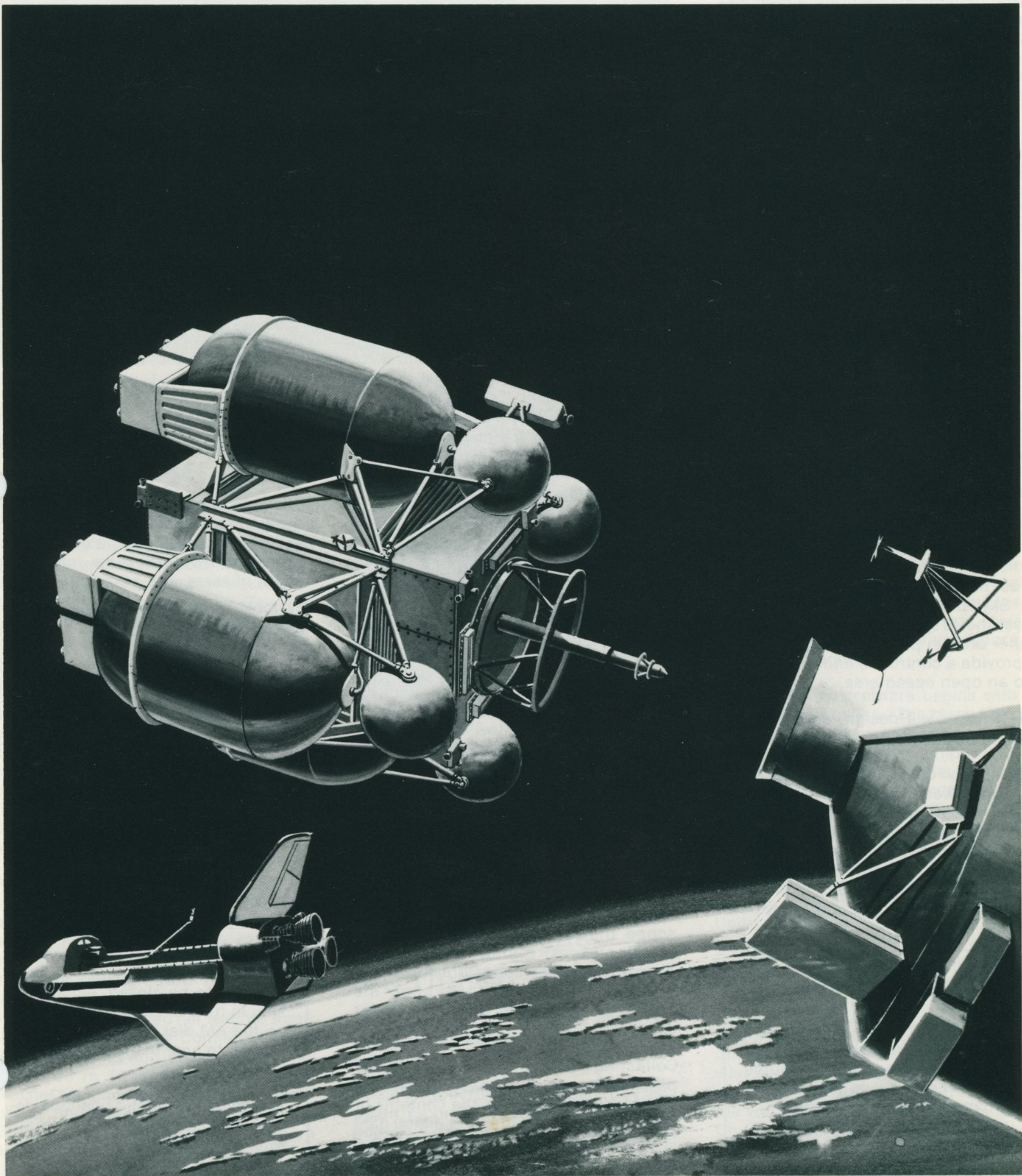


MARTIN MARIETTA

# news

DENVER DIVISION

NUMBER 16/1977



# Division selected to build teleoperator retrieval system

The Denver division has been chosen by NASA to provide a remotely controlled small propulsion stage to survey, stabilize, and maneuver space-craft in low Earth orbits.

The system, called the teleoperator retrieval system, will be used in conjunction with the Space Shuttle in the early 1980s.

Robert J. Molloy is program director for the division.

The free-flying monopropellant craft will be carried to the vicinity of an orbiting spacecraft in the cargo bay of a Space Shuttle. An astronaut, using television and a remote command and control system will guide the stage from the Shuttle's bay to a rendezvous with a spacecraft.

Using the television camera mounted on the stage, the Shuttle crew will look at the satellite to determine its condition and, if necessary, dock with it.

Powered by small hydrazine engines, the stage could maneuver spacecraft into higher orbits. Once its mission is completed, the stage will return to the vicinity of the Space Shuttle via its own guidance and computer system. When in range, the Shuttle crew remotely guides the craft to the Shuttle for retrieval.

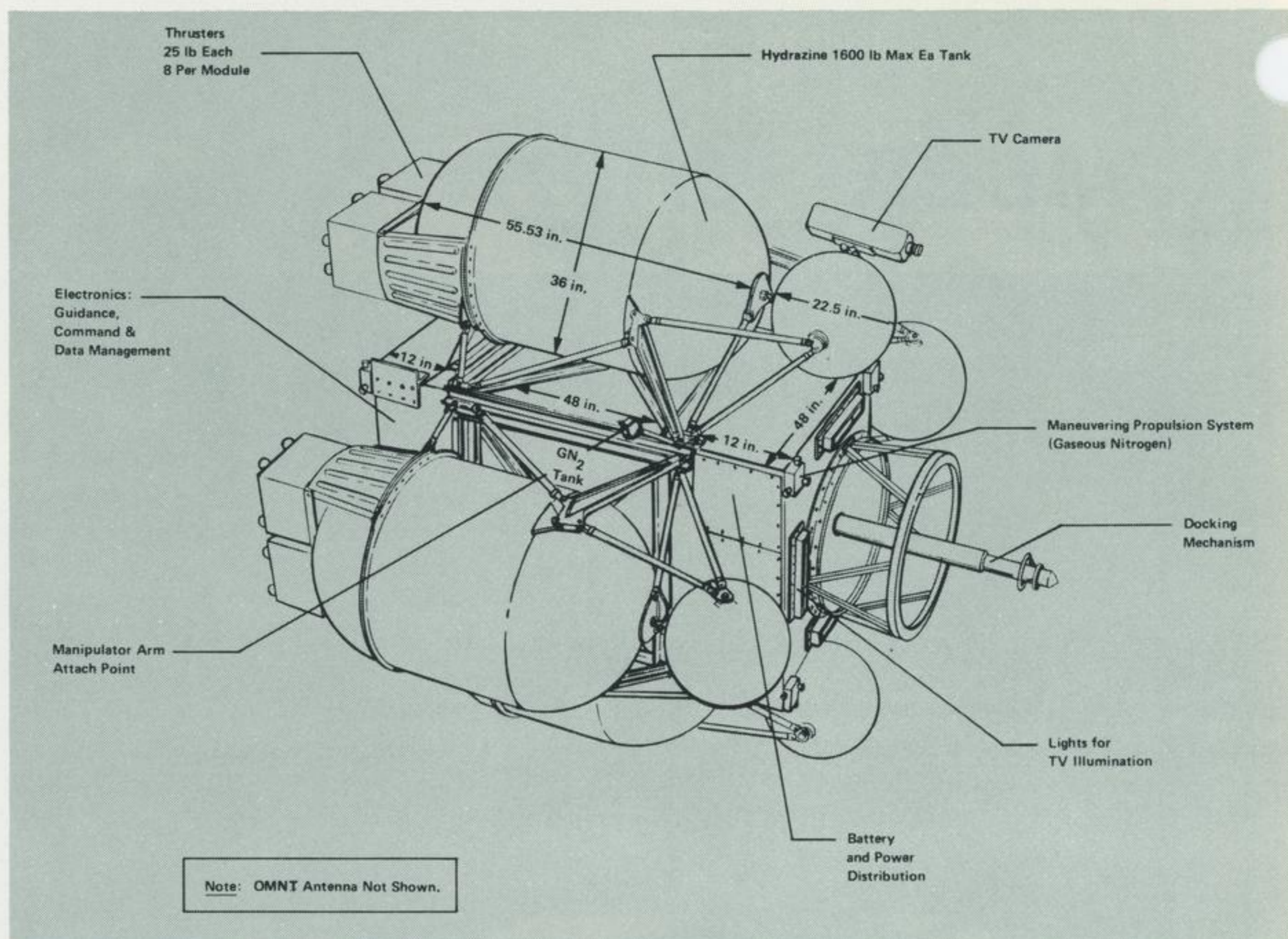
Plans call for the unit to first be used to adjust the orbit of the abandoned orbiting Skylab space station. It will either boost the 175,000-pound Skylab into a higher orbit to permit astronaut revisits or provide a controlled and safe reentry into an open ocean area.

The division will design, engineer, assemble, test, and integrate the stage.

The unit is an outgrowth of the division's work on earlier NASA projects, including the astronaut maneuvering unit; space maneuvering television; the Viking automated spacecraft; and the Skylab multiple docking adapter. A major portion of the propulsion unit is an adaptation of the Titan transtage attitude control system engine.

## On the Cover

Teleoperator retrieval system in cover drawing moves from Shuttle orbiter cargo bay to inspect and perhaps dock with a satellite.



Teleoperator retrieval stage as proposed by Denver division.

## Division to build instrument for Space Telescope

A faint objects spectrograph, an instrument to aid astronomers to study stars and galaxies 100 times fainter than now seen through telescopes, will be built by the Denver division as part of the scientific package put into Earth orbit aboard the Space Telescope.

The instrument will use the optics in the Space Telescope to view galaxies several billion light years away from Earth.

Work on the project will be done with the University of California at San Diego for NASA's Goddard Space Flight Center.

Space Telescope will go into space in the cargo bay of the Space Shuttle orbiter in 1983. From space it can view far away objects without the filtering effects of the Earth's atmosphere.

The faint objects spectrograph is one of the four instruments on Space Telescope that scientists believe will revolutionize astronomy by providing deep space observations previously not possible simply looking through the Earth's atmosphere as we have done for centuries.

Collecting refracted light after it has passed through the Space Telescope, the instrument analyzes the contents of the light wave. The analyzed digital data is transmitted to Earth where it is converted to a photograph for visual analysis.

The spectrograph will search for previously unknown objects in the Universe, examine features associated with black holes, and provide new information about quasars.

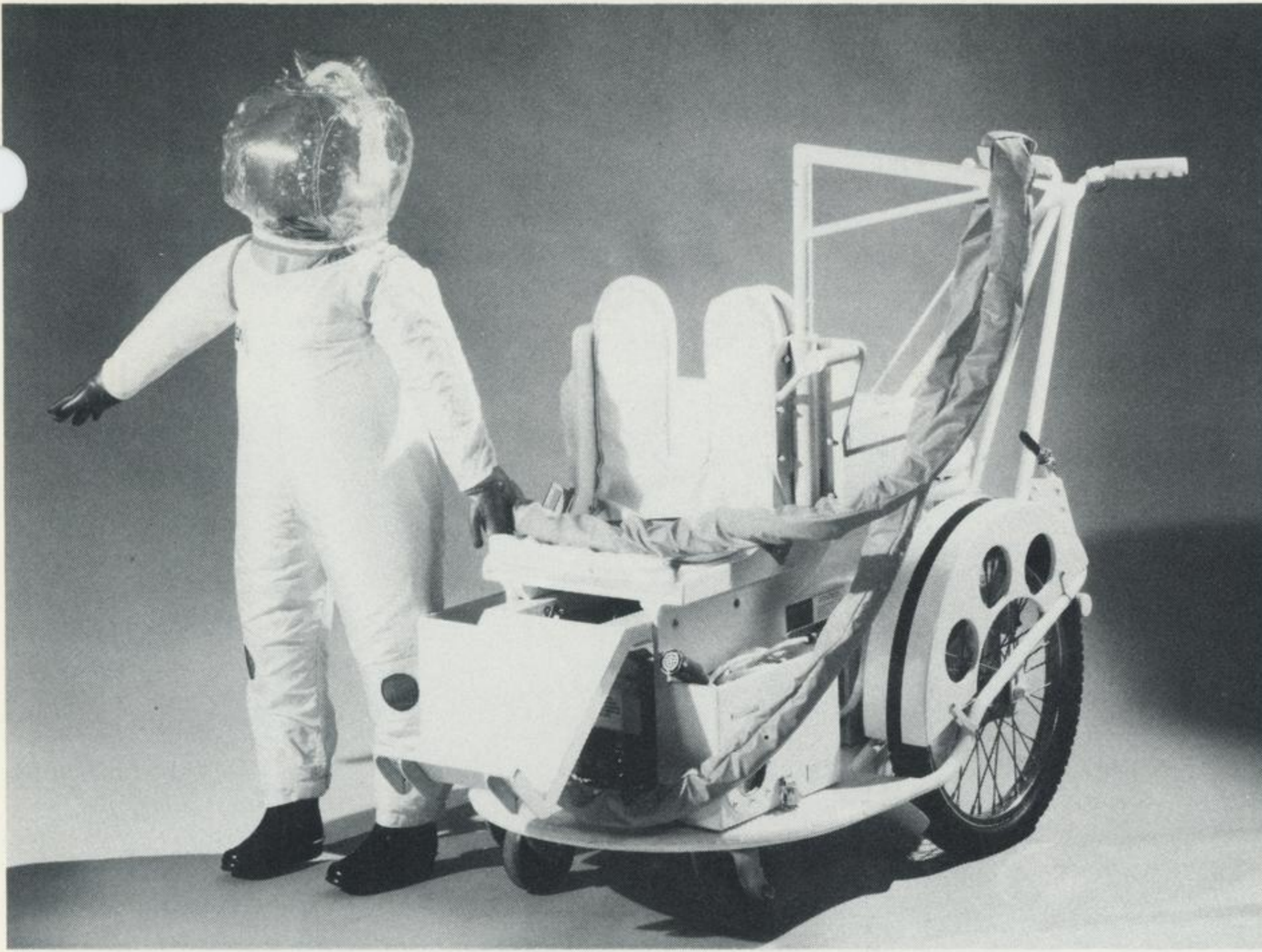
By looking at far away galaxies never before seen, scientists will be able to better study the rate of expansion of our Universe, previously measured only by the shift of light speed from nearby galaxies as the light reached the Earth's surface.

## When weather is bad listen to the radio

Arrangements have been made with two Denver radio stations to broadcast special plant closing announcements for Denver division employees.

When winter storms appear severe enough to perhaps cause division facilities to be closed, employees should tune to either KOA, 850 Kh on the AM dial, or to KDEN, 1340 Kh AM, to hear instructions on reporting to work.

The division's public relations department made the arrangements with KOA and KDEN to provide this special service to employees.



*Tiny suit with its support system cart allows children to remain in isolation and still move about.*

## Space technology protects tiny astronaut from germs

The tiny astronaut is wandering the halls of Texas Children's Hospital and soon may be completing missions to the zoo, a fire station, and to NASA's Johnson Space Center.

For the first time in his life, the six-year-old Houston boy can leave his stationary isolation area at the hospital and explore his unknown world because NASA astronauts explored some of the unknowns of space.

William D. Carmean, who has been with the Denver division since 1959 and at Houston since 1969, was the project director for the NASA-Martin Marietta team that developed the mobile biological isolation system used by young David.

The youngster is suffering from a disease known as severe combined immune deficiency. His body has no defense against germs or bacteria. What would amount to sniffles for a normal child could mean death for him.

Several facets of space technology contributed to the development of the NASA bioisolation system. The most obvious parallel is the astronaut's spacesuit which protects him from the hostile environment of space.

In the early Apollo lunar landing missions, the uncertainty of what type pathogens might be brought back from

the Moon prompted the development of the biological isolation garment which Apollo crewmen donned during their transfer from the spacecraft to the mobile quarantine facility aboard the recovery vessel.

David has a suit that works in reverse. The astronaut's wore their protective suits to keep germs and bacteria in; David's keeps germs and bacteria out.

David's suit is made from a rubberized nonporous fabric and is fitted with an integral tunnel that allows him to move from his sterile room into the suit without exposure to the outside atmosphere. A soft, transparent helmet, rubber gloves, and rubber boots are part of the one-piece suit. For added protection, a cover garment made of Nomex, the material used in the Gemini EVA suit, is worn over David's pressure suit.

An equipment cart, built from a lawnmower chassis, serves as a transporter for the suit's life support system. The self-contained system can provide support for excursions of up to four hours from its rechargeable aircraft batteries. It also may be plugged into normal 110 volt AC housepower or into a car's cigaret lighter.

The cart has a seat for the patient.

Carmean, who worked on the design of Titan fuel handler's protective suits, said

the system designed for David is also being tested at Children's Hospital of Los Angeles.

"In Los Angeles, the suits will be used by young cancer patients whose immunity drops during chemotherapy treatment," Carmean said. "It is expected the mobility of this isolation system will help psychologically as well as medically, allowing the patients to move about instead of being confined to an isolation room."

Carmean is program manager for the NASA technology utilization program at Johnson Space Center for Martin Marietta.

## Rocky Hockey night planned

Friday, December 9, will be Martin Marietta night at McNichols Arena when the Colorado Rockies meet the Toronto Maple Leafs in a National Hockey League match.

Tickets for the night have been purchased by the division and will be distributed to employees, by department, during the week of December 5. Each employee will receive two tickets. An attempt will be made to seat employee groups by department.

Each employee also will receive a Crazy George Guide to Understanding Hockey.

Schedule of events suggested and planned by the Rockies:

6:30 to 6:50 pm: Employees arrive at arena

6:50 pm to 7:10 pm: Teams warm-up

7:10 pm to 7:20 pm: Hockey clinic

7:25 pm: Official welcome of Martin Marietta employees

7:30 pm: Game begins

8:15 pm (approximate): Rockies will present an appreciation plaque to the division between the first and second periods

10:00 pm (approximate): Free skating for employees and families. Bring your own skates.

## Division to study tethered satellite for Space Shuttle

A satellite system tethered to the Space Shuttle to explore the near-space region between 50 and 75 miles above the Earth will be studied by the Denver division for NASA's George C. Marshall Space Flight Center.

The upper atmosphere area to be explored is too high to be studied by aircraft or balloons and too low for observations by spacecraft.

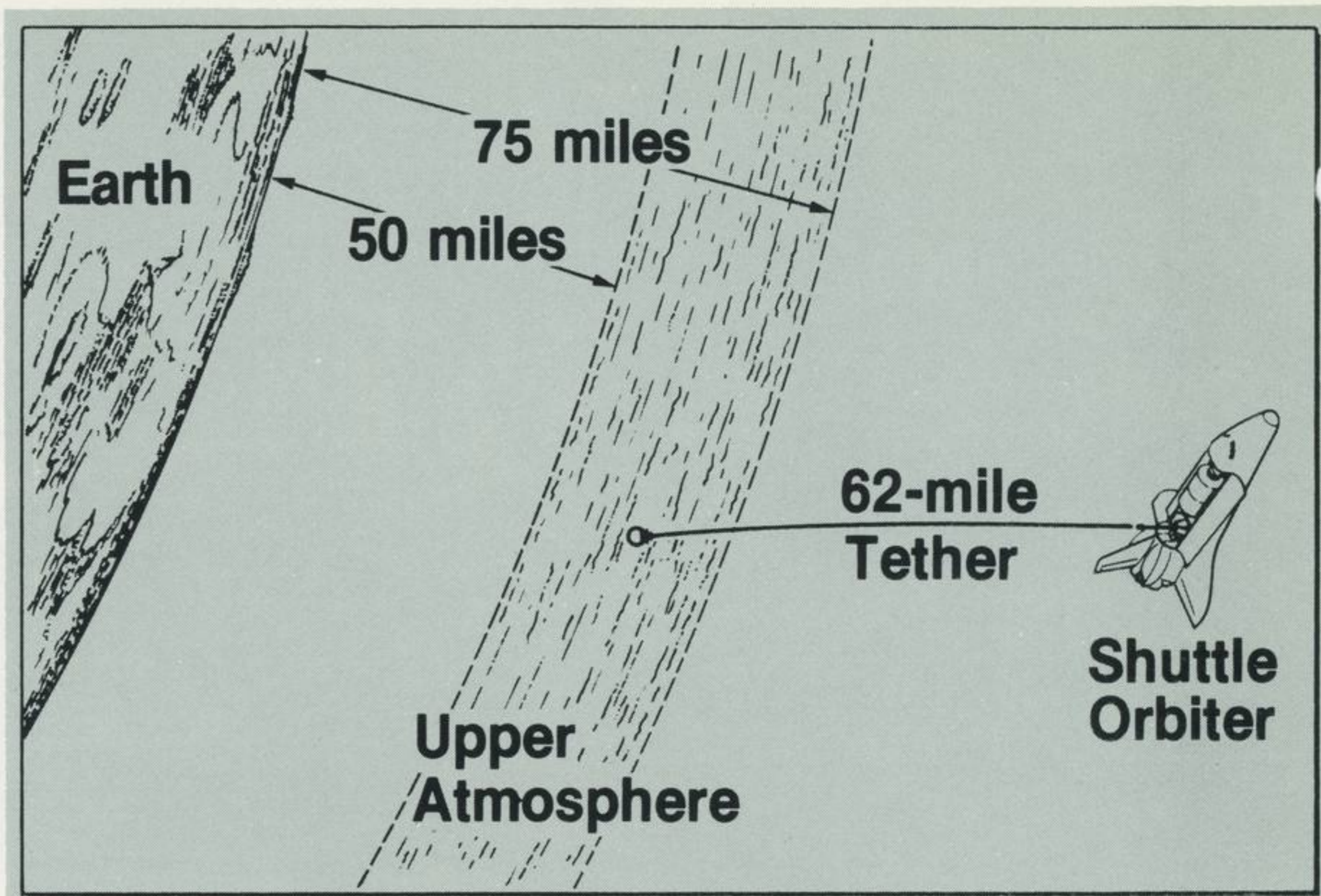
Results of the division's studies will permit later development of the tethered satellite system which will gather scientific data about the Earth's magnetic and gravity fields and study atmospheric or plasma physics.

As currently envisioned, the satellite would be unreeled from the Space Shuttle orbiter cargo bay on a thin cable up to 60-miles long and lowered into the upper regions of the Earth's atmosphere. After the mission, the satellite would be reeled back into the cargo bay and the data gathered from the satellite would be scientifically analyzed.

An untethered satellite cannot remain in low orbit for significant periods because atmospheric drag quickly effects the orbit and the satellite would return to the more dense lower atmosphere and burn up.

Other potential applications for a similar tethered system include cargo transfer between two space vehicles, retrieval of satellites or debris from space without having to maneuver the orbiter, and transfer of large amounts of energy to satellites remote from the orbiter.

NASA envisions several flights each year for the tethered satellite system on Space Shuttle during the 1983 and 1990 period, using various experiment payloads.



Drawing shows application of tethered satellite systems.

## Major changes made in salaried insurance plan

The Martin Marietta Corporation's annual review of benefit plans for salaried employees has resulted in major changes in the group insurance plan medical insurance provisions for active and retired employees.

Two new coverages have been added.

A "sudden and serious" illness benefit covers expenses for emergency care in a hospital caused by a serious illness and includes ambulance fees. The benefit provides specific coverage for serious illness similar to the plan's emergency accident coverage.

The other new coverage provides reimbursement at semi-private room rates for treatment at state or federally licensed alcohol or drug abuse facilities for up to 45 days per confinement. Out-patient coverage will be provided under the medical catastrophe provisions with reimbursement on the basis of 80 percent of 50 percent of covered expenses.

Increases in coverage include:

- Medical catastrophe maximum up from \$100,000 to \$1 million
- Dollar conversion factor applicable to the surgical, anesthesia, and diagnostic schedules up from \$8 to \$9
- Improved maternity benefits with increase in payments for normal delivery from \$200 to \$315; Caesarean section from \$400 to \$450; and miscarriage from \$100 to \$135. New born infant expenses, such as hospital nursery fees, now will be covered.

- In-hospital doctor's attendance benefit up from \$6 to \$8 per day of confinement

For retired salaried employees, the convalescent hospital expense benefit goes from \$22 per day to the semi-private room rate. In addition, retired salaried employee contributions for medical insurance will be eliminated January 1, 1978.

Active salaried employees pay none of the cost of medical insurance.

The changes in the plan went into effect October 1.

## Performance Sharing Plan announced

A pamphlet presenting the highlights of the Martin Marietta Performance Sharing Plan has been distributed to all salaried employees at the Denver division.

The plan, as described in the pamphlet, will provide salaried employees the opportunity for a systematic, substantial, and personal investment program. It also will provide a way to reward employees on total Corporation performance.

Employees may contribute up to six percent of their base salaries into a choice of investment funds. The Corporation will match the employee's annual contributions on the Corporation's results for the year.

The plan is targeted to begin in the first quarter of 1978.

### MARTIN MARIETTA NEWS

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Elinor Durso and Bill Hunt, CMA Supervisor, with electrical technician Dick Guay, check voltage and current recorder reading of an airborne flight battery.

### At Vandenberg

## Quality assurance's family affair

"Quality Assurance" are household words at the Durso residence. Elinor is a quality assurance inspector assigned to Vandenberg flight operations' contractor maintenance area, while Ray, her husband of 19 years, is a civil servant in the Air Force quality assurance program at Vandenberg AFB.

Among others, Elinor's responsibilities are receipt and storage inspection of ordnance items; material shipping receiving inspections; and calibration lab surveillance. She also performs in-process inspections of modifications, repair and tests accomplished in the mechanical shops, the electrical/electronic, and SCAPE suit shops.

An experienced quality assurance inspector, Elinor has diversified experiences both educationally and vocationally. After completion of a four-year course at IBM's technical training school in Kingston, New York, she was employed by them as a technical supervisor. She later earned her teacher's certificate from Brevard Community College in Florida, and consequently was employed in Titusville as a substitute teacher for kindergarten through eighth grade. She is also accomplished in the German language, keypunch operation and, for variety, is a NASA-certified solderer.



Vandenberg flight operations director Thomas S. Fujiyoshi listens attentively as Officer Shelby Adams of the California State Highway Patrol explains the rationale behind the California 55 mile an hour speed limit. Adams held a one-day safety symposium for Martin Marietta employees at Vandenberg AFB recently as part of the aerospace firm's emphasis on highway safety.

### At Canaveral

## Everyone gives the United Way

Every employee at the Denver division's Canaveral flight operations has pledged a contribution to the United Way.

Eddie L. Roberts, who headed the campaign, reported a five percent increase in contributions this year, with employees pledging \$21,362 to support Canaveral area United Way agencies.

## United Way drive called successful

The recently completed United Way fund drive in the division was called successful by Robert G. Garcia, coordinator of the campaign.

"We always aim for 100 percent participation in the campaign," Garcia said, "and five of our departments achieved that goal. Others came close. We have nearly 93 percent of all employees contributing to United Way."

Contributions are more than \$10,000 higher this year than they were in 1976. In 1976, employees contributed \$157,182; pledges this year are \$167,805.

## Christmas at Pops on Channel 6

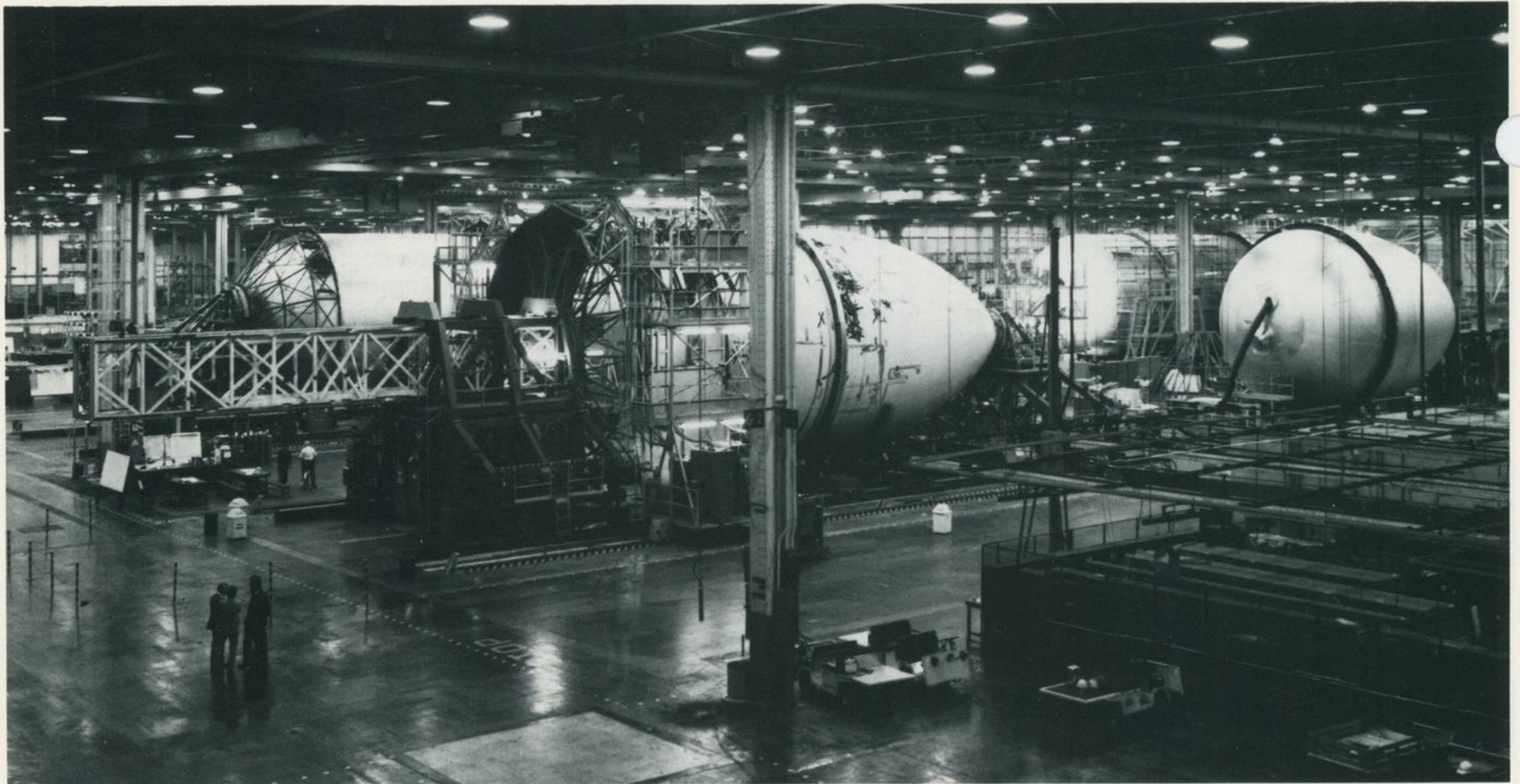
Whip up some eggnog, drape some tinsel on your television set, and join Arthur Fiedler and the Boston Pops Orchestra for Christmas at Pops, December 23 at 9 pm on Channel 6 on PBS.

Taped at Boston's famous Symphony Hall amidst traditional Pops tables, punch, and colorful Christmas decorations, Christmas at Pops features Maestro Fiedler and the Boston Pops, joined by the Tanglewood Festival Chorus, John Oliver, conductor.

The night's musical fare begins with a suite of carols called "The Many Moods of Christmas," then continues with the dream pantomime from Humperdinck's "Hansel and Gretel," Waldteufel's well-known "Skater's Waltz," Irving Berlin's "White Christmas," and "Sleigh Ride" by Leroy Anderson.

A sing-along is encouraged when Maestro Fiedler turns to such caroling favorites as "Joy to the World," "It Came Upon a Midnight Clear," "Away in the Manger," and "Jingle Bells." And the evening ends in the holiday spirit, as it began, with another "Moods of Christmas" suite.

Along the way, Maestro Fiedler — Boston's best-known and best-loved citizen, who has put an indelible mark on the musical tastes of millions throughout the world — is visited by a very familiar Christmas guest in a red suit and white beard, who presents the 83-year-old conductor with a very special present.



The standard test article and ground vibration test article liquid oxygen and liquid hydrogen tanks are being prepared for testing in this photograph at Michoud.

The standard test article liquid oxygen tank is in the immediate foreground. It is positioned on the 5018 assembly fixture having its welds x-rayed. After further instrumentation and testing, the tank will be transported by barge to the Marshall Space Flight Center (MSFC) in Huntsville for structural testing.

## Orlando to expand production facility

Martin Marietta has signed an agreement to purchase a 15-acre site and two existing leased buildings housing the Orlando division's electronics production facility near Ocala, Florida. The Corporation plans construction on the site that will more than double the present size of the plant.

Initially, the expanded complex will produce printed circuit boards and other electronic components to meet anticipated high-volume production of the U.S. Army's Copperhead laser-guided projectile, which is among the principal defense contracts held by the Orlando division of Martin Marietta Aerospace.

The construction phase of the Ocala expansion program is scheduled for completion by June 1978, according to Robert J. Whalen, vice president and general manager of the Orlando division. The enlarged plant should reach full production in 1979.

The standard test article liquid hydrogen tank, in the right background, is being instrumented for testing at MSFC. Before being transported by barge, the tank will be moved to the vertical assembly building for thermal protective system application and intertank mating. It will then go to Huntsville.

The ground vibration test article liquid oxygen tank, in the right foreground, is mounted on the 7023 fixture. After completing weld x-rays and miscellaneous instrumentation, the tank is moved to the

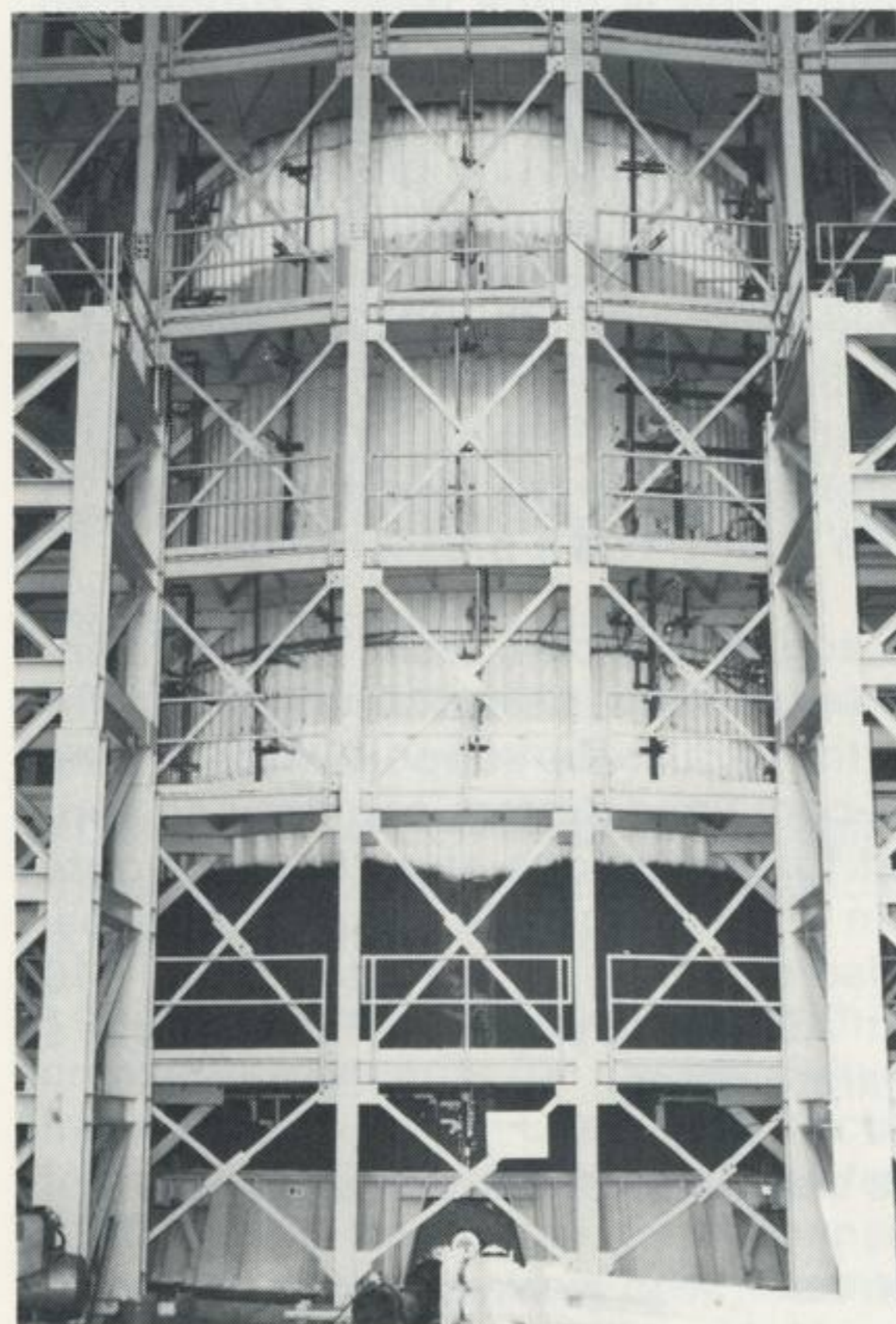
vertical assembly building for cleaning, prime coating, and mating with the ground vibration test article liquid hydrogen tank and the intertank. The ground vibration test article external tank will go to MSFC for vibration tests.

The ground vibration test article liquid hydrogen tank, in the left background, is undergoing major assembly in the 5019 fixture. Completion of the assembly weld will be followed by normal production cycles, resulting in the tank becoming a major part of the ground vibration test article external tank.

## Dividend increased

Martin Marietta Corporation announced its Board of Directors has voted this year's second increase in the cash dividend on its common stock, raising the quarterly payment to 40 cents, or a \$1.60 annual rate.

The fourth quarter payment, at the new 40 cent rate, will be paid on December 30, 1977, to shareowners of record as of November 28. The prior quarterly rate was 37½ cents per share.



*The last in a series of 10 tests to verify that the external tank can withstand the structural stress of flight toward earth orbit has been successfully completed at the Marshall Space Flight Center, Alabama.*

*During the tests, in which there were no failures, loads as high as 4.5 million pounds were applied upward and downward to the cylindrical tank. The loads were applied by large hydraulic jacks actuated by computer commands and monitored by 2568 instrumentation channels. The applied forces were exerted to induce bending and twisting effects as well as straight up-and-down loads.*

*The tank is shown in the test stand.*