TITAN MISSILE MEMOIRS

Insight into the little-known human side of early missile technology a half-century ago.

by Earl See

Editor's Note: An early survey of the AAHS membership indicated there is little current interest in missiles and spacecraft. However, we cannot ignore the reality that these sky-borne vehicles are tomorrow's aviation history. The following article is a cautious venture by the AAHS into the world of missiles and in no way implies this is a preview of articles to come. Additionally, it relates principally to the little-known human side of this infant technology of 50 years ago with a lesser emphasis on the missiles themselves.

Introduction

Aviation historians have various and wide interests in aviation history. However, their interests generally fall within the categories of the *people*, *places* and *planes* that contributed to the romance or advancement of aviation history. For some historians, the "planes" must have wings — fixed or rotary — and propellers (or rotors). A broader definition may include aircraft that are wingless (lighter-than-air vehicles) or propeller-less (sailplanes), with a latter-day interest in turbine-powered airplanes.

Unfortunately, these criteria ignore airborne vehicles that have neither wings nor propellers or air-breathing engines. But these aerial vehicles also have contributed greatly to the advancement of aviation. And, depending on their appellation, they may be major instruments of scientific exploration or mass destruction. The former are called spacecraft, the latter are known as missiles.

Preface

A wingless rocket-propelled missile, with a deadly warhead mounted on its nose, was introduced to the world by the Germans in World War II. This *vengeance* missile was known as a V-2. Following the war, many of the scientists, engineers and technicians who contributed to this burgeoning technology emigrated to the United States. This talented group formed the nucleus of the American rocket and missile programs.

The postwar rocket-propelled vehicles had mixed and diverse purposes. They varied from satellite-bearing launch vehicles, to Intermediate Range Ballistic Missiles (IRBMs), to the larger and long-range Intercontinental Ballistic Missiles (ICBMs). The popular ICBMs during the 1950s were the R&D Atlas and Titan missiles. Their early successes or failures at Cape Canaveral were viewed with interest on the evening news. Their failures were often due to powerplant problems or errant guidance systems. Whatever the cause, their finale was often a conflagration of flame and thunderous eruption of missile debris.

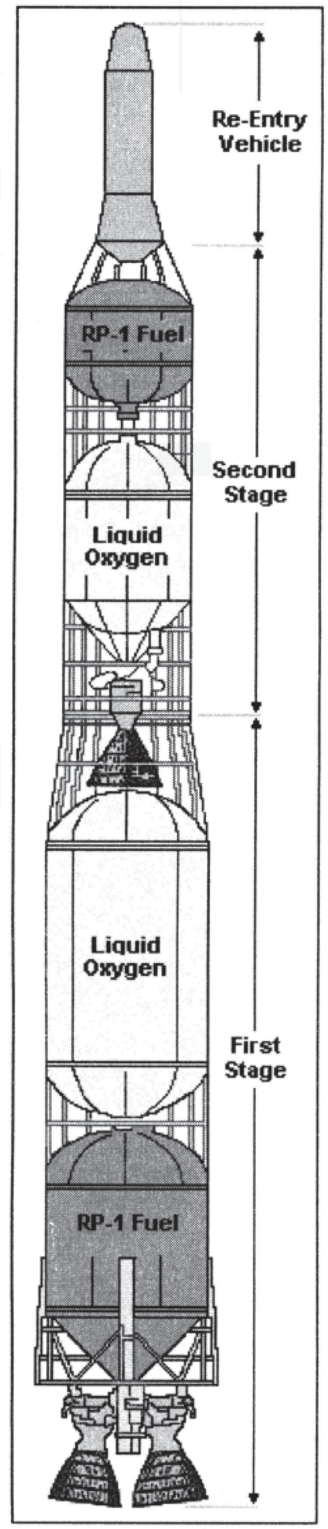
The TITAN I Missile

The Titan I (SM-68) strategic missile was developed as a backup and in parallel with the Atlas (SM-65) ICBM. But, unlike the Atlas, it was a large two-stage missile with a longer range and bigger payloads. The propellants for the missiles were RP-1 (kerosene) and LOX (liquid oxygen).

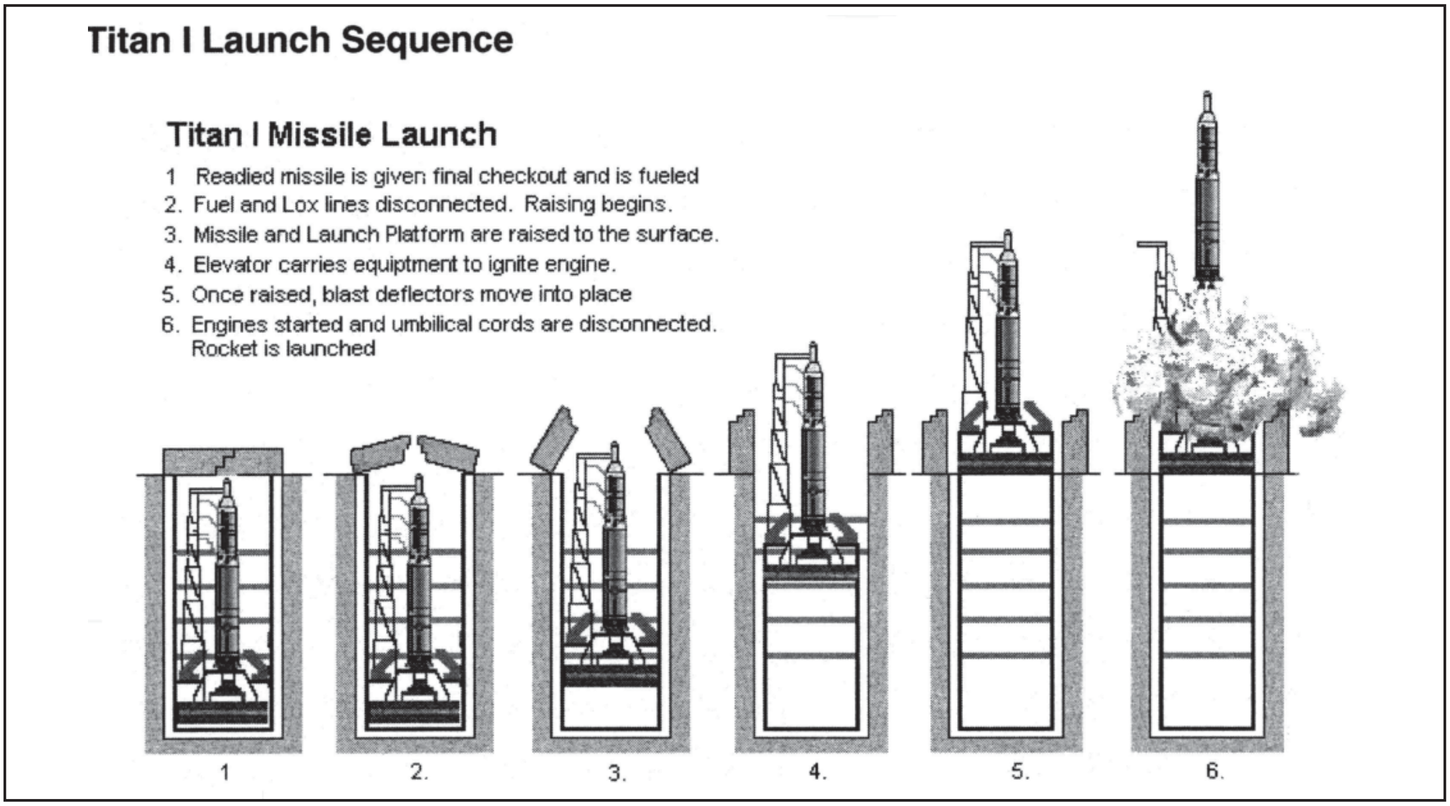
The Titan I missile was stored in a hardened 160-foot deep underground concrete silo and raised on an elevator to the surface for launch.

An Exciting Challenge

As a young aeronautical engineer with two years experience at McDonnell Aircraft Co. in St. Louis, this fledgling missile technology sounded exciting. The interest in missiles increased when I was informed of the new Titan test site being constructed near the Pacific Ocean in the central coast of California. The former Camp Cooke near Santa Maria, Calif., became Vandenberg AFB and was to be the west coast launch site for polar orbit of spacecraft and follow-on testing, training and integration of ICBM weapon systems. The ground-floor opportunities and the appealing



Interior profile of a Titan I missile. (All photos and figures from the author's collection)



Titan I Launch Sequence.

climate convinced me this was an excellent career move. As a flight-test engineer, I looked forward to working on rocket-propelled wingless vehicles. Following a successful interview with The Martin Co., I soon headed for the west coast.

Systems Activation

Introduction to the Titan missile system was spent attending orientation and training courses. This was followed by being certified in operation of various facility, electrical, propulsion, launch, and missile operating systems. We prepared many test and qualification procedures and, following installation of the instrumentation and facility systems, we "bought off" the systems by performing the test/qualification procedures.

The facility tests varied in their intensity, and they extended from the exhilaration of activating the loud Klaxon warning horns throughout the launch complex to the silent and mundane testing of silo bilge pumps. Additional tests included activation of the damage control system, including the fire and vapor detection and corrective action systems. During these tests, it was necessary for the operator at the launch control console to announce over the PA system that a test was in progress and to ignore the alarms. This announcement became routine during each series of tests. Eventually, the formal announcement degraded from a personnel warning to a simple statement by the announcer that I was on the way to the missile silo and "there is no cause for alarm!" It proved that these critical activities had their lighter moments.

But these facility tests were necessary to qualify the OSTF (Operational Systems Test Facility) to accept its first Titan missile. We subsequently performed the critical "missile handling" procedures when we installed the towering missile onto its elevated launch platform. We knew that this successful completion would signal the beginning of the systems integration procedures and the eventual launch of the missile.

Pre-Launch Preparations and Testing

The launch of each missile was preceded by pre-launch preparations, a readiness (R) count, and a terminal (T) countdown. During the R-count, supervisors and test engineers would attend daily meetings chaired by the test conductor. These meetings were not for the faint of heart. When attention was focused on an attendee, it was imperative the individual have timely and complete status of his responsible systems. It was to be a self-assured and articulate response, sans hesitation, ambivalence or vacillation. Those who did not meet these demanding criteria were promptly dismissed and replaced the following day. I managed to survive this ordeal and I realized that this "proving ground" early in my career would prepare me for anything I might encounter during my working years.

Unanticipated Obstacles

The testing of our facility systems was occasionally observed by Air Force personnel. Union regulations disallowed the "blue suiters" from adjusting or calibrating the test equipment. This was the private domain of the union technicians. Apparently in an effort to gain recognition, the union initiated a deliberate work slow-down during the time-sensitive "R-count." After repeated excuses and delays in obtaining a union technician to calibrate missile silo test equipment, I "authorized" an airman to calibrate the unit. I assured him I would accept full

Titan I Specifications	
Length:	98 feet
Stage 1 Engines:	Two Aerojet-General LR87-AJ-1
Thrust:	150,000 lbs each
Stage 2 Engine:	One Aerojet-General LR91-AJ-1
Thrust:	80,000 lbs
Guidance System:	Radio/Inertial guidance
Payload:	3,000 lbs
Max. speed:	15,000 mph
Max. altitude:	620 miles
Max. range:	6,300 miles

responsibility for his actions. He dutifully performed the task while being observed by "unavailable" union technicians. I was rudely informed that I was in trouble and the union steward would be informed of this flagrant violation. In response to this verbal threat, and for maximum dramatics, I stood upright on a 4x4-inch wooden beam outside the entrance to the missile silo and explicitly expressed my opinion of their union. This action and the vocal expletives assured me of receiving a grievance. However, grievances received by dedicated Martin test engineers were regarded by many observers as a commitment to the job.

A Successful "Dry Run"

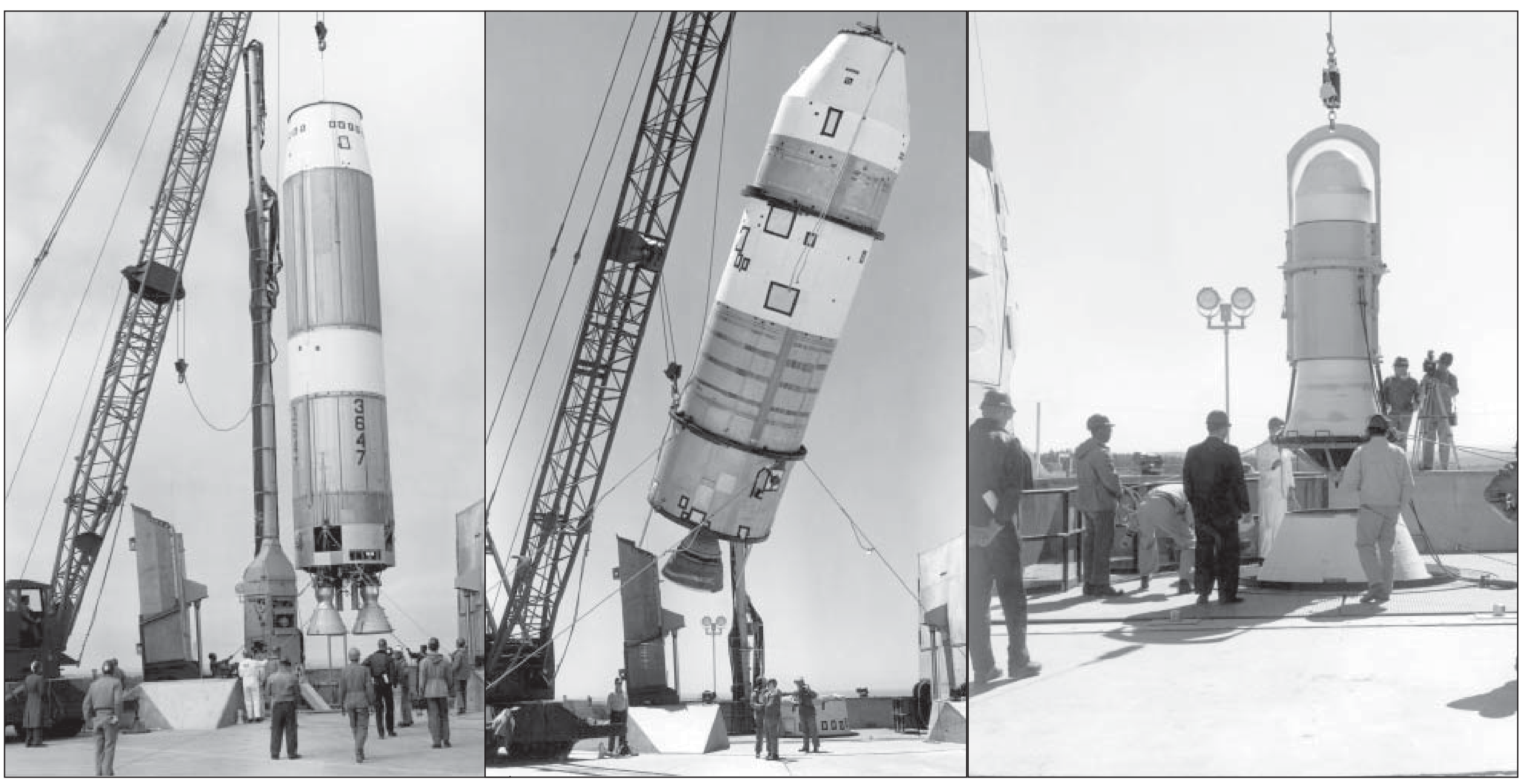
After a successful "dry run" to validate operation of the missile systems, we knew this scene would be repeated with a fully propelled missile during a "wet run" in early Dec. 1960. Success of this "wet run" would be followed by the first launch of a Titan missile from the OSTF launch site. At that time, the test sequence would progress through engine start and we would witness the first launch of a Titan missile from Vandenberg AFB.

The "Big Bang"

After conclusion of the successful wet run, the missile, at full gross weight, began its slow elevator descent from ground level to the base of the silo. Concurrently, the safety crew exited the control center and began their lengthy trek to the silo to "safe" the vehicle. Suddenly, there was a blast and a concussion that echoed throughout the launch complex.

Emergency and warning signals that remained intact following the explosion lit up brightly on the annunciator panels and the launch control console. At the time of explosion, the safety crew had entered the first set of blast locks within the personnel tunnel and waited for authorization to enter the second set of doors. After hearing the explosion, they hurriedly returned to the control center. It became a standing joke that we had never seen the lead safety engineer, who was slightly overweight, move at that speed as he breathlessly reappeared.

It became apparent the elevator portion of the launch gear failed and the missile, with full propellant tanks and at near gross weight, plummeted to the bottom of the silo. The tanks ruptured, dispensing the volatile fuel and the oxidizer.



LEFT: Installation of a Titan's first stage into the TF-1 missile silo. (USAF photo) CENTER: Installation of a Titan's second stage into the missile silo. (USAF photo) RIGHT: Placement of the re-entry vehicle onto the missile. The author is in the foreground at the far left in the photo. (USAF photo)

Inspection revealed the blast "launched" the missile debris, and all of the facility equipment within the silo, well outside the parameters of the launch site. Additionally, all of the contents within the adjacent propellant and equipment terminals were ejected and "launched" from their silos. This was not the type of missile launch we anticipated.

Devastation of the fully instrumented OSTF launch site left the operational systems testing of the Titan incomplete. Interest now turned toward a nearby training facility (TF-1) intended for training Air Force personnel. This facility was a launch complex that replicated an operational launch site. It was decided to instrument this site and complete the interrupted OSTF test program.

TF-1 Picks-Up the Pieces

Following completion of the move and modification of the TF-1 launch complex, the launch of a Titan was commenced. Completion of the pre-launch activities and the readiness-count brought the many long hours of demanding work and personal sacrifices to a conclusion. As the terminal-countdown progressed, we anxiously observed the sequence of events, fully aware that there were numerous checkpoints where the countdown could be shutdown or aborted. The most anxious moment was during a sequence checkout of the flight control system. This final check was movement of the vernier nozzles as they transitioned from their null (centered) position, to the extremes of their arc, and their return to null. It was at the completion of this test that we experienced either engine start or shutdown. If it was the latter, visible disappointment and audible sighs could be seen and heard throughout the control center.

This system failure meant we were in for a long day and night. It was necessary now to 'safe' the vehicle, offload the cryogenic oxidizer, repair the malfunction, and return to square one.

The launch of a Titan missile was not an end in itself. When a Titan lifted off and departed from its earthly restraints, our relief was only momentary. Our concerns now turned to the sustained burn of the engines and success of the guidance systems. As the missile ascended, we were aware the range safety officer was poised at his destruct switches prepared to destroy the bird if it veered off course.

When the missile successfully lifted off the launch pad, loud cheers would be heard throughout the control room. For some of the personnel, the exuberance was so great that several men, all professionals, unashamedly jumped up and down on top of a nearby table. However, the release of frustration was short-lived, because we knew we would soon be repeating the process. I'm convinced that the motivating factor that sustained most of the test engineers at the launch site, with its sacrifices of time and family, was that it was not a job; instead it was being an active participant in the vanguard of new technology, and it also was a personal test of endurance that contributed to our nation's security.

Collateral Damage

Perhaps known only to those who were there over 50 years ago, active participation and involvement in the testing of ballistic missiles during their infancy produced many personal challenges. The constant demands, stress and lengthy hours spent at the launch complex (particularly during the R and T phases) directly affected not only the test personnel but it also challenged many personal relationships, families and marriages.

A Final Titan Tale

As the compatibility testing of the Titan I came to a close at Vandenberg AFB, several experienced test engineers were designated as "tech reps" and we were transferred to Davis-Monthan AFB in Tucson to activate the next-generation Titan II (SM-68B) weapon system. This activity included the conducting of training classes, briefings, and the simulation of launch countdowns. Fortunately, these operational ICBMs were never fired in retaliation or anger. Today, all of the many Titan missile silos in the area remain empty – except for one.

A legacy to the Titan missile may be seen at the Titan Missile Museum near Tucson. Within the missile silo is an inert Titan II poised peacefully in the silo. There, visitors may view the missile and the launch control center. However, what is not apparent to the visitors are the many personal stories, and lingering memories, that occurred during the Titan activation period.

Epilogue

It is acknowledged that unmanned, wingless, ballistic vehicles may not share the romance of winged bombers. But regardless, missiles were designed by aeronautical engineers and manufactured by aircraft companies. In contemporary terms, these strategic missiles complement and are inextricably connected to a bomber and retaliatory force. And decades ago, they served a meaningful purpose when the cold war was heating up. ✈

Launch of a Titan I from Vandenberg AFB. (USAF photo)