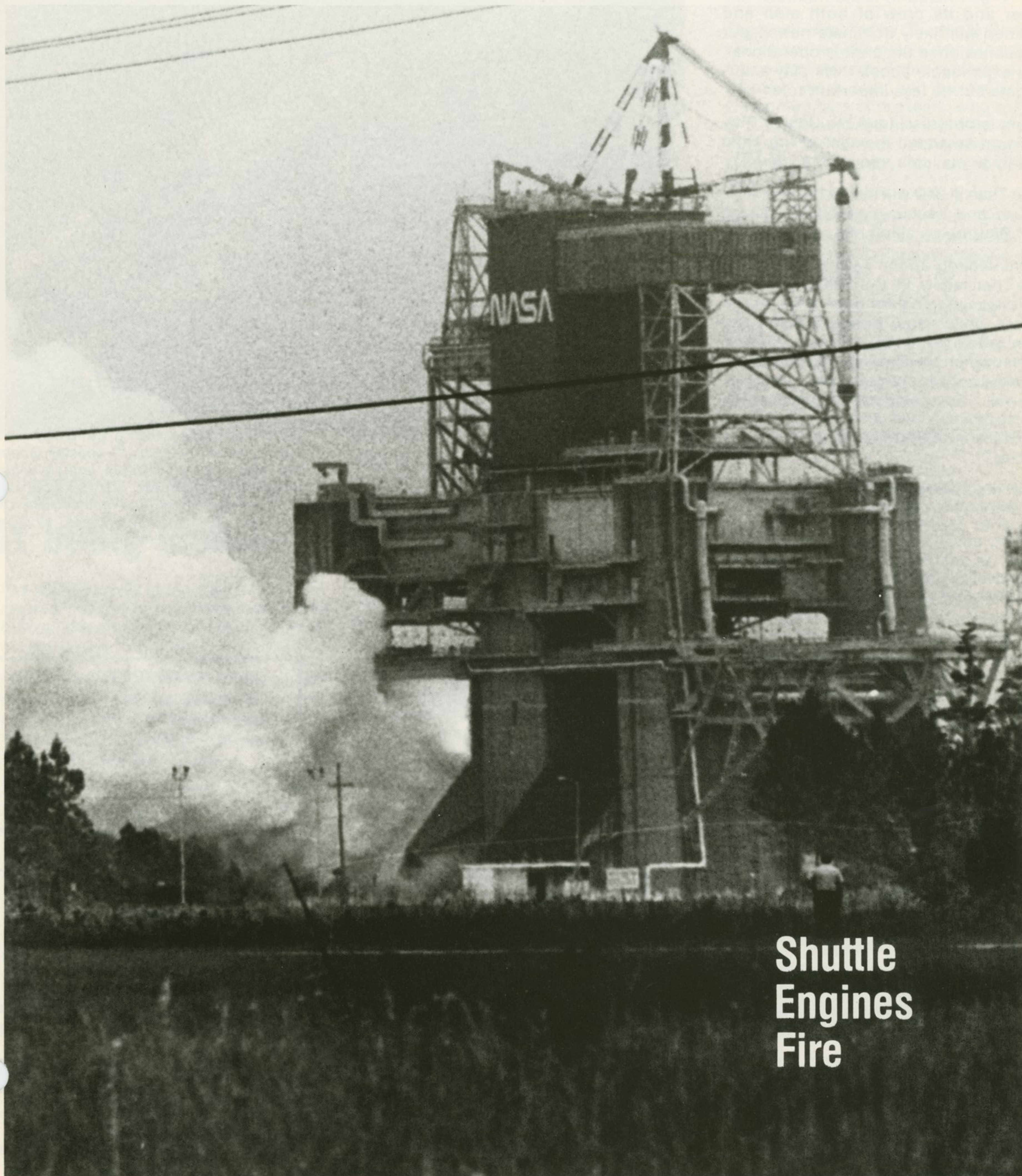


MARTIN MARIETTA

# news

DENVER DIVISION

NUMBER 7/1978



Shuttle  
Engines  
Fire

# Addition to Titan family to play key role in Shuttle

The age of the Space Shuttle is nearly upon us. And at a glance it would appear that the long and successful life of the expendable launch vehicle is at an ebb — not so, for the time being at least.

Although the reusable Space Shuttle orbiter and its crew of both men and women will likely dominate newspaper headlines once the craft is operational, the expendable booster will play a surrogate but no less important role.

Work is progressing at the Denver Division on an added member of the Titan family to play this role — Titan III 34D.

The Titan III 34D will insure the Air Force prime and backup capabilities during the Shuttle transition era.

Commenting on the newest member of the Titan family, Lt. Col. Gilbert F. Kelley, who is managing the project for the Air Force Space and Missile Systems Organization (SAMSO), said the question raised when the Defense Science Board chaired a study on the transition to Shuttle was, "How can the Department of Defense come up with an orderly transition from expendable to reusable launch vehicles?"

The recommendation was the Titan III 34D.

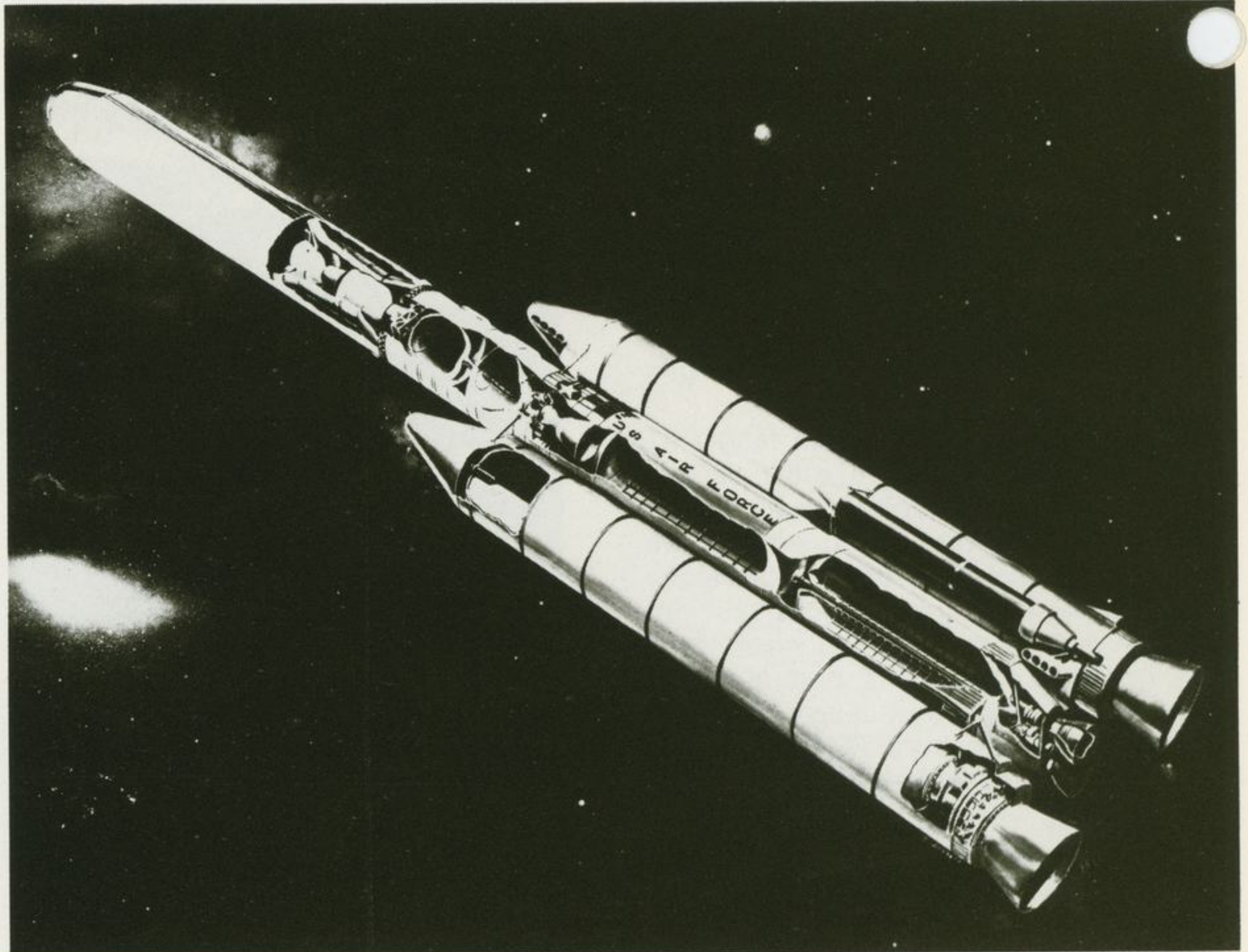
"Many advantages exist in the 34D concept, as opposed to continued use of a variety of boosters," Kelley said. "Two of them are common Titan III core for east and west coast launches and not having to dedicate a 34D launch vehicle to the east or west coast until six months prior to launch, as opposed to the three and one-half years required today."

The Titan III 34D also is compatible with the Inertial Upper Stage (IUS) now being developed. The IUS, designed to transport satellites from low-earth orbit to high-energy orbits or interplanetary trajectories, can be used with the Shuttle or as the upper stage for the 34D.

During the Shuttle backup era beginning in 1980, the 34D and IUS combination will be the contingency booster for top priority defense payloads. If a contingency launch is required, a Shuttle IUS with propellant offloaded — because of Titan throw-weight limitations — is installed on the Titan III 34D and readied for launch.

According to the Air Force, the entire reconfiguration process through launch will take about 90 days.

Although Titan III 34D will have an appearance similar to Titan IIID, some changes have been made to make it



unique. Solid rocket motors have been lengthened five feet each, one-half segment, to align with new common core attach points, and the payload fairing — a modification of the current Titan IIIC fairing — will range from 40 to 55 feet in length, depending on the type payload atop the IUS vehicle.

With the new fairing, the payload's environment will be nearly identical to that of the orbiter's cargo bay.

Current plans are to develop seven primary Titan III 34D launch vehicles with the first launch of two DSCS satellites in July 1980 from Cape Canaveral. Of the seven vehicles, four will be launched from the Eastern Test Range using the IUS and three will be used for polar launches from Vandenberg Air Force Base, Calif.

*Artist's concept shows cut-away of Air Force's modified Titan III booster renamed the 34D. The expendable launch vehicle, which can use the new Inertial Upper Stage (IUS), will launch its first satellites into orbit in July 1980. Concept was prepared by Denver Division artist Charles O. Bennett.*

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## Family Day at Lakeside

Martin Marietta Family Day at Lakeside will be held Saturday, June 17.

The amusement park at 45th and Sheridan will be reserved for Denver Division employees and their families from 10:30 am to 5:30 pm. Forty-two rides at the park will be free and will be operating from noon until 5:30 pm.

There will be games for children and adults in the stadium and the picnic

pavillion from 1 pm to 3 pm. Prizes will be awarded.

The Ridge Rider's Saddle Club will hold a gymkhana at the stadium from 3:30 pm to 5:30 pm.

A door prize drawing will be held at 3 in the central park.

Admission tickets for the event will be distributed with paychecks prior to Family Day.

# Authors, inventors honored at dinners

Eighty-two employees received recognition as authors and inventors at special award nights May 9 and May 17. Others will be honored for their contributions to the division's business at events scheduled through May and early June.

Matthew S. Imamura and Lee A. Skelly were named authors of the year at the May 9 event for their paper "Conceptual Definition of Automated Power Systems Management."

Robert O. Leighou was selected inventor of the year May 17. He was honored for his leadership in the development of high density digital tape recording technology.

Imamura is a senior staff engineer and Skelly a staff engineer in the division's electronics department.

Leighou is a senior staff engineer for data handling hardware.

Imamura, a native of Guam, has made significant contributions to many ongoing division programs and has supported many successful research and development proposals. He has published 12 papers on solar array/battery and fuel cell power systems. He has submitted three NASA new technology

*Robert O. Leighou, right, chosen Denver Division inventor of the year, receives a plaque from C. B. Hurtt, vice president and general manager of the division. Leighou received the award for his part in an invention used to maintain synchronization of tapes on division-built high speed recorders.*

disclosures and has one patent application in the area of solar cells and power processing systems. He was a key individual in the overall integration and operation of the Skylab power system.

Skelly has worked in the areas of computer aided design and simulation of radar systems; logic design of aerospace computers and special purpose space data processing systems; machine language programming for space computers; and has investigated effects of radiation on the operation and reliability of space electronic systems. He developed the software design, verification, and checkout on the microprocessor controlled battery system program.

Leighou is currently responsible for the development of an asynchronous data interleaver and deinterleaver for the Titan launch vehicle. He is also responsible for a division independent development and research task to improve the error rate in the high density digital tape recorders. He has been a technical director and a program manager for several contracts awarded the division by NASA.

Authors honored (individuals listed more than once indicate authorship or co-authorship of more than one paper):

*Honorable mention* - J. E. Anderson and D. A. Fester; P. E. Bingham and J. R. Tegart; D. A. Bolstad and L. W. Loechel; C. E. Carlston; B. C. Clark III; B. C. Clark III and A. J. Castro; B. A. Claussen II and R. E. Wachs; F. R. Clover Jr.; D. S. Crouch; Joseph DeVita; R. L. Donovan and Matthew S. Imamura; D. A. Fester, R. N. Eberhardt Jr., and J. R. Tegart; D. C. Freesland; R. C. Haefeli; M. S. Imamura and J. A. Sanders; R. N. Ingoldby; T. C. D. Knight; J. W. Lear and M. S. Imamura; D. R.

Lenorovitz; L. P. Oldham; W. E. Pipes III; J. R. Pretty and R. O. Hookway; J. A. Sanders and J. W. Lear; A. L. Satin and R. L. Gates; R. B. Schroer; R. S. Stites; E. L. Strauss; T. L. Tedrow, H. D. Brinkerhoff, and W. D. Rummel; J. R. Tewell and R. A. Spencer; J. P. Thornton and David Waddington; T. R. Tracey; K. W. Villyard and W. S. Ivers; R. E. Wachs and B. A. Claussen II.

*Distinguished contributors* - B. C. Clark III, A. J. Castro, and C. D. Rowe; E. A. Euler, G. L. Adams, F. W. Hopper (retired); M. S. Imamura and L. A. Skelly; C. E. Kirchhoff, J. D. Osborn, and B. A. McKeever; L. P. Oldham; F. M. Petersen, D. E. Cornick, and G. L. Brauer (Denver Data Center); P. P. Rao; P. S. Stafford.

Inventors honored:

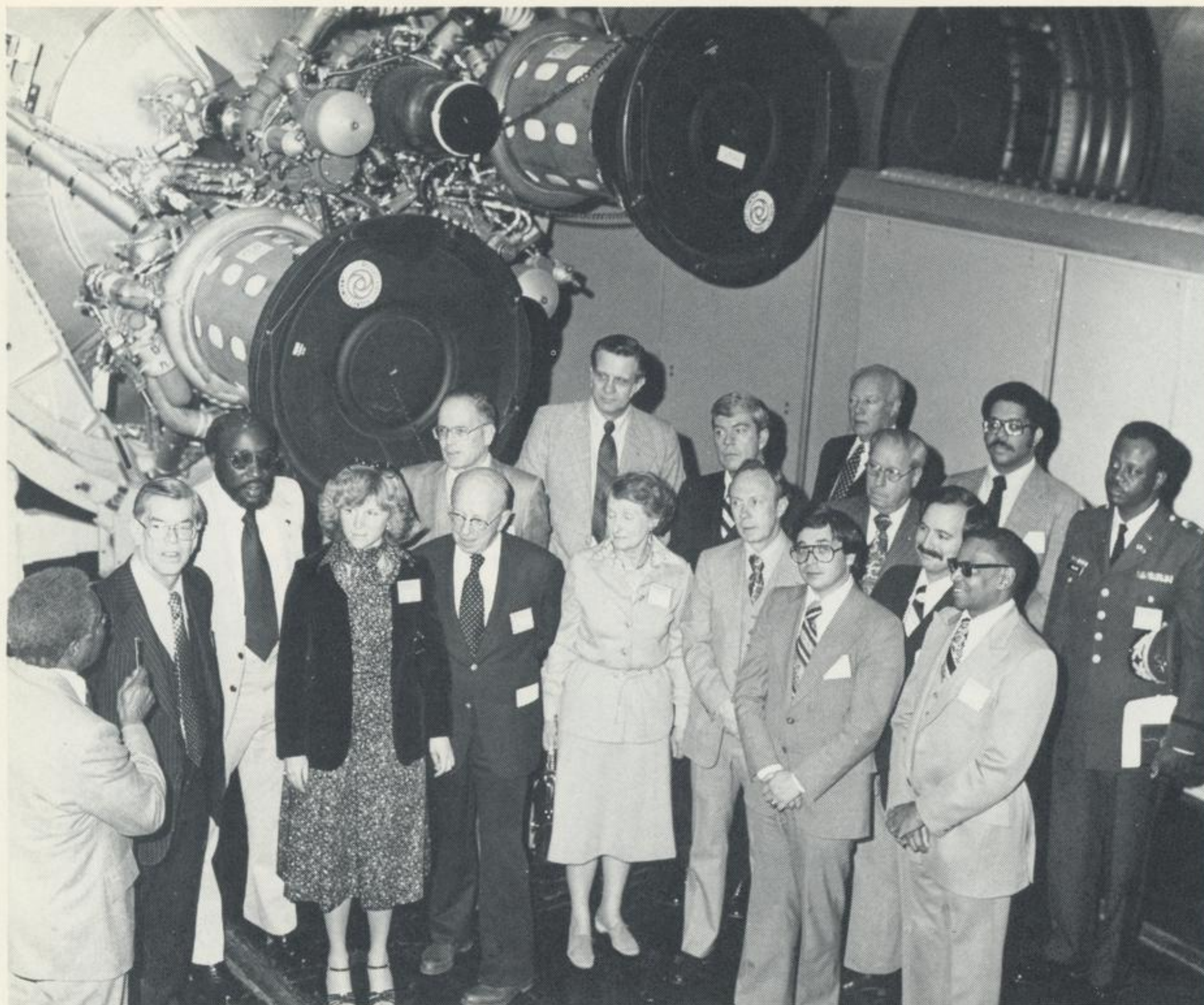
Jackie O. Bunting; Neil J. Butterfield; Merton L. Clevett; Theofanis R. Gavrilis; Lyle D. Graff; William A. Heffner; Roy J. Heyman; Charles F. Jackson; Bruno J. Jambor; Gerald E. Johnson; Robert O. Leighou; Guy D. Lynes; Dale A. Mikelson; Manuel R. Moreno; Delbert A. Morris; Raymond L. Opper; William J. Owen; Gary D. Rea; Fred R. Schwartzberg; Elvis D. Simon; Wayne E. Simon; Royzell F. Wells; Charles W. White.

Members of the publications award committee are E. A. Euler, W. L. DeRocher Jr., C. H. Green Jr., J. H. Kidd, George Morosow, with M. R. Macneal as secretary.

The committee selecting inventors for recognition included R. B. Bolles, W. L. Kershaw, R. H. Clausen, R. W. Vandekoppel, R. G. Morra, J. D. Eagen, P. L. DeArment, A. F. Knoke, with J. E. Salazar as secretary.

*C. B. Hurtt, left, vice president and general manager of the division, presented plaques to Matthew S. Imamura, center, and Lee A. Skelly, right, recognizing them as division authors of the year. Imamura and Skelly were co-authors of the award winning paper.*





The division's public relations department regularly invites community leaders to breakfast meetings for a briefing on current programs and for a tour of division facilities. The most recent guests are shown in the launch vehicle assembly area. Fitzroy Newsum, manager of civic liaison, at left with back to camera, describes the launch vehicle program. Guests, left to right back row, H. Douglas Bradley, chief staff writer, Sentinel newspapers; Dr. LaVerne McCummings, graduate school of social work, University of Denver; John W. Yetter, vice president, Stone & Webster Engineering Corp.; Roland D. Rousch, general manager, Marriott Hotel; James W. Reddick, president, Republic National Bank of Englewood; Steven L. R. McNicols, secre-

tarial representative, U. S. Department of Commerce; William H. Fonvielle, director of public affairs, Denver Regional Council of Governments; and Col. Alonzo Williams, commander, Rocky Mountain Arsenal; front row, Dr. Fern C. Portnoy, vice president and executive director, Piton Foundation; John C. Street, attorney; Mrs. Helen Street, attorney; J. Gregory Guinan, vice president, public affairs, KWGN TV; Douglas DiMarco, publisher, Colorado Business (extreme front); Norman Lawson, director, U. S. Department of Commerce (behind DiMarco); Nicholas L. Panetta, vice president, Republic National Bank; and George Morrison, administrative director, department of secondary education, Denver Public Schools.

## Aerospace sets intern program

Martin Marietta Aerospace has announced a June 15 deadline for applications for the Aerospace Headquarters Technical Operations Intern program.

The program will expose promising employees qualified in a technical field to operations at Aerospace headquarters as well as with selected Department of Defense, NASA, and other study groups having industry participants. In addition, the intern will take part in industry and professional associations, including congressional interfaces, affecting Martin Marietta Aerospace.

Further information on the program may be obtained from Roy Yamahiro, ext. 5226.

## Awards made for inventions

Nine Denver Division employees, two of them at Michoud operations, have been named by the Denver product development review board to receive cash awards for their inventions. Those receiving the awards and their inventions:

James C. Bedlair, space assembled structural member; Neil J. Butterfield, small bolt size separation device; Frederick W. Dawson and Thomas E. Nelson, antenna rib mounted solar panels; Jimmy W. Hill, Michoud, cryogenic cyntactic polyurethane adhesive; Robert O. Leighou, identification and recovery of interleaved asynchronous data in a noisy environment; Matthew Ti-Hua Liu, Michoud, fire retardant latex coating; William L. Newcomb, simplified isolation shock system — MX MAP; and Dr. Wayne E. Simon, hyper-space adaptive sorting.

## Your Insurance

This is one in a series of articles in which the most common questions about the Martin Marietta insurance program are discussed.

**Question:** When are hospital out-patient charges fully covered?

Martin Marietta medical insurance provides full payment for hospital out-patient charges

1. when a minor surgical procedure is performed

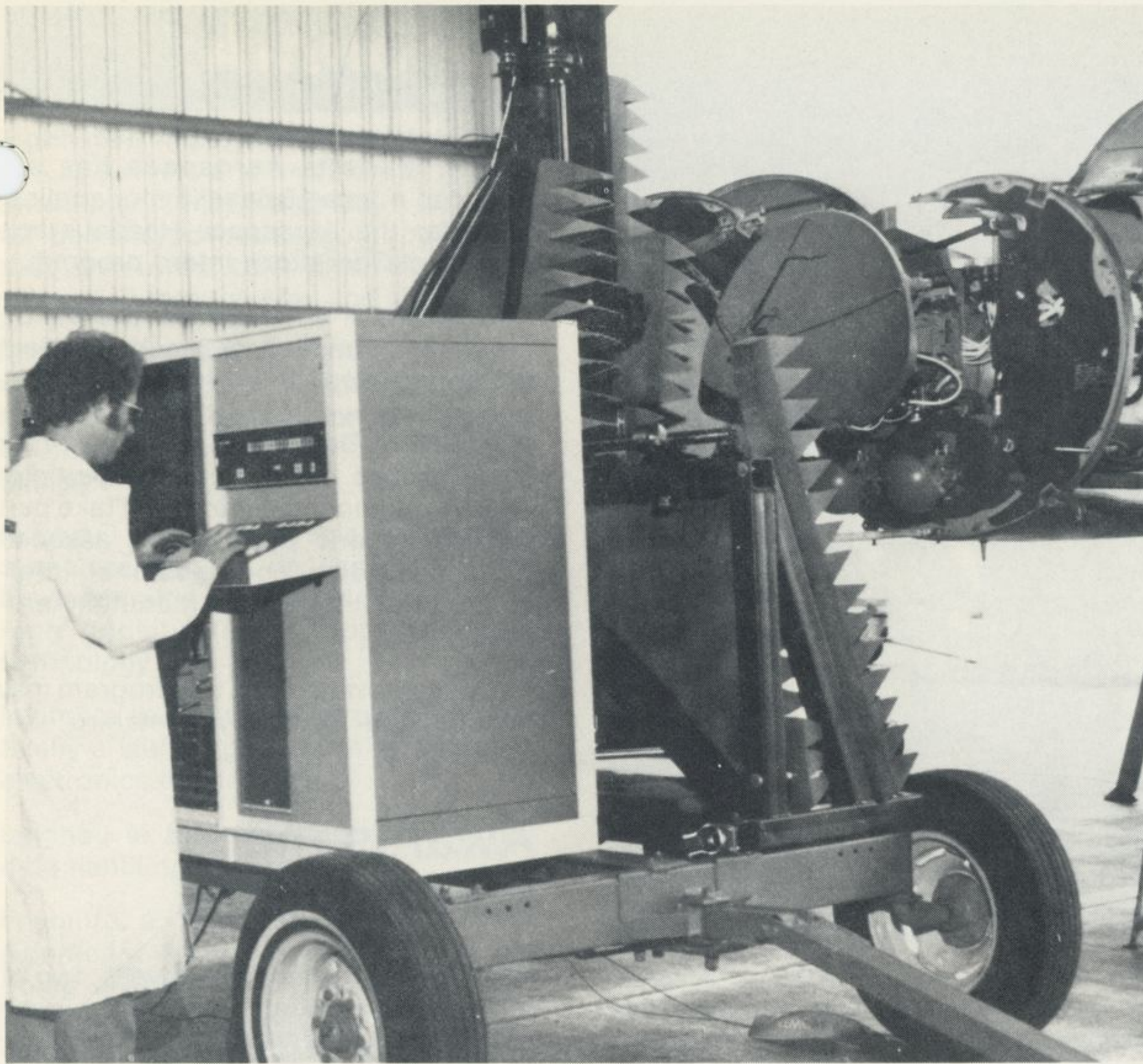
2. when treatment is given for an accidental injury within 48 hours after the accident

3. when treatment is received for a sudden and serious illness after the doctor's office is closed and when the illness would impair the health of the patient if the patient were not treated immediately.

### On the cover

The cluster of three Space Shuttle main engines, fueled by the main propulsion test external tank, successfully completed the first firing test at NASA's National Space Technology Laboratories, Bay St. Louis, Mississippi.

The engines ran for the planned 15 seconds at 70 percent of rated thrust, gulping liquid oxygen and liquid hydrogen from the filled external tank at a rate of more than 50,000 gallons-per-minute.



*Denver Division engineer Bruce McKeever is shown at the console of the portable pattern analyzer as it checks an antenna aboard an Air Force plane at Wright-Patterson Air Force Base. (See story: Pattern analyzer is being tested.)*

## Pattern analyzer is being tested

The Air Force has completed initial testing of a portable electronics instrument that quickly checks out aircraft antennas on the ground — rather than in flight.

Called a portable pattern analyzer, the device is the first instrument of its kind capable of testing the antenna properties of almost all Air Force radio frequency equipment.

The Denver Division built a laboratory model and the portable model of the device which was developed by the Air Force Avionics Laboratory's electronic technology division.

Mounted on a wheeled cart, the analyzer is rolled to the radome of an aircraft for antenna testing. The antenna measurements can be made with the radome off or on, and the analyzer requires only one coaxial cable hook-up to the antenna itself.

The portable pattern analyzer will be shipped to Cannon Air Force Base, N.M. in June for testing with F-111D aircraft.

The laboratory model is being used by the Air Force Avionics Laboratory for further research at Wright-Patterson Air Force Base in Ohio.

## Division to design heliostats, controls for European plant

The Denver Division has teamed with three European firms on a study contract for a 500 kilowatt solar electric generating demonstration plant to be built on the southern coast of Spain.

The work, directed by Charles N. Bolton, will be on the heliostat field and the master control system. Some systems engineering work also will be provided. Other members of the team, who will be in Denver the week of June 5 for meetings on the project, are Interatom of Cologne, MAN of Munich, and CASA of Madrid.

The contract was awarded by the International Energy Agency, an organization formed by nine European nations and the United States.

"In the first-phase contract we are to design the heliostat field and the master control system and provide cost estimates and time schedules in sufficient detail to permit approval for a demonstration plant," Bolton said.

The study is to be completed in September.

If approved, work on the second-phase contract for detail design and construction would begin in January 1979 and continue for two years.

The division is the only U.S. firm involved in the central receiver demonstration plant.



*The Martin Marietta Aerospace exhibit at the Hanover International Aerospace Exhibition featured the company's leadership in the precision delivery of tactical systems designed and built by the Orlando Division. Visitors to the exhibit, shown in the photograph, saw displays of TADS/PNVS fire control/navi-*

*gation system; Copperhead laser-guided artillery projectile; Pave Penny airborne laser spot tracker; and two systems being developed in cooperation with European firms, ATLAS and Bussard laser-guided mortar round.*

## At Michoud

### **External tank ground vibration tests begin this month**

The first phase of ground vibration tests on the Space Shuttle external tank and orbiter begin this month in the dynamic test tower at NASA's Marshall Space Flight Center, Huntsville, Ala.

This past month the external tank and orbiter were installed inside the test tower in the configuration they will be in during the post solid rocket booster separation phase of the launch. This is the first time these two major components have been mated as they will be during launch. The ground vibration test external tank was built by Martin Marietta at Michoud and delivered to NASA by barge in February.

The external tank and orbiter are soft-mounted inside the stand using a system of air bags and cables to suspend them under near flight conditions. Engineers then apply vibrations to the vehicles using air bags and exciters powered by acoustic amplifiers. Sensors on the external tank and orbiter will record the characteristics of the vibrations as they pass from one area of the vehicle to another.

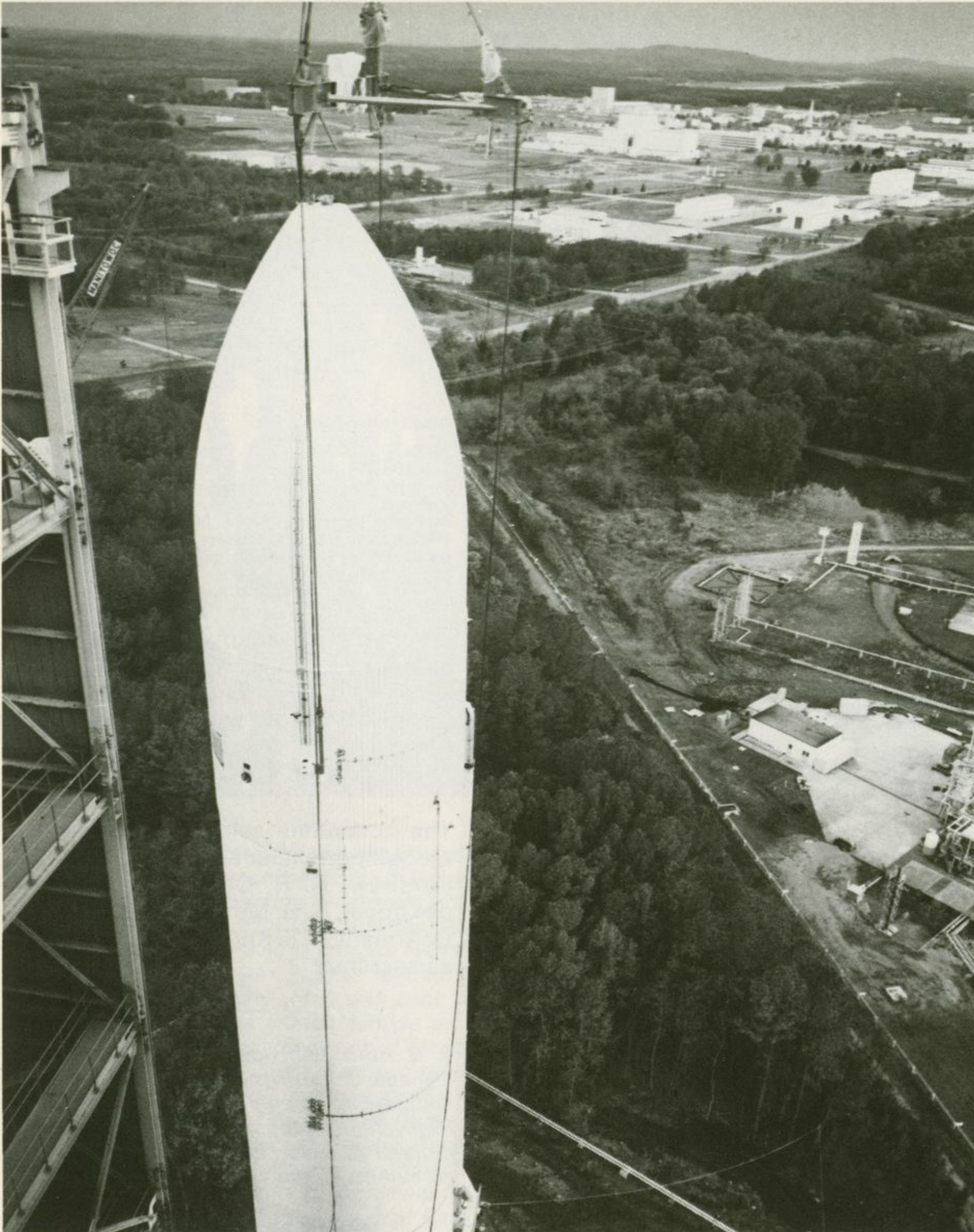
This information will allow test engineers to verify the system design and mathematical models that predict how the Shuttle's control system will react to the much more severe vibrations expected during the launch and flight into orbit.

Later in the test program this summer the solid rocket boosters will be mated to the external tank to test the system during the early boost phases of the launch.

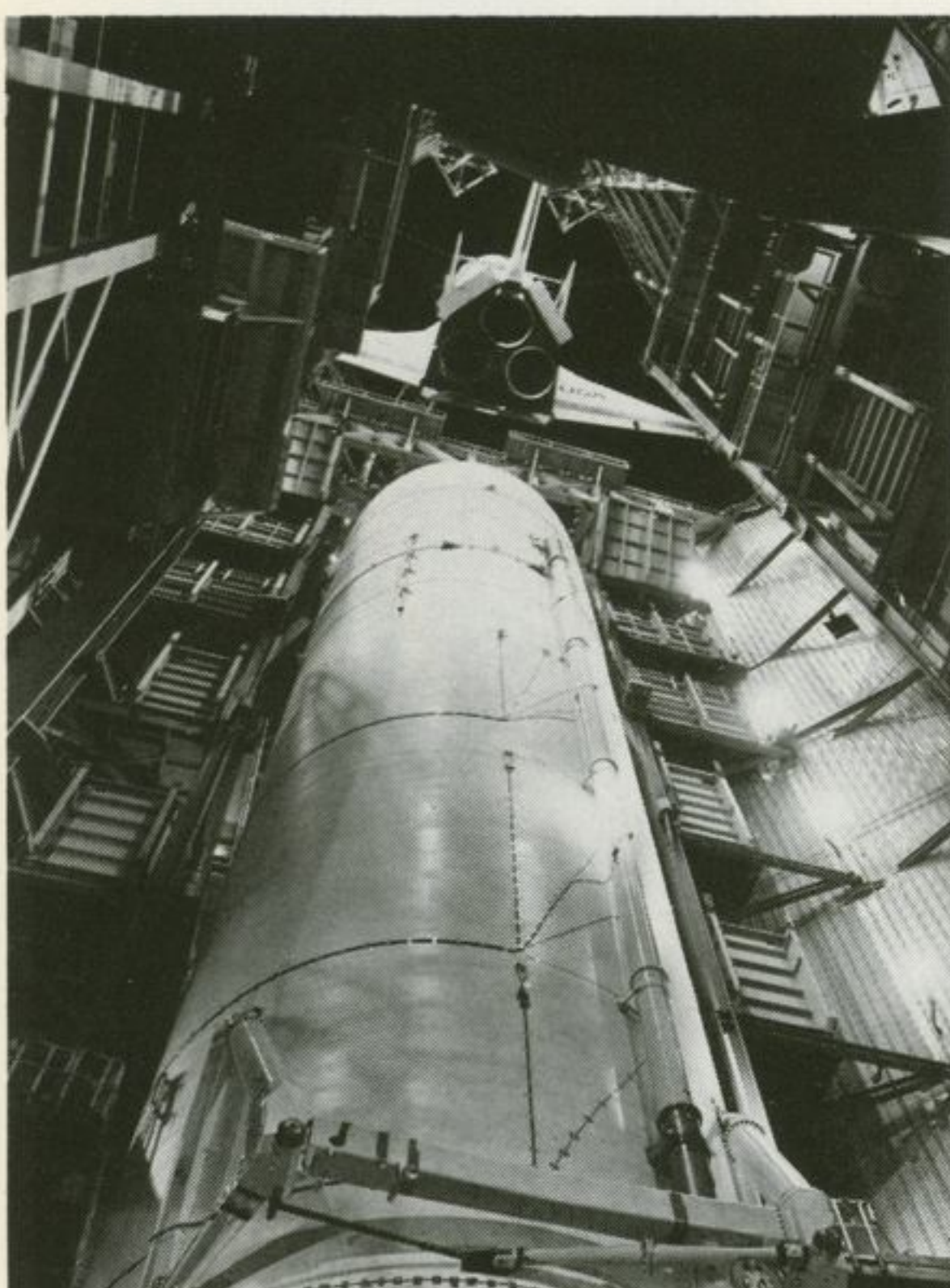
Approximately 75 engineers and technicians from Martin Marietta Michoud operations are in Huntsville conducting the external tank portion of the tests.

### **Michoud Operations wins safety contest**

Michoud operations has received an Award of Honor from the Metropolitan Safety Council of New Orleans. The award recognizes Michoud's exceptional safety record during a recent industrial safety contest sponsored by the Council.



*With the George C. Marshall Space Flight Center as a backdrop, the ground vibration test external tank is hoisted to the 216-foot level of the test stand where it is installed for tests with the orbiter vehicle.*



*The Space Shuttle orbiter is lowered alongside the external tank inside the ground vibration test stand at the NASA George C. Marshall Space Flight Center, Huntsville, Ala. This is in preparation for a series of ground tests with the two vehicles mated in various simulated launch conditions. Later this summer the solid rocket motors will be added to the external tank to complete tests on the entire launch vehicle as it will appear at Cape Canveral when it is launched in mid-1979.*