MARTIN MARIETTA
news
DENVER DIVISION

NUMBER 4/1976

Titan IIIC Launches 4 Satellites

Titan IIIC puts four satellites in space

A Martin Marietta built Titan IIIC, the Air Force's largest and most powerful rocket, was used in mid-March to launch four satellites on a single flight. The four weighed 3,427 pounds.

The launch, from Cape Canaveral, was the 24th for the Titan IIIC.

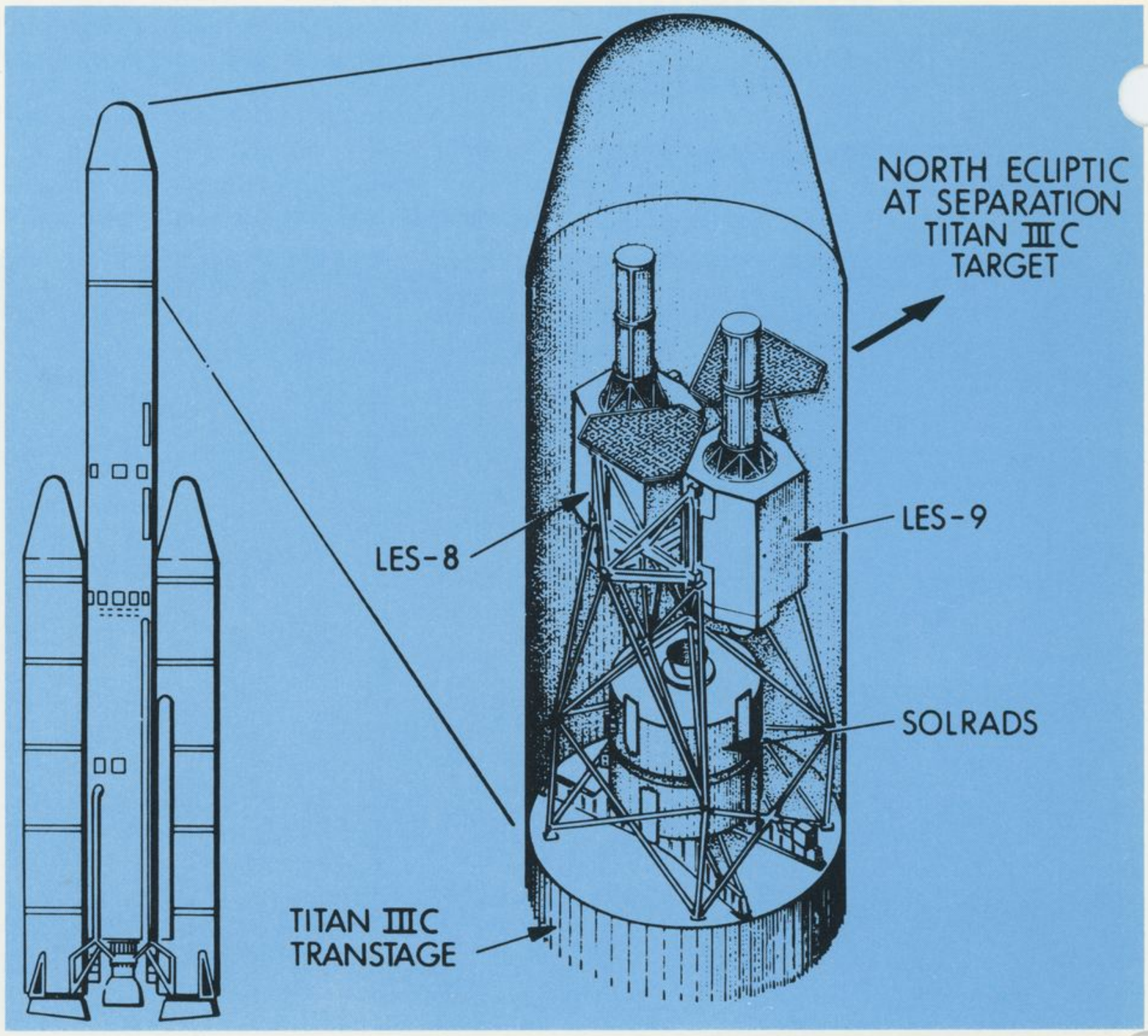
Two of the satellites, called LES 8 and 9, will be used to demonstrate improved techniques in world-wide communications. The other satellites are named Solrad 11 A and B and will be used to monitor electromagnetic and partical emissions from the Sun.

In the initial flight stage, the Titan placed its third stage—Transtage—and the satellites in an orbit 100 miles above the Earth. An hour and 11 minutes after launch the Transtage fired its engines, taking the satellites on a course to synchronous orbit—19,323 miles out in space.

Reaching synchronous orbit, Transtage fired again to stabilize the orbit and begin releasing the satellites.

Small motors on the two Solrad satellites later fired to push the satellites out to their final destination, 61,000 nautical miles in space and on the opposite side of the Earth from each other.

The LES 8 and 9 satellites are designed to operate in near synchronous orbit and communicate from satellite to satellite as well as with surface terminals.



Aritst's sketch shows placement of four satellites in nose cone of Titan IIIC.

On the Cover—
Titan IIIC lifts off from Cape Canaveral with its four-satellite payload.

Orlando wins new business--with help from Denver employees

The Air Force has awarded a contract for advanced strategic air-launched missile propulsion technology to Martin Marietta's Orlando division.

Estimated value of the contract is $33,599,099, of which $1,600,000 was obligated at the time of the award.

Purpose of the propulsion technology validation program is to demonstrate through very limited flight tests the technical maturity of the integral rocket ramjet propulsion system being considered for the advanced strategic air-launched missile ASALM.

The ASALM is a set of technological concepts providing for a missile having multi-mission capabilities, including bomber defense and primary strike.

A central part of ASLAM planning is the integral rocket ramjet engine design

Martin M. Koshar
Orlando

concept. The Air Force envisions the ASALM to be a possible replacement for current air-launched devices now in inventory. First flight of the missile is expected late in 1978 at White Sands Missile Range, New Mexico.

Technical director for the program at Orlando is Martin M. Koshar, who started his Martin Marietta career at Baltimore, transferred to Denver, and then moved to Orlando. He worked on the Titan I and Titan II programs while in Denver, primarily on propulsion systems. He was in Denver for 11 years and has been in Orlando nine years.

Koshar said Denver employees and technology have been used constantly in the development of the program for which the contract was recently awarded.

Included in the assistance have been inlet design, propulsion techniques, fuel loading procedures and processes, and use of the centrifuge to test the concepts.

Among the Denver employees Koshar cited for helping are Charles Brown, Dale Fester, Charles Hall, James Burridge, Morris Thorson, Richard Davis, and Michael Murphy.

Howard F. Keyser, director of marketing and advanced programs at Denver, reviewed the oral presentation for the proposal.

Where are our spacecraft?

Four more satellites—LES 8 and 9, Solrad 11 A and B—have been added to the more than 1700 put in space since 1959.

More than 700 of them are still out in space.

According to the Kennedy Space Center's *Spaceport News,* the U.S. tally at the end of 1975, counting launches for other nations and organizations, is 829 ups and 404 downs, leaving 425 still in space—most of them last seen at launch pads in Florida or California.

Where are they?

The majority are scientific, communications, and meteorology satellites whirling around Earth in orbits ranging from less than 100 miles to thousands of miles.

Forty to 50 are still functioning, including Explorer, ATS, Westar, Intelsat, SMS, Nimbus, Landsat, and OSO. Like their now-silent cousins, they will some day return to Earth in a fiery death.

Forty-three spaceships have bid farewell to Earth. They include 25 that now claim the Moon as home; 13 have become solar-orbiting gypsies; three have staked out future claims on Mars; one is heading for a rendezvous with the stars of the galaxy; and one whose course is yet undecided.

On the moon are:

Six Rangers launched between April 1962 and April 1965.

Seven Surveyors launched between May 1966 and February 1968.

Five Lunar Orbiters launched between August 1966 and September 1967.

Seven Lunar Modules launched during the Apollo Lunar Landing Program.

Also left behind on the lunar surface was an assortment of Apollo equipment, some still functioning, and three Lunar Rovers.

The Sun has staked the next largest claim on NASA spacecraft. Pioneers 4 through 9, launched between March 1959 and December 1968, are in sweeping solar orbits. Pioneers 6 through 9 are still working.

Other solar wanderers include Mariners 2 and 5 (Venus flybys), launched in August 1962 and June 1967; Mariners 4, 6, and 7 (Mars flybys), launched in November 1964, February 1969, and March 1969; Mariner 10 (Mercury/Venus flyby), launched November 1973; and the German-built Helios 1 Sun probe launched December 1974.

Mariner 9, launched May 1971, has been orbiting Mars since 1972. Now dead, the spaceship will crash on the Martian surface in about 50 years.

And, of course, there are Vikings 1 and 2 which will land on the surface of Mars this summer and take up permanent residence.

Pioneers 10 and 11 are in an entirely different category. They might best be described as spaceships without a solar system to come home to. Pioneer 10, for example, zipped past Jupiter in December 1973 at a velocity of 81,000 mph. Its speed, coupled with the slingshot effect of Jovian gravity, will take it out of the solar system towards the star Alderbaran. The journey will take 1.7 million years.

Pioneer 11 whizzed past Jupiter in December 1974 at 107,000 mph. Its speed and Jupiter's gravity whiplash altered its path toward a rendezvous with ringed Saturn in September 1979. Scientists are now deciding whether the spaceship should be guided past Titan, a moon of Saturn, or between the planet and its colorful and mysterious rings. The midcourse correction maneuver, when it comes, will decide Pioneer 11's fate—solar orbit or escape from the solar system.

Simulated extra vehicular activity (EVA) in the division's neutral bouyance tank was used by Astronaut Charles (Pete) Conrad to prove the concept of using man instead of mechanical equipment to service the Space Shuttle and to replace equipment. The space telescope, support system module, and scientific module were among the equipment handling tasks Conrad performed while in the simulated EVA.

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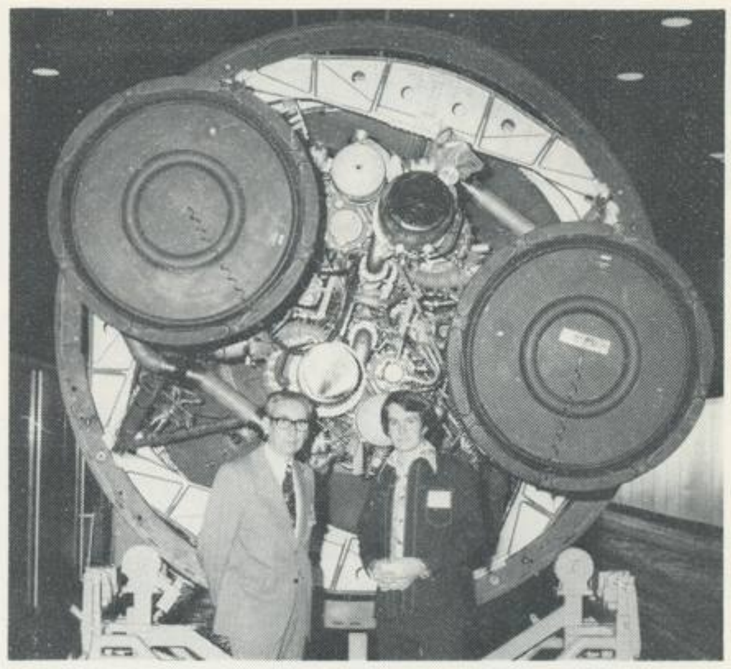


W. L. Kershaw, left, manager of the division's Independent Research and Development program, was host for David Reynolds, a senior at Aurora's Hinkley high school recently as Reynolds became an engineer for a day. The student's day-long visit at the division was part of a program of the Professional Enigneers of Colorado. Object of the program is to familiarize the prospective engineering student with the work of engineers in industry.

Little impact seen here for $2 bill

When the two dollar bill is reissued April 13 it is expected to have little impact on the two major cash handling functions at the division—the cafeteria and the cashier windows.

With the average purchase in the cafeteria running about $1.50 per person at lunch time, there may be some employees who will pay the tab with the $2 bill, but the single bill (instead of two $1 bills) will mean only a slight saving in time when it comes to counting the day's receipts.

Cashier windows, at least initially, will not have a supply of the new $2 bills. It would mean an added slot in the cash drawer and little savings in time since most transactions at the cashier windows are in five or 10 dollar increments.

Gilbert W. Ousley, second from right, U.S. Helios project manager, recently awarded NASA Group Achievement Awards to Denver division enployees who were part of the Helios team. The joint U.S.-West German spacegraft was launched by a Titan IIIE, C. E. Carnahan, left, head of launch vehicles for the division, was with award winners Richard Lea, Robert Morra, Richard Greenspun, and, far right, Ray Horn. Others receiving awards, but not shown, were Roy Hunter and John Lent.

Students gain from Skylab program

Scientists, engineers, and researchers have long benefited from the nation's space program. And so, in some ways, have manufacturers of consumer products.

That's as it should be. But Frank Tallentire of the Denver division and some officials at NASA saw another segment of the public that should be involved and benefiting—the high school student.

Skylab was the first of the space programs to get high school students involved, with 25 student experiments picked through a nation-wide selection process to be part of the scientific program.

The selection process did point up a lack of a fundamental understanding of science by some students. For example, one student suggested Skylab collect space rain so it could be compared with Earth rain.

"That student wasn't dumb," Tallentire asserts. "He just didn't understand the environment of space. That told us we needed to correct a situation and reinforced the need for the Skylab Education Program."

Recognition of the need and the objective of the education program is perhaps stated best in the preface to the seven manuals that were the first step in the Skylab Education Program.

The preface said:

"Characteristically, new scientific knowledge reaches general application in the classroom years after it is obtained. This long delay stems, to a large extent, from a lack of awareness that information is available and that it has relevance to secondary shool curricula.

"To accelerate this process, the National Aeronautics and Space Administration has prepared a series of documents concerning Skylab experiments to apprise the educational community in detail of the investigations being conducted in the Skylab Program, and the types of information being produced.

"The objective is not to introduce the Skylab Program as a subject in the classroom, but rather to make certain that the educational community is aware of the information being generated and that it will be available for use. Readers are urged to use these books as an aid to planning development of future curriculum supplement material to make the most appropriate use of this source of scientific knowledge."

Titled simply "Skylab Experiments," and dealing with seven categories of information in individual volumes, the books offer information for teachers, including suggestions on relevance to school curricula.

Using members of the National Science Teachers Association (NSTA) to review the material, Educational Programs division of NASA's Office of Public Affairs, headed by Dr. Fred Tuttle, learned that the "Skylabs Experiments" series "was too technical," and, according to prominent members of NSTA, "of no use to the student."

"This criticism," Tallentire recalled, "was not so much directed at what had been done, but was directed more at a second phase of the planned program—materials for students.

"What the educators were saying, as guidance for us, was that the format and approach in the 'Skylab Experiments' manuals was too detailed. They suggested much smaller bites of information, ones easily digested by students."

The editorial team, headed by Tallentire, returned to the task of developing concepts for student materials, keeping in mind the science teachers' directions.

A later meeting with members of the National Council for the Social Studies (NCSS) confirmed the basic concepts and added further guidance on format.

Using educational consultants from NSTA and NCSS as reviewers of ideas and drafts of material, the team was able to prepare 11 publications—three of which have been published and available to students and to the public.

Those published as *NASA Facts* are:

- The Spectrum—There's More Than Meets the Eye (a wall chart)
- Observing Earth from Skylab
- Why Survey from Space?

Yet to be printed are:

- What's the Use of Land?
- How to Build a Low-cost Spectroscope

And as back up to the wall chart of the Spectrum:

- Light and the Spectrum
- Astronomy and the Spectrum
- Life and the Spectrum
- Earth and the Spectrum
- Communications and the Spectrum
- Size and the Spectrum

Materials are available from the Superintendent of Documents of the U.S. Government Printing Office.

NASA cites employee

Frank Tallentire was recently recognized for his leading role in Skylab educational activities when NASA presented him an achievement award.

The citation said, "...to Frank Tallentire... for imaginative and dedicated activities in developing and stimulating, on a national scale, an appreciation for the potential of space studies as a major resource for students and teachers of science and social studies and for carrying this message to laymen and professionals across the nation, thereby greatly enhancing the return from space research."

Tallentire, a staff engineer, joined Martin Marietta in 1969 to work on pre-mission planning for Skylab mission evaluation. In 1971, he was assigned to work with NASA headquarters on the Skylab student project. He recently has been working on a team developing control and display requirements and concepts for Space Shuttle payloads.

Tallentire has a mechanical engineering degree from Wolverhampton Technical College in England.

Frank Tallentire at desk with NASA award a... Skylab Education Program wall chart on wall above him.

MARTIN MARIETTA
news
MICHOUD OPERATIONS

External tank program gigantic in all ways

The External Tank Program at the Michoud Operations is gigantic in all respects from the size of the plant (43 acres under one roof) to the size of the tank being produced (more than half the length of a football field) to the size and number of truck shipments bringing the necessary equipment and parts to New Orleans for retooling before production can begin.

From the start of the tooling effort, about 12 months ago, more than 150 truckloads of tooling parts have been delivered with another 175 loads to be delivered before tooling is completed in June.

Having more than 325 truckloads, some from as far away as Seattle, arriving at one point in the relatively short period of 18 months is not that unusual. It is the size of the loads that makes the operation unique.

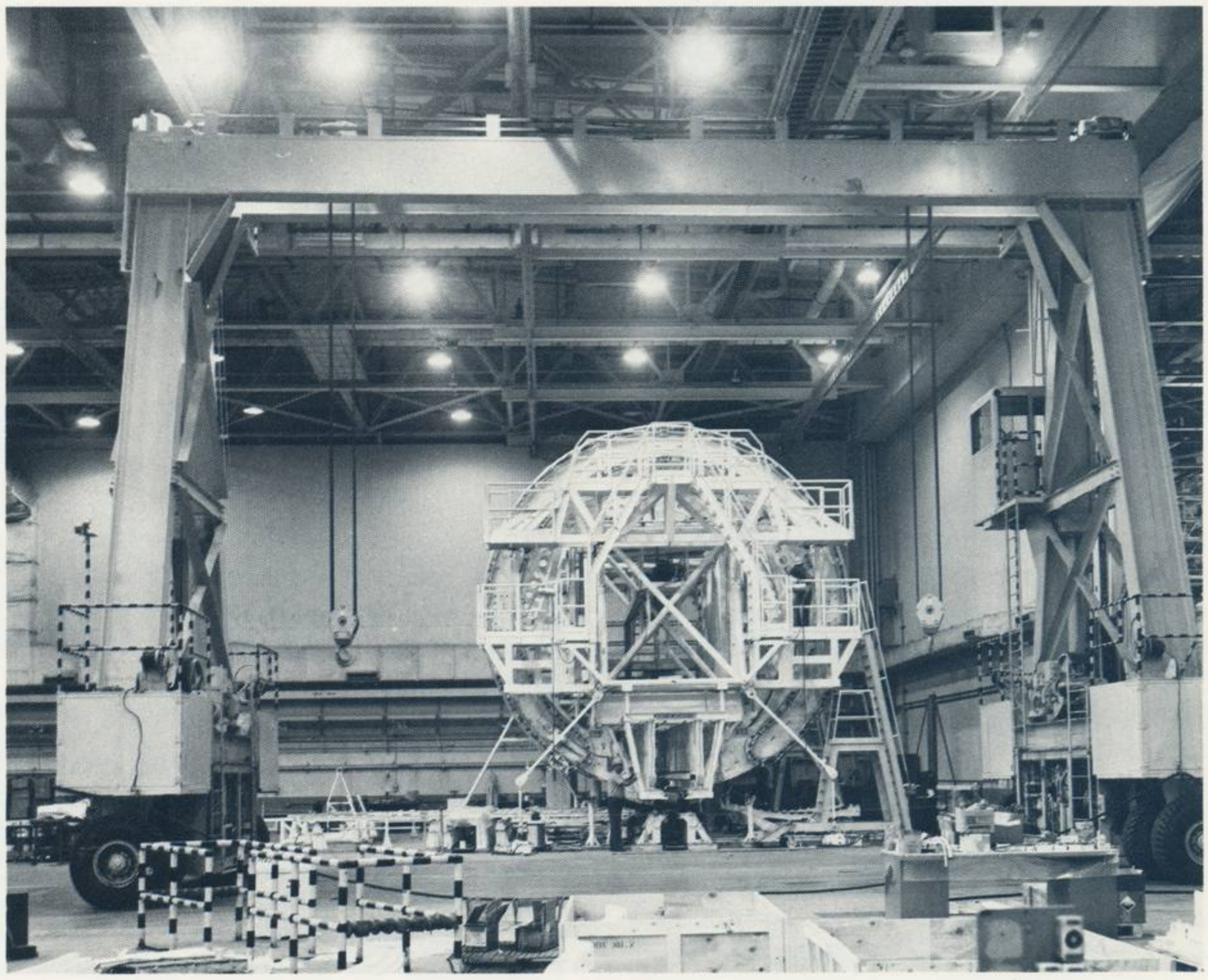
To assemble the largest fuel tank in the world, Martin Marietta first had to design and let contracts for some of the largest tools ever made. The parts of these tools are now descending on New Orleans under the watchful eye of Michoud Operations traffic and transportation department.

Ray Facchinello, Bill Douglass and Della Bruney are handling the day to day details, seeing that trucks arrive safely and on time. Douglass spent last weekend, for example, rounding up one trucker who had lost his way.

The normal road width restriction in the United States is 8 feet, however 75 percent of the trucks heading to Michoud will carry ovesize loads—some up to 18 feet in width.

State laws vary as to escort requirements, however, special permits and special escorts are required for each municipality the oversize trucks travel through.

The trucks must travel during daylight hours only in clear weather. Any law enforcement officer has the authority to order the truck off the road if he feels it is holding up traffic. Quite often a driver must sit by the side of the road to wait for rush hour traffic to subside.



In the center background is one of the major tools nearing completion for the ET Program at Michoud Assembly Facility. The tool function is to weld the three forward barrel assemblies of the liquid hydrogen tank. The tool will produce barrels which are 27 feet in diameter and 21 feet long. Each barrel consists of eight panels which are in both flat and curved shapes. The panels are sequentially loaded, trimmed, welded, and indexed around the fixture to complete the barrel assembly. All operations are controlled from the floor level. The tool contains pneumatic, electric, and hydraulic systems to perform its various functions. An unload tool, not shown in photo, is used to remove the completed barrel. This tool was designed by Michoud Operations and fabrication was accomplished by Martin Marietta in Baltimore. In the foreground of the photo is a giant mobile "A" frame gantry used to lift and move large components throughout the facility.

Also, the only time oversize loads can travel in New Orleans is between 10:00 p.m. and 4:00 a.m. This means drivers must stop at the parish line to await that six hour period—unless they have timed their driving to arrive at the proper time.

As Ray Facchinello remarked recently while waiting for a truck to arrive from General Dynamics in San Diego, "We're moving enough steel in here to build another bridge across the Mississippi."

Traffic rules set for MFA

Traffic regulations and procedures for enforcement have been established for the Michoud Assembly Facility (MAF).

Most significant aspect of the regulations, similar to those in force at other NASA operated facilities, is the traffic assessment system. Under the system accumulation of 12 points in a two-year period can result in suspension of driving privileges on MAF property for a six-month period.

Copies of the regulation have been posted on Martin Marietta bulletin boards. If you have questions regarding the regulations, call Martin Marietta security.

In Michoud

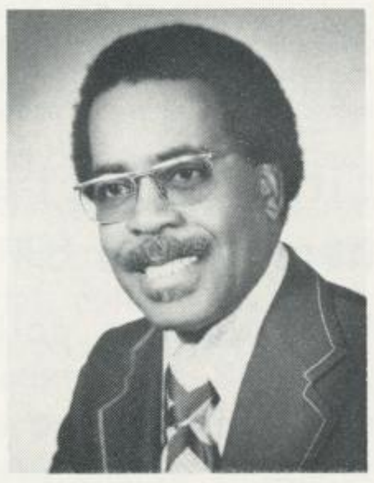
Call C. H. Fleischer at 3876 with suggestions or information for articles for the Martin Marietta News

From Michoud

EEO administrator named for Michoud

William V. Willis has been appointed administrator for Equal Employment Opportunity for the Michoud Operations.

Arriving in November 1975, Willis assumed responsibility for implementing the Corporate Policy on Equal Employment Opportunity for Michoud's 1,230 employees. Willis also maintains liaison with private and government organizations, and provides channels of communication and counseling with minority and female personnel at all levels.



William V. Willis Michoud

Willis comes to Martin Marietta from the Ingalls Shipbuilding division of Litton Industries in Pascagoula, Mississippi where he served as Equal Employment Opportunity analyst. He co-authored Ingalls Affirmative Action Plan for 1975, which ultimately resulted in the U.S. Navy releasing $252 million of contract funds.

He served previously as an industrial relations specialist with the Opportunities Industrialization Center in New Orleans where he kept close liaison with representatives of business, industrial and governmental organizations to develop and locate positions for minority and female graduates of the OIC training program.

Willis was born in New Orleans, Louisiana and attended schools in Orleans Parish receiving a Bachelor of Science degree from Southern University of Baton Rouge in 1956.

"Working for Martin Marietta on the External Tank is exciting and challenging," says Willis. "It reminds me of the phenomena of Buck Rogers when I was a kid—today that phenomena is a reality."

Among his many outside activities, Willis counts his participation in the Black Executive Exchange Program (BEEP) as one of the most important. Developed six years ago by the National Urban League, BEEP offers black college and university students a first hand view of business and industry by having experts on various phases of industry participate in a lecture series. Willis, naturally, builds his talks around the aerospace industry.

Willis is a member of National Association of Market Developers—New Orleans Chapter (past president), Omega Psi Phi Fraternity, the Kings, the Noblemen Civic Club (past president) and the Elks. He is also an honorary Colonel on Governor Edwards Staff and an honorary Senator of Louisiana.

When not on the golf course or in the swimming pool, Willis may be found with his youngest son Darryl and wife Cora watching his oldest, Robert, a former High School All American wide receiver, playing football for Jackson State University.

Robert W. Smith, manager of systems engineering, congratulates Daniel W. Drago, systems engineer, for receiving the first Michoud Operations Manned Flight Awareness Award for outstanding performance in the organization, preparation and support of the External Tank Critical Design Review. Successful completion of the CDR resulted in the release of engineering drawings for the official start of tank production.

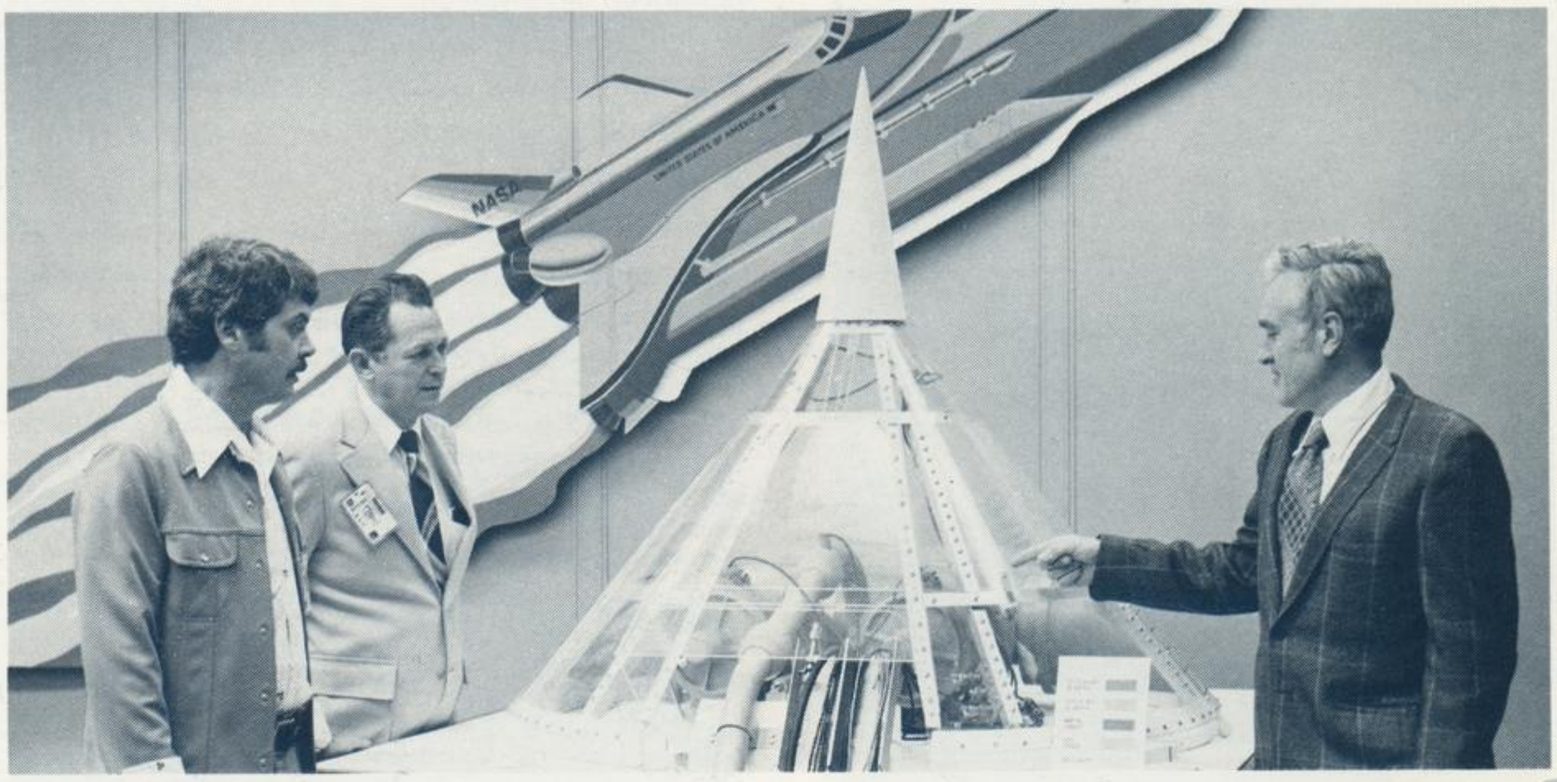
20 complete supervisor's course

A "Basic Fundamentals of Supervision" course which held its first weekly session in January was recently completed. Twenty employees were selected to participate.

The course was constructed into two phases. The initial phase consisting of seven sessions, was developed and conducted by the Tulane University Graduate School of Business with an overall objective of increasing supervisory effectiveness in various broad aspects of management. The second phase was conducted by Martin Marietta personnel who oriented their presentations toward scientific, unique problems being encountered in the Michoud Assembly Facility.

Supervisors completing the course were: Edward J. Goelz, Nunzy C. James, Dennis V. Folse, Pete D. Gomez, Jim B. McElray, Jerry A. Mattio, Bill G. Potts, Leaman C. Rawson, Herman M. Shiloh, Ken H. Crisler, Morey Robinson, Charles K. Johnson, Henry F. Snelgrove, Dick F Murphy, Buzz V. Snider, Ray E. Weaver, Pat E. Patchen, Tom O. Calhoun, Gordon R. Egbert, and Bill E. Cliff.

Among topics in the program are line supervisory function, supervisory leadership, effective motivation, company-union agreement, safety, and equal opportunity.



Shown as they examine the completed space allocation mockup of the forward end of the External Tank are, left to right, Richard R. Foll, manager, structures; William E. King, section chief, structural design; and Larry W. Norquist, manager, propulsion engineering.

The conical fairing forms an aerodynamic cov for the large vent and relief valves atop th liquid oxygen tank. The spike at the top of the fairing serves as a lighting rod. The new biconical shape is the result of an extensive redesign that significantly reduced the aerodynamic heating on the External Tank.