

DOUGLAS MISSILE TEST FACILITY,  
GAMMA TEST COMPLEX  
Southeast corner of the Douglas Missile Test Facility  
Rancho Cordova  
Sacramento County  
California

HAER CA-2310-C

BLACK AND WHITE PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

U.S. Department of the Interior  
National Park Service  
Pacific West Regional Office  
San Francisco, California

## HISTORIC AMERICAN ENGINEERING RECORD

### DOUGLAS MISSILE TEST FACILITY, GAMMA TEST COMPLEX

HAER No. CA-2310-C

**Location:** Sacramento County, California

The Douglas Missile Test Facility is in the City of Rancho Cordova, Sacramento County, California, about twelve miles east of the City of Sacramento. The testing facilities are contained within 1,700-acres located south of White Rock Road, north of Douglas Road, east of Sunrise Boulevard, and west of Grant Line Road in eastern Sacramento County. The Gamma Test Complex is 0.5 miles northwest of the Administration and Support area, between the Alpha Test Complex and Administration Area, in the southeast corner of the Douglas Missile Test Facility. The Gamma Complex abuts the Kappa Test Area on its western edge.

Approximate center of Gamma Test Complex: Latitude 38°33'58.46"N;  
Longitude 121°12'42.89"W

USGS 7.5 minute quadrangles Carmichael and Buffalo Creek, California,  
Photorevised 1992

**Present Owner:** Elliott Homes and Easton Development Company, LLC

**Present Use:** Abandoned

**Significance:** The Douglas Missile Test Facility Gamma Test Complex has been determined eligible for listing in the National Register of Historic Places. The Gamma Test Complex has been determined eligible under criterion A for its involvement with the NASA Saturn S-IVB attitude control motors, handling propellants, and fire auxiliary propulsion systems of the S-IVB stages, 1964-69. The remaining structures and landscape at the testing facility reflect architectural qualities unique to this facility, and reflect the specialized uses and development that occurred at the Test Facility (Criterion C). The Gamma Complex is best considered and understood as an integral component of the larger Douglas Missile Test Facility District.

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**Project**

**Information:** Elliot Homes currently plans to demolish all facilities associated with the Douglas Missile Test Facility. As part of the permitting process, the Army Corps of Engineers determined that buildings and structures associated with this facility are considered potentially eligible for listing in the National Register of Historic Places, and recommended HAER photo documentation and recordation of this facility. Environmental Science Associates conducted the background historical research, assisted by previous studies of the facility<sup>1</sup>. Robert Hicks provided all HAER quality photographs. Alan Lawrie provided technical expertise.

For additional information, see:

Douglas Missile Test Facility, HAER-CA-2310

Douglas Missile Test Facility, Alpha Test Complex, HAER-CA-2310-A

Douglas Missile Test Facility, Alpha Test Complex, Control Center,  
HAER-CA-2310-A-1

Douglas Missile Test Facility, Alpha Test Complex, Test Stand No. 1,  
HAER CA-2310-A-2

Douglas Missile Test Facility, Alpha Test Complex, Test Stand No. 2,  
HAER CA-2310-A-3

Douglas Missile Test Facility, Beta Test Complex, HAER-CA-2310-B

Douglas Missile Test Facility, Beta Test Complex, Terminal Equipment Room,  
HAER-CA-2310-B-1

Douglas Missile Test Facility, Beta Test Complex, Test Stand No. 3,  
HAER-CA-2310-B-2

Douglas Missile Test Facility, Gamma Test Complex, Test Structure,  
HAER CA-2310-C-1

Douglas Missile Test Facility, Kappa Test Complex, HAER CA-2310-D

Douglas Missile Test Facility, Sigma Test Complex, HAER CA-2310-E

Douglas Missile Test Facility, Solid Propellant Assembly Area, HAER CA-2310-F

**Part I. Historical Information**

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<sup>1</sup> Karen Weitze, Draft Historic Buildings and Structures Inventory Douglas Missile Test Facility Rio del Oro Specific Project Plan. Report to City of Rancho Cordova and U.S. Army Corps of Engineers, Sacramento District, from EDAW, Sacramento, and Weitze Research. (2005); Alan Lawrie, Return to Sacramento: a Review of Saturn Rocket Firings and Explosion. Paper presented at 43<sup>rd</sup> AIAA/ASME/SE/ASEE Joint Propulsion Conference and Exhibit, July, Cincinnati, Ohio. Published by the American Institute of Aeronautics and Astronautics, manuscript number AIAA 2007-5343. (2007); Rebecca Allen, National Register of Historic Places Evaluation of Structures Associated with the Douglas Missile Test Facility (P-34-4317), Rio del Oro, Rancho Cordova, California. Report to ECORP Consulting, Rocklin, and Elliot Homes, Folsom, from Past Forward, Inc., Garden Valley, California. (2011).

## A. Physical History

**1. Date of Construction:** 1964-65

**2. Architect/Engineer:** Aerojet General

**3. Builder:** Wismer-Becker

**4. Original Plans and Construction:** As part of the Douglas Missile Test Facility, Aerojet General installed structures in the Gamma Test Area in 1964-65. The Gamma Test Area is a smaller complex within the Douglas Missile Test Facility. NASA set up the Gamma Test Area to develop and test the Saturn S-IVB attitude control motors, handling propellants, and fire auxiliary propulsion systems of the S-IVB stages. Primary features of the Gamma Test Area are a three-cell test structure, test control center, and instrumentation center, as well as auxiliary structures and basins. While in planning, the site's name was the Attitude Control Area.

**5. Alterations and Additions:** Static testing ended in 1969, but test stands were maintained in a state of readiness into late 1972. No alterations were made.

## B. Historical Context:

As part of the Douglas Missile Test Facility, Aerojet General installed structures in the Gamma Test Area in 1964-1965. The Gamma Test Area is a smaller complex within the Douglas Missile Test Facility. NASA set up the Gamma Test Area to develop and test the Saturn S-IVB attitude control motors, handling propellants, and fire auxiliary propulsion systems of the S-IVB stages.

Wismer-Becker was the contractor for the construction of the Gamma complex, who completed work in July 1964. Douglas, who activated the site two months later, used it for hot fire testing the bipropellant Auxiliary Propulsion Modules used for attitude control and ullage motor settling on the S-IVB stages.

## Part II. Structural/Design/Equipment Information

### A. General Statement:

**1. Character:** The structures and landscape reflect architectural and engineering characteristics unique to this facility, as they were specifically designed for the development and testing of the Saturn S-IVB attitude control motors and the handling of hypergolic propellants. They reflect the specialized uses and development that occurred at the Douglas Missile Test Facility. The Gamma Complex was one of seven grouping of facilities within the larger complex.

**2. Condition of fabric:** Good to fair (see table below).

**B. Description of Facility:**

**1. Gamma Test Complex:** Primary features of the Gamma Test Area are a three-cell test structure, test control center, and instrumentation center, as well as auxiliary structures and basins. The Gamma complex consisted of a test structure containing three test cells; test control center, instrumentation center, maintenance and assembly building, and storage areas for the propellants. The test structure contained the three test cells and an equipment area. The cells were identified as Cell I, Cell II, and Cell III. Test Cell III was configured to test either module or cluster type hypergolic engines. HAER No. CA-2310-C-1 describes the main Test Structure in more detail.

Located 50 feet from the test cells was the test control center, built of a reinforced concrete structure. A separate instrumentation center was located 350' from the test control center.

| <b>Date of Construction</b> | <b>Common name</b>                        | <b>Description</b>  | <b>Condition</b>  |
|-----------------------------|---|---|---|
| 1964                        | Test Control Center                       | Reinforced concrete   | exterior good; interior in fair condition   |
| 1964                        | Test Structure                            | Reinforced concrete and steel   | good; some elements now missing   |
| 1964                        | Instrumentation Center                    | Reinforced concrete   | exterior good; interior in fair condition; exterior cable tray system now missing railing |
| 1964                        | Maintenance and Assembly                  | Prefabricated metal   | n/a; outside project area   |
| 1964                        | Power Substation                          | Attached to building 34   | appears to be missing some elements; esp. relation to cable tray system                   |
| 1964                        | Fuel Storage System                       | Above ground concrete facility and equipment                              | very good   |
| 1964                        | Oxidizer shelter                          | Above ground concrete facility and equipment; underground storage unknown | very good   |
| 1964                        | Circular propellant collection basins (2) | Concrete and metal facility   | very good   |

**2. Test Control Center.** This is a one-story, 37' long x 17' wide reinforced concrete structure east of the instrumentation center, and south/southwest of the test structure. The test control center features a flat roof, steel blast doors on the southeast, southwest, and northwest facades, and three viewing ports on the northeast façade. The viewing ports face the test structure. A raised cable tray runs from the northeastern corner of the instrumentation center to the northwest façade of the test control center. The approximate 12" thickness of the steel blast

door is especially notable. The building is divided into three rooms. Some of the infrastructure (lights, duct work) remains, but most of the flooring has been removed. Much of the equipment once stored in the building appears to have been recently removed, and placed outside of one of the doors, piled into an abandoned heap.

**3. Instrumentation Center.** The instrumentation center is a one-story, 52' long x 23' wide windowless reinforced concrete structure in the southwestern corner of the Gamma Test Area. It has a flat roof, steel blast doors on the east, west, and south facades, and an exterior-mounted, test-in-progress light system. A raised cable tray (missing most of its rails) runs from the northeastern corner of the instrumentation center to the test control center (blockhouse). The interior is divided into three rooms (including one bathroom). Much of the interior flooring was missing at the time of recordation.

**4. Maintenance and Assembly Building.** Note that this building was outside project boundaries, and inaccessible (it was not photographed). It is to the south/southwest of the secured portion of the Gamma Test Area. From a distance, the building appears to a large rectangular two-story prefabricated metal structure with corrugated siding and a simple gable roof.

**5. Power Substation.** This is a small ancillary concrete pad directly adjacent to the Instrumentation Center. The cable tray line leads up to the north side of the Instrumentation Center.

**6. Fuel Storage Shelter.** Lawrie notes the fuel storage shelter as storing monomethyl hydrazine (MMH).<sup>2</sup> Above-ground features are a concrete pedestal foundation, approximately 15' x 20' with a six-step stairway leading up to the platform. Metal railings outline the foundation. Various pieces of equipment are contained within the metal railing enclosure. It is unknown at this time if this leads to an underground storage area. A facility fuel vent, with a test-in-progress light system, is to the north of the platform.

**7. Oxidizer Shelter.** This shelter is west of the Fuel Storage Shelter, and is of a similar configuration. This facility stored nitrogen tetroxide (N2O4) used as a liquid propellant for rocket engines. The facilities are enclosed within a metal railing on top of an approximately 15' x 20' concrete platform, with a six-step stairway leading up to the platform on one side. The facility fuel vent is to the north. As with the Fuel Storage Shelter, the extent/presence of an underground facility is unknown.

**8. Circular Propellant and Collection Basins.** A circular concrete basin (approximately 15' diam.) is south of the Fuel Storage and Oxidizer shelters. The basins are approximately 6' deep, with a 3' above-ground barrier wall composed of a concrete wall and two-tier metal railing. A concrete channel leads away from

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<sup>2</sup> Lawrie 2007, p. 12.

the basin. The basins are now filled with weeds, but piping elements are still visible. A third collection basin is east of the Test Control Center that is similar in size and configuration to the other two propellant basins. There is a square concrete perimeter foundation outside of the circular basin. The concrete deluge channel from the Test Control Center runs directly from the Test Control Center to this collection basin. Safety shower stations are placed near these facilities.

**9. Other Features.** Lawrie notes a depression in the area of the “concrete disposal area.”<sup>3</sup> Weitze notes this as a retention pond.<sup>4</sup> Lawrie also noted helium and gaseous nitrogen tanks but these were not observed during recordation. They were likely removed for safety. Portions of the roadways are visible today.

**C. Mechanicals/Operation:** The Gamma complex handled hypergolic propellants and test firing of bipropellant Saturn S-IVB booster engines from 1964-69. In particular, Aerojet used this area for the firing of the Auxiliary Propulsion Systems of the S-IVB stages. The main propellants that were used here were monomethyl hydrazine fuel and nitrogen tetroxide oxidizer.

**D. Site Information:** The Douglas Missile Test Facility was constructed on the outskirts of Sacramento, in a suburban area known as Rancho Cordova. The Facility was situated south of the main highway (today known as Highway 50), amongst the remains of large numbers of dredge tailings, which in part provided existing earthen berms integral to the testing and captive firings. Although additional suburban shopping areas and commercial development now exist in the area south of Highway 50, this development has not encroached upon the main Douglas Missile Test Facility.

### Part III. Sources of Information

#### A. Primary Sources

Aerojet Builds New Missile Rocket Plant. *Aviation Week*, 19 March 1956.

Douglas Missile & Space System Division, Saturn/Apollo and Manned Orbital Research Laboratory Congressional Record Presentation. Presentation to the Honorable Olin Teague, Chairman, Manned Space Flight Subcommittee, U.S. House of Representatives, Washington, D.C., February 11, 1966. Manuscript, in possession of D.R. Brincka, copy held by Alan Lawrie.

Douglas Missile & Space System Division, Sacramento Test Center Resources Handbook, Douglas Report No. SM 37538 R1, Approved by D.R. Brincka, Director, Technical Operations, December 1966. Manuscript, in possession of D.R. Brincka, copy held by Alan Lawrie.

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<sup>3</sup> Lawrie 2007, Figure 21.

<sup>4</sup> Weitze 2005, p. 120.

Douglas Missile & Space System Division, Sacramento Test Center MSSD Beta Complex Facts, prepared by Logistics Support Services, Sacramento Test Center, approved by W.L. Duval, Director, Sacramento Test Center, no date given. Brochure in possession of D.R. Brincka, copy held by Alan Lawrie.

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*FLIGHT International*, Missiles and Spaceflight. 5 July 1962, pgs. 25-27, 1962.

The Saturn V Apollo Moon Rocket, Statement issued by NASA. Available at <<http://www.apollosaturn.com/svfacts.htm>>, 1963.

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## **B. Secondary Sources**

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Green, Paul, Interim Guidance, Treatment of Cold War Historic Properties for U.S. Air Force Installations. U.S. Air Force, Washington, D.C. Available at <<http://www.afcee.af.mil/shared>>, 1993.

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Lawrie, Alan, and Robert Godwin, *Saturn V: the Complete Manufacturing and Test Records plus Supplemental Material*. Apogee Books, Burlington, Ontario, Canada, 2005.

Weitze, Karen, Draft Historic Buildings and Structures Inventory Douglas Missile Test Facility Rio del Oro Specific Project Plan. Report to City of Rancho Cordova and U.S. Army Corps of Engineers, Sacramento District, from EDAW, Sacramento, and Weitze Research, 2005.

### **C. Likely Sources Not Yet Investigated**

According to Alan Lawrie, he originally wrote the AIAA (2007) paper as part of his research on the Saturn rockets because the Douglas Missile Test Facility, Sacramento Test Operations, as well as events that took place at the Facility, that had not been previously documented. He noted that Don Brincka, retired Director of Technical Operations at the SACTO facility, had managed to retain some documentation, but more importantly was able to answer some of Lawrie's more obscure questions. Mr. Brincka passed all of his papers over to Mr. Lawrie. Mr. Lawrie also stated that he had researched primary source material at the National Archives and Record Administration in Atlanta, Georgia.

Rebecca Allen contacted Ralph H. Allen, Historic Preservation Officer, Marshall Space Flight Center, Huntsville, Alabama. Mr. Allen noted that sources of information on the SACTO facility held by Marshall were limited. After further conversation, and a visit to the Sacramento area, Mr. Allen mailed Rebecca Allen two CD discs of information that he knew were available at the Marshall facility, including "Facility Inventory Sheets, Liquid Chemical Propulsion Test Facility Inventory," September 1986, completed by Aerojet (96 pages). This paper also details future plans for a facility that was never built. Mr. Allen also provided a CD of historic (unlabelled) photographs. Additional information may be at Marshall Space Flight Center.

The California History Room, California State Library, recently found a box of photographs concerning the Douglas Missile Test Facility that seem to have originated from Douglas archives. The 50+ photographs were indexed, but did not contain additional views critical to the current interpretation and documentation of the facility.

Several buildings associated with the Administrative Area were not recorded as part of this current project. These buildings remain standing, and are being actively used for other purposes.