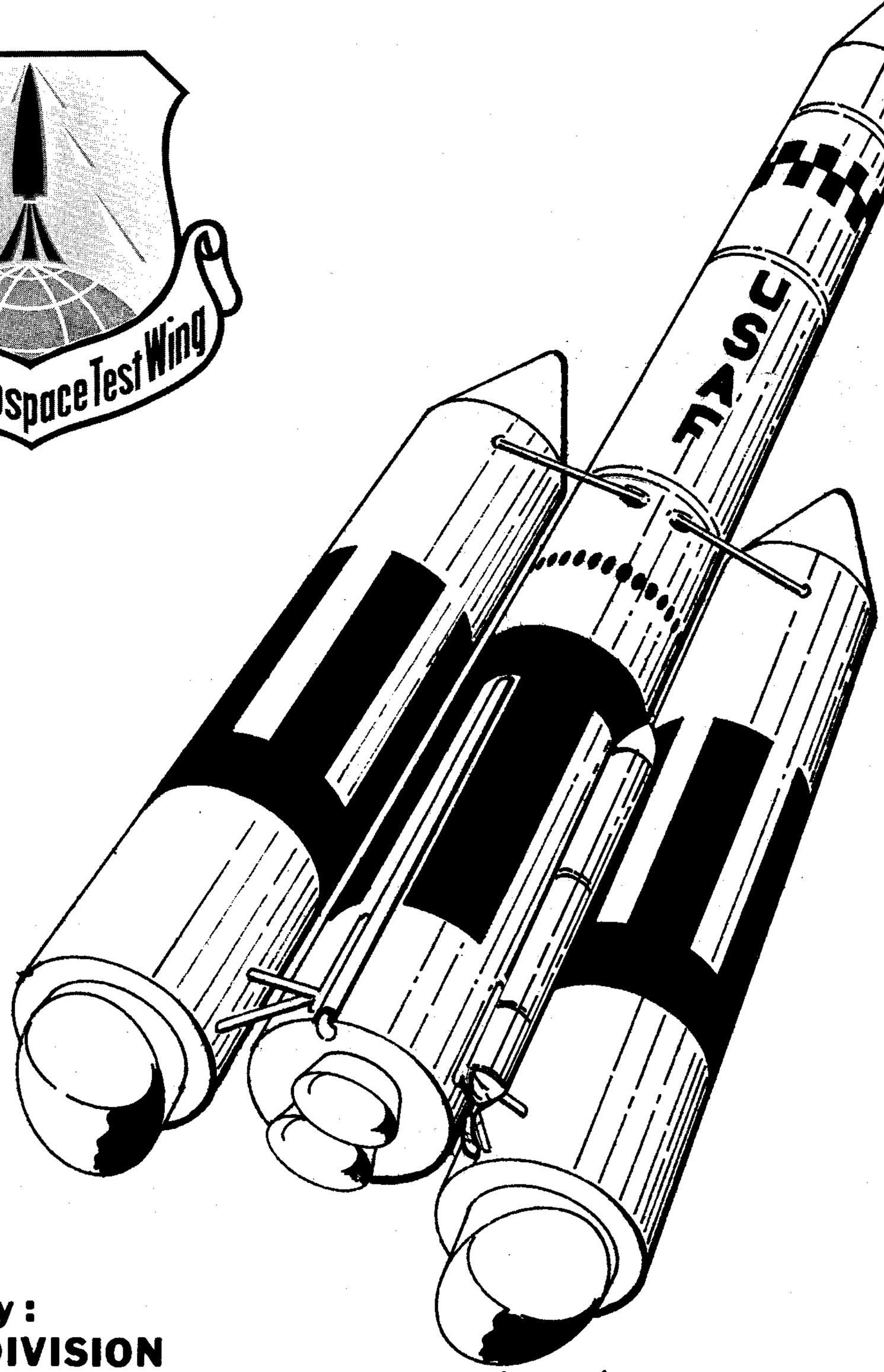
THE AIR FORCE

TITAN III

6555th Aerospace Test Wing



prepared by:
TITAN III DIVISION
6555th AEROSPACE TEST WING (SSD)
AIR FORCE SYSTEMS COMMAND
PATRICK AIR FORCE BASE, FLORIDA

WELCOME

FROM

OTTO C. LEDFORD, COL USAF

COMMANDER

6555th AEROSPACE TEST WING

Welcome to Cape Kennedy Air Force Station. We in the 6555th Aerospace Test Wing are happy that you are able to tour the Air Force Titan III Integrate-Transfer-Launch (ITL) facility. We believe what you will see here today will be interesting and informative. The ITL and the Titan IIIC were developed to give the United States Air Force valuable research and operational capability. Further, we believe it will pave the way for continued Air Force advances in both scientific and aerospace operations.

If my staff and I can be of further assistance to you, do not hesitate to call upon us.

OTTO C. LEDFORD
Colonel, USAF

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INTRODUCTION

The Titan III Standard Space Launch System was conceived by the Space Systems Division of the Air Force Systems Command and is being developed to provide a national launch capability for a wide variety of manned and unmanned space missions. President Lyndon B. Johnson announced on 25 July 1965 that Titan III would be the launch vehicle for the Air Force Manned Orbiting Laboratory (MOL).

The Titan III vehicle and its supporting ground environment, the Integrate-Transfer-Launch (ITL) facility comprise the Titan III Standard Space Launch System. The Titan III system uses what is referred to as a "building block" technique. Standardized individual components are mated for various space booster combinations. This allows the Air Force to meet varied launch and payload requirements with a single integrated system.

The Titan III Program was approved by the Department of Defense in August 1962. This research and development program consists of construction of the new Integrate-Transfer-Launch (ITL) facility at Cape Kennedy, and 17 Titan III vehicle launches by mid 1967.

To date the Titan III Program is on schedule, has met all test objectives, and is operating within the cost guidelines established by the Department of Defense.

TITAN III THE STANDARD SPACE LAUNCH SYSTEM

Titan III is being developed in two basic configurations.

Titan IIIA consists of a three-stage core using liquid propellant propulsion systems. First and second stages consists of the basic Titan II ICBM with structural modifications to provide for increased loads. A new Stage III (transtage) is positioned on top of the second stage. A standard aerodynamic payload fairing completes the profile of Titan IIIA. With the fairing in place, Titan IIIA, with a diameter of ten feet, stands 124 feet tall.

The second configuration, Titan IIIC, is essentially the Titan IIIA with the addition of two solid rocket motors (Stage 0) attached on opposite sides of the core.

Both the Titan IIIA and IIIC utilize the best features of the highly reliable Titan II hardware, Aerospace Ground Equipment (AGE), personnel/procedures system. The transtage and Solid Rocket Motors (SRM) were developed for this system, however, they are current state of art and did not require major technical breakthroughs. The factory environment, production-line technique for vehicle preparation and checkout add greatly to the increased efficiency and reliability of the ITL concept as compared to "on pad" buildup and checkout.

PROPULSION

The Stage I engines develop 430,000 pounds of thrust at sea level or 470,000 pounds when ignited in space. The Stage II engine develops 100,000 pounds of thrust at altitude. Both Stages I and II use an autogenous pressurization system, which pressurizes the fuel tank with gas generator products and the oxidizer tank with vaporized oxidizer. The new Transtage is the key to Titan III's versatility. It is designed to provide multiple re-start capability for changing orbits in space and to achieve lunar or deep-space trajectories. The Stage III engines develop a total thrust of 16,000 pounds and have a burning time of more than seven minutes.

Storable liquid propellants in Stages I, II, and the Transtage are hypergolic; they ignite when mixed. These propellants are a 50/50 blend of UDMH (unsymmetrical dimethylhydrazine) and hydrazine as fuel and nitrogen tetroxide (N_2O_4) as the oxidizer.

Each solid rocket motor (Stage 0) is 10 feet in diameter, 86 feet tall, and weighs 250 tons at ignition. The two solid rocket motors develop more than 2.4 million pounds of thrust at lift-off.

The solid propellant consists of ammonium perchlorate oxidizer, aluminum particles fuel, a synthetic rubber binder, and other materials to stabilize mass and control the burning rate.

FACILITIES

The Integrate-Transfer-Launch (ITL) Facility was developed as an integral part of the Titan III System. The ITL consists of facilities for the receipt, integration and transfer, as well as launch of large space vehicles and payloads.

The land on which these facilities are built is mainly filled land, six-and-a-half million cubic yards, dredged from the Banana River. Soil compaction, obtained by placing an overburden of fill at the specific building and launch complex sites, made the use of piling unnecessary in the construction of the ITL.

THE ITL SYSTEM

The Titan IIIA (core vehicle) components are received, inspected, erected and checked out in the Vertical Integration Building (VIB). Payloads may also be mated with the core vehicle while in the VIB. The Core is erected on a mobile transporter/thrust mount which can be moved from one area of the ITL to another by means of a double-track railroad system.

If the mission requires a Titan IIIC booster, the completely checked out core vehicle is moved to the Solid Rocket Motor Assembly Building (SMAB) where the two solid rocket

motors are attached (if the mission does not require the additional thrust provided by the solids, the SMAB is completely by-passed). The completed vehicle is then moved to one of the launch pads where it is ready for launch approximately five days later.

OUTSTANDING CHARACTERISTICS OF THE TITAN III SYSTEM

MISSION FLEXIBILITY: Designed to lift payloads in the 5,000 to 25,000 pound range into orbit. Titan III transtage allows for multiple restart capabilities in space which provide for: (1) transfer from a parking orbit to a higher orbit; (2) transfer from a parking orbit into a deep space trajectory; (3) change of plane of the payload orbit; (4) establishment of synchronous orbit.

Titan IIIA can deliver 5,900 pounds into a 100 nautical mile circular orbit and 3,600 pounds into a 1,000 nautical mile circular orbit.

Titan IIIC vehicle can place 25,000 pounds into a 100 nautical mile circular orbit, 2,100 pounds into a synchronous equatorial orbit, and can accelerate 5,400 pounds on deep space or lunar missions.

LAUNCH FLEXIBILITY: The vehicle delivered to the pad may be launched immediately or "held" indefinitely. Titan III has the inherent ability to react rapidly to mission changes with total replacement of one vehicle by another ready to be fueled and launched.

RELIABILITY: Titan III, utilizing the ITL facility, takes advantage of maximum standardization, simplified checkout, and minimum risk techniques made possible through overall system design.

ECONOMY AND LAUNCH RATE CAPABILITY: Booster and payloads are assembled "off-pad" in factory-like controlled environment. Several booster/payload combinations may be prepared simultaneously. All fuels (liquid and solid) are storable at normal temperatures--there are no equipment and handling problems as associated with super cool (cryogenic) fuels. Dual launch pads have been designed to afford a maximum launch rate of one vehicle per six days.

MAN-RATING: Titan III is built to launch both manned and unmanned payloads. Its systems have been designed and produced to insure not only the highest probability of mission success, but also the highest degree of pilot safety. Each component of Titan III is specially certified as being suitable for inclusion in a manned flight system.

ORGANIZATIONS PARTICIPATING IN TITAN III DEVELOPMENT

SPACE SYSTEMS DIVISION (AFSC)	Program Management
6555th Aerospace Test Wing (SSD)	Program Management and Launch Agency
AIR FORCE EASTERN TEST RANGE	Range Support
U. S. ARMY, CORPS OF ENGINEERS	Construction Agency
AEROSPACE CORPORATION	General Systems Engineering and Technical Direction
MARTIN-MARIETTA CORPORATION	Titan III Liquid Core Vehicle and Integrating Contractor
UNITED TECHNOLOGY CENTER	Solid Motor Contractor
A. C. ELECTRONICS DIVISION	Guidance Contractor
AEROJET-GENERAL CORPORATION	Liquid Engine Contractor
RALPH M. PARSONS COMPANY	Architectural Engineering and Design Contractor for ITL Complex

RESUME OF THE TITAN IIIA FLIGHT TEST PROGRAM

1. Test #4751, 1 September 1964. Vehicle #2 was launched from Complex 20 at 1000:06.32 EST. The flight proceeded normally, within Range Safety limits, and with the various uprange AFETR stations tracking the stages and receiving telemetry data. All events had occurred normally up through Stage III burning. Stage III, however, shutdown prematurely and the planned 100 NM circular orbit was never achieved and the Stage III reentered uprange from Ascension. The majority of the primary and secondary test objectives were achieved.

2. Test #6505, 10 December 1964. Vehicle #1 was launched at 1153:32.594 EST. All flight events took place as programmed and the desired 100 NM circular orbit was achieved. This flight was a scheduled repeat of the 1 September launch and all test objectives were achieved.

3. Test #0051, 11 February 1965. Vehicle #3, carrying a Lincoln Experimental Satellite (LES-1), lifted off from Complex 20 at 1019:04.657 EST. All systems performed precisely through the boost phase and the planned 100 NM orbit was achieved. After approximately three-fourths of an orbit (Off the southwest coast of California) the Transtage was ignited and placed the Transtage and payload into a transfer ellipse with an apogee of 1500 NM and a perigee (off the southwest coast of California) of 100 NM. At the second apogee, the Transtage was ignited the third time, circularizing the orbit at 1500 NM as planned. The LES-1 payload separated but its solid propellant "kick-motor" did not ignite and the LES-1 stayed in a 1500 NM circular orbit rather than achieving its planned ellipse with an apogee of approximately 9500 NM. All Titan III and about 95% of the LES-1 test objectives were met.

4. Test #0130, 6 May 1965. Vehicle #6, again carrying an MIT LES-1, and this time an ~~M~~IT Radar Calibration Sphere, as a dual payload, was launched at 1000:03.210 EST. This flight was a repeat of the 11 February 1965 flight, however, the Transtage was ignited a fourth time after the payloads were separated placing the Transtage and payload truss into a 1500 NM by 2000 NM elliptical orbit. All sequences occurred exactly as planned and all Titan III and payload objectives were achieved.

5. Test #0449, 18 June 1965. Vehicle #7, Titan IIIC, carrying a ballast payload of 21,098 pounds was launched at 0900:04.24 EST. Lift-off weight of the vehicle was 1,419,410 pounds. All flight events took place exactly as programmed and the desired 100 NM circular orbit was achieved. The payload was separated from the Transtage in the vicinity of Hawaii during the fourth orbit.


Complex 41
Complex 40
Solid Motor Assembly Building
Vertical Integration Building
Segment Ready Storage Building
Warehouse
Segment Receipt and Inspection Building
Motor Inert Component
Assembly Storage Building
Integrate - Transfer - Launch (ITL) Facility

Vertical Integration Building (VIB)

Solid Motor Assembly Building (SMAB)

A Titan III-C in Transport to the Launch Complex

Complex 40

Titan III-C on Complex 40

FIRST LAUNCH - TITAN III-C

AFSC - Patrick AFB, Fla.