the Missile and the Man

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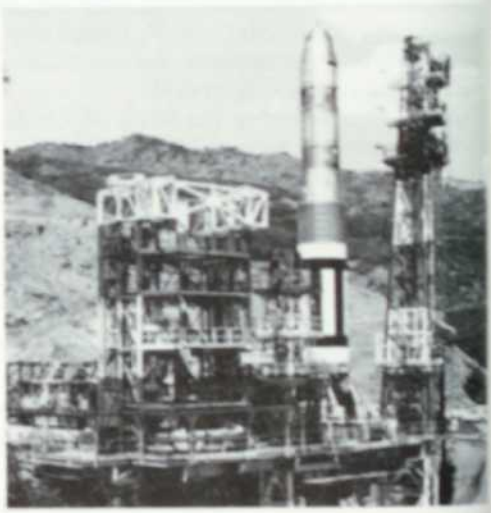

Titan poised on test stands.

The 10-story high Titan blasts upward from its Cape Canaveral launching pad for a test flight down the Atlantic missile range. Larger but lighter than the Atlas, the Titan has a 6,000 mile range at speeds over 17,000 miles per hour

HOWARD TEETER is the man behind the button when it is countdown time for the Titan intercontinental ballistic missile.

The Titan, America's most powerful ICBM, has been wholly designed, built and tested at a special missile complex in Denver, Colorado, which was constructed for this purpose by The Martin Company of Baltimore, Maryland.

Teeter, who earned his BS in mechanical engineering in 1948 and a BS in electrical engineering in 1951, has a complicated job with the Denver Division of The Martin Company, but in a nutshell, it is his responsibility to get the Titan off the ground.

As manager of the ground base systems department, and assistant general manager and director of the electronics division, he is in charge of two vital phases of the missile testing program. The real extent of his responsibilities isn't accurately reflected by his titles, however.

In his post as manager of the ground base systems department, Teeter is the man behind the Titan's ground operating equipment, its ground support equipment and its ground instrumentations equipment. In fact, all of the engineering outside of the skin of the missile is Teeter's problem.

The progress of all the ground support equipment is reported directly to Teeter by some 1,300 members of the engineering division. He must then evaluate and correlate these reports, keeping development on an even keel and eliminating trouble spots before they appear.

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Martin's Teeter & J. Bruce Wiley, '35bs

Ground support equipment includes this blockhouse containing hundreds of instruments and controls. Teeter's job includes design of this complex equipment used to determine bird's status, performance during countdown and firing.

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Equally important is his work in the electronics division. Directly under his supervision is a huge, complex electronic system known as the Master Operations Controller (MOC). It is the MOC that actually conducts the Titan countdown.

Checks of the missile's vital functions are programmed far in advance of the actual flight test, and all proper functions of the missile's sub-systems are verified automatically, eliminating the necessity for human memory and snap judgments.

The MOC monitors performance of all sub-systems during countdown and launching. Should a malfunction occur, MOC will initiate a hold-fire order or it will shut down the engine. MOC even acts as a trouble shooter, giving a clue to the location of the malfunction. This system has provided the missile engineers with much invaluable information and saved precious time.

The Titan, now in the advanced flight test phase, first went aloft on February 6, 1959. This first test was an unqualified success. Out of a dozen tests to date, the Titan has misfired only three times. Teeter proudly stresses that as far as he knows this is the best average in any missile testing.

The Titan made its first flight when it was little more than three years off the drawing board. Its history dates back to October, 1955, when the Air Force awarded The Martin Company the contract for design, fabrication and testing of a completely new weapon system—an intercontinental ballistic missile capable of delivering the heaviest possible payload at a range of at least 6,000 miles. Today, Martin's Titan contract totals $510,000,000.

Basic in the concept of producing the Titan system is the view that the very existence of such a weapon would negate the possibility of its ever being used. This is the deterrent force of the United States. To produce the operational system in the shortest possible time, the company decided to construct a new wholly integrated design, manufacture and test facility—and so construction began February 6, 1956, on the site of the Denver Division.

At the 7,000-acre complex, an engineer's line drawing can be transformed into a complete weapon system, including design, fabrication and captive testing. The utility of this integrated missile facility, the only one of its kind in the Western world, was proven three years later to the day when the Titan's maiden flight at Cape Canaveral was successful.

The lean, swift missile which Teeter engineers into the air is a 98-foot-long, 2-stage ICBM. Its first stage is 57 feet long and 10 feet in diameter. The second stage is 41 feet long, including the nose cone, and is 8 feet in diameter. Loaded, the missile weighs 110 tons. It is designed to deliver a nuclear warhead to a pre-selected target at a range at least 6,000 miles.

Titan's aerojet first stage engine, with its two thrust chambers, is the most powerful in the United States today. It has a thrust of 300,000 pounds, which is equivalent to the combined horsepower of 15,300 average-size American automobiles. The second stage has a thrust of 80,000.

When the Titan is launched, it rises vertically for about 20 seconds and then arches over into a curving trajectory which lasts for approximately 100 seconds. By this time it has attained a speed of about 5,300 miles per hour at which point the first stage shuts down and is separated from the rest of the missile.

After ignition of the second stage engine, powered flight continues until a speed of about 17,000 miles per hour is reached. Then the second stage engine shuts down and four vernier nozzles alone provide thrust. These nozzles adjust the velocity and correct the trajectory for the proper delivery of the re-entry vehicle.

The re-entry vehicle, after the adjustment and correction, separates from the second stage and continues in a free-fall path to the target. The highest point of the re-entry vehicle's trajectory is more than 500 miles above the earth.

The Titan will be used to augment the strategic effectiveness of manned bomber aircraft. When operational, Titans will be organized into Strategic Missile Squadrons. Each squadron will have several launch sites, arranged in launch complexes at an operational base. These complexes, including all the men and equipment to operate them, are fully contained underground. This is the unique Titan "hard base," designed to withstand pressure, shock and radiation from a nuclear blast.

Only a few minutes are required to launch a Titan after the order has been received.

The first large missile with two full stages, the Titan has been designed with far-reaching growth potential. Its powerful booster makes it of value to peaceful space ventures. It is capable of boosting satellites or other information-gathering equipment into the area of the moon and neighboring planets.

The Titan vehicle could be enlarged to the point that, boosted by high-energy propellants, it could land scientific packages on the moon.

Although testing of the Titan continues, Teeter says Titans are already on the production line. The number and rate of construction is classified information.

The Denver Division is continuing work on another Titan, the Titan B, an advanced cheaper version with larger second stage and storable propellants.

Teeter is well qualified for his post as the man behind the missile. During the past 10 years, his work has been concentrated in the missile field. He joined Martin's Denver Division in his present post in April, 1959, just in time to superintend most of the testing of the Titan.

He came to Martin from Northrup, Inc., where he had been since October, 1958, as assistant to the vice president. From January, 1958, to October, 1958, he was with Yuba Consolidated Industries, Inc. as vice president and manager of government product sales and vice president and general manager of the systems division.

He served as technical director of military research and development for Harvey Aluminum Corp. from January, 1956, to January, 1958. Prior to that time, he was with Convair as senior aerophysics engineer, senior systems installation engineer and, finally, as management assistant project engineer.

A graduate of Grandfield (Okla.) High School in 1936, Teeter studied engineering at O.U. from 1936 to 1942. In August, 1942, he joined Douglas Aircraft Company as hydraulics test engineer and layout designer. In October, 1944, he went with ONCO General Forming Ltd. as general manager.

Teeter returned to the University of Oklahoma in 1948 as a graduate assistant in engineering mechanics, teaching and studying until 1951.

Leadership comes naturally to this Sooner who captained his high school football team in 1936 and played tackle for the Big Red of 1941.

In profession circles, Teeter is active in the Institute of Aeronautical Sciences and the American Ordnance Association.

He and his wife, Mary, make their home in Denver with their four sons, Robert, 16; Mike, 8; Bruce, 7, and David, 5.