MARTIN MARIETTA
news
DENVER DIVISION

NUMBER 17/1979

Division Expenses
1979

JANUARY		1	2	3	4	5	6
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261 WORKING DAYS

- SALARIES AND WAGES (117 DAYS)
- GOODS, UTILITIES, TRANSPORTATION AND SERVICES (95 DAYS)
- LOCAL, STATE, FEDERAL TAXES (17 DAYS)
- PENSIONS, INSURANCE, AND DEBT SERVICE (22 DAYS)
- EARNINGS (PROFIT) (10 DAYS)

Unique business culture is key to success

"At this time last year, I said I was looking forward to an outstanding year in 1979," said C. B. Hurtt, division vice president and general manager.

"I have not been disappointed," he said.

"Our success in 1979 is a tribute to our people and the quality and reliability of their work," Hurtt said. "These skilled people and our improved facilities increase the resources we have available to meet the needs of our customers now and in the future."

Key to the division's success, Hurtt believes, is the division's unique way of doing business.

"I know of no other firm that puts as much emphasis as we do on mission success, integrity, and the open discussion of problems among ourselves and with our customers," said Hurtt.

A company culture

"We have developed a company culture, a company environment in which our people understand this emphasis and in which we have eliminated any fear people may have had to admit to problems," he said. "Problems cannot be solved if they are hidden. If we don't solve problems, we cannot assure our good customers that our products will perform exactly as they are meant to perform."

Hurtt outlined the major elements of the division's business culture as:

- An uncompromising commitment to mission success;
- Candor and responsiveness to our customers;
- Support to our subcontractors; and,
- An unwillingness to accept hardware, make a delivery, or recommend a launch or mission operation until all anomalies have been satisfactorily closed out.

It is these elements that made 1979 an outstanding year and gives the division a bright future through the mid-1980s, says Hurtt.

'79 predictions surpassed

All predictions for 1979 have been surpassed for orders, sales, profits, and return on investment.

"The success in 1979 has helped lay a solid foundation for success in the 1980s," Hurtt said. "In 1980, our business plan is based on 95 percent firm and follow-on business and five percent projected new business. Through 1984, our growth plan includes 75 percent firm and follow-on business and 25 percent new business."

To maintain diversity

To help assure that the division maintains its diversity, Hurtt said a new organization will be formed to evaluate proposed new product lines and "keep a sharp outlook for new product opportunities."

Also to keep the division a technological leader, there will be a substantial increase in independent research and development funds in 1980.

'We are doing well'

"I need not comment separately on each of our product areas," said Hurtt. "One statement covers them all: we are doing well.

"The future depends on our abiiity to implement the business we have," he said. "We must maintain our emphasis on mission success, on integrity, and on our willingness to discuss problems. If we do that, there will be no degradation of our performance as we grow to a billion dollar division."

Corporation to match gifts to the arts

The Corporation has announced a one-year experimental program in which it will match dollar-for-dollar employee gifts to the arts and other cultural institutions.

Cash gifts from $25 to $1,000 to museums; opera, drama, and dance companies; symphony orchestras; and certain other arts and cultural centers will be matched in 1980.

This program is in addition to the Corporation's educational gift matching program which was improved in 1979. For each dollar an employee gives to a qualifying school, the Corporation will now match it with two dollars. The maximum gift to any one accredited institution by an individual also has been raised from $1,000 to $2,000. The minimum gift is $25.

In the new program for the arts, a full-time salaried employee with a minimum of one year's continuous service is eligible to participate. To qualify for gift matching, recipient organizations must be operated for the benefit of the general public, be located in the United States or its territories, and have tax-exempt status as defined by the Internal Revenue Code.

Guidelines for the program will be available after January 1.

SCATHA satellite in 'good health'

After almost a year in orbit, SCATHA, a unique experimental electronics satellite built for the U.S. Air Force by the Denver Division, is in "good health" and functioning well.

Although the division's work initi was to end in January 1980, it is expec its tasks will be extended through at least March and the spring eclipse season.

It is during the eclipse that the most charging occurs. The spring eclipse will permit at least one more check by the experiments to determine the effects of spacecraft charging at high altitudes — the function from which the acronym SCATHA comes.

While the spacecraft has propellant sufficient for up to seven more years of operation, plans for its operation beyond the spring eclipse season have not been set.

During the January through March contract extension, the division tasks would include continued checks on the spacecraft's status, work on any hardware or software problems that might arise, and to assist in planning operation through the spring eclipse season.

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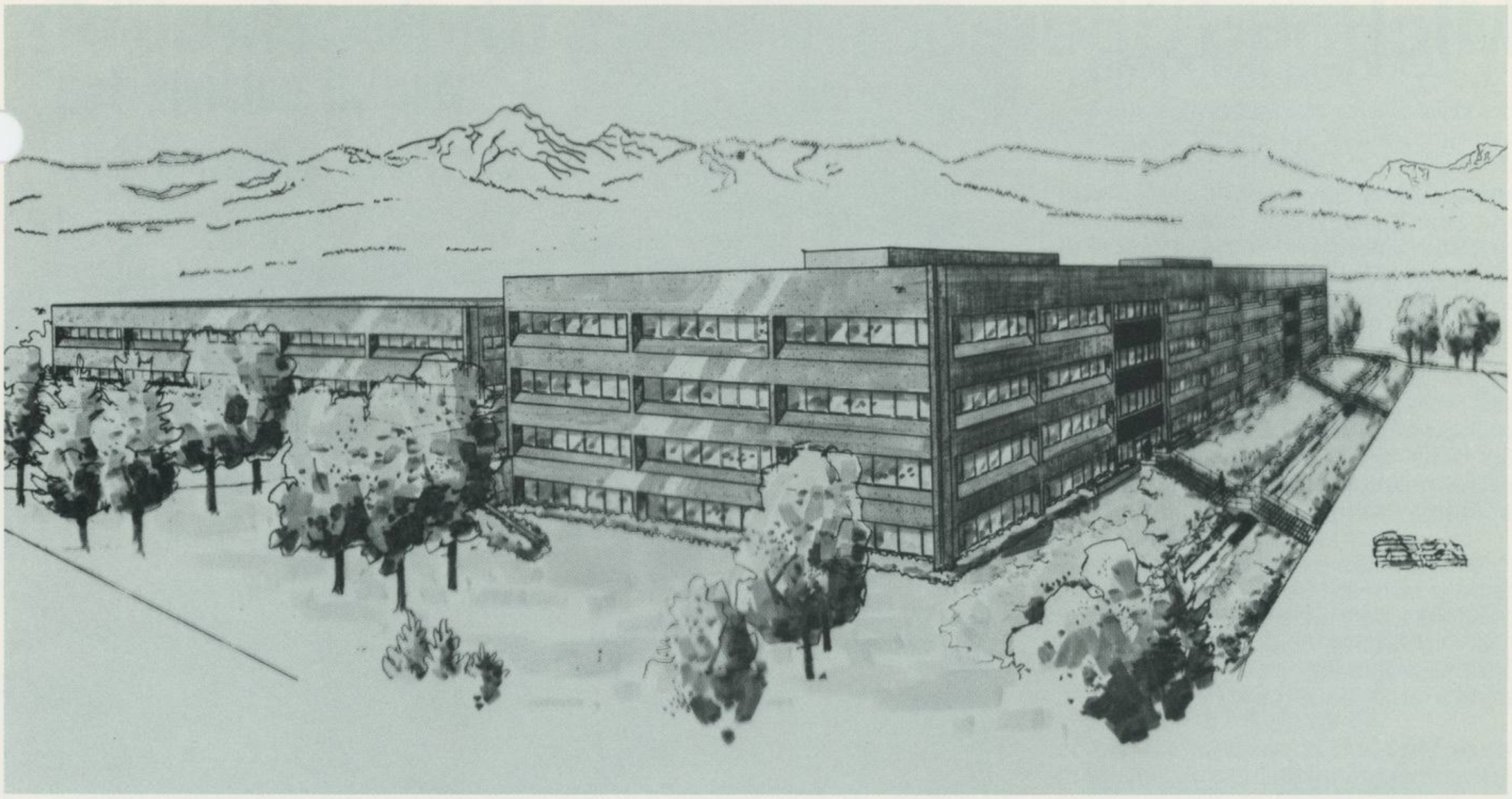


Ground breaking is expected in January for the 124,000 square-foot addition to the Denver Systems Center at Hampden and Wadsworth. The artist's concept shows how the building will look when the four-story addition is complete. Other facilities improvements are planned for 1980, with more than $25 million in capital funds allocated for the work.

Employment increases in '79; continued growth seen in '80

Our division's total employment increased by about 900 new employees in 1979 at Denver, Michoud, and Vandenberg," said R. E. Burnett, director of professional and industrial relations, "and we will require approximately 2000 additional employees in 1980."

The needs in 1980 are based on firm, not speculative requirements, Burnett added. "Our business requires that many more employees."

The 900 people added in 1979 do not reflect the true pace of hiring activity, Burnett pointed out. "For example," he said, "while our payroll has grown by about 900, we have hired approximately 1800."

Although the division has one of the lowest attrition rates in the aerospace industry — about one-half the industry average — people do retire and people do resign and they have to be replaced. That accounts for the difference between the number hired and the growth in total employment.

Of the professional employees hired in 1979, 200 have come to the company through the employee referral program. "We have been pleased with the way our employees have helped us in recruiting," Burnett said, "and we are continuing the employee referral program in 1980."

Also continuing will be a diverse advertising program as well as work with employment agencies. Advertising is regularly in 22 major newspapers and in 12 to 15 trade journals. More than 200 agencies are participating in the recruiting program.

"We will be busy in 1980 seeking the employees we need," Burnett said. "Our success in 1979 has been helped greatly by those outside our department who have assisted in recruiting and interviewing candidates. I know we can depend on the same excellent cooperation in 1980."

CAD/CAM use is expanding

By the end of the first quarter of 1980, the computer aided design/computer aided manufacturing (CAD/CAM) installation at the recently leased Greenwood Commons facility will have 30 design terminals and five computers to support them. With about 12 terminals to be installed in SSB and the upgrading of the CAD/CAM equipment in the engineering building, the division will have about 49 terminals.

With CAD/CAM, a product can be taken through all steps in its development and manufacture — except for the actual machining and assembly.

The product can be designed at a terminal using a keyboard, a magnetic stylus, and a television-like display. The whole product or any of its parts can be drawn on the screen, its dimensions changed, its shape altered — all before anything is put on paper.

Once complete, the design, which has been stored in the computer, can be transferred to a drawing, and tapes can be produced that will program the numerically controlled machines in the factory to produce the parts of the product.

A design can be accomplished in minutes or hours that could take days or weeks if the designer was doing the work at a desk or at a drawing board.

It is expected that in 1980, the design operation will require two shifts to meet requirements of division programs, with a third shift used to transfer design data from the computers to the plotters that produce the drawings.

Tapes for numerically controlled production machines will be used by the division and by contractors working with the division on major projects.

Liquid boost module to add thrust to Space Shuttle

Titan, the nation's workhorse launch vehicle already selected as a back up for the Space Shuttle, will be making another significant contribution to the success of the Shuttle in the mid-1980s.

In November 1979, a liquid boost module (LBM) was selected to provide thrust augmentation to improve Space Shuttle payload capacity.

The liquid boost module, composed of a pair of Titan stage one engines and four propellant tanks similar to those built for Titan, will be attached to the aft end of the external tank.

More thrust needed

Additional thrust for Space Shuttle is necessary to meet some Shuttle payload delivery requirements when launched from Vandenberg Air Force Base. Anticipated payload capacity for Shuttle without additional thrust is 24,000 pounds.

The Titan-derived liquid boost module will increase payload capacity to about 42,000 pounds — well over the launch requirements.

Development of the concept for the liquid boost module began early in 1979, with validation and cost studies completed in midyear, and presentations made to NASA in October and November. The concept was accepted and the LBM selected.

Tanks modified

While engines are the same as those on Titan, the tanks are slightly modified. The four tanks will be 10 feet in diameter, with two of them 268 inches long and two 238 inches long.

The engine/tank assembly will be equipped with a newly-designed support truss that will be attached to a separable skirt that is part of the external tank to be used for the increased-performance missions.

The LBM will be ignited five seconds after launch, eliminating the need for launch pad exhaust ducts for the engines. After burning 200 seconds, the assembly will be jettisoned. Burn time can be altered to decrease the thrust augmentation.

The engines, tanks, and truss will be built in Denver. The skirt will be built and attached to the external tank at Michoud. The LBM and the modified external tank, to be mated at Vandenberg, will be 24 feet longer than a standard external tank.

First launch in 1985

Authority to complete final design and to build the LBM is expected in the 1982 fiscal year, with first launch planned for 1985.

In 1980-81, the division will continue configuration studies, identify material for long-lead procurement, and support integration tasks to verify that the LBM will function with the full Space Shuttle assembly.

MMU delivery set for mid-1980

Skylab astronaut Paul J. Weitz trained on the maneuvering unit simulator before he and other astronauts tested the M509 backpack maneuvering unit inside the Skylab. The M509 was the forerunner of the MMU that will be used on early Space Shuttle missions.

Three manned maneuvering units will be delivered in mid-1980 for use in the Space Shuttle program. The units will be used by astronauts outside the orbiting Shuttle.

The first unit, to be completed in May, will be for qualification testing. The next two will be delivered in July and August. The MMU is being planned for the second Shuttle mission. However, it is possible the unit will be included on the first Shuttle flight.

Astronauts, wearing the backpack maneuvering unit, will circle and inspect the airplane-like orbiter while in space. they also will be able to perform a variety of activities outside the spacecraft, including rescue operations, spacecraft servicing and repair, cargo transfer, small satellite retrieval, science investigations and observations, and in-space construction.

Initially, astronauts will be tethered to the orbiter with a 120-foot line.

The maneuvering unit will be 49 inches tall, 32 inches wide, and 26 inches deep. It will weigh about 260 pounds when fully loaded with propellant.

The aluminum-shelled pack consists of two parallel maneuvering systems, a silver-zinc battery, a control electronics assembly, two hand controllers, and a cold gas nitrogen propulsion system. The propulsion system consists of a 30-inch long, 10-inch diameter propellant tank, and 12 small thrusters. Each of the thrusters will produce 1.6 pounds of thrust.

Normally, the maneuvering systems will be used in tandem, but each may operate independently.

To maneuver in space, an astronaut uses the hand controls where electronics translate the movements to fire the control thrusters.

The division has been involved in the development of backpack maneuvering units for several years and its experimental gas-jet maneuvering backpack, called the M509, was successfully test flown inside the Skylab space station in 1973 and 1974.

Solar energy contracts put division in new and growing business

The growing interest in alternative energy sources and the division's reputation for developing equipment with high reliability has led to the awarding of significant solar energy contracts to the division in 1979.

The latest was announced in early December. The Department of Energy awarded the $30 million contract to design and build 1800 heliostats for America's first functional solar power plant. Work will include design, fabrication, and check out of the heliostats and a computerized control system.

Heliostats are mirrored devices used to concentrate and focus the sun's rays onto a central receiver or boiler atop a 300-foot tower. Water pumped through the boiler is heated, creating steam to drive a turbine to produce electricity. Additional heat produced during peak midday operation will be stored in oil and gravel for electricity production during cloudy periods or at night.

The heliostats will be installed at a plant near Barstow, CA that is designed to produce 10 million Watts of electricity — enough to power 2500 homes.

Another major program, using a photovoltaic power system, will provide electricity for two Saudi Arabian villages. The photovoltaic system differs from the one planned in California in that no turbines are used. Point-focusing Fresnel lenses concentrate the Sun's rays onto solar cells that directly convert sunlight to electricity.

The system contains 160 photovoltaic arrays, a storage system of six batteries, and a computer control system to track the sun across the sky.

The division will design, fabricate, and install the 350 kilowatt system.

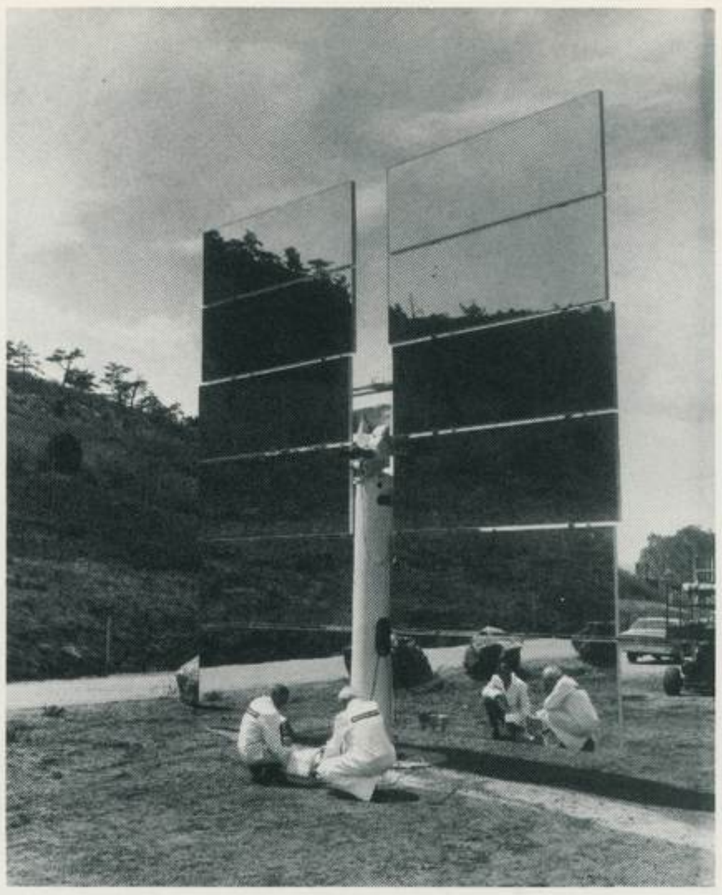
Installation of a 50 kilowatt system is to be completed in mid 1980 and expanded to the 350 kilowatt system in early 1981. As part of a five-year joint effort by the U.S. and Saudi Arabia to advance solar energy technology, the system may be expanded to produce one megawatt of power.

Other solar work that will continue in 1980 includes:

- study of a hybrid power plant, one that combines fossil fuel and solar power generators

- preliminary design of a central receiver solar power energy system that includes an electric power generation system and tanks and other equipment to store and pump molten salt used as a heat storage and transfer medium

- design and build two heliostats and develop a conceptual design for a manufacturing plant capable of producing 50,000 heliostats a year.



Eighteen hundred heliostats, like this one, will be built by the division. Here, engineers check the electronics control system.

Titan family enlarged with 34D delivery

The first Titan III 34D was completed in 1979, adding another member to the highly successful launch vehicle family produced by the Denver Division. Ceremonies marking its delivery will be held in early 1980.

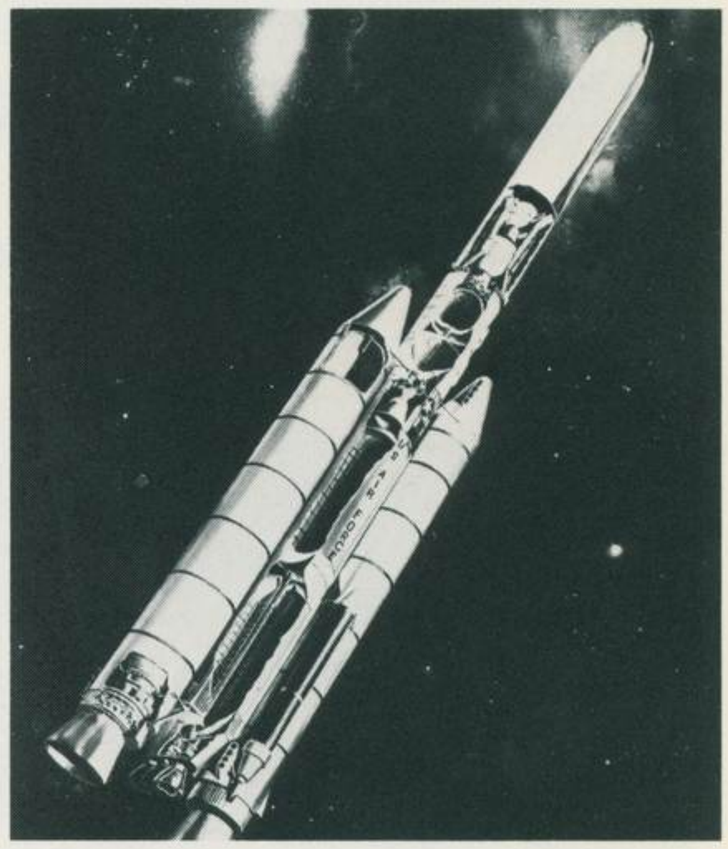
The new booster is to be used as a transition vehicle for both prime launch assignments and as a back up to Space Shuttle for launching Department of Defense spacecraft.

A second 34D vehicle is nearly complete and will be delivered early in 1980.

Both vehicles will be sent to Cape Canaveral in 1980 where they will undergo check out in the vertical integration building and then be available for launch.

Three more vehicles are to be completed and delivered to the Air Force in Denver in 1980.

The 34D is a modification of the Titan IIID. The basic core vehicle is five and one-half feet longer to accomodate the addition of a half segment of the solid rocket motor. System redundancy has been added to upgrade reliability.



In this artist's rendering, the Titan III 34D is shown with the inertial upper stage (IUS).

Two versions are being manufactured — one for use at Cape Canaveral and the other for West coast launches. The East coast version is built to interface with the inertial upper stage (IUS). The West coast vehicle includes a radio guidance system and will interface with spacecraft scheduled for launch from Vandenberg Air Force Base.

The first Titan 34D launch is expected in 1981.

Nine vehicles will be built under the current contract.

The division also is supporting launch complex modifications at Vandenberg necessary because of the added vehicle length and changes in electronics.

MX launcher proposal planned

Preparations to respond to a proposal request for the full scale engineering development for the Missile X launcher are under way.

It is anticipated the proposal will be submitted in mid-February with go ahead for the work in mid-May. The contract is expected to extend through June 1984.

The division would be responsible for the structures, cannister, breakout and erection subsystem, the environmental control subsystem, the electrical power subsystem, and electrical cabling and connectors.

The launcher hardware will be built to support test launches at Vandenberg Air Force base as well as other integrated tests. The division would also do the design, assembly, test, and some installation for the test program.

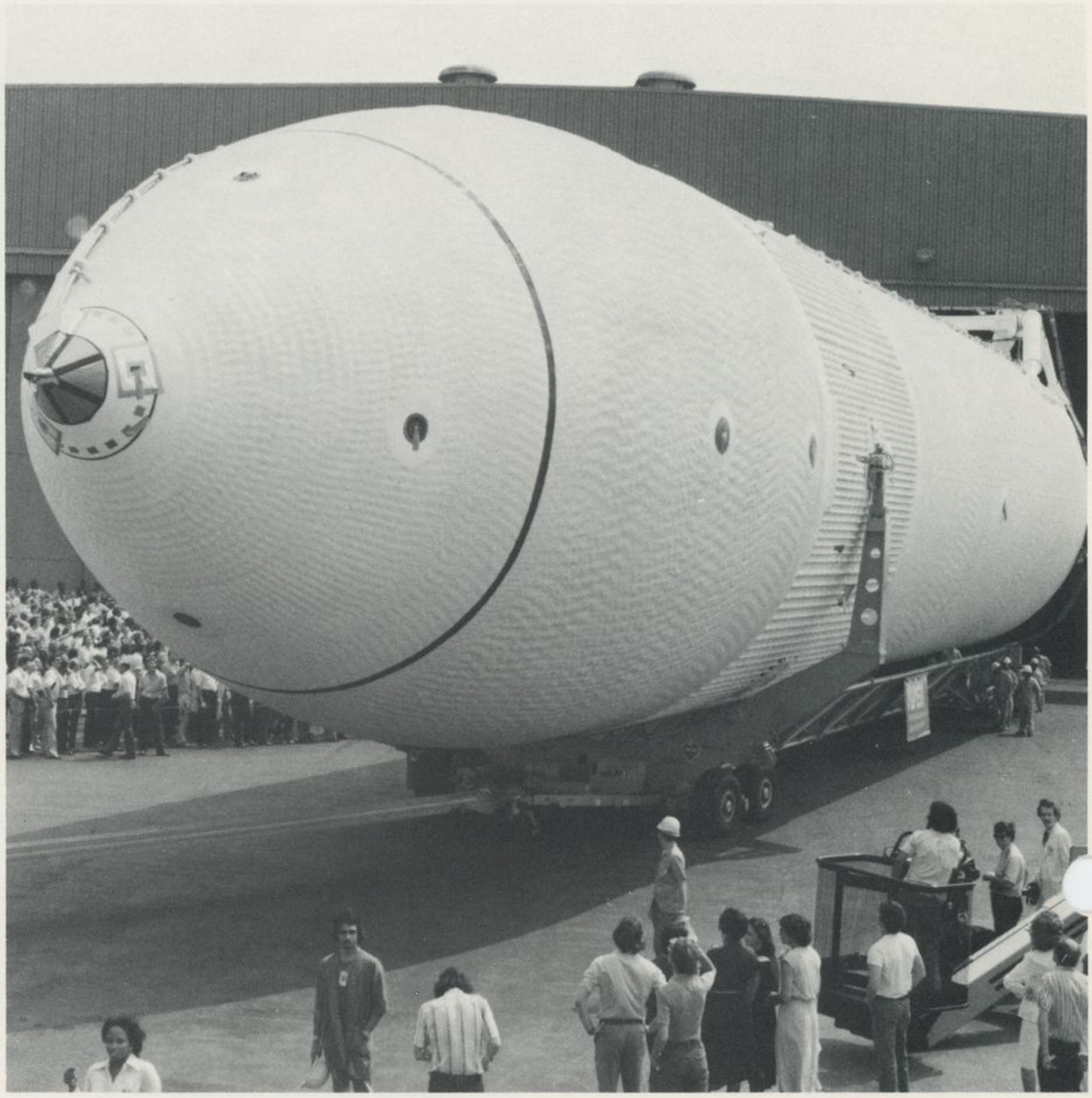
Michoud operations gears for production

Attend almost any meeting at Michoud and chances are good that two themes for 1980 will be overriding subjects of discussion — mission success and cost-effective rate production.

"With this past year's successful ground test program nearly completed," says Michoud Vice President Kenneth P. Timmons, "our attention is concentrated on mission success, THE critical element of manned space flight."

This means the external tank is rapidly moving from the design, develop, test, and evaluate phase to long-term, low-cost production of one tank for each Space Shuttle flight, perhaps as many as 445 tanks during the next 12 years.

A key Michoud highlight of 1979 was delivery in July of the first flight tank to the Kennedy Space Center (KSC) where it is now in the Vehicle Assembly Building for final tests and preparations for launch.



The first flight external tank departed Michoud June 29, 1979 and docked at the Kennedy Space Center July 6, 1979. The tank is now in the KSC vehicle assembly building undergoing tests and final preparations for the first Space Shuttle launch.

Facility test complete

A facility verification test program was completed at KSC using an earlier test article tank to provide a close check of systems and procedure to be used for future movement and stacking of flight Shuttle vehicles. It was also successful in training personnel in various operations of the huge mobile launch platform that will transport the Shuttle to the launch pad.

This year also saw the successful completion of a major ground vibration and structural test program at the Marshall Space Flight Center (MSFC) in Huntsville, AL.

Design is verified

A crucial and highly successful test was the structural test program that verified the design of the hydrogen tank. This test program was geared to measure the reaction of the test article under strain and deflection of transportation, handling, prelaunch, and flight loads. It involved eight months of testing using 40,000 channels of data during each of the six tests.

A portion of one structural test on the oxygen tank remains, but preliminary data indicate successful completion by mid-January. These tests included mating a fully configured, although not launch qualified, launch vehicle for the first time in the program.

Important to Michoud's future also was the submittal in 1979 of the increment II production phase contract proposal for an additional 27 tanks over the next four years.

Lightweight tank begun

Design work and future procurement have begun for the lightweight tank, a new NASA contract requirement for a tank 6000 pounds lighter than the current design.

Michoud operations has also prepared and begun to implement a producibility program to ensure low cost and efficient work during the future production contract.

Employment increases

Employment at Michoud has increased slightly during the past year with 2337 employees, including 221 at KSC, 45 at MSFC, and 33 at the National Space Technology Laboratories, Bay St. Louis, MS, where the Space Shuttle main engine tests are under way using a test-version external tank.

Facility expansion work is moving along on schedule, with vertical and horizontal tank cleaning and spray buildings going up on schedule and forecast to be completed in 1980.