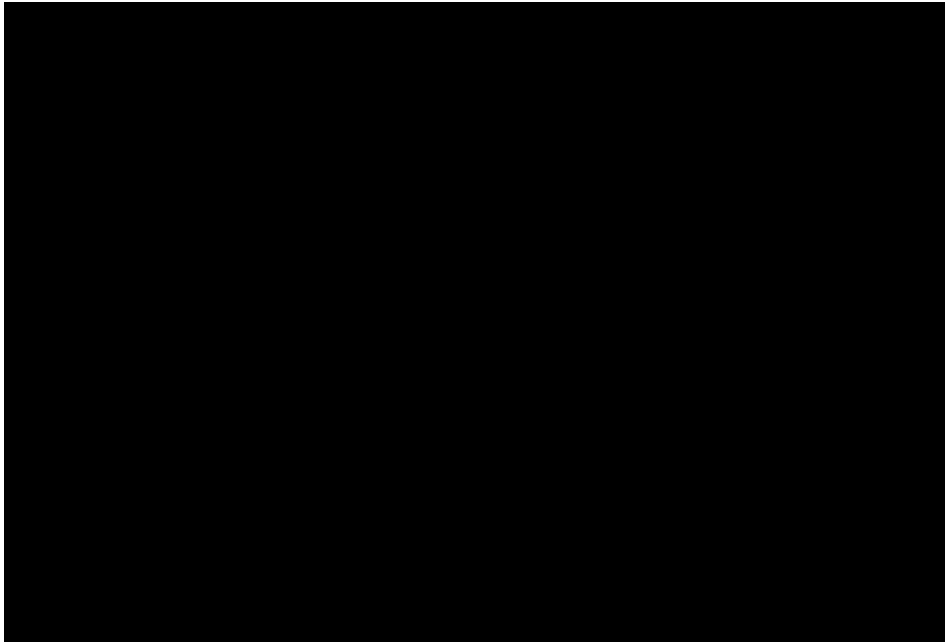
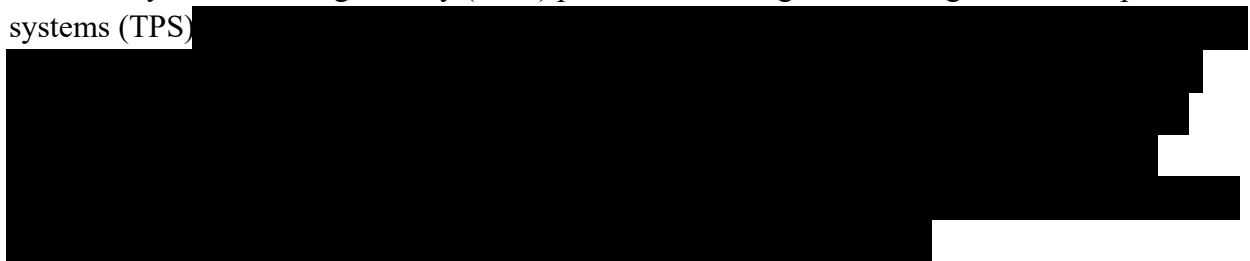
For project component 3, Aerodynamic Heating Facility (AHF) Model Insertion: please provide a photograph of the existing equipment, the date it was installed, describe subsequent modifications, and provide further information about the replacement equipment.

NASA response:

As described in the initial submission:

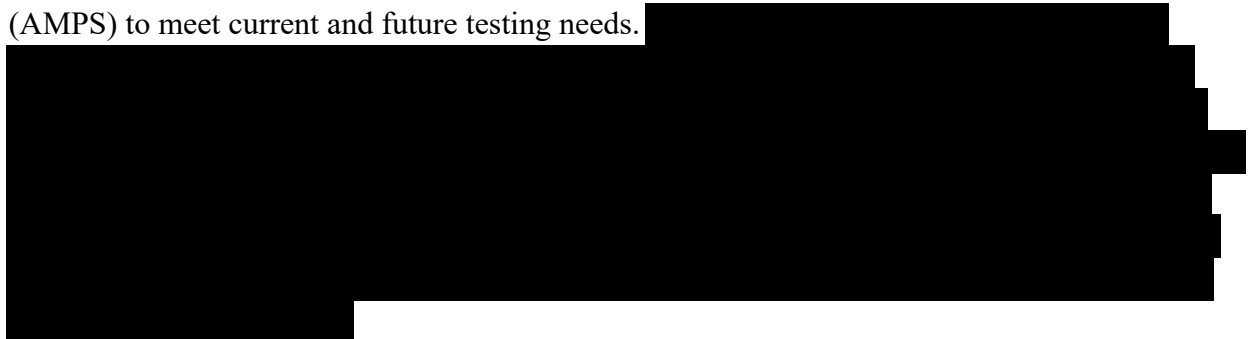
***Aerodynamic Heating Facility (AHF) Model Insertion.** The project would replace the existing model system [REDACTED] The project would create a more reliable, safer, and better performing system.*

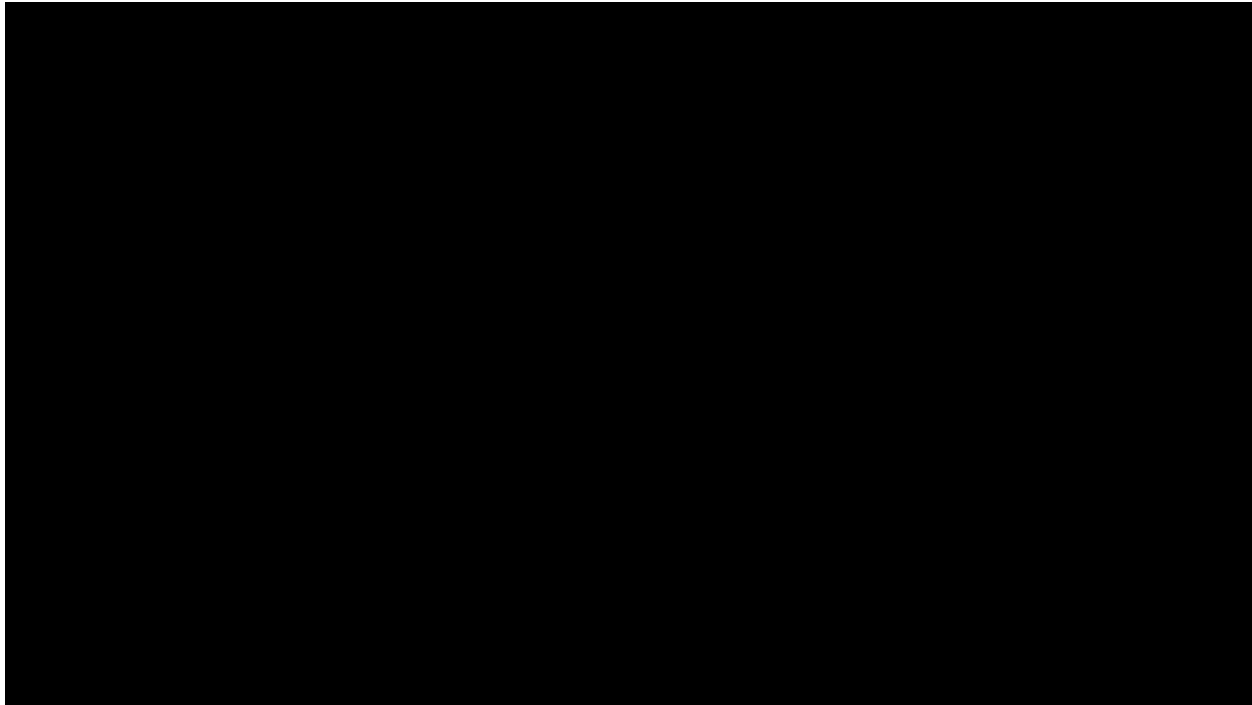
The Aerodynamic Heating Facility (AHF) performs critical ground testing for thermal protection systems (TPS)



Figures 4 and 5. The AMIS (left) and a computer model of AMIS (right).

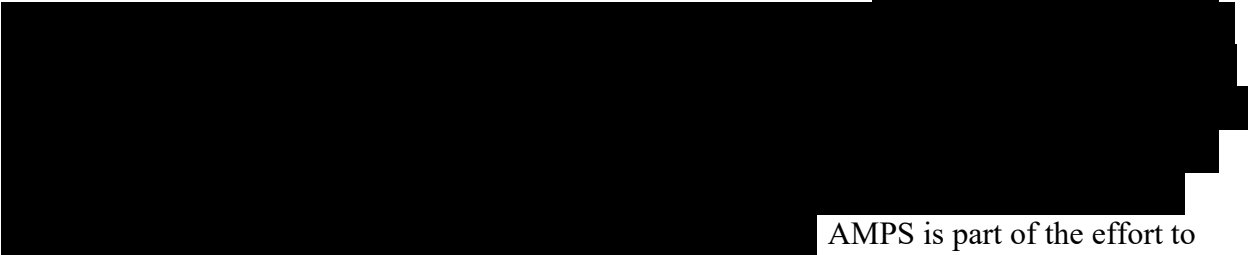
The proposed scope of work would replace AMIS with the AHF Model Positioning System (AMPS) to meet current and future testing needs.





Figures 6 and 7. Computer model of AMPS (left) and the AMPS enclosure (right).

AMPS will replace AMIS auxiliary systems outside of the test box.



AMPS is part of the effort to modernize the Arc Jet Complex by improving its safety, reliability, availability, and performance.

Effects Assessment

The significant characteristics of test box are associated with its ability to aid in industrial/scientific advancement. Alterations to the existing equipment and systems would improve safety and efficiency without diminishing the industrial/scientific character of the test box. The AMIS was installed outside the period of significance in 2002. The replacement of the AMIS with AMPS is necessary for safety, reliability, availability, and performance while still retaining the integrity of design, materials, workmanship, feeling, or association of the test box and the overall Arc Jet Complex. The proposed AHF modifications conform to the Secretary of the Interior’s Standards for Rehabilitation.

SHPO comment:

For project component 6, Safety and Interlock Control System: please provide a photograph of the existing equipment, the date it was installed, describe subsequent modifications, and provide further information about the replacement equipment.

NASA response:

As described in the initial submission:

Safety and Interlock Control System. The project would replace the existing safety and interlock control system with a modern standard system.

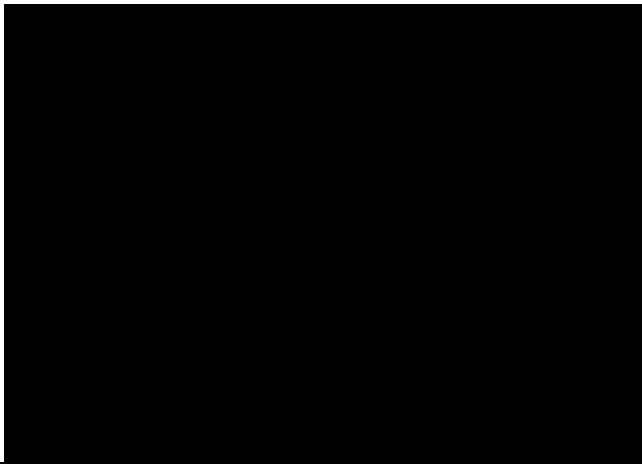
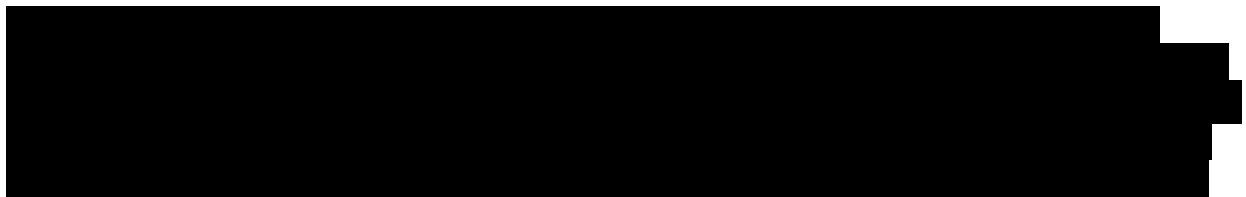


Figure 8:



These circuits of relays and wiring vary in criticality but ultimately exist to ensure facilities are operated in a manner which promotes the safety of personnel or facility equipment.





Figures 9-11: Example of the relay wiring that will be removed [redacted] and control panel to be updated with a computer touch screen for controls.



Both the ASCS and SICS will require updating the following: PLC hardware, input modules, output modules, communication modules, power supply, mounting, enclosure, wires, and cables. PLC components and associated modules are typically installed inside an enclosure or cabinet to protect them from environmental factors such as dust, moisture, temperature variations, and physical damage. Additionally the Human-Machine Interface (HMI) will be updated. An HMI provides operators or engineers with a visual representation of the process, real-time data monitoring, and the ability to control or modify parameters. HMIs can be separate devices or integrated into the PLC hardware.

Effects Assessment

The proposed safety and interlock control system project will use the minimal changes necessary to distinctive materials, features, and spaces. The systems proposed to be replaced were installed in the 1960s and 1970s and have been replaced piecemeal over the following decades. The incremental changes to the Arc Jet Complex and its equipment over its history have allowed it to contribute to technological advancement. Hardware and software involved in Arc Jet operations necessarily changes over time, and while all of it contributes to the complex, the individual components (e.g., pipes, wires, valves, controls, data systems, computing software, and utilities) are not significant in their own right. The proposed safety and interlock control system project will conform to the Secretary of the Interior's Standards for Rehabilitation.

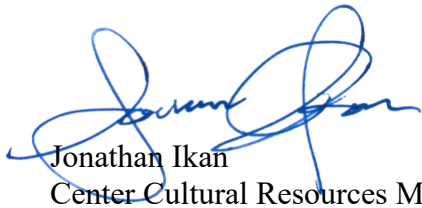
Finding of Effect

As previously submitted, based on the analysis conducted by qualified architectural historians who meet the Secretary of the Interior's professional qualifications standards, NASA ARC made a finding of No Adverse Effect.

NASA ARC requests the SHPO's concurrence on NASA ARC's finding of No Adverse Effect related to this project pursuant to 36 CFR 800.5(b). NASA requests the SHPO's response within 30 days of receipt of this letter, as specified in 36 CFR 800.5(c).

Please contact me at jonathan.d.ikan@nasa.gov or at (650) 604-6859 with your comments or questions.

Sincerely,



Jonathan Ikan
Center Cultural Resources Manager



Ames Research Center, MS 213-8
Moffett Field, California 94035

cc:

HQ/EMD/Rebecca Klein, Ph.D., RPA