AD NUMBER

AD320128

CLASSIFICATION CHANGES

TO: unclassified

FROM: secret

LIMITATION CHANGES

TO:

Approved for public release, distribution unlimited

FROM:

Controlling DoD Organization...Army Ballistic Missile Agency, Redstone Arsenal, AL.

AUTHORITY

ARRADCOM ltr, 15 Sep 1981; ARRADCOM ltr, 15 Sep 1981

SECRET

October 20, 1960
1365

Report Nr. M-LOD-01-TR-45.1-60
Copy 99 of 154 Copies

INDEX AND TEST RESULTS
PART I
of the
Firing Test Report
Redstone Missile CC-2037 (U)
Prepared By
Reports & Publications Section

ARMY BALLISTIC MISSILE AGENCY
REDSTONE ARSENAL, ALABAMA

ABMA Form 485, Rev 1 May 59 Previous edition is obsolete.

SECRET

October 20, 1960 Report Nr. M-LOD-OI-TR-45.1-60
1365 Copy _____ of 154 Copies

INDEX AND TEST RESULTS
PART I
of the
Firing Test Report
Redstone Missile CC-2037 (U)
Prepared By
Reports & Publications Section

This Report contains 7 classified pages.

Copy Nr. 1 RECORD COPY

LAUNCH OPERATIONS DIRECTORATE
GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

SECURITY NOTE

This document contains information affecting the national defense of the United States within the meaning of the Espionage Law, Title 18, U.S.C., Sections 793 and 794 as amended. The transmission or revelation of its contents in any manner to an unauthorized person is prohibited by law.

(U) ABSTRACT
PART I

This is Part I of the Firing Test Report. It includes a summary of test results, primary and secondary missions, and a brief history of the missile. A detailed abstract of the complete Firing Test Report and an index of its six parts may be found at the back of this report. A more complete analysis of the performance of this missile will be made by the pertinent divisions of the George C. Marshall Space Flight Center, Huntsville, Alabama.

CONTENTS
PART I

		Page
(S)	INTRODUCTION	1
(S)	SUMMARY OF TEST	1
(S)	MISSIONS OF THE MISSILE	2
(S)	TRAJECTORY	
	Precalculated Trajectory	2
	Firing Site and Firing Azimuth	2
	Target	2
	Impact	2
	FLIGHT TEST RESULTS	
(S)	Significant Events	3
(S)	Propulsion	3
(S)	Guidance and Control	3
(S)	Structural	3
(U)	Electrical (Missile)	3
(U)	Electrical (Ground)	4
(U)	Ground Equipment	4
(S)	Nose Cone	4
(S)	Telemetered Measurements	4
	COUNTDOWN REVIEW	
(S)	Schedule	4
(S)	Holds	4
(U)	Weather Observations	5

CONTENTS
PART I
(Continued)

	Page
(U) FLIGHT TEST RECORDS DISTRIBUTED	
Documentary and Engineering Sequential Photographs	5
Ground Instrumentation Systems Records	5
(C) BRIEF HISTORY OF THE MISSILE WHILE AT CCMTA	5
(U) REFERENCES	8
(U) ABSTRACT OF THE COMPLETE FIRING TEST REPORT	10
(U) INDEX TO THE COMPLETE FIRING TEST REPORT	11

INTRODUCTION

(U) This report includes a brief summary of test results, missions of the missile, trajectory data, and a detailed breakdown of missile systems performance during flight. The countdown is also reviewed and a history of the missile while at Cape Canaveral is given along with a daily schedule of Launch Operations Directorate activities.

(S) Redstone Missile CC-2037 was a tactical type ballistic missile produced and assembled at the Chrysler Corporation, and shipped to Launch Operations Directorate, Cape Canaveral, Florida. The missile has an A-7 engine, system-6 stabilized platform and amplifier boxes, and an LN-2 heater-cooler. Redstone Missile CC-2037 was fired to a prescribed range of 173.869 nautical miles. This is an engineering qualification of production missiles (EQPM) type test.

(S) SUMMARY OF TEST

Redstone Missile CC-2037 was fired from Complex 56, Pad 6 at 2244 hours EST on October 5, 1960. Ignition, liftoff, mainstage, and booster powered flight were normal.

Post flight records evaluation reveals, however, that telemeter signal was lost before impact, indicating a probable break-up of the missile. From 50,000 feet on down, heavy flutter and vibrations are observed on all 4 vanes. After preceding loss of vibration measurements and at an altitude of approximately 12,000 feet (radar altimeter reading), vane 2 moves out causing a roll of more than 300 degrees per second of the missile. The control system tries to correct but vane 2 does not respond to control signals. The roll movement causes the limit switch to close, which zeros vanes 1, 3, and 4. Again vane 2 does not follow the signals. When the stabilizer loses its frame of reference, control is completely lost. At approximately 5,000 feet altitude the missile seems to break up.

Investigation should be concentrated on behavior of the control system and the possible influence of the observed vibrations on its operation.

A complete detailed evaluation of the records is in progress at the George C. Marshall Space Flight Center in Huntsville, Alabama.

(S) MISSIONS OF THE MISSILE

The missions of this flight are to evaluate the performance of the Block II Redstone Missile with respect to military characteristics requirements, specifically to:

A. Test ruggedness and reliability of the missile to meet established standards.

B. Determine whether hit accuracy at burst point is within specified CEP.

(S) TRAJECTORY

Precalculated Trajectory

The trajectory was precalculated by the Aeroballistics Division, George C. Marshall Space Flight Center, Huntsville, Alabama. For details of the precalculated trajectory refer to Aeroballistics Report Nr. DA-TM-61-60 dated 7 July 1960 - SECRET.

Firing Site and Firing Azimuth

The missile was fired from Complex 56, Pad 6, Cape Canaveral Missile Test Annex, Atlantic Missile Range, Florida, on an azimuth of 110.62962 degrees east from true north.

Target

The target (predicted impact point) was calculated to be 173.869 nautical miles (322.005 km) from the firint site on an azimuth of 111.702 degrees east from true north. Target coordinates:

Geodetic Latitude	27	Degrees	19	Minutes	55.196	Seconds	North
Longitude	77	Degrees	32	Minutes	59.993	Seconds	West

Impact

Preliminary uprange records indicated the missile impacted in the preselected target area.

FLIGHT TEST RESULTS

(S) Significant Events

The functional time of the significant events which occurred during flight are listed below: Times listed under "Predicted" were precalculated by Aeroballistics Division and are given for reference and comparison with the actual times which were obtained by a preliminary evaluation of uprange telemetry records. All values listed are in seconds of flight.

Liftoff motion (first motion) occurred 0.30 seconds after range zero time 2 24 hours 01 seconds (Eastern Standard Time).

	Predicted	Actual
Booster Cutoff	119.311	117.97
Separation	133.18	133.3
Deceleration Switch		353.88
Loss of Signal (Aircraft)		378.2

(S) Propulsion

The power plant functioned normally, instrument compartment pressure was satisfactory, powered flight was normal and all associated systems operated as intended.

(S) Guidance and Control

Inertial guidance telemetry indicates the missile was well contained to the intended flight path until the roll limit switch operated.

(S) Structural

The structural members in the missile performed satisfactorily until approximately 5,000 feet when the missile seemed to break up just before loss of telemetry signal.

(U) Electrical (Missile)

All electrical systems and components performed satisfactorily during the countdown and flight.

(U) Electrical (Ground)

All electrical ground components functioned properly during the firing countdown.

(U) Ground Equipment

All ground equipment functioned properly during the firing countdown.

(S) Nose Cone

The Warhead and Adaption Kit (AK) system functioned normally through first look. The Fire Signal, pre-set for 4500 feet does not appear on the downrange telemetry record. The telemetry records indicate that loss of signal occurred at the time the Fire Signal should have been recorded or just prior to the Fire Signal Event. Photographic coverage of the spotting charge has not been received from downrange as of this date. In view of the lack of Fire Signal telemetry records, a negative spotting charge report is anticipated.

(S) Telemetered Measurements

Good telemetry records were obtained from launch to 378.5 seconds

COUNTDOWN REVIEW

(S) Schedule

The firing countdown began at T-240 minutes at 1730 hours EST on October 5, 1960. The count was continuous except for the following holds:

(S) Holds

T-Time	Time EST	Duration	Cause
T-165	1845	14 Minutes	To await a Downrange weather decision as to the possibility of adequate BC-4 camera coverage
T-90	2014	36 Minutes	" " " "
T-12	2208	24 Minutes	" " " "

(U) Weather Observations

At the time of launch, the following firing site weather observations were recorded:

Precipitation	None
Visibility	10 Miles
Pressure	30.0 Inches (1016.0 Millibars)
Temperature	26.7 Degrees C
Dew Point	20.5 Degrees C
Relative Humidity	70 Per Cent
Surface Winds	110 Degrees at 13 Knots

(U) FLIGHT TEST RECORDS DISTRIBUTED

Documentary and Engineering Sequential Photographs

Moving pictures and still photographs were taken of various activities during missile handling, testing, assembling, and firing countdown operations between the time the missile arrived at Cape Canaveral, Florida and the time of firing the missile. The films provide documentary coverage for preparing moving pictures, detailed engineering reports, progress reports, historical reports, unsatisfactory condition reports, and engineering studies. These photos are maintained in the files of the Engineering Sequential and Pictorial Coverage Section of the Launch Operations Directorate at Cape Canaveral, Florida. Duplicates were distributed to pertinent organizations for use in films and various reports. Since thousands of feet of moving pictures were made and hundreds of still photographs were taken, no attempt will be made to list the negative numbers or subjects.

Ground Instrumentation Systems Records

Records obtained by ground instrumentation systems are maintained on file in the Data Office of the Launch Operations Directorate at Cape Canaveral, Florida. These records consist of telemetry records, measuring calibration curves, measuring programs, weight records, electronic tracking system records, consolidated data, instrumentation performance records from RCA, and optical tracking data. Duplicate records are distributed to pertinent organizations as they become available.

(C) BRIEF HISTORY OF THE MISSILE WHILE AT CCMTA

Redstone Missile CC-2037 arrived by aircraft at Patrick Air Force Base on September 2, 1960 and was delivered to the Launch Operations Directorate, Hangar D

checkout area on September 3, 1960. Pre-erection work was performed. On September 15, 1960, the missile was transferred to Complex 56, Pad 6 and erected. The scheduled launch on September 29, 1960 was postponed to October 4, 1960 because of time lost due to Hurricane Donna. The Simulated Flight Test was conducted on October 3, 1960. The October 4, 1960 launch date was scrubbed due to down range cable trouble. The missile was rescheduled for firing and fired at 2244 hours EST on October 5, 1960.

A detailed breakdown of the work performed on the missile follows: This breakdown was extracted from the Launch Operations Directorate Daily Schedule.

September 3, 1960	Missile received and transported to Hangar D
September 5, 1960	Holiday
September 6, 1960	Disassembly of warhead and aft units
September 7, 1960	Measuring checks
September 8, 1960	Measuring Breakwire rework
September 9, 1960	Measuring Breakwire rework
September 12, 1960	Final assembly Weight & C G measurements
September 13, 1960	Final assembly Weight & C G measurements
September 14, 1960	Fuze System compatibility check Reassembly of warhead and aft units
September 15, 1960	Transfer to pad 6 Erect, weight, and align Electrical and pneumatic connections Leakage tests Tune antennas Measuring setup Apply missile power Power plant checks
September 16, 1960	Power plant checks Leakage checks Measuring calibrations

September 19, 1960	Power plant checks Leakage checks Pressurization tests Closed loop RF tests Measuring calibrations
September 20, 1960	DCR OAT Pressurization tests Measuring calibrations Closed loop RF tests
September 21, 1960	Navigation-Gyro tests Measuring calibrations
September 22, 1960	Complete Navigation-Gyro tests Measuring calibrations
September 23, 1960	Measuring calibrations
September 26, 1960	Cooling test Measuring calibrations
September 27, 1960	Measuring calibrations
September 28, 1960	RF checks with Range Measuring calibrations
September 29, 1960	G&C OAT Ordnance Fit checks
September 30, 1960	Plug drop OAT Compartment pressure test Preparation for SFT
October 3, 1960	Simulated Flight Test
October 4, 1960	Scrub
October 5, 1960	Launch

(U) REFERENCES

1. Aeroballistics Division Report Nr. DA-TM-61-60 dated July 7, 1960, "Trajectory Data for the Test Firing of Redstone Missile Nr. 2023 If Fired Under an Aiming Azimuth of 110.62962° E from N (U)-SECRET.

2. Memorandum For Record, dated September 9, 1960, "Trajectory Data for the Test Firing of Redstone Missile Nr. 2037" Dynamics Analysis Branch.

3. Post Firing Report Redstone Missile CC-2037, Teletype CCMTA 310, P061100Z, dated October 6, 1960, Launch Operations Directorate, Titusville, Florida - SECRET and addenda thereto.

4. Ground Instrumentation System Records - Maintained in Data Office Files, Launch Operations Directorate, Cape Canaveral, Florida.

PREPARED BY:

Report Nr. M-LOD-01-45.1-60

Reports & Publications Section

APPROVED BY:

KURT H. DEBUS
Director,
Launch Operations Directorate

DISTRIBUTION: LOD List Nr. 1

(U) ABSTRACT
of the
COMPLETE
FIRING TEST REPORT

The complete Firing Test Report contains the plans for the testing and firing of a missile by Launch Operations Directorate personnel and details the data collected during this process. It is published in six parts and is distributed as soon as the information is available. Part I, the Index and Test Results, covers data collected during and immediately after the missile flight and is distributed approximately 7 days after the actual launch. Part II consists of Part IIA, the Instrumentation Plan and Part IIB, the Instrumentation Analysis. A provisional Instrumentation Plan is distributed (to a select, immediate need to know, group) approximately four weeks prior to the launch date and is followed weekly by up to date plans. The final or Consolidated Instrumentation Plan is published one week prior to the missile flight. Part IIB details the actual instrumentation coverage obtained during the missile flight and is distributed approximately 30 days after the firing. Part III, the Firing Site Weight Report, contains the weight data collected during missile testing, erection, and countdown. It is published approximately 4 days after the launch date. Part IV, the Master Operational Schedule, details the procedures for the Simulated Flight Test, the launch countdown, and provides the schedule for Prelaunch Preparations and launch day. This part is distributed about 2 weeks prior to the scheduled launch date. Part V, the Unsatisfactory Condition Reports, contains all the UCRs written against the missile and associated equipment at the Launch Operations Directorate.

INDEX
to the
COMPLETE FIRING TEST REPORT
(PART I THROUGH PART V)

PART

INDEX AND TEST RESULTS I
Part I of the Firing Test Report Redstone Missile CC-2037

- Introduction
- Summary of Test
- Missions of the Missile
- Trajectory
- Flight Test Results
- Countdown Review
- Flight Test Records Distributed
- Brief History of Missile While at CCMTA
- References
- Abstract of the Complete Firing Test Report
- Index to the Complete Firing Test Report

INSTRUMENTATION PLAN IIA
Part IIA of the Firing Test Report Redstone Missile CC-2037

- Introduction
- Preflight Data
- Onboard Instrumentation Equipment
- Ground Instrumentation Systems
- Special Data Disposition
- Display of Inflight Data
- Flight Safety Instrumentation
- Impact Instrumentation
- Special Instrumentation
- Tentative Missile Safety Plan

INSTRUMENTATION ANALYSIS IIB
Part IIB of the Firing Test Report Redstone Missile CC-2037

- Introduction
- Summary of Instrumentation Performance
- Telemetry
- Optical Tracking - Metric Cameras
- Electronic Tracking
- Telemetry Measurements

INDEX
(Continued)

	PART
Flare Sequence Data	
FIRING SITE WEIGHT REPORT Part III of the Firing Test Report Redstone Missile CC-2037	III
Introduction Atmospheric Conditions Propellants and Gases Missile and Component Data	
MASTER OPERATIONAL SCHEDULE Part IV of the Firing Test Report Redstone Missile CC-2037	IV
Introduction Code Identification Simulated Flight Test L.-1 Day Schedule Launch Day Schedule	
UNSATISFACTORY CONDITION REPORTS Part V of the Firing Test Report Redstone Missile CC-2037	V