



DEPARTMENT OF THE AIR FORCE  
HEADQUARTERS SPACE AND MISSILE SYSTEMS CENTER (AFMC)  
LOS ANGELES, CA

MEMORANDUM FOR: Martin Marietta Astronautics Group  
P.O. Box 179  
Denver CO 80201

24 Oct 94

FROM: HQ SMC/SDA  
2420 Vela Way, Suite 1467  
Los Angeles AFB CA 80245-4659

SUBJECT: Declassification of Titan I and II Documents

Reference: (a) Martin Marietta Letter, 19 Aug 94, same subject  
(b) DoD 5200.1R/AFR 205-1, para 1.603.1.b.6

1. We have reviewed your request (ref a) for declassification of the following documents:

(a) Titan I and II Captive and Flight Tests, Jun 1961, classified Confidential.

(b) Titan I Captive and Flight Firing History, Nov 1961, classified Confidential.

(c) Titan I Captive and Flight Test Firing History, Feb 1961, classified Confidential.

2. Under the provisions of ref b, information contained in the above documents is declassified. Please ensure those documents are remarked in accordance with DoD 5200.1R and DoD 5220.22M, citing this correspondence as authority for that action. Please disseminate this decision to any government or contractor activity you determine appropriate to eliminate continued unnecessary protection measures for this information.

3. If there are any questions, please contact Mr. Ted Millward, SMC/SDAP, 310-363-3602.

H.E. MUNSON, GM14  
Chief, Acquisition Security  
Directorate of Program Management

cc: SMC, Det 10/CC/SP  
SMC/MEE (Mr. Buchholz)

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# INFORMAL REPORT

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*Charles H. Kocher*  
CHARLES H. KOCHER  
CHIEF, SECURITY OPERATIONS  
Date **24 Oct 1994**

FEBRUARY 1962



**MARTIN**  
**MARIETTA**

## TITAN I CAPTIVE- AND FLIGHT-TEST FIRING HISTORY (U)

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TITAN I CAPTIVE- AND FLIGHT-  
TEST FIRING HISTORY

February 1962

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Martin Marietta Corporation  
Aerospace Division  
Denver 1, Colorado

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FOREWORD

This document supersedes and replaces MI-61-49. Please destroy the superseded document in accordance with the Industrial Security Manual for Safeguarding Classified Information. Aerospace Division personnel refer to the Martin Security Manual, P-58-10 (Rev 1).

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DEFINITION OF TERMS

All times shown are as follows except as noted:

- 1) Booster time is read as  $87FS_1$  to  $87FS_2$  or shutdown;
- 2) APDA time is read as  $GGFS_1$  to  $91FS_1$ ;
- 3) Sustainer time is read as  $91FS_1$  to  $91FS_2$  or shutdown;
- 4) Vernier time is read as  $91FS_2$  to  $GGFS_2$  or shutdown.

Planned range lists the predicted range and impact area.

Actual range lists the actual range and crossrange deviation.

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INTRODUCTION

A need has existed for a compilation of data from the Titan I captive firings and flight tests. The test integration unit has prepared this document to make this information available to interested persons.

Included in this document are missile numbers, events and dates, location of events, duration of firing by stage, planned and actual ranges, test results, and the resulting action. This information is given for Lots A, B, C, G, J, M, V, VS, and the Category II missiles of the SM configuration. This history covers firings at the Denver, AMR, and PMR stands.

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## TITAN I FIRING HISTORY

Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
A Battle-ship	Run 1 (1) 3/1/58	Den D-1		1.83 Booster			Preflight checkout shuttle valves locked in checkout position causing engine shutdown.	Test rescheduled.
	Run 1 (2) 3/5/58	Den D-1		1.8 Booster			Emergency shutdown initiated because of pressure oscillation in thrust chamber manifold.	Test rescheduled.
	Run 1 (3) 4/20/58	Den D-1		2.8 Booster			Low lox pump suction pressure caused by collapse of bellows liner resulted in automatic shutdown.	Prepared for Run 2.
	Run 2 4/25/58	Den D-1		7.9 Booster			Successful.	Prepared for Run 3.
	Run 3 (1) 4/26/58	Den D-1		15.7 Booster			Successful. Flight controls not installed.	
	Run 3 (2) 5/2/58	Den D-1		15.0 Booster			Successful. Flight controls installed.	Prepared for Run 4.
	Run 4 5/18/58	Den D-1		23.0 Booster			Flight controls kill due to broken valve current resistor on actuator No. 3.	Prepared for Run 5.
	Run 5 5/22/58	Den D-1		32.0 Booster			Inadvertent water kill.	Prepared for Run 6.
	Run 6 5/25/58	Den D-1		120.0 Booster			Successful.	Prepared for Run 7.
	Run 7 5/29/58	Den D-1		120.0 Booster			Successful.	Prepared for Run 8.
	Run 8 6/6/58	Den D-1		120.0 Booster			Successful.	Prepared for Run 9.
	Run 9 (1) 7/4/58	Den D-1		0.0 Booster			Shutdown due to explosion in gas generator lox bootstrap line.	Test rescheduled.
	Run 9 (2) 7/4/58	Den D-1		116.0 Booster			Successful. Shutdown by lox low level sensor.	Prepared for Run 10.
Run 10 7/16/58	Den D-1		118.0 Booster			Successful. Shutdown by fuel low level sensor.	Prepared for Run 11.	
Run 11 (1) 7/21/58	Den D-1		0.7 Booster			Shutdown due to explosion in A/J start box.	Test rescheduled.	
Run 11 (2) 8/2/58	Den D-1		116.0 Booster			Successful.	Prepared for Run 12.	
Run 12 8/3/58	Den D-1		124.2 Booster			Successful. Minimum NPSH for Denver established.	Prepared for Run 13.	
Run 13 8/15/58	Den D-1		134.0 Booster			Successful.	Prepared for Run 14.	

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TITAN I FIRING HISTORY (cont)

Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
A Battle-ship (cont)	Run 14 8/20/58	Den D-1		139.7 Booster			Partially successful full duration firing. Fire started in engine compartment at FS <sub>1</sub> + 113 sec and continued until end of run.	Program completed.
A-1 ✓	Captive Run 1 (1) 8/24/58	Den D-2	✓	2.4 Booster			Erroneous kill initiated by insufficiently damped chamber pressure meter. Engine shutdown gox rich and burned out turbine.	Deleted automatic chamber pressure and suction pressure kills. Incorporated vent valve in gox start line. Test rescheduled.
	Captive Run 1 (2) 9/7/58	Den D-2		30.0 Booster			Successful.	
	Captive Run 2 9/14/58	Den D-2		30.0 Booster			Successful.	
	Captive Run 3 9/26/58	Den D-2		80.7 Booster			Successful. Premature S/D by erroneous patching. Small fire caused damage to engine wiring harness.	
	Captive Run 4 10/8/58	Den D-2		130.0 Booster			Successful. Minor damage from fire in engine compartment.	
A-2	Prefiring Checkout 10/19/58	Den D-2					Stage I helium container exploded causing structural failure of Stage I lox tank and missile collapse.	Removed facility check valve. Established requirement for N <sub>2</sub> to be kept out of helium container during lox loading.
A-3	MCF 1 (1) 11/13/58	Den D-2		2.9 Booster			Automatic shutdown by low fuel tank pressure.	Test rerun.
	MCF 1 (2) 11/15/58	Den D-2		29.8 Booster			Successful. IPS command receiver S/D.	Missile shipped to AMR.
	FRF 1 12/17/58	AMR P-15	P200	22.5 Booster			Successful. Command receiver S/D. Lost 1BE umbilical.	Missile readied for flight.
✓	Flight 1 12/20/58	AMR P-15	P200	4.6 Booster			Test terminated before liftoff. S/A No. 1 lox suction line burst and missile was slightly damaged.	Missile returned to Denver for repairs and new engine.
	MCF 2 1/17/59	Den D-2		30.0 Booster			Successful.	Missile shipped to AMR.
	FRF 2 1/29/59	AMR P-15	P200	23.6 Booster			Successful.	Missile readied for flight.
	Flight 2 (1) 2/3/59	AMR P-15	P200	2.1 Booster			S/A No. 2 did not boot-strap due to water frozen in the No. 2 gas generator valve rocker box, and test was terminated before liftoff.	Test-rerun.
	Flight 2 (2) 2/6/59	AMR P-15	P200	127.1 Booster	270 BOA	242 6.6 L	Successful flight and all test objectives were achieved.	

*changed Helicoil design - changed line composition*

*Proc. change - Decay checks initiated*

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## TITAN I FIRING HISTORY (cont)

Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
A-4	MCF 1 ✓ 12/13/58	Den D-2		30.3 Booster			Successful.	Missile shipped to AMR.
	FRF 1 (1) ✓ 1/6/59	AMR P-15	P200	2.7 Booster			Improper interface plug (P-5) connection resulted in S/A No. 1 not bootstrapping, and caused shutdown.	Test rerun.
	FRF 1 (2) ✓ 1/10/59	AMR P-15	P200	1.7 Booster			Improper operation of thrust chamber valve caused hard start that damaged engine.	Missile returned to Denver for repairs.
	MCF 2 ✓ 3/9/59	Den D-2		30.0 Booster			Successful.	Missile shipped to AMR for flight.
	Flight ✓ 4/3/59	AMR P-15	P200	126.0 Booster	247 BOA	261 3.6L	Successful. Staging rockets and BTL installed.	
A-5	MCF 1 (1) ✓ 1/6/59	Den D-2		1.0 Booster			Early pitch program initiation caused shutdown.	Test rerun.
	MCF 1 (2) ✓ 1/7/59	Den D-2		2.6 Booster			Terminated due to electrical malfunction in thrust controller circuitry.	Test rerun.
	MCF 1 (3) ✓ 1/10/59	Den D-2		29.9 Booster			Successful except that lox rich mixture during shutdown damaged both gas generators.	Gas generator re-placed and test rerun.
	MCF 1 (4) ✓ 1/29/59	Den D-2		0.0 Booster			Gas generator circuit breaker open. Shutdown at 87FS <sub>1</sub> by engine malfunction monitor.	Test rerun.
	MCF 1 (5) ✓ 1/30/59	Den D-2		32.3 Booster			Successful.	Missile shipped to AMR.
	FRF ✓ 2/20/59	AMR P-15	P200	23.3 Booster			Successful. Command receiver shutdown.	Missile readied for flight.
	Flight ✓ 2/25/59	AMR P-15	P200	111.3 Booster	270 BOA	126 6.5R	Successful. (Early shutdown fuel low level sensor malfunction.)	A0 4324
A-6	MCF 1 (1) ✓ 2/19/59	Den D-2		25.6 Booster			Gear box of S/A No. 1 malfunctioned and engine shutdown.	S/A No. 1 pump assembly was replaced and test rerun.
	MCF 1 (2) ✓ 2/24/59	Den D-2		32.5 Booster			Successful.	Missile shipped to AMR.
	FRF ✓ 4/23/59	AMR P-15	P200	23.4 Booster			Successful. Command receiver shutdown.	Missile prepared for flight.
	Flight 1 (1) ✓ 4/28/59	AMR P-15	P200	2.8 Booster			Shorted pin in control can caused actuator 2 to go hard over, resulting in test termination before liftoff.	Test rerun.

Re located  
control  
can to  
prevent  
performance  
loss.

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TITAN I FIRING HISTORY (cont)

Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
A-6 (cont)	Flight 1 (2) 5/4/59	AMR P-15	P200	126.0 Booster S/A No. 1 120.0 Booster S/A No. 2	270 BOA	304 11.5R	Test successful except that S/A No. 1 did not shut down until propellant depletion, due to malfunction of S/A No. 1 gas generator valve. First Titan to separate due to separation bolts and rails being installed.	
B Battle-ship	Run 1 (1) 11/4/58	Den D-1					Unsuccessful attempt due to maloperation of the helium start valve.	Placed heater blanket around start valve.
	Run 1 (2) 11/6/58	Den D-1					--Do--	--Do--
	Run 1 (3) 11/7/58'	Den D-1		20 APDA			Successful.	Prepared for Run 2.
	Run 2 (1) 11/13/58	Den D-1		8 APDA 0.97 Sustainer			Unsuccessful attempt due to low fuel suction pressure because of improper fuel line heating.	Repaired heater on fuel suction line.
	Run 2 (2) 11/16/58	Den D-1		8 APDA 3.0 Sustainer			--Do--	--Do--
	Run 2 (3) 11/19/58	Den D-1		8 APDA 15.0 Sustainer 10.2 Vernier			Successful. Vernier phase terminated early due to human error.	Prepared for Run 3.
	Run 3 11/25/58	Den D-1		8 APDA 58.0 Sustainer			Successful although Stage II engine shutdown by erroneous fuel suction pressure reading.	Prepared for Run 4.
	Run 4 12/4/58	Den D-1		8 APDA 139.0 Sustainer 61.0 Vernier			Successful.	Prepared for Run 5.
	Run 5 12/9/58	Den D-1		8 APDA 137.6 Sustainer			Partially successful due to early shutdown of Stage II engine caused by low level sensor failing to operate.	Prepared for Run 6.
Run 6 1/7/59	Den D-1		133.0 Booster			Partial success. Shutdown occurred because of lox starvation due to vortexing keeping low level sensors covered.	Prepared for Run 7.	
Run 7 1/14/59	Den D-1		127.5 Booster 118.5 Sustainer 67.0 Vernier			Successful, although long APDA bypass period caused by intermittent low level sensor.	Prepared for Run 8.	

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TITAN I FIRING HISTORY (cont)

Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
B Battle-ship (cont)	Run 8 (1) 1/17/59	Den D-1		127.6 Booster			Stage II gas generator failed to bootstrap.	Test rescheduled.
	Run 8 (2) 1/20/59	Den D-1		31.9 Booster			Stage I firing terminated by erroneous signal from low level sensors.	Test rescheduled.
	Run 8 (3) 1/24/59	Den D-1		130.3 Booster 45.08 Sustainer 21.8 Vernier			Stage II shutdown by erroneous low level sensor signal.	Prepared for Run 9.
	Run 9 (1) 2/2/59	Den D-1					Gas generator did not start due to loss of power.	Test rescheduled.
	Run 9 (2) 2/10/59	Den D-1		14.35 APDA 119.31 Sustainer 55.87 Vernier			Successful.	Prepared for Run 10.
	Run 10 2/26/59	Den D-1		127.3 Booster 1.45 Sustainer			Pressure sequencing valve maloperation caused Stage II thrust chamber valve to close, resulting in lox pump rupture and fire.	Test rescheduled.
	Run 10A (1) 3/19/59	Den D-1					Test aborted because of a hole in fuel suction line.	Test rescheduled.
	Run 10A (2) 3/20/59	Den D-1					Test aborted because of insufficient air flow in air conditioning system.	Test rescheduled.
	Run 10A (3) 3/23/59	Den D-1		6 APDA			Successful.	Program completed.
	B-2	Captive Run 1 (1) (Stage II firing only) 3/7/59	Den D-3		7.3 APDA 2.0 Sustainer			Engine shutdown prematurely due to MOC operator error.
Captive Run 1 (2) (Stage II firing only) 3/12/59		Den D-3		7.3 APDA 45.0 Sustainer 15.0 Vernier			Successful.	Prepared for Run 2.
Captive Run 2 4/22/59		Den D-3		128.0 Booster 9.7 APDA 97.4 Sustainer			Successful even though no vernier period. Stage II firing was cutoff prematurely by power interruption on APS bus.	Captive program completed.

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TITAN I FIRING HISTORY (cont)

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Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
B-4	SCF 1 (1) 5/12/59	Den D-3		0.20 Booster			Test terminated due to a sequencer malfunction.	SCF rescheduled.
	SCF 1 (2) 5/15/59	Den D-3		1.72 Booster			Test terminated because of cavitation in the subassembly lox pump caused by blowback from gas generator. An explosion occurred and resulted in the destruction of Stage I.	Instigated extensive crew training.
B-5	SCF 7/18/59	AMR P-19		30.14 Booster 29.88 Sustainer 29.99 Vernier			Satisfactory.	Missile prepared for FRF.
	FRF 7/25/59	AMR P-19	P13	4.99 Booster			Satisfactory. Test was terminated by a manual kill because of low level in Stage I hydraulic reservoir caused by operator error in time of shutdown of ground pump.	Missile was prepared for flight.
	Flight 8/14/59	AMR P-19	P13	2.87 Booster	2020 BOA		Test was terminated by an automatic engine kill when the umbilicals disconnected early due to premature missile release. Missile fell back to the launch stand and was destroyed	
B-6	SCF 1 (1) 7/17/59	Den D-3	Dummy	43.3 Booster			Recycling of flight controls programmer caused the Stage I engine to run past the 30-sec programmer shutdown time. Test was terminated by an emergency shutdown signal.	Rerun.
	SCF 1 (2) 8/3/59	Den D-3	Dummy	27.35 Booster			Manual kill due to APDA lox pump cavitation caused by mis-wiring of OSBVAP.	Rerun.
	SCF 1 (3) 8/6/59	Den D-3	Dummy	30.0 Booster 29.89 Sustainer 17.65 Vernier			Satisfactory. Vernier period short because of low Pfd.	Missile shipped to AMR.
	FRF 9/24/59	AMR P-19	P13				During countdown, a high pressure helium umbilical disconnected from the missile and punctured the Stage I fuel tank.	High pressure umbilicals were tied down to prevent whipping.
B-7	Flushing Operation 8/13/59	Den D-3					During flushing operations, the Stage II lox tank false bottom was damaged.	Changed lox loading procedures.

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## TITAN I FIRING HISTORY (cont)

Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
B-8	SCF 9/28/59	Den D-3	Dummy	30.02 Booster 29.13 Sustainer 0.0 Vernier			Satisfactory. No solo vernier because the hot gas diversion valve did not shuttle.  During shipment to AMR, Stage I tanks collapsed due to differential pressures created because the tanks were not properly vented.	Missile shipped to AMR.  Verify proper tank venting before shipment.
B-9	SCF 10/16/59	Den D-3	Dummy	31.17 Booster 28.10 Sustainer 29.35 Vernier			Satisfactory.	Missile shipped to AMR.
	FRF 11/17/59	AMR P-19	P13				During Stage I lox loading, the lox tank collapsed because of a collapsing differential pressure.	Lox to be loaded in tanks under positive pressure.
B-7a	FRF 12/11/59	AMR P-19	P13	30.0 Booster			Satisfactory.	Missile prepared for flight.
	Flight 1/27/60	AMR P-19	P13	1.72 Booster			Test was terminated due to excessive turbine speed of subassembly 2. The turbine was replaced.	Rerun.
	Flight 2/2/60	AMR P-19	P13	125.0 Booster 111.2 Sustainer 47.2 Vernier	2024 BOA	2026 0.02 R	Flight was successful, and all Lot B flight test objectives were achieved. First successful staging and sustainer ignition.	
<p>Note: The B-7a missile was composed of B-7 Stage I and B-6 Stage II.</p>								
CET	Run 1 (1) 6/19/59	Den D-1		2.20 Booster			No power to thrust controller due to incorrect wiring. Low PC caused S/D.	Test rescheduled.
	Run 1 (2) 6/24/59	Den D-1		70.00 Booster			Manual kill. Fire in engine compartment. High Tfi.	Test rescheduled.
	Run 1 (3) 7/2/59	Den D-1		6.0 Booster			Automatic kill. Low fuel tank top pressure.	Test rescheduled.
	Run 1 (4) 7/9/59	Den D-1		132.89 Booster			Successful. S/D by fuel storage sensor.	
	Run 2 7/22/59	Den D-1		130.08 Booster			Successful. Fuel exhaustion, both turbines damaged. OST S/D.	
	Run 3 8/14/59	Den D-1		130.73 Booster			Successful. Injectors returned to A/J for flushing.	
	Run 4 9/19/59	Den D-1		129.70 Booster			Successful.	
	Run 5 9/23/59	Den D-1		130.44 Booster			Successful.	

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Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
CET (cont)	Run 6 * 11/6/59	Den D-1		136.50	Booster		Successful. High turbine inlet temperature spikes on engine start. Replaced S/A No. 1 PDA.	
	Run 7 1/20/60	Den D-1		132.29	Booster		Successful.	
	Run 8 1/25/60	Den D-1		130.46	Booster		Successful.	
	Run 9 (1) 1/27/60	Den D-1		1.29	Booster		TCPS connector failed.	Test rescheduled.
	Run 9 (2) 1/29/60	Den D-1		6.00	Booster		S/A No. 1 turbine failed.	Test rescheduled.
	Run 9 (3) 2/18/60	Den D-1		129.14	Booster		Successful. Lox exhaustion, no damage.	
	Run 10 2/19/60	Den D-1		128.88	Booster		Successful.	
	Run 11 3/9/60	Den D-1		129.10	Booster		Successful.	
	Run 12 3/10/60	Den D-1		129.52	Booster		Successful.	
	Run 13 3/11/60	Den D-1		129.10	Booster		Successful.	
	Run 14 3/11/60	Den D-1		129.40	Booster		Successful.	
	Run 15 (1) 3/14/60	Den D-1		74.10	Booster		Manual kill. Fire in engine compartment.	Test rescheduled.
	Run 15 (2) 3/16/60	Den D-1		130.37	Booster		Successful.	
	Run 16 3/24/60	Den D-1		131.54	Booster		Successful.	
	Run 17 3/30/60	Den D-1		129.32	Booster		Successful.	
	Run 18 3/30/60	Den D-1		129.40	Booster		Successful.	
	Run 19 3/31/60	Den D-1		128.53	Booster		Successful.	
	Run 20 4/1/60	Den D-1		130.62	Booster		Successful.	
	Calibration Run 1/13/60	Den D-1		135.11	Booster		Successful.	
	Calibration Run 2/12/60	Den D-1		131.66	Booster		Successful.	

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## TITAN I FIRING HISTORY (cont)

Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
CET (cont)	Run A (1) 7/23/59	Den D-1		8 APDA 6.3 Sus- tainer			Erroneous manual kill. HGV temperature was abnormal.	Test rescheduled.
	Run A (2) 10/21/49	Den D-1		8 APDA 139.9 Sus- tainer 52.1 Vernier			Successful.	
	Run B (1) 10/23/59	Den D-1		8 APDA 1.56 Sus- tainer			Automatic kill. TCVPSV shuttled closed.	Test rescheduled.
	Run B (2) 11/6/59	Den D-1		8 APDA 139.7 Sus- tainer 52.3 Vernier			Successful.	
	Run C (1) 12/18/59	Den D-1		8 APDA 1.7 Sus- tainer			Automatic kill. In- sufficient valve actua- tion pressure.	Test rescheduled.
	Run C (2) 12/23/59	Den D-1		8 APDA 1.7 Sus- tainer			Automatic kill. In- sufficient valve actua- tion pressure.	Test rescheduled.
	Run C (3) 1/15/60	Den D-1		8 APDA 137.4 Sus- tainer 54.6 Vernier			Successful.	
	Run D 1/20/60	Den D-1		8 APDA 139.5 Sus- tainer 52.5 Vernier			Successful.	
	Run E 1/22/60	Den D-1		8 APDA 138.8 Sus- tainer 31.4 Vernier			Successful.	
	Run F 2/3/60	Den D-1		8 APDA 128.7 Sus- tainer			Successful.	
	Run G 2/4/60	Den D-1		8 APDA 133.2 Sus- tainer 58.3 Vernier			Successful.	
	Run H 2/8/60	Den D-1		8 APDA 138.0 Sus- tainer 54.0 Vernier			Successful.	
	Run I (1) 2/9/60	Den D-1		8 APDA 136.1 Sus- tainer 55.9			Insufficient data for evaluation.	Test rescheduled.
	Run I (2) 3/4/60	Den D-1		1.36 APDA			Automatic kill. APDA turbine overspeed.	Test rescheduled.
	Run I (3) 3/7/60	Den D-1		8 APDA 134.6 Sus- tainer 57.3 Vernier			Insufficient data for evaluation.	Test rescheduled.

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Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
CET (cont)	Run I (4) 3/15/60	Den D-1		8 APDA 139.7 Sus-tainer 4.65 Vernier			Successful.	
	Run J (1) 2/10/60	Den D-1		8 APDA 60.0 Sus-tainer			Manual kill. APDA turbine failed.	Test rescheduled.
	Run J (2) 3/18/60	Den D-1		8 APDA 141.2 Sus-tainer 50.6 Vernier			Successful.	
	Run K (1) 3/23/60	Den D-1		5 APDA			Manual kill. Hole burned in gas generator.	Test rescheduled.
	Run K (2) 3/25/60	Den D-1		8 APDA 142.4 Sus-tainer 49.6 Vernier			Successful.	
	Run L 3/28/60	Den D-1		8 APDA 141.4 Sus-tainer 50.6 Vernier			Successful.	
	Run M 3/29/60	Den D-1		8 APDA 140.0 Sus-tainer 52.0 Vernier			Successful.	
	Run N 3/31/60	Den D-1		8 APDA 139.5 Sus-tainer 55.0 Vernier			Successful.	
	Run O (1) 4/1/60	Den D-1		8 APDA 30.0 Sus-tainer			Manual kill. Aero-heating simulator failed to shut off at GGFS1 + 5 sec as programmed.	Test rescheduled.
	Run O (2) 4/4/60	Den D-1		8 APDA 139.63 Sus-tainer 52.37 Vernier			Successful.	
	Run P 3/30/60	Den D-1		8 APDA 139.9 Sus-tainer 52.1 Vernier			Successful.	
	Run Q 4/4/60	Den D-1		8 APDA 137.9 Sus-tainer 54.1 Vernier			Successful.	
	Run R 4/11/60	Den D-1		8 APDA 138.0 Sus-tainer 54.0 Vernier			Successful.	
	Run S 4/12/60	Den D-1		8 APDA 136.9 Sus-tainer 55.1 Vernier			Successful.	

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TITAN I FIRING HISTORY (cont)

Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
CET (cont)	Run T (1) 4/13/60	Den D-1		8 APDA 1.75 Sustainer			Automatic kill. Hot gas valve actuation arm failed.	Test rescheduled.
	Run T (2) 4/15/60	Den D-1		8 APDA 137.5 Sustainer 54.5 Vernier			Successful.	Program terminated.
C-1	SCF 12/10/59	Den D-4	Dummy	37.2 Booster 27.6 Sustainer 29.5 Vernier			Satisfactory.	Missile was shipped to AMR for flight test.
	Flight 3/8/60	AMR P-16	P13	134.5 Booster	3250 BOA	430	Stage I flight was satisfactory. Failure of the Stage II gas generator to start terminated powered flight. Gas generator valve or gas generator pilot valve failed to open.	All check valves were removed from GGVPV fuel actuation plumbing.
C-2	8/20/59	Den D-4					Stage II was damaged when the Stage II erector was inadvertently lowered with the work platforms in place, puncturing both Stage II propellant tanks.	
C-3	SCF 10/14/59	Den D-4	Dummy	36.1 Booster 17.0 Sustainer			Successful, except that Stage II was shut down prematurely because of an operational error.	Missile was shipped to AMR for FRF and flight testing.
	FRF 12/3/59	AMR P-16	RVX-3	30.0 Booster			Satisfactory.	Missile was prepared for flight.
	Flight 1 (1) 12/10/59	AMR P-16	RVX-3	1.7 Booster			Shutdown due to improper umbilical disconnect, resulting in an inadvertent flight controls kill.	Correct umbilical disconnect wiring.
	Flight 12/12/59	AMR P-16	RVX-3	4.2 Booster	3250 BOA		The missile was destroyed at launch due to launch shocks causing a destruct relay to chatter and activate the destruct system.	Destruct system was redesigned.
C-4	SCF 1 (1) 11/10/59	Den D-4	Dummy	7.43 Booster			Stage I was shut down due to a false Stage I fuel tank underpressure signal.	Rerun.
	SCF 1 (2) 11/12/59	Den D-4	Dummy	36.42 Booster			Stage I firing was satisfactory. Stage II did not start due to failure of the helium start valve.	Rerun.

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TITAN I FIRING HISTORY (cont)

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Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
C-4 (cont)	SCF 1 (3) 11/14/59	Den D-4	Dummy	36.6 Booster 28.2 Sustainer 29.6 Vernier			Satisfactory.	Missile was shipped to AMR for FRF and flight testing.
	FRF 1/24/60	AMR P-16	RVX-3	30.0 Booster			Satisfactory.	Missile was prepared for flight.
	Flight 2/5/60	AMR P-16	RVX-3	55.4 Booster	3250 BOA	5.3	The guidance compartment structure failed approximately 50 sec after liftoff due to excessive differential pressure across the skin, resulting in the R/V separating and missile failure.	Guidance compartment structure was modified.
C-5	SCF 1 (1) 1/22/60	Den D-4	Dummy	1.17 Booster			Stage I shut down due to instrumentation problems. Stage I engine was damaged during shutdown due to high turbine temperature.	Engine was replaced and test rerun.
	SCF 1 (2) 1/28/60	Den D-4	Dummy	36.6 Booster 29.02 Sustainer 29.9 Vernier			Satisfactory.	Missile was shipped to AMR for flight test.
	Flight 4/8/60	AMR P-16	P13	134.2 Booster 42.9 Sustainer	3250 BOA	596	Stage I flight, staging, and sustainer ignition were satisfactory. A failure of the sustainer lox pump terminated powered flight.	Later data indicated that this was a gear box pressurization problem.
C-6	SCF 2/17/60	Den D-4	Dummy	36.1 Booster 28.5 Sustainer 29.5 Vernier			Satisfactory.	Missile was shipped to AMR for flight test.
	Flight 4/28/60	AMR P-16	P13	133.4 Booster 133.5 Sustainer 52.8 Vernier	3247 BOA	3244 0.8 R	Successful full-duration two-stage flight.	
G-2	Captive Run 1 (1) 10/13/59	Den D-2	Dummy	98.85 Booster			Run terminated because of underpressure indication of Stage II deflector plate water.	Test rescheduled.
	Captive Run 1 (2) 10/20/59	Den D-2	Dummy	133.48 Booster 143.87 Sustainer			Run terminated by automatic turbine overspeed kill caused by lox depletion, resulting in lox pump overspeed.	Proceeded to second part of program.
	Captive Run 2 (1) 10/29/59	Den D-2	Dummy	1.76 Booster			Run terminated by manual kill when turbine inlet temperature limit was exceeded, caused by a lox rich mixture.	Test rescheduled.

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## TITAN I FIRING HISTORY (cont)

Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
G-2 (cont)	Captive Run 2 (2) 11/5/59	Den D-2	Dummy	58.78			Run terminated when S/A No. 2 lox pump shaft failed. Missile damage caused by a small fire in the engine compartment, which started when the fuel discharge line ruptured.	G captive program terminated.
G-4	SCF 12/2/59	Den D-2	Dummy	36.76 Booster 28.26 Sustainer 30.12 Vernier			Satisfactory.	Missile shipped to AMR for FRF.
	FRF 2/10/60	AMR P-15	RVX-4A	30.0 Booster			Satisfactory but S/A No. 1 GGV operated abnormally.	S/A No. 1 gas generator replaced and missile prepared for flight.
	Flight 2/24/60	AMR P-15	RVX-4A	138.26 Booster 151.65 Sustainer 50.60 Vernier	4344 BOA	4340 0.6 L	Successful full-duration two-stage flight. Data capsule recovered.	
G-5	SCF 1 (1) 12/22/59	Den D-2	Dummy	32.97 Booster 31.80 Sustainer 30.09 Vernier			Stage II performance was low. Sustainer engine was replaced.	Rerun of Stage II only.
	SCF 1 (2) 1/6/60	Den D-2	Dummy	34.85 Sustainer			Successful.	Missile shipped to AMR and prepared for flight.
	Flight 3/22/60	AMR P-15	RVX-4A	136.44 Booster 146.58 Sustainer 37.2 Vernier	4344 BOA	4304 0.1 R	Satisfactory, except vernier engine shut down prematurely and staging was abnormal due to malfunction of staging bolts.	Faulty shipment of bolts replaced before G6 flight.
G-6	SCF 1 (1) 1/30/60	Den D-2	Dummy	32.0 Booster 5.91 Sustainer 0.11 Vernier			Test terminated due to underpressure kill, Stage II lox tank, caused by regulator. Regulator replaced.	Reran Stage II firings.
	SCF 1 (2) 2/2/60	Den D-2	Dummy	0.0 Booster 32.78 Sustainer 30.72 Vernier			Satisfactory.	Missile shipped to AMR and prepared for flight.
	Flight 4/21/60	AMR P-15	RVX-4A	138.48 Booster 149.48 Sustainer 23.26 Vernier	4344 BOA	4281 0.7 L	Satisfactory, except vernier engine shut down prematurely because of lox depletion of ATPA cup due to sloshing.	Slosh baffles were installed in Missiles G-7, G-8, G-9, and G-10.
G-7	SCF 2/25/60	Den D-2	Dummy	36.42 Booster 29.32 Sustainer 29.95 Vernier			Satisfactory, except for low performance at booster shutdown due to excessive lox dropout.	Redesigned Stage I lox tank baffles and installed on Missiles G-7 through G-10 before flight. Missile prepared for flight.

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TITAN I FIRING HISTORY (cont)

Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
G-7 (cont)	Flight 5/13/60	AMR P-15	4-1	136.87 Booster 154.39 Sustainer 66.23 Vernier	4393 - ASC Net	4392 0.4 L	Successful. Long vernier solo period due to low vernier thrust.	
G-8	SCF 1 (1) 3/30/60	Den D-2	Dummy	4.38 Booster			S/A No. 1 combustion chamber failed due to combustion instability.	Installed new engine.
	SCF 1 (2) 5/26/60	Den D-2	Dummy	0.2 Booster			M-1 timer in A/J GSE caused a shutdown signal to be sent.	Reran test.
	SCF 1 (3) 6/1/60	Den D-2	Dummy	35.38 Booster 28.82 Sustainer 29.98 Vernier			Successful.	Shipped to AMR.
G-9	Flight 9/29/60	AMR P-15	RVX-3B	129.12 Booster 155.60 Sustainer 0.0 Vernier	8701 BOA	5096	Booster shutdown early due to shutdown sensor malfunction. No vernier because sustainer ran until fuel depletion. No R/V separation.	Low level sensor monitoring capability installed in GSE.
	SCF 4/14/60	Den D-2	Dummy	36.22 Booster 27.87 Sustainer 30.03 Vernier			Satisfactory.	Missile shipped to AMR and prepared for flight.
G-10	Flight 6/8/60	AMR P-15	4-1a	135.91 Booster 153.6 Sustainer 42.5 Vernier	4393 ASC Net	4395 0.9 L	Successful full-duration two-stage flight and re-entry vehicle separation, except for IPS power failure during sustainer phase.	
	SCF 5/13/60	Den D-2	Dummy	37.10 Booster 27.34 Sustainer 65.04 Vernier			Satisfactory. Long vernier period to test redesigned helium lines.	Missile shipped to AMR and prepared for flight.
J-2	Flight 6/25/60	AMR P-15	4-1	138.26 Booster 154.9 Sustainer 55.9 Vernier	4393 ASC Net	4392 0.3 R	Successful full-duration two-stage flight and re-entry vehicle separation, except for IPS power failure during sustainer phase due to failure of uncanistered inverter.	Uncanistered inverters removed from program.
	Captive Run 1 (1) 5/11/60	Den D-3	Dummy	1.512 Booster			Test terminated by Stage I fuel tank underpressure kill caused by secondary regulator failure.	Test rerun. Secondary regulators were modified.
	Captive Run 1 (2) 5/17/60	Den D-3	Dummy	139.05 Booster 2.72 Sustainer			Test terminated by Stage II lox tank underpressure kill caused by ruptured helium heat exchanger discharge line.	Test rerun after helium lines replaced with ones of higher temperature rating.

## TITAN I FIRING HISTORY (cont)

Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
J-2 (cont)	Captive Run 1 (3) 5/20/60	Den D-3	Dummy	0.00 Booster 135.00 Sus- tainer 54.20 Vernier			Successful. Test terminated by manual kill due to burning tape in the engine compartment.	Missile prepared for Run 2.
	Captive Run 2 5/26/60	Den D-3	Dummy	136.66 Booster 128.07 Sus- tainer 64.82 Vernier			Successful.	Missile shipped to AMR.
	FRF 6/17/60	AMR P-20	4-2	29.98 Booster			Successful. $T_{os}$ was high at 87FS <sub>1</sub> .	Missile prepared for flight.
	Flight 7/1/60	AMR P-20	4-2	14.38 Booster	4385 ASC Net		Hydraulic fitting failed, causing loss of missile hydraulics and control. Range safety officer destructed missile.	Manufacturing procedures and equipment changed to improve hydraulic fittings installation.
J-3	Captive Run 3 8/10/60	Den D-3	Dummy	137.48 Booster 127.49 Sus- tainer 2.44 Vernier			Successful even though test terminated during vernier phase due to short in actuator 6 <sub>2</sub> causing a kill.	Missile shipped to AMR. Actuator follow-up pot cementing process was changed.
	FRF 10/4/60	AMR P-20	4-2	30.00 Booster			Successful.	Missile prepared for flight.
	Flight 10/7/60	AMR P-20	4-2	139.00 Booster 157.10 Sus- tainer 42.60 Vernier	4393 ASC Net	4392 0.9 R	Successful. Did not measure outage.	
J-4 <i>Last static</i>	SCF 1 (1) 6/20/60	Den D-3	Dummy	26.81 Booster			Run terminated due to loss of Stage II flame bucket water caused by defective switch in water console. Broken flowmeter damaged S/A No. 2.	Test rerun.
	SCF 1 (2) 6/25/60	Den D-3	Dummy	33.81 Booster 32.92 Sus- tainer 30.09 Vernier			Successful. Broken flowmeter damaged S/A No. 1.	Missile shipped to AMR.
	Flight 7/28/60	AMR P-20	4-1	104.99 Booster	4389 ASC Net	84	Booster shutdown when S/A No. 1 lox discharge line ruptured due to premature closing of S/A No. 1 lox thrust chamber valve. Lox topping umbilical failed to disconnect properly.	Thrust chamber valve modified to prevent inadvertent closing.
J-5	SCF 1 (1) 7/21/60	Den D-3	Dummy	2.21 Booster			Nitrogen start line burst before bootstrap.	Test rerun after all MS fittings were reworked.
	SCF 1 (2) 7/27/60	Den D-3	Dummy	34.03 Booster 31.48 Sus- tainer 30.04 Vernier			Successful.	Missile shipped to AMR.

TITAN I FIRING HISTORY (cont)

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Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
J-5 (cont)	Flight 8/30/60	AMR P-20	4-1	140.50 Booster 154.60 Sus-tainer 46.20 Vernier	4393 ASC Net	4392 0.64 L	Successful. Stage II lox topping line did not disconnect properly.	
J-6	SCF 10/11/60	AMR P-19		35.02 Booster 31.75 Sus-tainer 30.08 Vernier			Successful.	Missile prepared for flight.
	Flight 10/24/60	AMR P-19	4-1	140.14 Booster 152.45 Sus-tainer 46.03 Vernier	5348 BOA	5350 1.07 L	Successful. Did not measure outage.	
J-7	SCF 7/25/60	AMR P-19		35.00 Booster 31.69 Sus-tainer 32.03 Vernier			Successful.	Missile prepared for flight.
	Flight 8/10/60	AMR P-19	4-2	138.34 Booster 153.75 Sus-tainer 1.42 Vernier	4393 ASC Net	4280 1.9 L	Partially successful. Verniers shutdown due to lack of tank pressures caused by malfunction of helium check valve at liftoff, allowing leakage throughout flight. Lox topping line check valve malfunctioned.	
J-8	SCF 1 (1) 8/26/60	AMR P-19		1.99 Booster			Booster did not boot-strap due to nitrogen start disconnect retraction.	
	SCF 1 (2) 8/31/60	AMR P-19		1.74 Booster			Test terminated due to low Stage I fuel tank pressure.	Kill limit was lowered and test was rerun.
	SCF 1 (3) 9/6/60	AMR P-19		35.04 Booster 31.29 Sus-tainer 30.06 Vernier			Successful.	Missile prepared for flight.
	FRF 1 (1) 9/21/60	AMR P-19	4-2	1.22 Booster			Erroneous turbine overspeed indication.	
	FRF 1 (2) 9/23/60	AMR P-19	4-2	30.02 Booster			Successful.	
	Flight 9/28/60	AMR P-19	4-2	136.53 Booster 152.35 Sus-tainer 40.05 Vernier	4393 ASC Net	4393 0.55 L	Successful.	
J-9	SCF 1 (1) 10/28/60	Den D-2	Dummy	36.0 Booster 12.0 Sus-tainer			Test terminated by loss of APS power due to loose terminal on APS bus.	Test rerun.
	SCF 1 (2) (Stage II only) 11/11/60	Den D-2	Dummy	31.6 Sus-tainer 29.7 Vernier			Successful.	Missile shipped to AMR.

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## TITAN I FIRING HISTORY (cont)

Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
J-9 (cont)	Flight 12/20/60	AMR P-20	4-4	138.83 Booster	4385 ASC Net	394	Not successful because Stage II gas generator failed to start. Failure was believed to be due to foreign matter locking the ATPA pumps.	
J-10	SCF 1 (1) 11/28/60	Den D-2	Dummy	35.00 Booster 5.38 Sustainer			Test terminated by erroneous indication of no Stage II deflector water.	Test rerun for Stage II firing only.
	SCF 1 (2) 11/30/60	Den D-2	Dummy	31.23 Sustainer 29.82 Vernier			Successful.	Missile shipped to AMR.
	Flight 1/20/61	AMR P-19	4-1	138.12 Booster 0.0 Sustainer 174.29 Vernier (GGFS <sub>1</sub> - GGFS <sub>2</sub> )	4385 ASC Net	375	Not successful because sustainer did not start. An improper umbilical disconnect sequence at LO resulted in a 91FS <sub>2</sub> signal that prevented the hot gas valve from opening at 91FS <sub>1</sub> .	Missile circuitry was changed to prevent recurrence of this problem.
J-11	SCF 12/13/60	Den D-2	Dummy	35.4 Booster 30.9 Sustainer 30.0 Vernier			Successful.	Missile shipped to AMR for flight.
	Flight 2/10/61	AMR P-20	3-2b	138.48 Booster 148.59 Sustainer 49.39 Vernier	4387 ASC Net	4387 0.37 R	Successful.	
J-12	SCF 1 (1) 12/29/60	Den D-2	Dummy	35.7 Booster 31.0 Sustainer 29.5 Vernier			Unsuccessful due to low performance of S/A No. 2 and slow ignition of Stage II spark plugs.	Test was rescheduled after spark plug investigation.
	SCF 1 (2) 1/11/61	Den D-2	Dummy	4.35 Booster			Test was terminated due to a malfunction of the Stage I secondary fuel pressure regulator.	Test was rescheduled.
	SCF 1 (3) 1/13/61	Den D-2	Dummy	35.5 Booster 31.0 Sustainer 30.0 Vernier			Successful.	Missile shipped to AMR for flight.
	Flight 3/2/61	AMR P-20	4-1	138.84 Booster 52.90 Sustainer 61.91 Vernier	5301 BOA	730.7	Partially successful. A failure of the sustainer engine gear box resulted in sustainer shutdown. The flight controls-guidance crossover occurred after the first step of the BTL pitch program was sent. Gear box failure was believed to have been due to a malfunction of the gear box pressure relief valve that permitted vaporization of the lubrication oil.	The pressure relief valves were put in series on all later missiles.

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WWW.CHROMEHOOVES.NET TITAN I FIRING HISTORY (cont)

Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
S J-13	SCF 2/14/61	AMR P-19		35.87 Booster 30.26 Sus-tainer 30.04 Vernier			Successful.	Missile prepared for flight.
	Flight 2/20/61	AMR P-19	4-4	139.77 Booster 152.40 Sus-tainer 50.69 Vernier	4387 ASC Net	4388 0.33 L	Successful.	
S J-14	SCF 2/8/61	Den D-3	Dummy	35.4 Booster 31.4 Sus-tainer 30.0 Vernier			Successful.	Missile shipped to AMR for flight.
	Flight 3/28/61	AMR P-19	4-2a	137.12 Booster 153.14 Sus-tainer 41.47 Vernier	4387 ASC Net	4386 0.13 L	Successful.	
P J-15	SCF 2/24/61	Den D-3	Dummy	35.6 Booster 31.3 Sus-tainer 30.9 Vernier			Successful.	Missile shipped to AMR for flight.
	Flight 3/31/61	AMR P-20	3-2	73.92 Booster	8701 BOA	11	Unsuccessful due to premature booster engine shutdown caused by gear box pressurization problem.	
S J-16	FRF 5/16/61	AMR P-20	4-2b	30.05 Booster			Successful.	Missile prepared for flight.
	Flight 5/23/61	AMR P-20	4-2b	140.62 Booster 156.33 Sus-tainer 47.40 Vernier	4389 ASC Net	4388 0.24 R	Successful. Stage II gear box lost pressurization but did not affect flight objectives.	
S J-17	Flight 9/6/61	AMR P-20	4-2a	141.09 Booster 148.62 Sus-tainer 48.93 Vernier	5305.1 BOA	5305.3 1.41 R	Successful.	
S J-18	Flight 7/20/61	AMR P-20	4-2a	141.04 Booster 154.60 Sus-tainer 46.73 Vernier	4389 ASC Net	4390 0.16 L	Successful. First use of decoy, Mod I (1), and supplementary gear box pressurization (tank top pressure).	
S J-19	Flight 8/3/61	AMR P-20	4-4	138.90 Booster 156.81 Sus-tainer 43.25 Vernier	4389 ASC Net	4389 0.16 R	Successful. First use of Mod II decoy (1) and zero leak fuel pre-valves.	
S J-20	Flight 9/28/61	AMR P-20	4-4	141.05 Booster 155.49 Sus-tainer 47.56 Vernier	4389 ASC Net	4389 1.33 L	Successful. First use of turbine exhaust for pressurizing gear boxes.	
S J-21	Flight 10/24/61	AMR P-20	4-1	141.51 Booster 160.61 Sus-tainer 47.85 Vernier	5300 BOA	5302.1 0.4 R	Successful.	

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## WWW.CHROMEHOOVES.NET TITAN I FIRING HISTORY (cont)

Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
J-22	Flight 1 (1) 11/16/61	AMR P-20	TVX-3	1.98 Booster			Unsuccessful. Automatic Stage I fuel tank underpressure kill.	Replaced Stage I fuel tank regulator.
	Flight 1 (2) 11/21/61	AMR P-20	TVX-3	141.45 Booster 162.47 Sustainer 71.59 Vernier	4389 ASC Net	4385 0.3 L	Successful.	
J-23	Flight 12/13/61	AMR P-20	TVX-3	139.69 Booster 158.69 Sustainer 47.27 Vernier	4389 ASC Net	4387 2.6 L	Successful.	
M-1	SSCF 6/1/61	AMR P-19		31.21 Sustainer 29.91 Vernier			Successful.	Missile prepared for FRF.
	FRF 6/14/61	AMR P-19	4-4	30.02 Booster			Successful.	Missile prepared for flight.
	Flight 6/23/61	AMR P-19	4-4	141.044 Booster 12.482 Sustainer	4341 BOA	379	Unsuccessful. Stage I flight met all objectives, including successful use of IGS guidance. Stage II flight was terminated due to a failure of the hydraulic system, resulting in missile tumbling and subsequent engine shutdown.	Laboratory tests duplicated failure; tests indicate a partially activated battery caused failure. Also changed hydraulic pump motor capacitors. Changing electrical insulation check procedures during missile manufacturing to prevent damage during installation and checkout operations. Adding instrumentation to subsequent missiles for additional evaluation of hydraulic system during flight.
M-2	Flight 7/25/61	AMR P-19	4-4	141.07 Booster 158.64 Sustainer 32.35 Vernier	4341 BOA	4342 0.25 L	Successful flight but error in programming of the IGS computer resulted in the removal of VECO and prearm signals, preventing the R/V release signal from being sent. Also lost Tel II T/M information.	Reprogrammed computer for all subsequent flights.
M-3	Flight 9/7/61	AMR P-19	4-4	141.39 Booster 160.83 Sustainer 28.78 Vernier	4389 ASC Net	4370 2.61 L	Successful. ACSP computer sensed a velocity erroneously, causing early sustainer shutdown resulting in R/V falling short of target. Apparently noise in the triggering circuits caused erroneous signal.	ACSP will attenuate the 15-volt triggering pulse to 5 volts to reduce the 2-volt noise inherent on carrier.

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TITAN I FIRING HISTORY (cont)

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Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
S M-4	Flight 10/6/61	AMR P-19	4-4	141.26 Booster 159.39 Sus-tainer 27.5 Vernier	4389 ASC Net	4301 15.2 R	Computer sensed a velocity erroneously during Stage I flight. First Lot M use of gear box pressurization using turbine exhaust.	
S M-5	Flight 11/29/61	AMR P-19	4-4	139.57 Booster 159.08 Sus-tainer 24.21 Vernier	4389 ASC Net	4389 0.1 L	Successful.	
M-6	Flight 12/15/61	AMR P-19	4-4	140.51 Booster 292.22 Gas Generator	4389 ASC Net	383	Unsuccessful. Staging power relay did not remain locked in, allowing the 91FS <sub>1</sub> timer to reset and resulting in a lack of Stage II engine ignition. Stage I flight was good.	A new relay is being substituted on subsequent missiles and a retest procedure will be followed.
S M-7	Flight 1/29/62	AMR P-19	TVX-3	140.57 Booster 159.38 Sus-tainer 39.94 Vernier	4389 ASC Net	4389 0.3 R	Successful. Poor sustainer gas generator operation for short period after 91FS <sub>2</sub> and decoy fairings coming off early did not affect impact.	
SM-2	MVF 1 (1) 11/30/60	Den D-3	Dummy	2.60 Booster			Slow booster engine start, failing to make TCVS-3 before an early M <sub>2</sub> timer timed out.	Interim fix was to supply power to M <sub>2</sub> timer with a battery for next run.
	MVF 1 (2) 12/1/60	Den D-3	Dummy	35.40 Booster 31.60 Sus-tainer 31.20 Vernier			Successful.	Missile prepared for shipment.
	Flight 9/23/61	PMR TF-1, L-1	4-5H	129.74 Booster 157.41 Sus-tainer 3.84 Vernier	3904 Wake Net	3428 5 L	Partial success. Booster engine shutdown early. Sustainer engine started early due to early 91FS <sub>1</sub> timer, and ran until lox exhaustion. Short vernier period due to either gas generator explosion or sustainer turbine cavitation and explosion.	
SM-4	MVF 1 (1) 1/5/61	Den D-4	Dummy	1.83 Booster			Malfunction shutdown due to premature expiration of M <sub>2</sub> timer.	M <sub>2</sub> timer disabled. MOC function control was used to perform the timer function.
	MVF 1 (2) 1/9/61	Den D-4	Dummy	2.6 Booster			Malfunction shutdown due to TCVS-3 <sub>1</sub> dropout.	TCVS-3 <sub>1</sub> was adjusted to nominal value.

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WWW.CHROMEHOOVES.NET TITAN I FIRING HISTORY (concl)

Missile	Event and Date	Location	Re-entry Vehicle	Test Duration (sec)	Range (n mi)		Results	Resulting Action
					Plan	Actual		
SM-4 (cont)	MVF 1 (3) 1/12/61	Den D-4	Dummy	35.8 Booster 31.9 Sustainer 30.7 Vernier			Successful.	Missile prepared for shipment.
	Flight 1/20/62	PMP TF-1, L-3	4-5B	108.15 Booster 13.46 Gas Generator	3904 Wake Net	100	S/A No. 2 yaw actuator went hardover at lift-off + 98.1 seconds. Sustainer engine failed to ignite. Separation achieved.	
VS-1	MRF 8/24/60	Den D-4		35.00 Booster			Successful.	Prepared for shipment.
	Captive (In-silo) 3/7/61	PMR SLTF	4-6A	8.00 Booster			Successful. Environmental data obtained.	Prepared for flight.
	Flight 5/3/61	PMR SLTF	4-6B	137.70 Booster	130 BOA	130	Successful. Missile destructed to check out range safety at 180.89 seconds after 87FS <sub>1</sub> .	
V-2	SCF 1 (1) 8/9/60	Den D-4		0.00 Booster			The N <sub>2</sub> disconnect parted and sealed at 87FS <sub>1</sub> , resulting in no gas reaching the turbine.	Replaced disconnect, replaced Stage I engine, and cleaned lox tank.
	SCF 1 (2) 8/12/60	Den D-4		2.00 Booster			Malfunction shutdown due to TCVS dropout as a result of low N <sub>2</sub> start pressure and failure to bootstrap.	Changed N <sub>2</sub> start valve.
	SCF 1 (3) 8/16/60	Den D-4		35.05 Booster 30.84 Sustainer 29.96 Vernier			Successful.	Missile prepared for shipment to PMR.
	Wet Exercise 12/3/60	PMR OSTF					While lowering the missile after an abort, the elevator accelerated, and when the elevator hit the bottom of the silo the missile tanks ruptured, resulting in missile and silo destruction.	OSTF program transferred to TF-1. Elevator modified at TF-1 and all operational bases.

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By A. Andrews. February 1962. 27 p. Tables.

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This informal report is a compilation of the Titan I captive firings and flight tests at the Denver test stands, the Atlantic Missile Range, and the Pacific Missile Range. The missiles are listed by Lot, and pertinent test data are included.

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