

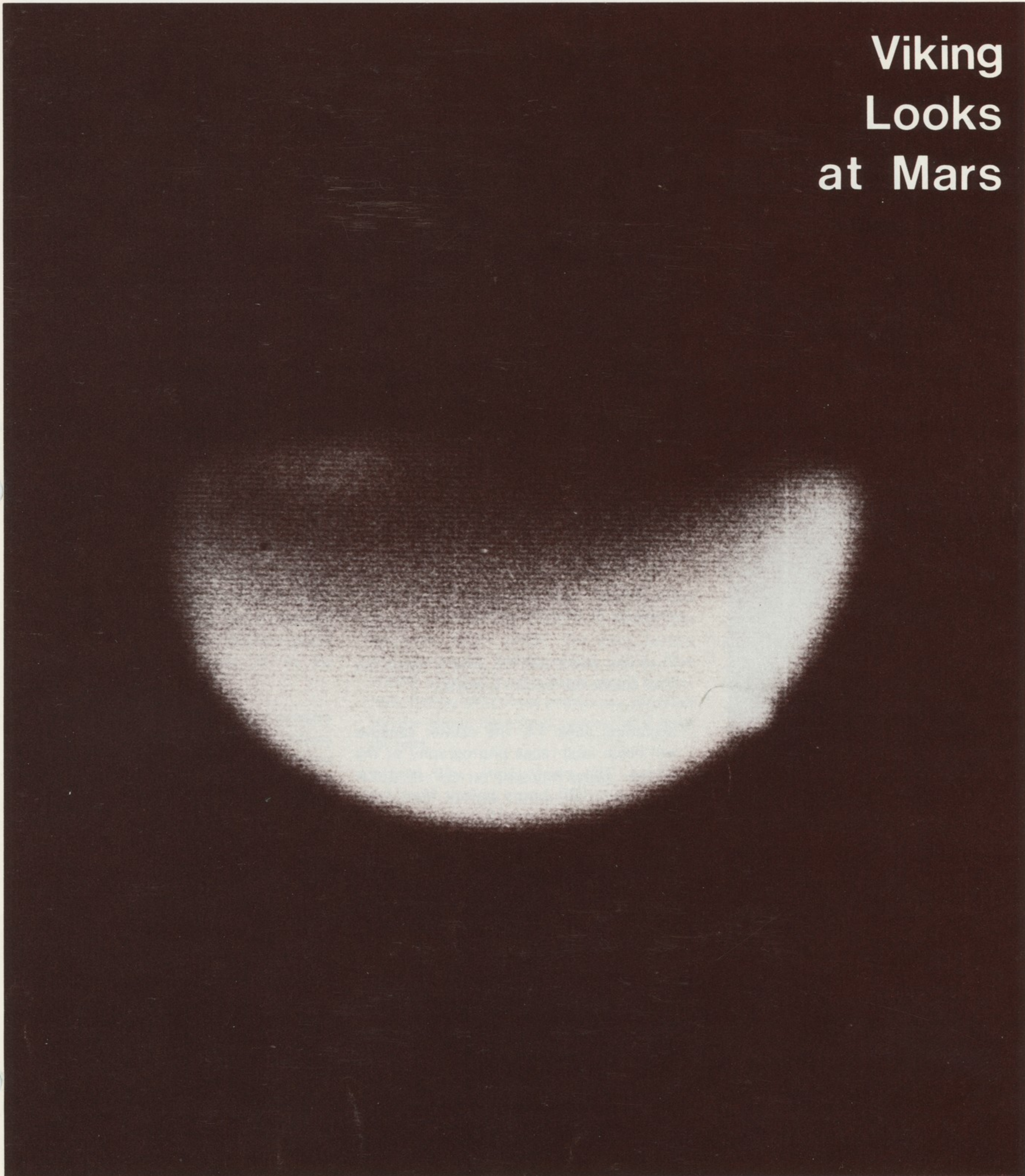
MARTIN MARIETTA

news

DENVER DIVISION

NUMBER 7/1976

Viking
Looks
at Mars



Manipulator arm development at mid-point

The manipulator arm will be used in space in conjunction with a closed circuit TV system to provide the dexterity of a human arm for maintaining, servicing, and troubleshooting of satellites. Proposed for use on the earth orbit tele-operator spacecraft (EOTS), the manipulator arm can be operated remotely from Space Shuttle or a ground-based station.

"We have developed manipulator technology over the past seven or eight years with internal funds and under several NASA study contracts," Britton said. "We are the leader in the technology and are the only U. S. company with a contract for production of a flight manipulator."

Britton, a graduate of Drexel University, began his Martin Marietta career on the student coop program in Baltimore, working there until 1968 when he came to Denver.

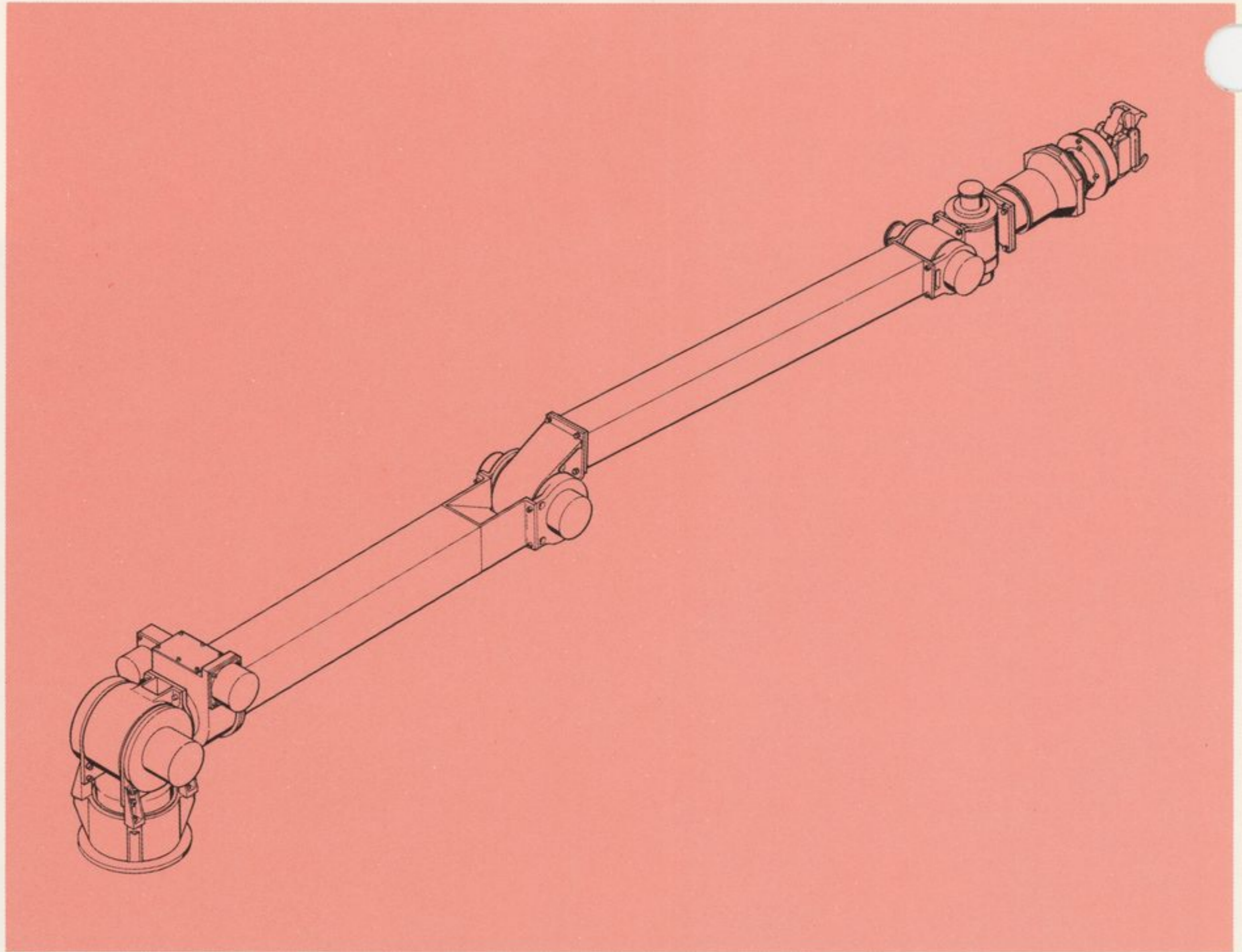
He was technical lead and later program manager on the lunar drill program. Upon that program's completion, he became product integrity engineer on the Viking lander surface sampler. He has continued to work on an interim basis on the surface sampler while leading development on the manipulator arm.

Also assigned to the protoflight manipulator arm program are Gilbert M. Kyrias, technical lead; Michael Snodgrass and Carter Lord, designers; L. K. Schwab, electrical lead; Lloyd LaGrange, manufacturing lead and machinist; and Ronald Phelps, machinist.

The protoflight unit is being built in the engineering model shop.

The division is mid-way in a program to design and build a protoflight manipulator arm to be used for general purpose servicing or troubleshooting of satellites in space.

W. R. Britton, who was proposal manager and became program manager, assigned to systems engineering, when the contract was won, said, "The word 'protoflight' describes this program perfectly because the unit is a development and qualification test unit and will become the flight article."



Protoflight manipulator arm is an eight-foot long replacement for the human arm and hand to be used in space for servicing and inspection of satellites. Like its human counterpart, it has a shoulder, at left, an elbow, in center, and a wrist, at far right.

June busy month for Viking

June will be a busy and eventful month for Viking I as the space craft moves closer to its meeting with Mars.

First key event will be June 9 when the final course correction is made.

Beginning June 14, the orbiter cameras will begin long range photography of the planet. The photography will continue until about 20 hours before Mars orbit insertion, set for June 19.

Viking will be placed in a 930-mile by 20,500-mile orbit with a period of 24.6 hours to match Mars period of rotation.

The spacecraft will orbit Mars for at least 10 days after reaching the planet to acquire data for a precise landing and to check the preselected landing sites which have not been viewed since the Mariner IX flight in 1972.

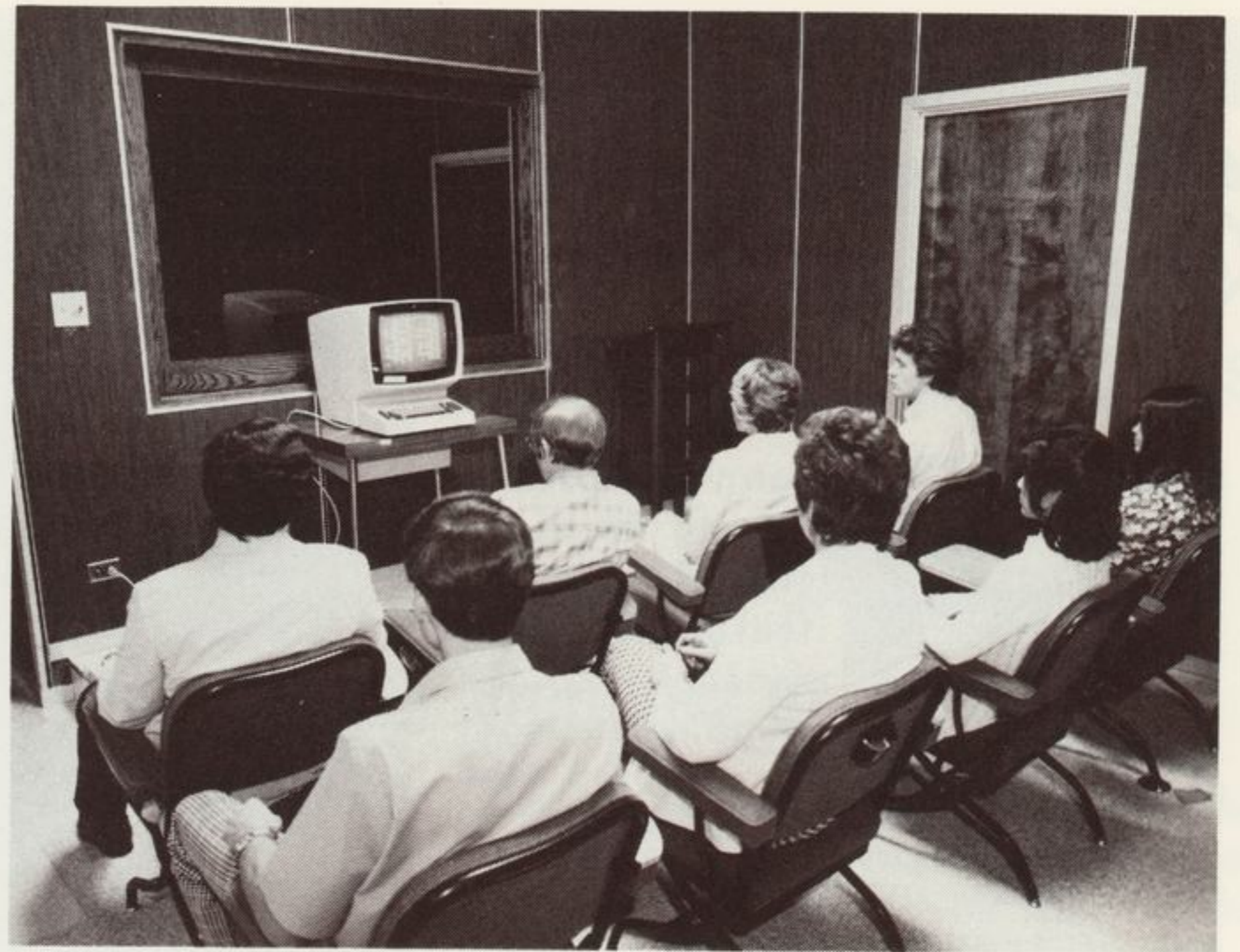
The orbiter scientific instruments will be used to determine whether the surface is suitable for landing and whether the moisture and temperature conditions are compatible with the search for life.

On the Cover

At 7,000,000 miles and closing the first Viking Spacecraft's cameras are now well in view of Mars as it approaches the planet at more than 73,000 miles-per-hour relative to Earth. The photo on the cover was taken May 1. The small light area at upper left is Mars' south polar hood, a large bluish-white cloud that covers the south pole much of the Mars year. The spacecraft has already flown more than 373,000,000 miles on its 11-month journey to a soft landing on Mars now scheduled for July 4. Viking 1 will enter Mars orbit June 19 and begin photographing the surface to verify a suitable landing site. Viking 2, an identical spacecraft now following Viking 1, will enter Mars orbit August 7 and is scheduled to make its landing September 4. The photo was received and enhanced at the Viking Mission Operations Center at the Jet Propulsion Laboratory in Pasadena, California. (The small white bulge at lower right is a computer error.)



Dr. David R. Lenorovitz, left, who heads the division's man-computer interaction laboratory, reviews operation of laboratory equipment with Robert Working and Rosemary Morrell, systems designers and programmers.



Members of the software systems section, headed by John Flater, check out a display of program information in the man-computer interaction laboratory's new facilities in SSB.

MCIL develops more usable, lower cost systems

More useable computer systems developed at much lower costs are the goal of the division's man-computer interaction laboratory (MCIL) recently moved to the Space Support Building (SSB).

MCIL is part of the mission operations and software department headed by Dr. Richard J. Sylvester. Dr. David R. Lenorovitz is in charge of MCIL, working for John Flater, chief of the software systems development section. Robert Working and Rosemary Morrell handle programming and software implementation.

"Everyone in a work environment that uses computers to support the decision-making process is necessarily concerned with man-computer interaction and its effect on the quality and timeliness of the work output," Lenorovitz said. "There is a consensus that deficiencies in functional design are major contributors to the cost of computer system development.

"Our experience shows that the inclusion of a rigorous evaluation of the total man-system interaction as part of initial system design produces computer systems that are more useable and can be developed at lower cost."

MCIL concentrates its efforts on the early stages of system development attempting to overcome deficiencies that result from a mismatch of system capabilities and user needs.

To develop a fuller understanding of the total problem-solving process, the MCIL uses a variety of simulation and modeling

techniques in cooperation with the user. The result is more workable man-computer systems.

Included in the functions of the MCIL are:

1. provide design support in the area of human factors in computer systems for division projects and projects of outside agencies;
2. design and develop methods and analytical tools to aid in defining user requirements and in the designing of operational computer systems;
3. perform experimental research in man-computer interaction.

Among projects where MCIL work has been applied are the functional design of a programming language for allocation and network scheduling; functional de-

sign of an interactive scheduling system; development of an on-board equipment check-out system for a space mission; and preliminary design and analysis of a command and control system.

"We can simulate a system before the system exists," Dr. Lenorovitz said, "showing the customer alternatives and an evaluation of each alternative. We help the customer determine his needs before hardware is designed and built, saving him money.

"There are still some things man can do better than a computer and we are devising ways for man to use his thinking abilities and then to communicate with the computer. We are developing effective two-way communication between man and computer."

First quarter energy savings aid other efforts

Energy savings ranging from 13.8 percent to 78.1 percent in the first quarter of 1976 have permitted the division to divert money from the purchase of electricity, natural gas, and fuel oil to other uses—including added support to proposal efforts and improved facilities maintenance to help protect the division's facility investment.

Here are the savings in 1976 over expenditures in 1975:

Electricity: January, 33.7 percent; Febru-

ary, 35.7 percent; March, 33.8 percent.

Natural gas: January, 23.7 percent; February, 14.6 percent; March, 13.8 percent.

Fuel oil: January, 33.7 percent; February, 78.1 percent; March 43 percent.

MARTIN MARIETTA NEWS

Published by Public Relations
MARTIN MARIETTA AEROSPACE
Call Ext. 5364 with suggestions
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Denver Division
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Denver, Colorado 80201

June 1976

Viking featured on TV Programs

Denver division employees have been participating in local television programs in an effort to spur interest in the Viking mission to Mars and its rendezvous with the planet in July.



Cooley

Carolyn Cooley, chief of the lander science sequencing team, appeared on the "Denver Now" program May 11 on Channel 2. Ms Cooley is a mem-

ber of the Viking Flight team and currently is on assignment at the jet Propulsion Laboratory (JPL) in Pasadena, Calif.

Robert J. Polutchko, who manages the the lander support office in Denver as part of the Viking flight team, appeared on "Free Time Express," the young peoples program on Channel 9. The show was taped for replay Saturday, June 5 at 5:30 pm.

Dr. Benton C. Clark, inventor of the x-ray fluorescence experiment on Viking, was featured in a 19-minute segment of "Colorado Weekly," on Channel 6. Participating with Dr. Clark was John H. Boyd Jr., director of public relations. The program will be aired June 15 at 7 pm.

"Sounding Board," the Channel 9 weekend feature program spotlighted John Goodlette, Viking chief engineer, and Dr. James D. Porter, head of mission planning for the Viking flight team at JPL. The program will be shown July 3.

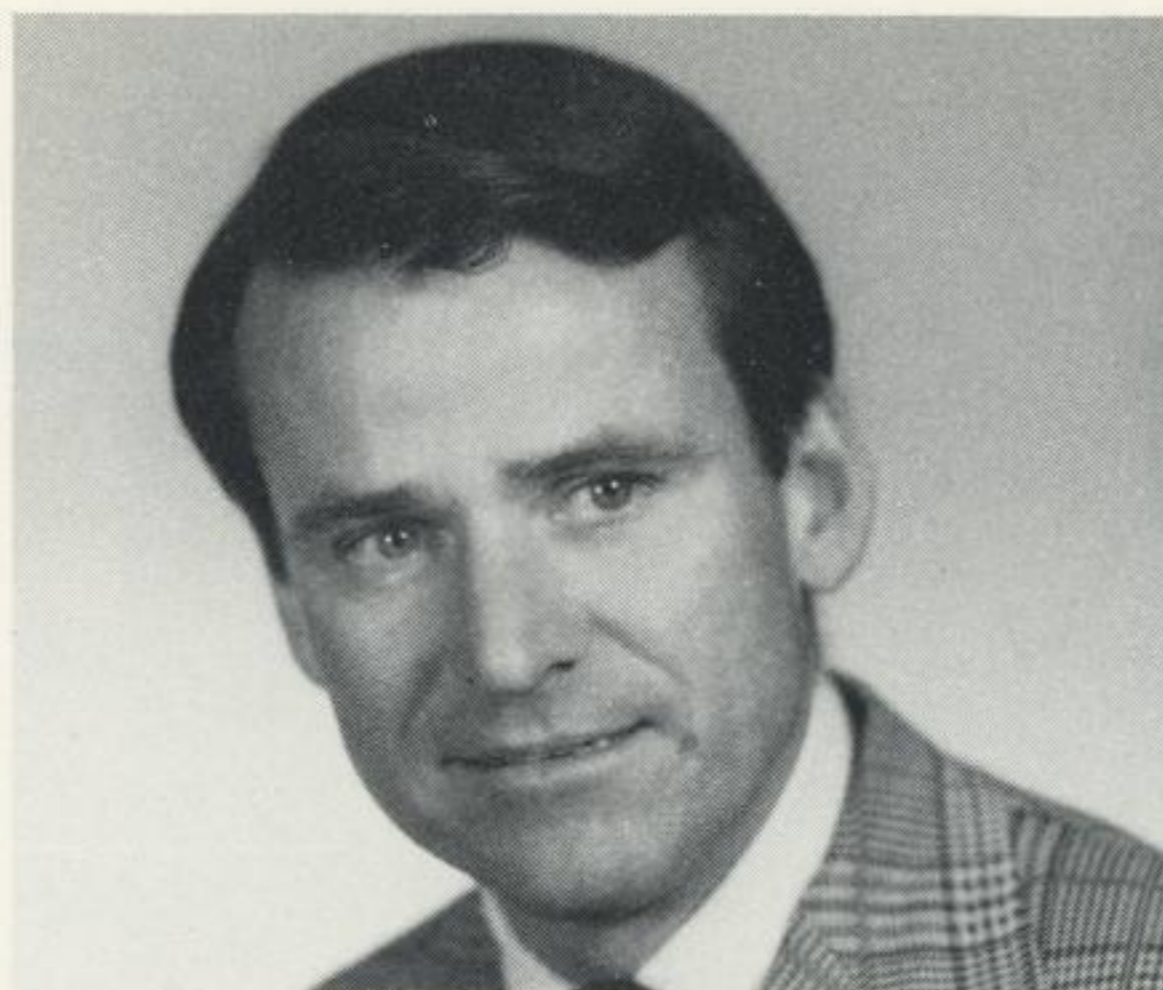
Noted scientist is new JPL director

Dr. Bruce C. Murray, noted planetary scientist and authority on Mars, Mercury, and Venus, has taken over as director of the Jet Propulsion Laboratory (JPL) at California Institute of Technology. He replaces Dr. William H. Pickering, who is retiring.

The Denver division has a close association with JPL, particularly on the Viking Project.

Dr. Murray has been at Caltech since August 1960 when he was named a research fellow in space science in the division of geological sciences. In 1963, he became associate professor of planetary science in that division.

From 1968 until his appointment as JPL director, he was professor of planetary science in Caltech's division of geological and planetary science.

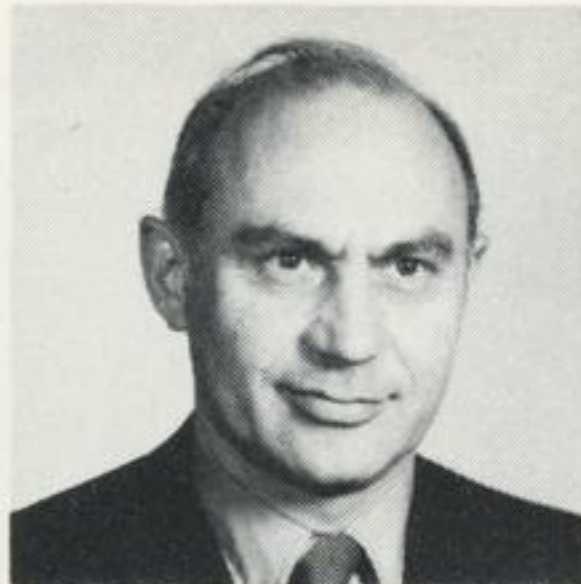


C. B. Hurtt, division vice president for program development and acting head of command and information systems, will deliver the graduation address at the Emily Griffith Opportunity School. Graduation for the Denver School is scheduled June 10. Hurtt was also named recently to the five-member board of directors of the Littleton Municipal Building Authority. The recently created nonprofit corporation was founded primarily to acquire, through purchase or lease, real estate in Littleton, make improvements to that real estate, and lease it for municipal purposes for the city of Littleton.

Ferrarini, Serotta in new management posts

D. D. Ferrarini and Maurice Serotta have assumed new management positions with Martin Marietta Aerospace.

Ferrarini, who has been business manager in the program development function in Denver, has been named to manage the combined legal and contracts function for the Orlando division. Serotta replaces him at the Denver division.



Serotta



Ferrarini

Ferrarini began his career with Martin Marietta in 1939 as a helper in assembly in the company's Middle River plant. After military service during World War II, he returned to the company and was a supervisor in assembly in Baltimore, moving later into the industrial relations function. In 1950 he was assigned to the contracts function there.

He came to Denver in 1970 with an assignment in contracts.

Ferrarini holds BS and LLB degrees from the University of Baltimore.

Serotta, a graduate of the U.S. Military Academy, has been with Martin Marietta 18 years, 13 of them in Baltimore and five of them in Denver. He earned his master's degree in chemical engineering from the University of Michigan.

News to feature information on basic economics

"The need for communicating the economics of business has seldom been more urgent than it is now," John H. Boyd Jr., director of public relations for the division, said in announcing a new feature for the Martin Marietta News.

The articles planned for the News will provide basic business facts, general economic information, and specific economic information about the division.

"Recent polls indicate only 19 percent of those questioned have a great deal of confidence in business," Boyd said. "It is my belief this low



Boyd

opinion of business is the result of a lack of information and a lack of understanding of what it takes to keep a business running."

The News articles will be prepared so employees will have information and an understanding of business.

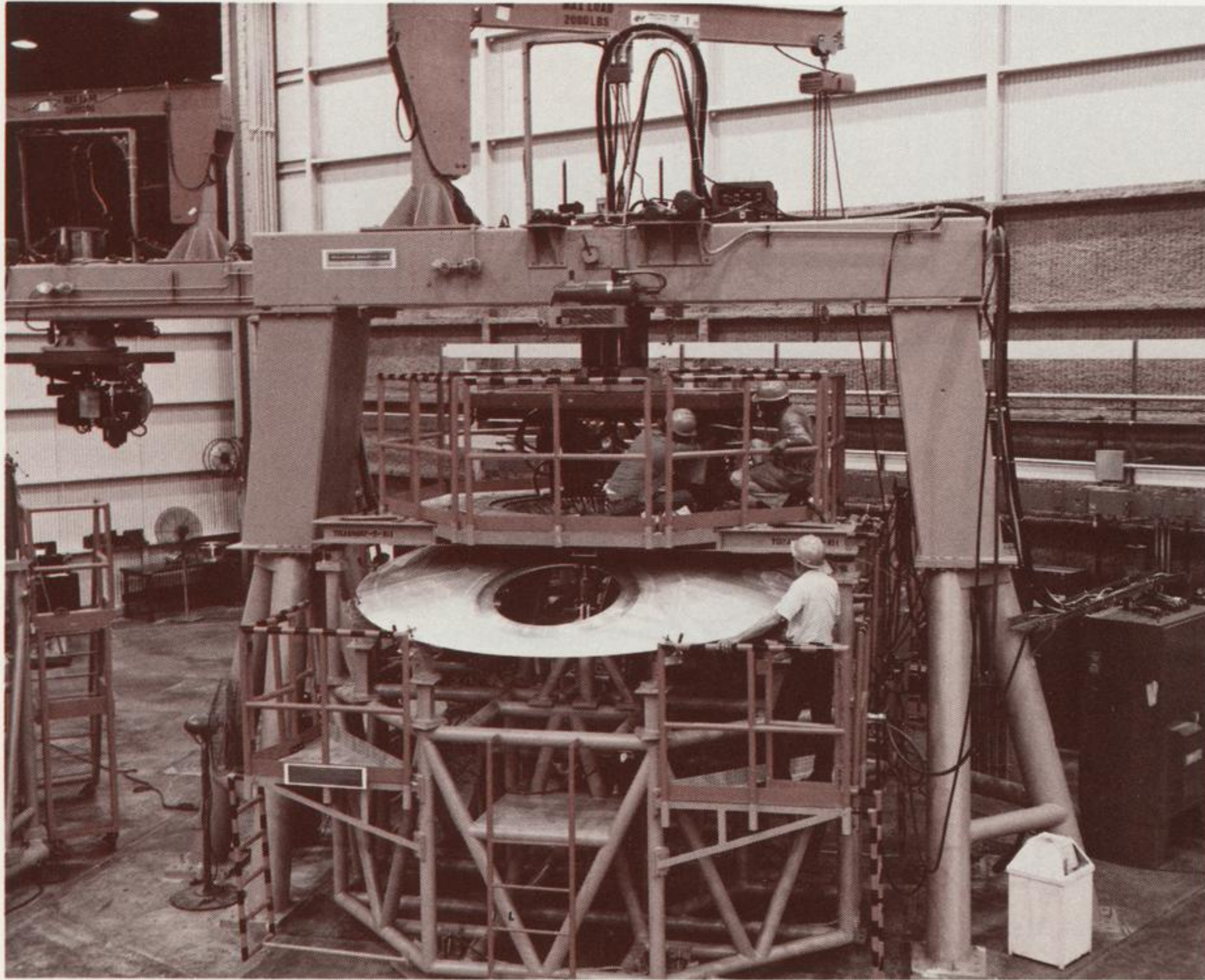
"In the year-end edition of the News, we published a calendar depicting the number of days of income it took for the division to pay our salaries, to buy supplies, to pay taxes, to provide pensions and insurance, to pay shareowners for the use of their money," Boyd said. "It is this kind of information we want employees to have.

"With an understanding of these economic facts, employees can aid in correcting the misinformation their neighbors and friends may have about the division and business in general."

Boyd's interest in providing more information to more people goes beyond the confines of the division. He is a member of the Project Confidence committee of the Colorado Association of Commerce and Industry. This group is working with business and industry in all of Colorado to develop a better understanding of the economics of business.

"Division management makes daily decisions based on the economics of our business," Boyd said. "We want everyone who is a part of this business to understand how and why those decisions were made."

'The Trojan Horse'



Larry Lang, welder, and Larry DeCuir, mechanic, are shown in process of machining a precision hole in an aft hydrogen tank dome cap as E. D. Allen, welding supervisor, observes their progress.

The gantry structure above their heads supports the machining head and the automatic weld equipment.

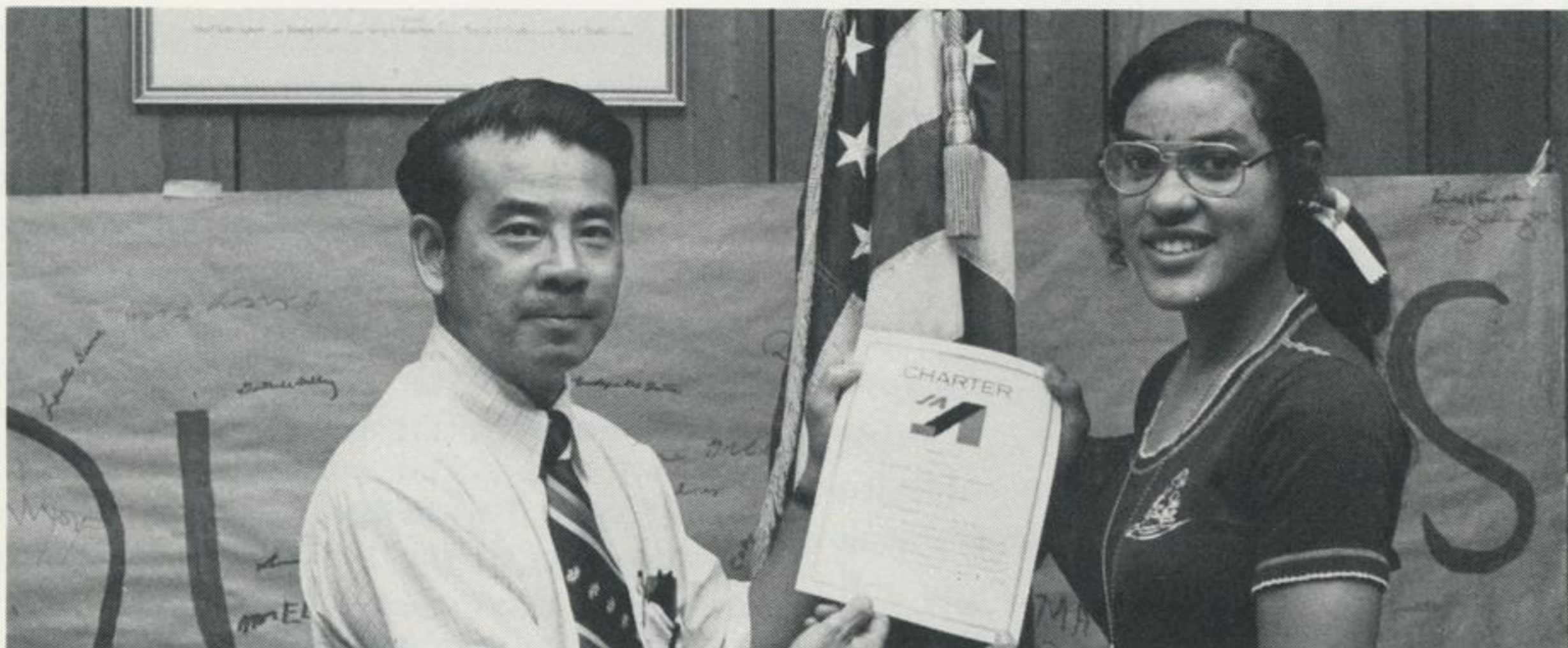
The dome cap is supported in a weld fixture below the gantry which locates and clamps the cap as well as the syphon plate-support fitting which is to be welded.

After the hole is completed, the syphon plate-support fitting is shrunk by chilling in liquid nitrogen, inserted into the dome cap and clamped. The fitting is allowed to warm up to ambient temperature and expand within the machined hole to attain an interference fit. The weld head

is then positioned and automatically sequenced to complete the weld operation.

To allow unloading, air bearings are energized and the fixture is easily maneuvered from under the weld gantry for access by the overhead crane. The visible opening in the dome cap is a man-hole fitting which was previously installed by the above described process in a similar tool.

Because of its size and shape, this tool located in the subassembly area of Michoud Assembly Facility, is commonly called "The Trojan Horse."



Alfred S. York, adviser for Michoud operations sponsored Junior Achievement Company, Jamart II, displays the company charter along with JA company president, Faye Doucette.

MARTIN MARIETTA

news

MICHOUD OPERATIONS

Michoud JA advisers honored at banquet

Seven Michoud operations employees and more than 2,000 teenagers were honored at the 21st annual Greater New Orleans Junior Achievement awards banquet.

Cited for their work as advisers to JA companies were Ray A. Baham, production operations; William T. Brown, material operations; Leona K. Hall, engineering; Gloria H. Richardson, production operations; Marilyn D. Robinson, product assurance; Marie C. Troullier, planning and computer services; and Alfred S. York, production operations.

The banquet was the culmination of a year's business activity for Junior Achievement companies.



Dominic Varacalle, structural design engineer, receives a Manned Flight Awareness Performance Award from A. M. Norton, director of engineering at Michoud. Varacalle also received a TV set for his suggestion to eliminate the use of matched and coordinated tools by outside vendors and Michoud operations production operations in connection with the liquid oxygen (LO₂) cable tray. This suggestion, which allows the use of regular drill plates, resulted in a cost savings of \$68,000.

In Michoud

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

From Michoud

Viking executive featured speaker at AIAA meeting



Goodlette

John Goodlette, Viking chief engineer, was the featured speaker recently at the monthly meeting of the Greater New Orleans chapter of

the American Institute of Aeronautics and Astronautics. The Denver division man discussed the mission of Viking I and Viking II.

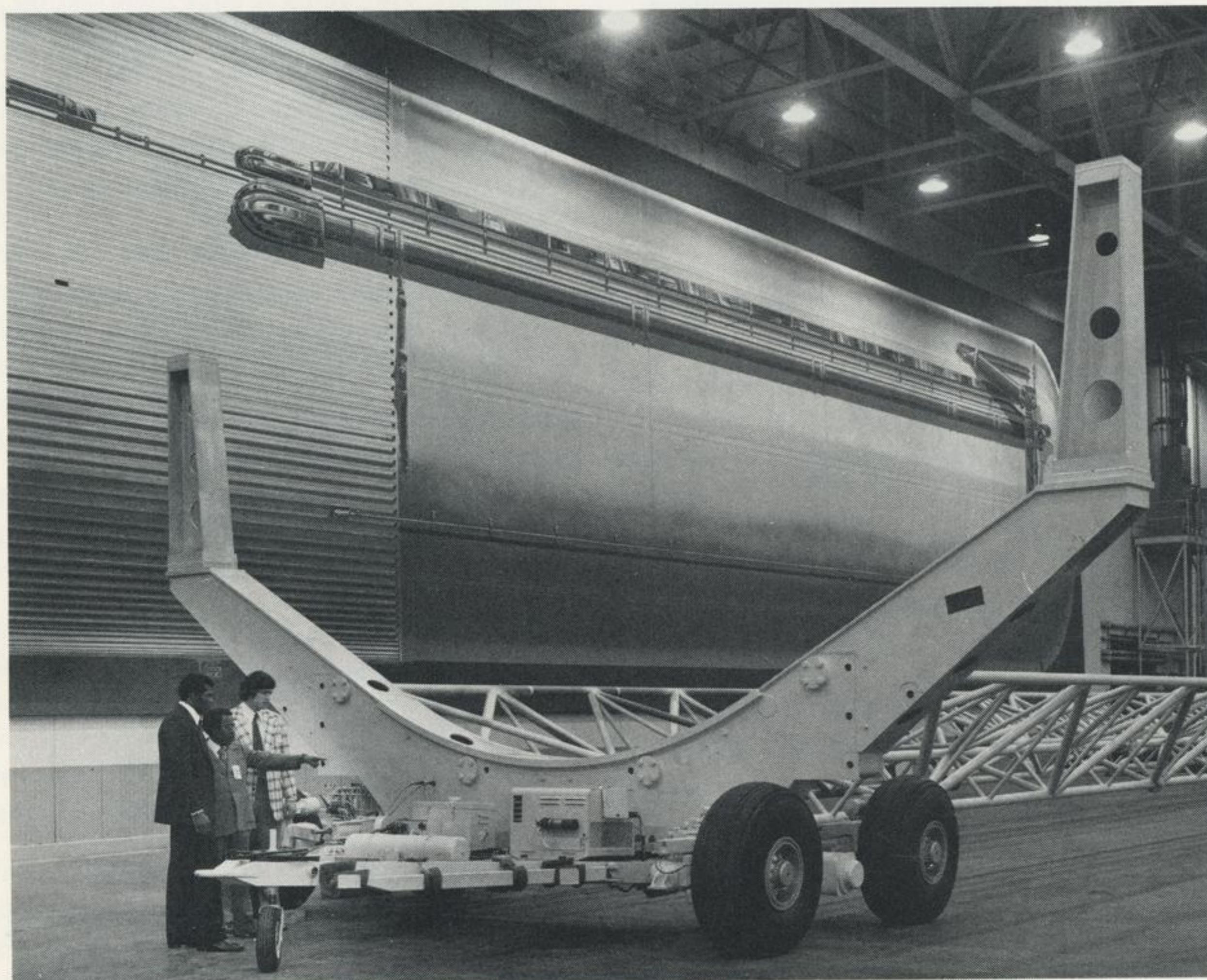
George Pfaff of Michoud operations product assurance was chairman for the event.

"The first Viking craft," Goodlette said, "will end its 11-month journey to Mars 15 days prior to its scheduled landing date of July 4, 1976. As now scheduled, the first Viking landing will occur at 8:45 pm CST on Sunday evening to commemorate the bicentennial of the United States."

Goodlette said both Viking I and Viking II are in perfect condition and discussed the pictures Viking I is transmitting to Earth.



Doug Sharp (at the console), Jay Williams and Ben Jurado (top side) check over the latest addition to Michoud's major production tooling—forward ogive trim and weld fixture. This 130,000 pound fixture, trims and welds together the eight panels and forward closure fitting of the forward og assembly of the external tank. The fixture was designed and fabricated by General Dynamics.



Summer work program begins for young people

Michoud operations summer employment program for under-privileged young people in the Greater New Orleans area is underway. In past summers, work has been provided for a total of 24 young people.

The summer program at Michoud is conducted in cooperation with the Department of Commerce and the National Football League. Community directors for the program are Bob Pollard and Durland Moore, members of the New Orleans Saints front four.

Bill Willis, center, describes function of external tank transporter to Bob Pollard, left, and Durland Moore, right, of the New Orleans Saints. The players are involved in a youth summer employment program and toured the Michoud Assembly Facility.